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Ontario

July 26, 2019

NOTICE TO BUILDING CODE USERS

The enclosed replacement pages to the 2012 Building Code Compendium Edition[1] reflect recent amendments to the Building Code (O. Reg. 332/12), Supplementary Standards and Appendix A which came or come into effect on various dates from March 6, 2018 through January 1, 2022. In particular, the 2012 Building Code Compendium is amended by:

- O. Reg. 79/18 to modify the "applicable law" reference to "Ontario Municipal Board" which was replaced with "Local Planning Appeal Tribunal" effective March 6, 2018.
- O. Reg. 388/18 to address occupancy requirements for buildings in the Lower Don area of Toronto effective July 20, 2018.
- O. Reg. 87/19 to address farm buildings containing hazardous extraction operations for cannabis effective July 1, 2019. These changes are consistent with Fire Code changes made by O. Reg. 33/19.
- O. Reg. 88/19 to harmonize the Building Code with 2015 national construction codes with the following effective dates:
  - May 2, 2019 – removal of technical requirements for electric vehicle charging,
  - January 1, 2020 – broad range of technical changes, and
  - January 1, 2022 – changes related to stairs, guards and handrails.

Changes to the Code are identified on the amendment pages by a unique symbol and a corresponding effective date. These pages should be inserted in your Code now with the exception of pages identified with a date bar at the bottom indicating an effective date of January 1, 2020 or January 1, 2022. These pages should be kept in a secure place until they are required to be inserted.

Publications Ontario is the official publisher and vendor of the 2012 Building Code Compendium and the amendment pages. You may contact Publications Ontario by phone at 416-326-5300, 1-800-668-9938 (toll-free), TTY 1-800-268-7095 or www.publications.gov.on.ca.

For further information, please visit the Building Code website at www.ontario.ca/buildingcode.

[1] The Compendium is not an official copy of the Act and Code. Official copies of the legislation can be accessed from www.e-laws.gov.on.ca.

2012 Building Code Compendium

Volume 1

May 2, 2019 update
(Containing O. Reg. 79/18, O. Reg. 388/18, O. Reg. 87/19 and O. Reg. 88/19)

COMMENCEMENT

Ontario Regulation 332/12 comes into force on the 1st day of January, 2014.

r1 Amending Ontario Regulation 151/13 comes into force on the 1st day of January, 2014.
r2 Amending Ontario Regulation 360/13 comes into force on the 1st day of January, 2014.
r2.1 Amending Ontario Regulation 360/13 comes into force on the 1st day of January, 2015.
r3 Amending Ontario Regulation 361/13 comes into force on the 1st day of January, 2014.
r3.1 Amending Ontario Regulation 361/13 comes into force on the 1st day of January, 2015.
r4 Amending Ontario Regulation 368/13 comes into force on the 1st day of January, 2015.
r5 Amending Ontario Regulation 191/14 comes into force on the 1st day of January, 2015.
r6 Amending Ontario Regulation 139/17 comes into force on the 1st day of July, 2017.
r6.1 Amending Ontario Regulation 139/17 comes into force on the 1st day of January, 2018.
r7 Amending Ontario Regulation 462/17 comes into force on the 1st day of January, 2018.
r8 Amending Ontario Regulation 563/17 comes into force on the 1st day of January, 2018.
r9 Amending Ontario Regulation 79/18 comes into force on the 3rd day of April, 2018.
r10 Amending Ontario Regulation 388/18 comes into force on the 20th day of July, 2018.
r11 Amending Ontario Regulation 88/19 comes into force on the 2nd day of May, 2019.
r11.1 Amending Ontario Regulation 88/19 comes into force on the 1st day of January, 2020.
r11.2 Amending Ontario Regulation 88/19 comes into force on the 1st day of January, 2022.
r12 Amending Ontario Regulation 87/19 comes into force on the 1st day of July, 2019.

m1 Ruling of the Minister of Municipal Affairs and Housing (Minister's Ruling) MR-13-S-24 comes into force on the 1st day of January 2014.
m2 Ruling of the Minister of Municipal Affairs (Minister's Ruling) MR-16-S-25 comes into force on the 7th day of July 2016.
m3 Ruling of the Minister of Municipal Affairs (Minister's Ruling) MR-16-S-26 comes into force on the 7th day of July 2016.
m4 Ruling of the Minister of Municipal Affairs (Minister's Ruling) MR-16-S-27 comes into force on the 1st day of January 2017.
m5 Ruling of the Minister of Municipal Affairs (Minister's Ruling) MR-17-S-28 comes into force on the 1st day of January 2018.

EDITORIAL

e1 Editorial correction issued for January 1st, 2014.
e2 Editorial correction issued for January 1st, 2014.
e2.1 Editorial correction issued for January 1st, 2015.
e3 Editorial correction issued for January 1st, 2015.
e4 Editorial correction issued for July 7th, 2016.
e5 Editorial correction issued for January 1st, 2017.
e6 Editorial correction issued for July 1st, 2017.
e6.1 Editorial correction issued for January 1st, 2018.
e7 Editorial correction issued for January 1st, 2018.
e8 Editorial correction issued for January 1st, 2020.
e8.1 Editorial correction issued for January 1st, 2022.
e9 Editorial correction issued for July 1st, 2019.

COVER PHOTO CREDITS

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ISBN 978-1-4868-0569-3 (set)
ISBN 978-1-4868-0574-7 (vol. 1)
ISBN 978-1-4868-3643-7 (May 2, 2019 update – Print)
ISBN 978-1-4868-3644-4 (May 2, 2019 update – PDF)

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Preface

Introduction

The Building Code is a regulation made under the Building Code Act, 1992. This edition of the Building Code Compendium contains the Supplementary Standards referenced by the Code and additional explanatory material and is prepared for purposes of convenience only. For the authoritative text of the Building Code regulation, see the official volumes. The 2012 Building Code was enacted by Ontario Regulation 332/12, which came into force on January 1, 2014.

The Building Code sets out technical requirements for the construction (including renovation) and demolition of buildings, the change of use of existing buildings where the change would result in an increase in hazard and the maintenance and operation of on-site sewage systems. The technical requirements of the Building Code do not have application to existing buildings other than the maintenance and operation of on-site sewage systems and buildings which undergo a change of use where the change would result in an increase in hazard.

The Code is essentially a set of minimum provisions respecting the safety of buildings with reference to public health, fire protection, accessibility and structural sufficiency. It is not intended to be a textbook on building design, advice on which should be sought from professional sources. Its primary purpose is the promotion of public safety through the application of appropriate uniform building standards.

The 2012 Building Code updated the previous edition of the Building Code, which dated from 2006. Many of the changes introduced into the 2012 Building Code increased the level of harmonization between Ontario's Code and those in other Canadian jurisdictions. As well, the 2012 Building Code is written in an objective-based format which is intended to promote innovation and flexibility in design and construction.

The Building Code and the Model National Construction Codes

The Canadian Commission on Building and Fire Codes (CCBFC), supported by the National Research Council (NRC), released new editions of the model National Building, Plumbing and Fire Codes (mNBC, mNPC and mNFC) in 2010. These Codes have no legal status unless adopted by a province, territory or municipality.

Ontario's 2012 Building Code applies throughout Ontario and is based in large measure on the 2010 mNBC and mNPC. The amendments to the Building Code filed in May 2019 introduce further changes that harmonize with the 2015 mNBC and mNPC. However, differences between the model National Codes and Ontario's Building Code occur. Ontario's 2012 Building Code has Ontario-specific requirements in areas such as energy efficiency, water conservation, renovation of existing buildings, and barrier-free access. Ontario has also moved to consolidate construction requirements from other legislation into the Building Code, including those related to on-site sewage systems, pools, spas, food premises, private sewers and private water supplies.

Objective-Based Code Format

The 2012 Building Code is Ontario's second edition of the Building Code published in an objective-based format. The objective-based format augments specific technical requirements by identifying the underlying objectives and sub-objectives of those requirements (see table below). Each technical requirement that is an acceptable solution in Division B is linked to one or more of the objectives, as well as functional statements, through the Attribution Tables in Supplementary Standard SA-1. Some objectives were developed jointly by the NRC and Canadian provincial/territorial jurisdictions.

OBJECTIVES AND SUB-OBJECTIVES OF THE BUILDING CODE

Objective	Sub-Objective
Safety	Fire Safety
	Structural Safety
	Safety in Use
	Resistance to Unwanted Entry
Health	Indoor Conditions
	Sanitation
	Noise Protection
	Vibration and Deflection Limitation
	Hazardous Substances Containment
	Privacy*
	View to the Outdoors*
Accessibility	Barrier-Free Path of Travel
	Barrier-Free Facilities
Fire, Structural Water and Sewage Protection of Buildings	Fire Protection of the Building
	Structural Sufficiency of the Building
	Protection of Adjacent Buildings from Fire
	Protection of Adjacent Buildings from Structural Damage
	Water and Sewage Protection of Buildings and Facilities
Resource Conservation*	Water and Energy Conservation*
	Infrastructure Capacity*
Environmental Integrity*	Air Quality
	Water and Soil Quality
Conservation of Buildings*	N/A

*Ontario-specific objectives are highlighted in grey.

The objective-based format is intended to assist Building Code users to understand the "why" behind Code requirements, as well as the "what". This new format is more flexible and more responsive to innovation, as it should provide Code users with more information to evaluate construction equivalents and acceptable alternatives to the requirements of the Code.

The objective-based framework establishes a framework for evaluating "alternative solutions" against the performance achieved by the "acceptable solutions" set out in the Code.

Objectives

Every technical requirement that is an acceptable solution in Division B is linked to at least one objective, which explains the objective which the requirement is intended to achieve.

Functional Statements

Functional Statements describe what the design and construction of the building must do to achieve the objectives. At least one functional statement is linked to each technical requirement that is an acceptable solution in Division B.

Structure of the Objective-Based Code

The Building Code is divided into three Divisions, which are further subdivided into Parts.

Division A Compliance, Objectives and Functional Statements

Part 1 Compliance and General

- Organization and application
- Compliance
- Interpretation
- Defined terms, symbols and abbreviations
- List of applicable law for the purposes of obtaining a permit under Sections 8 and 10 of the Act

Part 2 Objectives

Part 3 Functional Statements

Division B Acceptable Solutions

Part 1 General

Part 1 contains the compliance and general requirements of the code, including organization, application, interpretation, terms and abbreviations, and referenced documents and organization.

Part 2 Reserved

Part 2 is reserved to maintain the organization of the acceptable solutions in a manner similar to previous Codes and to accommodate potential future changes in this Code and the model National Building Code (mNBC).

Part 3 Fire Protection, Occupant Safety and Accessibility

Part 3 contains the requirements with respect to health and fire safety, which depend upon the use to which a building is put and its type of occupancy. The first Section contains material relating to occupancy classification and the more occupancy and fire safety within floor areas, exit requirements, requirements for service spaces and health requirements. Section 3.8. contains requirements for those buildings required to be accessible to persons with physical or sensory disabilities. Section 3.11. includes requirements for the design of public pools.

Part 4 Structural Design

Part 4 is made up of four Sections. The first deals with the loads to be used in design calculations and the methods of design to be followed. Section 4.2. regulates foundation design and construction. Section 4.3. deals with design in wood, masonry, concrete, steel, aluminum and glass. Section 4.4. deals with the design of air-supported structures, parking structures and guards over retaining walls. Section 4.3. and parts of Section 4.4. contain performance requirements referring to the design methods outlined in detail in the relevant Canadian Standards.

Part 5 Environmental Separation

Part 5 includes requirements for the design of building elements to control groundwater, condensation and the penetration of wind and rain.

Part 6 Heating, Ventilating and Air-Conditioning

Part 6 provides for the safe functioning of heating, ventilating and air-conditioning equipment installed in a building. The requirements deal mainly with installation standards for design.

Part 7 Plumbing

Part 7 governs the design, construction and installation of plumbing systems within properties. It also addresses the required material to be certified or in compliance with a testing standard.

Part 8 Sewage Systems

Part 8 governs the design, construction, operation and maintenance of various class of sewage systems located within properties. It addresses sewage systems up to 10,000 litres capacity serving one lot. Systems larger than 10,000 litres/day and off-lot (communal) sewage systems are regulated under the Ontario Water Resources Act, with approvals issued by the Ministry of Environment. MOE also regulates waste approvals for the hauling of sewage and land application sites under Part V of the Environmental Protection Act.

Part 9 Housing and Small Buildings

Part 9 provides detailed requirements for the construction of houses and small buildings up to 600 m^2 per floor and 3 storeys in height, and applies to all occupancies except assembly, care or detention and high hazard industrial.

Part 10 Change of Use

Part 10 governs the requirements with respect to a change in major occupancy without any proposed construction to the buildings.

Part 11 Renovation

Part 11 provides for flexibility in meeting life safety requirements when renovating existing buildings, with or without changes in major occupancies of the buildings or parts of the buildings. This flexibility allows, subject to certain conditions, the use of alternate methods of compliance to requirements contained in Parts 3, 4, 6, 8, 9, or 12, for all existing buildings or any major occupancies.

Part 12 Resource Conservation

Part 12 regulates the mandatory and enabling energy efficiency requirements, and insulation in residential and non-residential buildings.

Highlights of Major Changes in 2012 Code

Resource Conservation

This edition of the Building Code promotes resource conservation through building design and construction by:

- Expanding the use of treated rainwater, greywater and non-potable water including permitting storm sewage or greywater to be used as a water supply for flushing of water closets or urinals, subsurface irrigation and priming of traps.
- Permitting treated rainwater to be used as a water supply for clothes washers, laundry trays, mop sinks, bedpan washers, flushing of water closets and urinals, hose bibbs, subsurface irrigation and priming of traps.
- Requiring newly installed water closets in Group C occupancies to be 4.8 L per flush (LPF) or less. Where a 4.1/6.0 LPF dual flush water closet is installed, it is deemed to meet this requirement.
- Requiring newly installed urinals to meet 1.9 litres per flush requirements in all occupancies.
- Requiring high efficiency shower heads (7.6 litres per minute) in residential occupancies.
- Permitting the installation of drainless composting toilets in all areas, including those with municipal services.
- Requiring that large buildings for which building permits are applied, on or after January 1, 2017, meet either:
    - an energy efficiency level that is 13% higher than levels required in 2012 and up until December 31, 2016, or
    - conformance to Division 1 and Division 3 or 5 of MMAH Supplementary Standard SB-10 “Energy Efficiency Requirements”. (These new provisions also address requirements for carbon dioxide equivalents and peak electric demand.)
- Requiring that houses for which building permits are applied, on or after January 1, 2017, meet either:
    - an energy efficiency level that is 15% higher than the level required in 2012 and up until December 31, 2016, or
    - conformance to Chapters 1 and 3 of MMAH Supplementary Standard SB-12 “Energy Efficiency for Housing” that sets out alternate compliance paths for meeting a performance level that is equal to a rating of 80 or more when evaluated in accordance with NRCan, “EnerGuide for New Houses”.
- This edition of the Code also implements other incremental energy-conserving changes including requirements to provide programmable thermostats, and to equip all gas-fired furnaces installed in “Part 9" dwellings with electronically commutated motors.

Fire Safety

- New definitions for ‘fire stop’ and ‘fire block’ are added.
- Permit smoke detectors that sound a localized in-suite alarm to be installed in dwelling units of multi-unit residential buildings.
- Require a smoke alarm in all sleeping rooms within dwelling units.
- Require a hard-wired smoke alarms to have a 7-day battery-back-up power supply to ensure continued protection during extended power outages.
- Require exits signs to use the ISO standard symbol using the green “running man” with an arrow sign. This replaces the traditional exit sign requirements such as “EXIT” and “EXIT/SORTIE” in red lettering on a contrasting background.

Environmental Separation/Building Envelope

Changes include the following:

- Earthquake loads need not be considered in the design of building envelope components for buildings other than post-disaster buildings.
- Require building components to be selected based on exposure and climactic conditions.
- Require seismic effects to be considered in the design for environmental separations in post-disaster buildings.
- Prescriptive requirements for shakes and shingles have been deleted.
- Reference to the AAMA/WDMA/CSA 101/I.S.2/A440, “NAFS - North American Fenestration Standard/Specification for Windows, Doors, and Skylights”. This replaces the previous CAN/CSA-A440.0, “Windows” standard.
- New provisions related to the performance of fenestration have been added.

Harmonization with the Electrical Code

- Certain provisions addressing electrical installations are relocated and harmonized between the Ontario Electrical Safety Code and the Building Code.
- Electrical provisions such as the mounting of electrical meters, location of consumer electrical services and underground installation of consumer electrical services have been deleted from Subsection 9.34.4. of Division B.

Radon Protection

- The annual average concentration of radon 222 within buildings is reduced to 200 Bq/m^3 from 250 Bq/m^3, in accordance with Health Canada Guidelines, in areas where radon is known to exist.

Part 3, Division B - Fire Protection and Occupant Safety

- Relocation of certain provisions to the Building Code from the Fire Code, including those regulating fixed building elements such as ventilation systems, access to egress routes and fire separations.
- Adding new requirements to limit the distance between adjacent unprotected openings on the same face of a building having a limiting distance of less than 2 metres.

Part 4, Division B - Structural Design

Changes to Part 4 include:

- Clarification of load combination requirements.
- Experimental methods for design for the dynamic effects of wind, including modification factors and corresponding system restrictions for Cold-Formed Steel Structures,
- Inelastic deflections in steel roof deck and timber diaphragms,
- Clarification of requirements for ductile connections
- Adding requirements for consideration of slope stability.

Part 6, Division B - Heating, Ventilating and Air-Conditioning

Changes made to Part 6 include:

- Addition of a new Subsection 6.2.13., "Ventilation for Laboratories", to address ventilation in laboratories and to reference NFPA 91, "Exhaust Systems for Air Conveying of Vapors, Gases, Mists and Noncombustible Particulate Solids".
- Limitations on the permitted exposure levels for carbon monoxide and nitrogen dioxide in repair garages.
- Permission to provide battery operated carbon monoxide alarms in buildings not supplied with electrical power.

Code Amendment History

The first Ontario Building Code was issued in 1975. The 1975 and subsequent editions of the Building Code have been issued as follows:

Building Code Edition	Date Filed	Effective Date
O. Reg. 925/75 (1975 Building Code)	November 24, 1975	December 31, 1975
O. Reg. 583/83 (1983 Building Code)	September 15, 1983	November 30, 1983
O. Reg. 419/86 (1986 Building Code)	July 18, 1986	October 20, 1986
O. Reg. 413/90 (1990 Building Code)	July 30, 1990	October 1, 1990
O. Reg. 403/97 (1997 Building Code)	November 3, 1997	April 6, 1998
O. Reg. 350/06 (2006 Building Code)	June 28, 2006	December 31, 2006
O. Reg. 332/12 (2012 Building Code)	November 2, 2012	January 1, 2014

The following Table lists the amendments to the 2012 Building Code made since the filing of O. Reg. 332/12.

Regulatory Amendments to the 2012 Building Code – Ontario Regulation 332/12			
Amendment	Date Filed	Effective Date	Nature of Amendment
O. Reg. 151/13	May 9, 2013	January 1, 2014	Sprinklering of retirement homes
O. Reg. 360/13	December 20, 2013	January 1, 2014	Fees
		January 1, 2015	
O. Reg. 361/13	December 20, 2013	January 1, 2014	Housekeeping changes, fireplace emission limits Revise Supplementary Standard SA-1
		January 1, 2015	EIFS
O. Reg. 368/13	December 27, 2013	January 1, 2015	Accessibility
O. Reg. 191/14	September 23, 2014	January 1, 2015	Midrise wood construction, accessibility, housekeeping changes Revise Supplementary Standards SA-1, SB-1, SB-2, SB-3, SB-12
O. Reg. 139/17	May 17, 2017	July 1, 2017	Retirement homes, 2 unit houses Revise Supplementary Standard SA-1
		January 1, 2018	Electric vehicle charging, pipe sizing, sewage systems Revise Supplementary Standard SA-1
O. Reg. 462/17	December 7, 2017	January 1, 2018	Applicable law
O. Reg. 563/17	December 19, 2017	January 1, 2018	Electric vehicle charging

Regulatory Amendments to the 2012 Building Code – Ontario Regulation 332/12 (Cont'd)			
Amendment	Date Filed	Effective Date	Nature of Amendment
O. Reg. 79/88	March 6, 2018	April 3, 2018	Applicable law
O. Reg. 388/18	July 20, 2018	July 20, 2018	Occupancy requirements - Lower Don Area
O. Reg. 87/19	May 2, 2019	July 1, 2019	Cannabis extraction operation
O. Reg. 88/19	May 2, 2019	May 2, 2019	Electric vehicle charging, leaching chambers
		January 1, 2020	Harmonization with 2015 mNBC and 2015 mNPC changes
		January 1, 2022	Stairs, ramps, handrails and guards

The following Table lists Minister's Rulings that have been made to adopt amendments to codes, formulae, standards, guidelines or procedures referenced in the 2012 Building Code.

Minister's Rulings to adopt amendments to codes, formulae, standards, guidelines or procedures referenced in the 2012 Building Code			
Ruling Number	Date of Ruling	Effective Date	Nature of Amendment
MR-13-S-24	September 1, 2013	January 1, 2014	Revise Table 1.3.1.2. of Division B Revise Supplementary Standards SA-1, SB-5 and SB-12
MR-16-S-25	July 7, 2016	July 7, 2016	Revise Table 1.3.1.2. of Division B Revise Supplementary Standard SB-5
MR-16-S-26	July 7, 2016	July 7, 2016	Revise Table 1.3.1.2. of Division B Revise Supplementary Standard SB-12
MR-16-S-27	December 22, 2016	January 1, 2017	Revise Table 1.3.1.2. of Division B Revise Supplementary Standard SB-10
MR-17-S-28	December 29, 2017	January 1, 2018	Revise Table 1.3.1.2. of Division B Revise Supplementary Standard SA-1

1.1.2.7. Existing Buildings (See Appendix A.)

(1) Except as provided in Section 3.17. of Division B, Section 9.40. of Division B and Part 11 of Division B, if an existing *building* is extended or is subject to material alteration or repair, this Code applies only to the design and *construction* of the extensions and those parts of the *building* that are subject to the material alteration or repair.

(2) If an existing previously occupied *building* is moved from its original location to be installed elsewhere, or is dismantled at its original location and moved to be reconstituted elsewhere, this Code applies only to changes to the design and *construction* of the *building* required as a result of moving the *building*.

1.1.3. Building Size Determination

1.1.3.1. Building Size Determination of Building Divided by Firewalls (See Appendix A.)

(1) Where a *firewall* divides a *building*, each portion of the *building* that is divided shall be considered as a separate *building*, except for the purposes of,
(a) a determination of *gross area* in Section 1.2. of Division C,
(b) a fire alarm and detection system in Sentence 3.2.4.2.(1) of Division B or Article 9.10.18.1. of Division B, and
(c) a *plumbing system* interconnected through a *firewall*.

1.1.3.2. Building Size Determination of Building Divided by Vertical Fire Separations

(1) Except as permitted in Sentence (2), if portions of a *building* are completely separated by a vertical *fire separation* that has a *fire-resistance rating* of at least 1 h and that extends through all *storeys* and *service spaces* of the separate portions, each separated portion may be considered to be a separate *building* for the purpose of determining *building height* if,
r6 (a) each separated portion is not more than three *storeys* in *building height* and is used only for *residential occupancies* other than a *retirement home*, and
(b) the unobstructed path of travel for a firefighter from the nearest *street* to one entrance to each separated portion is not more than 45 m.

(2) The vertical *fire separation* in Sentence (1) may terminate at the floor assembly immediately above a *basement* if the *basement* conforms to Article 3.2.1.2. of Division B.

Section 1.2. Compliance

1.2.1. Compliance With Division B

1.2.1.1. Compliance With Division B

(1) Compliance with Division B shall be achieved,
(a) by complying with the applicable *acceptable solutions* in Division B, or (See Appendix A.)
(b) by using *alternative solutions* that will achieve the level of performance required by the applicable *acceptable solutions* in respect of the *objectives* and *functional statements* attributed to the applicable *acceptable solutions* in MMAH Supplementary Standard SA-1, "Objectives and Functional Statements Attributed to the Acceptable Solutions". (See Appendix A.)

(2) For the purposes of Clause (1)(b), the level of performance in respect of a *functional statement* refers to the performance of the *functional statement* as it relates to the *objective* with which it is associated in MMAH Supplementary Standard SA-1, "Objectives and Functional Statements Attributed to the Acceptable Solutions".

1.2.2. Materials, Appliances, Systems and Equipment

1.2.2.1. Characteristics of Materials, Appliances, Systems and Equipment

(1) All materials, *appliances*, systems and equipment installed to meet the requirements of this Code shall possess the necessary characteristics to perform their intended functions when installed in a *building*.

1.2.2.2. Used Materials, Appliances and Equipment

(1) Unless otherwise specified, recycled materials in *building* products may be used and used materials, *appliances* and equipment may be reused when they meet the requirements of this Code for new materials and are satisfactory for their intended use.

Section 1.3. Interpretation

1.3.1. Interpretation

1.3.1.1. Designated Structures

(1) The following structures are designated for the purposes of clause (d) of the definition of *building* in subsection 1(1) of the Act:

(a) a retaining wall exceeding 1 000 mm in exposed height adjacent to,
  (i) public property,
  (ii) access to a *building*, or
  (iii) private property to which the public is admitted,
(b) a pedestrian bridge appurtenant to a *building*,
(c) a crane runway,
(d) an exterior storage tank and its supporting structure that is not regulated by the *Technical Standards and Safety Act, 2000*,
(e) signs regulated by Section 3.15. of Division B that are not structurally supported by a *building*,
(f) a solar collector that is mounted on a *building* and has a face area equal to or greater than 5 m^2,
(g) a structure that supports a wind turbine generator having a rated output of more than 3 kW,
(h) a dish antenna that is mounted on a *building* and has a face area equal to or greater than 5 m^2,
(i) an *outdoor pool*,
(j) an outdoor *public spa*, and
(k) a *permanent solid nutrient storage facility* with supporting walls exceeding 1 000 mm in exposed height.

1.3.1.2. Farm Buildings

r12 **(1)** Except as provided in Sentences (2) to (7), *farm buildings* shall conform to the requirements in the CCBFC NRCC 38732, "National Farm Building Code of Canada".

(2) Articles 1.1.1.2. and 3.1.8.1. and Subsections 3.1.4. and 4.1.4. in the CCBFC NRCC 38732, "National Farm Building Code of Canada" do not apply to *farm buildings*.

(3) In the CCBFC NRCC 38732, "National Farm Building Code of Canada", references in Articles 1.1.1.3., 2.2.2.1., 2.2.2.2., 2.3.1.1., 2.3.2.1., 3.1.1.1., 3.1.1.2., 3.1.2.1. and 3.1.6.1. to the CCBFC NRCC 38726, "National Building Code of Canada", are deemed to be references to Ontario Regulation 403/97 (Building Code), as it read on December 30, 2006.

(4) A *farm building* of *low human occupancy* having a *building area* not exceeding 600 m^2 and not more than three *storeys* in *building height* is deemed to comply with the structural requirements of the CCBFC NRCC 38732, "National

Farm Building Code of Canada" if it is designed and constructed in conformance with MMAH Supplementary Standard SB-11, "Construction of Farm Buildings".

(5) A *liquid manure* storage tank shall comply with the requirements of Part 4 of Division B of this Code and the requirements of Part 4 of the CCBFC NRCC 38732, "National Farm Building Code of Canada".

(6) A *permanent solid nutrient storage facility* shall comply with the requirements of Part 4 of Division B of this Code.

r12 **(7)** Where a *floor area* or portion of a *floor area* within a *farm building* is intended to contain a *hazardous extraction* operation involving cannabis, the *floor area* or portion of the *floor area* shall be designed and constructed to comply with,

(a) the requirements for locking, latching and other fastening devices for doors set out in Article 2.7.2.2. of Division B of the Fire Code made under the *Fire Protection and Prevention Act, 1997*,

(b) the ventilation requirements set out in Articles 4.1.7.2. to 4.1.7.6. of Division B of the Fire Code, where the *hazardous extraction* operation is intended to involve the use of *flammable liquids* or *combustible liquids*, and

(c) the ventilation requirements set out in Clauses 5.1.4.2.(1)(a) to (d) and (g) of Division B of the Fire Code, where the *hazardous extraction* operation is intended to involve the use of flammable gases.

Section 1.4. Terms and Abbreviations

1.4.1. Definitions of Words and Phrases

1.4.1.1. Non-defined Terms

(1) Definitions of words and phrases used in this Code that are not included in the list of definitions in Articles 1.4.1.2., 1.4.1.3. and 1.4.1.4. and are not defined in another provision of this Code shall have the meanings that are commonly assigned to them in the context in which they are used, taking into account the specialized use of terms by the various trades and professions to which the terminology applies.

1.4.1.2. Defined Terms

(1) Each of the words and terms in italics in this Code has,

(a) the same meaning as in subsection 1(1) of the Act, if not defined in Clause (b) or (c),

(b) the same meaning as in each of the following provisions for the purposes described in the provision:

(i) Sentences 1.4.1.3.(1) and (2) of Division A, and

(ii) Sentences 3.13.1.2.(1), 7.1.3.1.(1), 8.1.1.2.(1) and 11.1.1.2.(1) of Division B, or

(c) the following meaning for the purposes of this Code:

r6.1 *Absorption trench* means an excavation in *soil*, as defined in Part 8 of Division B, or in *leaching bed fill*, being part of a *leaching bed*, in which a *distribution pipe* or *leaching chamber* is laid that allows infiltration of the *effluent* into the *soil*, as defined in Part 8 of Division B, or *leaching bed fill*.

Acceptable solution means a requirement stated in Parts 3 to 12 of Division B.

Accessible means, when applied to a *fixture*, connection, *plumbing appliance*, valve, *cleanout* or equipment, to be accessible with or without having to first remove an access panel, door or similar obstruction, but a *fixture*, connection, *plumbing appliance*, valve, *cleanout* or equipment is not accessible if access can be gained only by cutting or breaking materials.

Access to exit means that part of a *means of egress* within a *floor area* that provides access to an *exit* serving the *floor area*.

r4 *Adaptable seating* means a fixed seat or seats designed to facilitate a side transfer from a wheelchair. (See Appendix A.)

Additional circuit vent means a *vent pipe* that is installed between a *circuit vent* and a *relief vent* to provide additional air circulation.

Adfreezing means the adhesion of *soil* to a *foundation unit* resulting from the freezing of *soil* water.

Air admittance valve means a one-way valve designed to allow air to enter the *drainage system* when the pressure in the *plumbing system* is less than the atmospheric pressure.

Air barrier system means an assembly installed to provide a continuous barrier to the movement of air.

Air break means the unobstructed vertical distance between the lowest point of an *indirectly connected waste pipe* and the *flood level rim* of the *fixture* into which it discharges.

Air-conditioning is the process of treating air in a space to control simultaneously its temperature, humidity, cleanliness, and distribution to meet the comfort requirements of the occupants of the space.

Air gap means the unobstructed vertical distance through air between the lowest point of a water supply outlet and the *flood level rim* of the *fixture* or device into which the outlet discharges.

Air-supported structure means a structure consisting of a pliable membrane that achieves and maintains its shape and support by internal air pressure.

Alarm signal means an audible signal transmitted throughout one or more zones of a *building* or throughout a *building* to advise occupants that a fire emergency exists.

Alert signal means an audible signal to advise designated persons of a fire emergency.

Allowable bearing pressure means the maximum pressure that may be safely applied to a *soil* or *rock* by the *foundation unit* considered in design under expected loading and subsurface conditions.

Allowable load means the maximum load that may be safely applied to a *foundation unit* considered in design under expected loading and subsurface conditions.

Alternative solution means a substitute for an *acceptable solution*.

Appliance means a device to convert fuel into energy and includes all components, controls, wiring and piping required to be part of the device by the applicable standard referred to in this Code.

Architect means the holder of a licence, a certificate of practice or a temporary licence under the *Architects Act*.

Area affected by a significant drinking water threat means an area described in Clause 1.10.2.3.(2)(b) of Division C.

Artesian groundwater means a confined body of water under pressure in the ground.

As constructed plans means *construction* plans and specifications that show the *building* and the location of the *building* on the property as the *building* has been constructed.

Assembly occupancy means the *occupancy* or the use of a *building* or part of a *building* by a gathering of persons for civic, political, travel, religious, social, educational, recreational or similar purposes or for the consumption of food or drink.

Attic or roof space means the space between the roof and the ceiling of the top *storey* or between a dwarf wall and a sloping roof.

Auxiliary water supply means, when applied to premises, any water supply on or available to the premises other than the primary *potable* water supply for the premises.

Backflow means a flowing back or reversal of the normal direction of the flow.

Backflow preventer means a device or a method that prevents *backflow* in a *water distribution system*.

Back-siphonage means *backflow* caused by a negative pressure in the supply system.

Back-siphonage preventer means a device or a method that prevents *back-siphonage* in a *water distribution system*.

Back vent means a pipe that is installed to vent a *trap* off the horizontal section of a *fixture* drain or the *vertical leg* of a water closet or other *fixture* that has an integral siphonic flushing action and "*back vented*" has a corresponding meaning.

Backwater valve means a *check valve* designed for use in a gravity *drainage system*.

Barrier-free means, when applied to a *building* and its facilities, that the *building* and its facilities can be approached, entered and used by persons with physical or sensory disabilities.

Basement means one or more *storeys* of a *building* located below the *first storey*.

Closure means a device or assembly for closing an opening through a *fire separation* or an exterior wall, such as a door, a shutter, wired glass and glass block, and includes all components such as hardware, closing devices, frames and anchors.

Combustible means that a material fails to meet the acceptance criteria of CAN/ULC-S114, "Test for Determination of Non-Combustibility in Building Materials".

Combustible construction means a type of construction that does not meet the requirements for *noncombustible construction*.

Combustible fibres means finely divided combustible vegetable or animal fibres and thin sheets or flakes of such materials which, in a loose, unbaled condition, present a flash fire hazard, and includes cotton, wool, hemp, sisal, jute, kapok, paper and cloth.

Combustible liquid means any liquid having a *flash point* at or above 37.8°C and below 93.3°C.

Compliance alternative means a substitute for a requirement in another Part of Division B that is listed in Part 10 or 11 of Division B, and "*C.A.*" has a corresponding meaning.

Compressed gas means,

(a) any contained mixture or material having a vapour pressure exceeding one or both of the following,
  (i) 275.8 kPa (absolute) at 21°C, or
  (ii) 717 kPa (absolute) at 54°C, or
(b) any liquid having a vapour pressure exceeding 275.8 kPa (absolute) at 37.8°C.

Computer room means a room,

(a) that contains electronic computer or data processing equipment such as main frame type,
(b) that is separated from the remainder of the *building* for the purpose of controlling the air quality in the room by a self-contained climate control system, and
(c) that has an *occupant load* of not more than one person for each 40 m^2 of the room.

Conditioned space means space within a *building* in which the temperature is controlled to limit variation in response to the exterior ambient temperature or interior differential temperatures by the provision, either directly or indirectly, of heating or cooling over substantial portions of the year.

Construction index means a level on a scale of 1 to 8 determined in accordance with Table 11.2.1.1.A. of Division B designating the expected *performance level* of the *building* structure with respect to the type of *construction* and fire protection of an existing *building*, and "*C.I.*" has a corresponding meaning.

Contained use area means a supervised area containing one or more rooms in which occupant movement is restricted to a single room by security measures not under the control of the occupant.

r5 *Continuous vent* means a *vent pipe* that is an extension of a vertical section of a *branch* or *fixture drain*.

Cooktop means a cooking surface having one or more burners or heating elements.

Critical level means the level of submergence at which a *back-siphonage preventer* ceases to prevent *back-siphonage*.

Dangerous goods means those products or substances that are regulated by the *Transportation of Dangerous Goods Regulations* made under the *Transportation of Dangerous Goods Act, 1992* (Canada).

Day camp means a camp or resort that admits persons for a continuous period not exceeding 24 hours.

Dead end means a pipe that terminates with a closed fitting.

Dead load means the weight of all permanent structural and nonstructural components of a *building*.

Deep foundation means a *foundation unit* that provides support for a *building* by transferring loads either by end-bearing to a *soil* or *rock* at considerable depth below the *building* or by adhesion or friction, or both, in the *soil* or *rock* in which it is placed. *Piles* are the most common type of *deep foundation*.

Design activities means the activities described in subsection 15.11(5) of the Act.

Design bearing pressure means the pressure applied by a *foundation unit* to *soil* or *rock*, which pressure is not greater than the *allowable bearing pressure*.

Design capacity means, in the definition of *sewage system*, the total daily design *sanitary sewage* flow determined in accordance with Article 8.2.1.3. of Division B.

Designer means the person responsible for the design.

Design load means the load applied to a *foundation unit*, which load is not greater than the *allowable load*.

Detention occupancy (Group B, Division 1) means an *occupancy* in which persons are under restraint or are incapable of self preservation because of security measures not under their control.

Developed length means, when applied to a pipe and fittings, the length along the centre line of the pipe and fittings.

Directly connected means physically connected in such a way that neither water nor gas can escape from the connection.

Distilled beverage alcohol means a beverage that is produced by fermentation and contains more than 20% by volume of water-miscible alcohol.

Distillery means a *process plant* where *distilled beverage alcohols* are produced, concentrated or otherwise processed, and includes facilities on the same site where the concentrated products may be blended, mixed, stored or packaged.

Distributing pipe means a pipe or piping in a *water distribution system*.

r6.1 *Distribution box* means a device for ensuring that *effluent* from a *treatment unit* is distributed in equal amounts to each line of *distribution pipe* or *leaching chamber* in a *leaching bed*.

Distribution pipe means a line or lines of perforated or open jointed pipe or tile installed in a *leaching bed* for the purpose of distributing *effluent* from a *treatment unit* to the *soil*, as defined in Part 8 of Division B, or *leaching bed fill* in the *leaching bed*.

Diving board means a flexible board.

Diving platform means a rigid platform that is not a *starting platform*.

Drainage system means an assembly of pipes, fittings, *fixtures* and appurtenances on a property that is used to convey *sewage* and *clear water waste* to a main sewer or a *private sewage disposal system*, and includes a *private sewer*, but does not include *subsoil drainage piping*.

Drinking water system has the same meaning as in subsection 2(1) of the *Safe Drinking Water Act, 2002*.

Drum trap means a *trap* whose inlet and outlet are in the sides of the cylindrical body of the *trap*.

Dual vent means a *vent pipe* that serves two *fixtures* and connects at the junction of the *trap arms*.

Dwelling unit means a *suite* operated as a housekeeping unit, used or intended to be used by one or more persons and usually containing cooking, eating, living, sleeping and sanitary facilities.

Earth pit privy means a latrine consisting of an excavation in the ground surmounted by a superstructure.

Effluent means *sanitary sewage* that has passed through a *treatment unit*.

Electric space heating means an electric energy source that provides more than 10 per cent of the heating capacity provided for a *building* and includes,

(a) electric resistance unitary baseboard heating,
(b) electric resistance unitary cabinet heating,
(c) electric resistance ceiling cable or floor cable heating,
(d) electric resistance central furnace heating,
(e) electric hot water space heating, and
(f) air source heat pumps in combination with electric resistance backup heating.

Excavation means the space created by the removal of *soil*, *rock* or *fill* for the purposes of construction.

Exhaust duct means a duct through which air is conveyed from a room or space to the outdoors.

Exit means that part of a *means of egress*, including doorways, that leads from the *floor area* it serves to a separate *building*, an open public thoroughfare or an exterior open space protected from fire exposure from the *building* and having access to an open public thoroughfare. (See Appendix A.)

(e) premises where a licensed activity, as defined in the *Food Safety and Quality Act, 2001*, is carried on by a person who is required to hold a licence issued under that Act,
(f) an egg-grading station or an egg-processing station, as defined in subsection 1(1) of Ontario Regulation 171/10 (Eggs and Processed Egg), made under the *Food Safety and Quality Act, 2001*,
(g) a *floor area* occupied by a church, service club or fraternal organization for the purpose of,
  (i) preparing meals for special events for its members and personally invited guests, or
  (ii) conducting bake sales, or
(h) a *farm building*.

Forced-air furnace means a *furnace* equipped with a fan that provides the primary means for the circulation of air.

Force main means a *sanitary drainage pipe* through which *sanitary sewage* is conveyed by mechanical or pneumatic propulsion.

Foundation means a system or arrangement of *foundation units* through which the loads from a *building* are transferred to supporting *soil* or *rock*.

Foundation unit means one of the structural members of the *foundation* of a *building*, such as a footing, raft and *pile*.

Fresh air inlet means a *vent pipe* that is installed in conjunction with a *building trap* and terminates in *open air*.

Frost action means the phenomenon that occurs when,
(a) water in *soil* is subjected to freezing which, because of the water ice phase change or ice lens growth, results in a total volume increase or the build-up of expansive forces under confined conditions or both, and
(b) the subsequent thawing leads to loss of *soil* strength and increased compressibility.

Functional statement means a function set out in Table 3.2.1.1. that a *building* or an element of a *building* is intended to perform.

Furnace means a *space-heating appliance* that uses warm air as the heating medium and usually provides for the attachment of ducts.

Gaming premises means premises that are a gaming site as defined in the *Ontario Lottery and Gaming Corporation Act, 1999*.

Gas vent means that portion of a venting system designed to convey vent gases to the outdoors,
(a) from the *vent connector* of a gas-fired *appliance*, or
(b) directly from the *appliance* when a *vent connector* is not used.

Grade means the average level of proposed or finished ground adjoining a *building* at all exterior walls.

Graded lumber means lumber that has been graded and stamped to indicate its grade, as determined by the NLGA, "Standard Grading Rules for Canadian Lumber".

Greywater means *sanitary sewage* of domestic origin that is derived from *fixtures* other than *sanitary units*.

Gross area means the total area of all floors above *grade* measured between the outside surfaces of exterior walls or between the outside surfaces of exterior walls and the centre line of *firewalls*, except that, in any *occupancy* other than a *residential occupancy*, where an access or a *building* service penetrates a *firewall*, measurements shall not be taken to the centre line of such *firewall*.

Ground water means, when applied to a *sewage system*, water below the surface of the ground that occupies a zone of the earth's mantle that is saturated with water.

Ground water table means, when applied to a *sewage system*, the elevation of the upper surface of the *ground water* existing in the area of the *sewage system*.

Groundwater means a free standing body of water in the ground.

Groundwater level means the top surface of *groundwater*.

Guard means a protective barrier, with or without openings through it, that is around openings in floors or at the open sides of stairs, landings, balconies, *mezzanines*, galleries, raised *walkways* or other locations to prevent accidental falls from one level to another.

Hauled sewage means *sanitary sewage* that,
(a) is not finally disposed of at the site where it is produced and is not conveyed by a sewer to *sewage works*, and

(b) is stored or retained at the site where it is produced for periodic collection, handling, treatment, transportation, storage or processing prior to final disposal at a place other than where it was produced,

and includes *sanitary sewage* that is removed from a *sewage system* for the purpose of cleaning or maintaining the system.

Hauled sewage system means works, installations, equipment, operations and land used in connection with the collection, handling, treatment, transportation, storage, processing and disposal of *hauled sewage*, as regulated under the *Environmental Protection Act*.

Hazard index means a level on a scale of 1 to 8 determined in accordance with Tables 11.2.1.1.B. to 11.2.1.1.N. of Division B, designating the life safety hazard to occupants of a *building* based on,

(a) use and *occupancy*,
(b) *occupant load*,
(c) the use and function of floor spaces,
(d) the difficulty of egress,
(e) the fire load of contents, finishes and furnishings,
(f) the configuration or compartmentation of floor spaces, and
(g) the size of the *building*,

and "*H.I.*" has a corresponding meaning.

Hazardous classroom means a classroom,

(a) that is supplied with flammable gas,
(b) that contains hazardous substances such as chemicals or explosive dusts,
(c) that contains large quantities of *combustible* materials, or
(d) where cooking equipment is used.

r12 *Hazardous extraction* means a process to remove or separate a substance from a solution or mixture that involves the use of *flammable liquids*, *combustible liquids* or flammable gases as solvents in the process.

Hazardous room means a room containing sufficient quantities of a substance that, because of its chemical nature, may create an atmosphere or condition of imminent hazard to health.

Header means a *vent pipe* that connects two or more *vent stacks* or *stack vents* to *open air*.

Header line means a line of pipe with watertight joints installed in a *sewage system* for the purpose of distributing *effluent* from a *treatment unit* to the *distribution pipe* in a *leaching bed*.

Heat detector means a *fire detector* designed to operate at a predetermined temperature or rate of temperature rise.

Heavy timber construction means that type of *combustible construction* in which a degree of fire safety is attained,

(a) by placing limitations on the sizes of wood structural members and on the thickness and composition of wood floors and roofs, and
(b) by the avoidance of concealed spaces under floors and roofs.

Heritage building means a *building*,

(a) that is designated under the *Ontario Heritage Act*, or
(b) that is certified to be of significant architectural or historical value by a recognized, non-profit public organization whose primary object is the preservation of structures of architectural or historical significance and the certification has been accepted by the *chief building official*.

(See Appendix A.)

High ground water table means the highest elevation at which there is physical evidence that the *soil*, as defined in Part 8 of Division B, or the *leaching bed fill* has been saturated with water.

High hazard industrial occupancy (Group F, Division 1) means an *industrial occupancy* containing sufficient quantities of highly *combustible* and flammable or explosive materials to constitute a special fire hazard because of their inherent characteristics.

Holding tank means a tank designed to totally retain all *sanitary sewage* discharged into it and requiring periodic emptying.

Home for special care means a home for the care of persons requiring nursing, residential or sheltered care.

Surface water means water on the surface of the ground.

Tarion Warranty Corporation means Tarion Warranty Corporation as designated under section 2 of the *Ontario New Home Warranties Plan Act*.

Theatre means a place of public assembly intended for the production and viewing of the performing arts or the screening and viewing of motion pictures, and consisting of an auditorium with permanently fixed seats intended solely for a viewing audience.

Trap means a fitting or device that is designed to hold a liquid seal that will prevent the passage of gas but will not materially affect the flow of a liquid.

Trap arm means that portion of a *fixture drain* between the *trap weir* and the *vent pipe* fitting.

Trap dip means the lowest part of the upper interior surface of a *trap*.

Trap seal depth means the vertical distance between the *trap dip* and the *trap weir*.

Trap standard means the *trap* for a *fixture* that is integral with the support for the *fixture*.

Trap weir means the highest part of the lower interior surface of a *trap*.

Treatment unit means a device that, when designed, installed and operated in accordance with its design specifications, provides a specific degree of *sanitary sewage* treatment to reduce the contaminant load from that of *sanitary sewage* to a given *effluent* quality.

Tribunal means the Licence Appeal Tribunal established under the *Licence Appeal Tribunal Act*, *1999*.

r6.1 *Type A dispersal bed* means a *leaching bed* that receives *effluent* from a Level IV *treatment unit* as described in Table 8.6.2.2. of Division B and that is comprised of a stone layer or *leaching chambers* installed over an unsaturated sand layer as described in Subsection 8.7.7. of Division B.

Type B dispersal bed means a *leaching bed* comprised of a *pressurized distribution system* that uniformly distributes *effluent* from a Level IV *treatment unit* as described in Table 8.6.2.2. of Division B to the underlying *soil*, as defined in Part 8 of Division B, through a set of *distribution pipes* installed in a bed comprised of septic stone.

Unit heater means a suspended *space heater* with an integral air circulating fan.

Unprotected opening means, when applied to an *exposing building face,*

(a) a doorway, window or opening, other than one equipped with a closure having the required *fire-protection rating*, or

(b) any part of a wall forming part of the *exposing building face* that has a *fire-resistance rating* less than required for the *exposing building face*.

Unstable liquid means a liquid, including *flammable liquids* and *combustible liquids*, that is chemically reactive to the extent that it will vigorously react or decompose at or near normal temperature and pressure conditions or that is chemically unstable when subjected to impact.

Vacuum breaker means *back-siphonage preventer*.

Vapour barrier means the elements installed to control the diffusion of water vapour.

Vent connector means, when applied to a heating or cooling system, the part of a venting system that conducts the *flue* gases or vent gases from the *flue collar* of a gas *appliance* to the *chimney* or *gas vent*, and may include a draft control device.

Vent pipe means a pipe that is part of a *venting system*.

Vent stack means a *vent pipe* that is connected at its upper end to a *header* or is terminated in *open air* and that is used to limit pressure differential in a *soil* or *waste stack*.

Venting system means an assembly of pipes and fittings that connects a *drainage system* with *open air* for circulation of air and the protection of *trap* seals in the *drainage system*.

Vertical leg means the vertical portion of a *fixture* drain and includes the portion of a drain from the outlet of a water closet bowl to the point where the connecting piping changes to horizontal.

Vertical service space means a shaft that is oriented essentially vertically and that is provided in a *building* to facilitate the installation of *building* services, including mechanical, electrical and plumbing installations and facilities such as elevators, refuse chutes and linen chutes.

Vulnerable area has the same meaning as in subsection 2(1) of the *Clean Water Act, 2006*.

Walkway means a covered or roofed pedestrian thoroughfare used to connect two or more *buildings*.

Waste pipe means a *sanitary drainage pipe* that carries the discharge from a *fixture* directly to a *waste stack*, *soil stack*, *sanitary building drain*, *branch* or *sewage system*.

Waste stack means a vertical *waste pipe* that passes through one or more *storeys* and includes any offset that is part of the stack that conducts liquid waste from *fixtures* other than *sanitary units*.

Water distribution system means an assembly of pipes, fittings, valves and appurtenances that conveys *potable water* to water supply outlets, *fixtures*, *plumbing appliances* and devices from the *water service pipe* or from a *point of entry treatment unit* located in the *building*.

Water purveyor means the owner or operator of a *drinking water system*.

Water service pipe means a pipe on the property that conveys *potable* water from a *drinking water system* or a *private water supply* to the inside of the *building*.

Water system means a *water service pipe*, a *private water supply*, a *water distribution system*, a *fire service main* or any part of any of them.

Wave action pool means a *public pool* equipped with a means for inducing wave motion in the water.

Wet vent means a *waste pipe* that also serves as a *vent pipe*.

Working capacity means the volume of liquid that a *treatment unit* or *holding tank* is capable of holding without overflowing while it is in its working position, but does not include the volume of liquid contained in a compartment in which a pump or siphon is installed.

X-ray equipment includes x-ray imaging systems, processing equipment and equipment directly related to the production of images for diagnosis or directly related to irradiation with x-rays for therapy.

X-ray machine means an electrically-powered device producing x-rays,
(a) for the irradiation of a human being or an animal for a therapeutic or diagnostic purpose, or
(b) for industrial use.

Yoke vent means a *vent pipe* that is connected at its lower end to a *soil* or *waste stack* and at its upper end to a *vent stack* or a *branch vent* that is connected to a *vent stack*.

1.4.1.3. Definition of Applicable Law (See Appendix A.)

(1) For the purposes of clause 8(2)(a) of the Act, *applicable law* means,
(a) the statutory requirements in the following provisions with respect to the following matters:
r6 (0.i) section 14 of Ontario Regulation 137/15 (General) made under the *Child Care and Early Years Act, 2014* with respect to the approval of plans for a new *building* to be erected or an existing *building* to be used, altered or renovated for use as a *child care centre* or for alterations or renovations to be made to premises used by a *child care centre*,
r9 (i) section 114 of the *City of Toronto Act, 2006* with respect to the approval by the City of Toronto or the Local Planning Appeal Tribunal of plans and drawings,
(ii) section 59 of the *Clean Water Act, 2006* with respect to the issuance of a notice by the risk management official for the *construction* of a *building*,
r6 (iii) reserved,
(iv) section 194 of the *Education Act* with respect to the approval of the Minister for the *demolition* of a *building*,
r11 (v) reserved,
(vi) section 5 of the *Environmental Assessment Act* with respect to the approval of the Minister or the Environmental Review Tribunal to proceed with an undertaking,

(vii) section 46 of the *Environmental Protection Act* with respect to the approval of the Minister to use land or land covered by water that has been used for the disposal of waste,

(viii) section 47.3 of the *Environmental Protection Act* with respect to the issuance of a renewable energy approval,

(ix) section 168.3.1 of the *Environmental Protection Act* with respect to the *construction* of a *building* to be used in connection with a change of use of a property,

(x) paragraph 2 of subsection 168.6(1) of the *Environmental Protection Act* if a certificate of property use has been issued in respect of the property under subsection 168.6(1) of that Act,

(xi) section 14 of the *Milk Act* with respect to the permit from the Director for the *construction* or alteration of any *building* intended for use as a plant,

(xii) section 11.1 of Ontario Regulation 267/03 (General), made under the *Nutrient Management Act*, *2002*, with respect to a proposed *building* or structure to house farm animals or store nutrients if that Regulation requires the preparation and approval of a nutrient management strategy before *construction* of the proposed *building* or structure,

(xiii) subsection 30(2) of the *Ontario Heritage Act* with respect to a consent of the council of a *municipality* to the alteration or *demolition* of a *building* where the council of the *municipality* has given a notice of intent to designate the *building* under subsection 29(3) of that Act,

(xiv) section 33 of the *Ontario Heritage Act* with respect to the consent of the council of a *municipality* for the alteration of property,

(xv) section 34 of the *Ontario Heritage Act* with respect to the consent of the council of a *municipality* for the *demolition* of a *building*,

(xvi) section 34.5 of the *Ontario Heritage Act* with respect to the consent of the Minister to the alteration or *demolition* of a designated *building*,

(xvii) subsection 34.7(2) of the *Ontario Heritage Act* with respect to a consent of the Minister to the alteration or *demolition* of a *building* where the Minister has given a notice of intent to designate the *building* under section 34.6 of that Act,

(xviii) section 42 of the *Ontario Heritage Act* with respect to the permit given by the council of a *municipality* for the erection, alteration or *demolition* of a *building*,

r7 (xviii.1) section 17.4 of the *Ontario New Home Warranties Plan Act* with respect to the provision of a confirmation by the Registrar for the *construction* of a residential condominium conversion project,

(xix) section 14 of the *Ontario Planning and Development Act*, *1994* with respect to any conflict between a development plan made under that Act and a zoning by-law that affects the proposed *building* or structure,

r9 (xx) section 41 of the *Planning Act* with respect to the approval by the council of the *municipality* or the Local Planning Appeal Tribunal of plans and drawings,

(xxi) section 42 of the *Planning Act* with respect to the payment of money or making arrangements satisfactory to the council of a *municipality* for the payment of money, where the payment is required under subsection 42(6) of that Act,

r3 (xxii) section 2 of Ontario Regulation 239/13 (Activities on Public Lands and Shore Lands — Work Permits and Exemptions), made under the *Public Lands Act*, with respect to the work permit authorizing the *construction* or placement of a *building* on public land,

r3 (xxii.1) section 5 of Ontario Regulation 239/13 with respect to the exemption from the requirement to obtain a work permit authorizing the *construction* or placement of a *building* within an unpatented mining claim,

(xxiii) section 34 or 38 of the *Public Transportation and Highway Improvement Act* with respect to the permit from the Minister for the placement, erection or alteration of any *building* or other structure or the use of land,

(b) the following provisions of Acts and regulations:

(i) subsection 102(3) of the *City of Toronto Act, 2006*,

(ii) sections 28 and 53 of the *Development Charges Act*, *1997*,

(iii) sections 257.83 and 257.93 of the *Education Act*,

(iv) subsection 5(4) of the *Environmental Assessment Act*,

(v) subsection 133(4) of the *Municipal Act*, *2001*,

(vi) subsection 24(3) of the *Niagara Escarpment Planning and Development Act*,

(vii) subsection 27(3) of the *Ontario Heritage Act*,

(viii) section 33 of the *Planning Act* except where, in the case of the *demolition* of a residential property, a permit to *demolish* the property is obtained under that section,

(ix) section 46 of the *Planning Act*,

r6 (b.1) by-laws made by a *municipality* under an agreement entered into under section 5.81 of the *Aeronautics Act* (Canada),

(c) regulations made by a conservation authority under clause 28(1)(c) of the *Conservation Authorities Act* with respect to permission of the authority for the *construction* of a *building* or structure if, in the opinion of the authority, the control of flooding, erosion, dynamic beaches or pollution or the conservation of land may be affected by the development,

(d) by-laws made under section 108 of the *City of Toronto Act, 2006*, but only with respect to the issuance of a permit for the *construction* of a green roof if the *construction* of the roof is prohibited unless a permit is obtained,

(e) by-laws made under section 40.1 of the *Ontario Heritage Act*,

(f) by-laws made under section 34 or 38 of the *Planning Act*,

r6 (g) subject to Clause (h), by-laws made under Ontario Regulation 173/16 (Community Planning Permits) made under the *Planning Act*,

(h) by-laws referred to in Clause (g) in relation to the development of land, but only with respect to the issuance of a development permit if the development of land is prohibited unless a development permit is obtained,

r6 (i) by-laws made under Ontario Regulation 246/01 (Development Permits) made under the *Planning Act* which continue in force despite the revocation of that Regulation by reason of section 19 of Ontario Regulation 173/16 (Community Planning Permits) made under that Act,

(j) orders made by the Minister under section 47 of the *Planning Act* or subsection 17(1) of the *Ontario Planning and Development Act*, *1994*, and

(k) by-laws made under any private Act that prohibit the proposed *construction* or *demolition* of the *building* unless the by-law is complied with.

(2) For the purposes of clause 10(2)(a) of the Act, *applicable law* means any general or special Act, and all regulations and by-laws enacted under them that prohibit the proposed use of the *building* unless the Act, regulation or by-law is complied with.

1.4.1.4. Other Definitions for the Purposes of the Act

(1) For the purposes of the Act, *architect*, *as constructed plans* and *professional engineer* have the same meaning as that set out in Clause 1.4.1.2.(1)(c).

1.4.2. Symbols and Other Abbreviations

1.4.2.1. Symbols and Other Abbreviations

(1) In this Code, a symbol or abbreviation listed in Column 1 of Table 1.4.2.1. has the meaning listed opposite it in Column 2.

Table 1.4.2.1.
Symbols and Abbreviations
Forming Part of Sentence 1.4.2.1.(1)

Symbol or Abbreviation	Meaning
1 in 2	slope of 1 vertical to 2 horizontal
ABS	acrylonitrile-butadiene-styrene
ASWG	American Steel Wire Gage
Bq	becquerel(s)
$CBOD_5$	the five day carbonaceous biochemical oxygen demand
r5 cd	candela(s)
CFU	colony forming units
cm	centimetre(s)
cm^2	square centimetre(s)
CO_2e	*carbon dioxide equivalent*
CPVC	chlorinated poly (vinyl chloride)
dB(A)	A-weighted sound level
°	degree(s)
°C	Degree(s) Celsius
diam	diameter
DWV	drain, waste and vent
ft	foot (feet)
g	gram(s)
ga	gauge
gal	imperial gallon(s)
gal/min	imperial gallon(s) per minute
h	hour(s)
HVAC	heating, ventilating and air-conditioning
Hz	hertz
in.	inch(es)
J	joule(s)
kg	kilogram(s)
kg/m^2	kilograms per square metre
kN	kilonewton(s)
kPa	kilopascal(s)
r6 kV	kilovolt(s)
kW	kilowatt(s)
L	litre(s)
L/min	litre(s) per minute
L/s	litre(s) per second
LPF	litres per flush
lx	lux
Column 1	2

Table 1.4.2.1. (Cont'd)
Symbols and Abbreviations
Forming Part of Sentence 1.4.2.1.(1)

Symbol or Abbreviation	Meaning
m	metre(s)
m²	square metre(s)
m^3	cubic metre(s)
m/s	metre(s) per second
max.	maximum
mg/L	milligram(s) per litre
min	minute(s)
min.	minimum
MJ	megajoule(s)
mm	millimetre(s)
MPa	megapascal(s)
N	newton
N/A	not applicable
ng	nanogram(s)
No.	number(s)
nom.	nominal
o.c.	on centre
OSB	oriented strandboard
Pa	pascal(s)
PB	polybutylene
PE	polyethylene
PE/AL/PE	polyethylene/aluminum/polyethylene
PEX	crosslinked polyethylene
PEX/AL/PEX	crosslinked polyethylene/aluminum/crosslinked polyethylene
PVC	poly (vinyl chloride)
RSI	thermal resistance, International System of Units
s	second(s)
temp.	temperature
T&G	tongue and groove
V	volt(s)
W	watt(s)
wt	weight
%	percent
µg	microgram(s)
µm	micron
Column 1	2

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Table 1.3.1.2. (Cont'd)
Documents Referenced in the Building Code
Forming Part of Sentence 1.3.1.2.(1)

Issuing Agency	Document Number	Title of Document(1)	Code Reference
ULC	CAN/ULC-S115-11	Fire Tests of Firestop Systems	3.1.5.16.(3) 3.1.9.1.(1) 3.1.9.1.(2) 3.1.9.1.(3) 3.1.9.3.(7) 3.1.9.4.(3) 3.1.9.4.(7) 9.10.9.6.(2) 9.10.9.7.(3)
ULC	CAN/ULC-S124-06	Test for the Evaluation of Protective Coverings for Foamed Plastic	3.1.5.12.(2)
ULC	CAN/ULC-S126-06	Test for Fire Spread Under Roof-Deck Assemblies	3.1.14.1.(1) 3.1.14.2.(1)
ULC	CAN/ULC-S134-92	Fire Test of Exterior Wall Assemblies	3.1.5.5.(1) 3.2.3.7.(3) 3.2.3.7.(6)
ULC	CAN/ULC-S135-04	Test Method for the Determination of Combustibility Parameters of Building Materials Using an Oxygen Consumption Calorimeter (Cone Calorimeter)	3.1.5.1.(2)
ULC	CAN/ULC-S138-06	Fire Test for Fire Growth of Insulated Building Panels in a Full-Scale Room Configuration	3.1.5.12.(7)
ULC	ULC-S139-00	Fire Test for Evaluation of Integrity of Electrical Cables	3.2.7.10.(2) 3.2.7.10.(3)
ULC	CAN/ULC-S143-09	Fire Tests for Non-Metallic Electrical and Optical Fibre Cable Raceways	3.1.5.20.(1)
ULC	S505-1974	Fusible Links for Fire Protection Service	3.1.8.9.(1)
ULC	S513-1978	Threaded Couplings for 38 mm and 65 mm Fire Hose	3.2.9.2.(7)
ULC	CAN/ULC-S524-06	Installation of Fire Alarm Systems	3.1.8.12.(2) 3.1.8.12.(3) 3.2.4.5.(1) 3.2.4.22.(6) 3.2.4.22.(11) 9.10.19.4.(3) 9.10.19.6.(2)
ULC	CAN/ULC-S531-02	Smoke Alarms	3.2.4.22.(1) 9.10.19.1.(1)
ULC	CAN/ULC-S537-04	Verification of Fire Alarm Systems	3.2.4.5.(2) 3.2.4.22.(6)
ULC	CAN/ULC-S543-09	Internal Lug Quick Connect Couplings for Fire Hose	3.2.9.2.(7)
r6 ULC	CAN/ULC-S553-02	Installation of Smoke Alarms	3.2.4.22.(9) 9.10.19.3.(3)
ULC	CAN/ULC-S561-03	Installation and Services for Fire Signal Receiving Centres and Systems	3.2.4.8.(4)
ULC	CAN/ULC-S572-10	Photoluminescent and Self-Luminous Signs and Path Marking Systems	3.4.5.1.(5) 9.9.11.3.(3)
ULC	CAN/ULC-S610-M87	Factory-Built Fireplaces	9.22.8.1.(1)
ULC	S628-93	Fireplace Inserts	9.22.10.1.(1)
ULC	CAN/ULC-S629-M87	650ºC Factory-Built Chimneys	9.21.1.2.(1)
Column 1	2	3	4

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Table 1.3.1.2. (Cont'd)
Documents Referenced in the Building Code
Forming Part of Sentence 1.3.1.2.(1)

Issuing Agency	Document Number	Title of Document(1)	Code Reference
ULC	CAN/ULC-S639-M87	Steel Liner Assemblies for Solid Fuel-Burning Masonry Fireplaces	9.22.2.3.(1)
ULC	CAN/ULC-S701-11	Thermal Insulation, Polystyrene, Boards and Pipe Covering	Table 5.10.1.1. 9.15.4.1.(1) Table 9.23.16.2.A. 9.25.2.2.(1) 9.25.2.2.(4)
ULC	CAN/ULC-S702-09	Mineral Fibre Thermal Insulation for Buildings	Table 5.10.1.1. Table 9.23.16.2.A. 9.25.2.2.(1)
ULC	CAN/ULC-S703-09	Cellulose Fibre Insulation (CFI) for Buildings	Table 5.10.1.1. 9.25.2.2.(1)
ULC	CAN/ULC-S704-11	Thermal Insulation, Polyurethane and Polyisocyanurate Boards, Faced	Table 5.10.1.1. Table 9.23.16.2.A. 9.25.2.2.(1)
ULC	CAN/ULC-S705.1-01	Thermal Insulation - Spray Applied Rigid Polyurethane Foam, Medium Density - Material - Specification	Table 5.10.1.1. 9.25.2.2.(1)
ULC	CAN/ULC-S705.2-05	Thermal Insulation - Spray Applied Rigid Polyurethane Foam, Medium Density - Application	5.3.1.3.(3) Table 5.10.1.1. 9.25.2.5.(1)
ULC	CAN/ULC-S706-09	Wood Fibre Thermal Insulation for Buildings	Table 5.10.1.1. 9.23.15.7.(3) Table 9.23.16.2.A. 9.25.2.2.(1) 9.29.8.1.(1)
ULC	CAN/ULC-S716.1-12	Exterior Insulation and Finish Systems (EIFS) – Materials and Systems	5.10.3.1.(1) 9.27.13.1.(1) 9.27.13.2.(1)
ULC	CAN/ULC-S716.2-12	Exterior Insulation and Finish Systems (EIFS) – Installation of EIFS Components and Water Resistive Barrier	9.27.13.3.(2)
ULC	CAN/ULC-S716.3-12	Exterior Insulation and Finish Systems (EIFS) – Design Application	9.27.13.3.(1)
ULC	CAN/ULC-S741-08	Air Barrier Materials - Specification	5.4.1.2.(1)
ULC	ULC/ORD-C263.1-99	Sprinkler-Protected Window Systems	3.1.8.18.(1)
ULC	ULC/ORD-C199P-02	Combustible Piping for Sprinkler Systems	3.2.5.14.(2) 3.2.5.14.(5)
ULC	ULC/ORD-C1254.6-1995	Fire Testing of Restaurant Cooking Area Fire Extinguishing System Units	6.2.2.6.(2) 3.6.4.3.(1)
USDA	October 1993	Soil Survey Manual	8.2.1.2.(2)
r10 WT	October 20, 2016	Port Lands Flood Protection and Enabling Infrastructure Due Diligence Report	1.3.3.6.(4) of Division C
Column 1	2	3	4

Notes to Table 1.3.1.2.:
(1) Some titles have been abridged to omit superfluous wording.

1.3.2. Abbreviations

1.3.2.1. Abbreviations of Proper Names (See Appendix A.)

(1) In this Code, an abbreviation of proper names listed in Column 1 of Table 1.3.2.1. has the meaning assigned opposite it in Column 2.

Table 1.3.2.1.
Abbreviations of Proper Names
Forming Part of Sentence 1.3.2.1.(1)

Abbreviation	Meaning
ACGIH	American Conference of Governmental Industrial Hygienists
AISI	American Iron and Steel Institute
ANSI	American National Standards Institute
APHA	American Public Health Association
ASHRAE	American Society of Heating, Refrigerating and Air-Conditioning Engineers
ASME	The American Society of Mechanical Engineers
ASPE	American Society of Plumbing Engineers
ASSE	American Society of Sanitary Engineering
ASTM	American Society for Testing and Materials
AWPA	American Wood-Preservers' Association
AWS	American Welding Society
AWWA	American Water Works Association
BCMOH	British Columbia Ministry of Health
BNQ	Bureau de Normalisation du Québec
CAN	National Standard of Canada designation The number or name following the CAN designation represents the agency under whose auspices the standard is issued. CAN1 designates CGA, CAN2 designates CGSB, CAN3 designates CSA, and CAN4 designates ULC.
CCBFC	Canadian Commission on Building and Fire Codes
CGSB	Canadian General Standards Board
CSA	Canadian Standards Association
CWC	Canadian Wood Council
DBR	Division of Building Research, known as the Institute for Research in Construction since 1985
EPA	Environmental Protection Agency
FINA	Fédération Internationale de Natation
HI	Hydronics Institute
HRAI	Heating, Refrigerating and Air-Conditioning Institute of Canada
HUD	U.S. Department of Housing and Urban Development
HVI	Home Ventilating Institute
Column 1	2

Table 1.3.2.1. (Cont'd)
Abbreviations of Proper Names
Forming Part of Sentence 1.3.2.1.(1)

	Abbreviation	Meaning
r5	IAPMO	International Association of Plumbing and Mechanical Officials
	IESNA	Illuminating Engineering Society of North America
	ISO	International Organization for Standardization
r6	MMA	Ontario Ministry of Municipal Affairs
	MMAH	Ontario Ministry of Municipal Affairs and Housing
	MOE	Ontario Ministry of the Environment
	NFPA	National Fire Protection Association
	NLGA	National Lumber Grades Authority
	NRCan	Natural Resources Canada
	NSF	NSF International, formerly called National Sanitation Federation
	SMACNA	Sheet Metal and Air Conditioning Contractors National Association Inc.
	TC	Transport Canada
	TPIC	Truss Plate Institute of Canada
	UL	Underwriters Laboratories Inc.
	ULC	Underwriters' Laboratories of Canada
	USDA	United States Department of Agriculture
	WEF	World Environment Federation
r10	WT	Waterfront Toronto
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Part 3

Fire Protection, Occupant Safety and Accessibility

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(4) Sentences (1) to (3) do not apply to a *building* containing electrical equipment and electrical installations used exclusively in the generation, transformation or transmission of electrical power or energy intended for sale or distribution to the public.

3.1.20. Glass in Guards

3.1.20.1. Glass

(1) Except as provided in Sentence 3.3.4.7.(1), glass in *guards* shall conform to MMAH Supplementary Standard SB-13, "Glass in Guards".

r11 ## 3.1.21. Reserved

Section 3.2. Building Fire Safety

3.2.1. General

3.2.1.1. Exceptions in Determining Building Height

e3 **(1)** A rooftop enclosure provided for elevator machinery, a stairway or a *service room* used for no purpose other than for service to the *building*, shall not be considered as a *storey* in calculating the *building height*.

(2) Space under tiers of seats in a *building* of the arena type shall not be considered as adding to the *building height* provided the space is used only for dressing rooms, concession stands and similar purposes incidental to the *major occupancy* of the *building*.

(3) Except as required by Sentence (5), the space above a *mezzanine* need not be considered as a *storey* in calculating *building height* provided,

(a) the aggregate area of *mezzanines* that are not superimposed does not exceed 40% of the open area of the room in which they are located, and (See Appendix A.)

(b) except as permitted in Sentence (8) and Sentence 3.3.2.11.(3) the space above the *mezzanine* is used as an open area without *partitions* or subdividing walls higher than 1 070 mm above the *mezzanine* floor.

(4) Except as required by Sentence (5), the space above a *mezzanine* need not be considered as a *storey* in calculating the *building height* provided,

e3 (a) the aggregate area of *mezzanines* that are not superimposed and do not meet the conditions of Sentence (3) does not exceed 10% of the *floor area* in which they are located, and

(b) the area of *mezzanine* in a *suite* does not exceed 10% of the area of that *suite*.

(5) Except as permitted by Sentences (6) and (7), each level of *mezzanine* that is partly or wholly superimposed above the first level of *mezzanine* shall be considered as a *storey* in calculating the *building height*.

(6) Platforms intended solely for periodic inspection and elevated catwalks need not be considered as floor assemblies or *mezzanines* for the purpose of determining *building height* provided,

(a) they are not used for storage,

(b) they are constructed with *noncombustible* materials unless the *building* is permitted to be of *combustible construction*, and

(c) where they are intended to be occupied, they have an *occupant load* of not more than four persons.

(7) *Mezzanines*, elevated walkways and platforms that are intended to be occupied in Group F, Division 2 or 3 *major occupancies* need not be considered as *storeys* in calculating *building height* provided,

(a) the *building* is of *noncombustible construction*, and

(b) the *occupant load* is not more than four persons.

(4) Except as provided in Sentence (1), where the *leaching bed* is constructed as a *shallow buried trench*, the total length of *leaching chamber* shall not be less than the value determined by Table 8.7.3.1A.

Table 8.7.3.1A.
Length of Leaching Chamber in Shallow Buried Trench
Forming Part of Sentence 8.7.3.1A.(4)

Percolation Time, (T) of *Soil*, min	Length of *Leaching Chamber*, m
1 < T ≤ 20	Q/75
20 < T ≤ 50	Q/50
50 < T < 125	Q/30
Column 1	2

where,

Q = the total daily design *sanitary sewage* flow in litres, and

T = the design *percolation time*.

8.7.3.2. Absorption Trenches

(1) Except as provided in Sentence (2), *absorption trenches* shall be,
(a) approximately the same length and not more than 30 m in length,
(b) not less than 500 mm and not more than 1 000 mm in width,
(c) not less than 600 mm and not more than 900 mm in depth,
r11 (d) centred not less than,
  (i) 1 600 mm apart where used in conjunction with,
    (A) a *distribution pipe*,
    (B) a Type I *leaching chamber*, or
    (C) a Type II *leaching chamber* constructed in *leaching bed fill*, or
  (ii) 2 400 mm apart where used in conjunction with a Type II *leaching chamber*, other than a Type II *leaching chamber* constructed in *leaching bed fill*,
(e) located so that the bottom of the *absorption trench* is not less than 900 mm above the *high ground water table*, rock or *soil* with a *percolation time* of more than 50 minutes, and
r6.1 (f) backfilled, after the installation of the *distribution pipe* or *leaching chamber* with *leaching bed fill*, so as to ensure that after the *leaching bed fill* settles, the surface of the *leaching bed* will not form any depressions.

(2) *Absorption trenches constructed* as a *shallow buried trench* shall be,
(a) approximately the same length and not more than 30 m in length,
(b) not less than 300 mm and not more than 600 mm in width,
(c) not less than 300 mm and not more than 600 mm in depth,
(d) centred not less than 2 000 mm apart,
(e) not less than 900 mm at all points on the bottom of the *absorption trench* above the *high ground water table* or rock, and
(f) backfilled, after the installation of the *distribution pipe* with *leaching bed fill*, so as to ensure that after the *leaching bed fill* settles, the surface of the *leaching bed* will not form any depressions.

8.7.3.3. Distribution Pipe

(1) Except for a *shallow buried trench*, the *distribution pipe* used in the *construction* of a *leaching bed* shall be,
(a) not less than 3 in. trade *size* for gravity flow systems,
(b) installed with a uniform downward slope from the inlet with a drop of not less than 30 mm and not more than 50 mm for each 10 m of *distribution pipe* for gravity flow systems, and
(c) installed within a layer of stone conforming to Sentence (5).

(2) Prior to backfilling, the stone layer required by Clause (1)(c) shall be protected in such a manner so as to prevent *soil* or *leaching bed fill* from entering the stone by completely covering it with,
(a) untreated building paper, or
(b) a permeable geo-textile fabric.

(3) Every pressurized *distribution pipe* shall be self-draining so as to prevent freezing of its contents.

(4) Every pressurized *distribution pipe* shall,
(a) be not less than 1 in. trade *size*, and
r6.1 (b) have orifices of at least 3 mm in diameter, spaced equally along the length of the pipe to provide even distribution of the *effluent*.

(5) The stone layer required by Clause (1)(c) shall,
(a) be comprised of washed septic stone, free of fine material, with gradation conforming to Table 8.7.3.3.,
(b) be not less than 500 mm in width,
(c) extend not less than 150 mm below the *distribution pipe*, and
(d) extend not less than 50 mm above the *distribution pipe*.

r6.1 **(6)** This Article does not apply to a *distribution pipe* within a *leaching chamber*.

Table 8.7.3.3.
Gradation of Septic Stone
Forming Part of Sentences 8.7.3.3.(5) and 8.7.8.2.(6)

Particle Size	Percent Passing
53 mm	100
19 mm	0 - 5
75 µm	0 - 1
Column 1	2

r6.1 8.7.3.4. Leaching Chamber

(1) Prior to backfilling, the *leaching chamber* shall be,
(a) installed level over the length of the *absorption trench*,
(b) securely connected together, section to section,
(c) free of structural damage, uncut and used full length,
(d) equipped with end caps installed on both ends,
(e) equipped with an integrated splash plate at the inlet end of each line of *leaching chamber*, to prevent soil scouring, and
(f) protected in such a manner so as to prevent *soil* or *leaching bed fill* from entering the *leaching chamber*.

(2) Except for a *shallow buried trench*, the *distribution pipe* within a *leaching chamber* shall be not less than 3 in. trade *size* for dosed systems.

(3) Every pressurized *distribution pipe* within a *leaching chamber* shall,
(a) extend over the entire length of the *leaching chamber*,
(b) be not less than 1½ in. trade *size*,
(c) have orifices of at least 6 mm in diameter, spaced equally along the length of the pipe to provide even distribution of the *effluent*,
(d) be supported,
(e) be self-draining so as to prevent freezing of its contents, and
(f) have cleanouts installed at the downstream end of each line of *leaching chamber* to allow for servicing of the system.

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r6 9.34.2.2. Lighting Outlets in Houses and Dwelling Units

r6 **(1)** Except as provided in Sentence (2), a lighting outlet with fixture controlled by a wall switch shall be provided in kitchens, bedrooms, living rooms, utility rooms, laundry rooms, dining rooms, bathrooms, water closet rooms, vestibules and hallways in a *house* or an individual *dwelling unit*.

(2) Where a receptacle controlled by a wall switch is provided in bedrooms or living rooms, such rooms need not conform to the requirements of Sentence (1).

9.34.2.3. Stairways

(1) Every stairway shall be lighted.

r6 **(2)** Except as provided in Sentence (3), 3-way wall switches located at the head and foot of every stairway shall be provided to control at least one lighting outlet with fixture for stairways with four or more risers in a *house* or an individual *dwelling unit*.

(3) The stairway lighting for *basements* that do not contain finished space or lead to an outside entrance or built-in garage and that serve not more than one *dwelling unit* is permitted to be controlled by a single switch located at the head of the stairs.

9.34.2.4. Basements

(1) A lighting outlet with fixture shall be provided for each 30 m^2 of floor area or fraction of it in unfinished *basements*.

(2) The outlet required in Sentence (1) nearest the stairs shall be controlled by a wall switch located at the head of the stairs.

9.34.2.5. Storage Rooms

(1) A lighting outlet with fixture shall be provided in storage rooms.

9.34.2.6. Garages and Carports

(1) A lighting outlet with fixture shall be provided for an attached, built-in or detached garage or carport.

(2) Except as provided in Sentence (3), lighting outlets required in Sentence (1) shall be controlled by a wall switch near the doorway.

(3) Where the lighting outlet and fixture required in Sentence (1) are ceiling mounted above an area not normally occupied by a parked car, or are wall mounted, a fixture with a built-in switch is permitted to be used.

(4) Where a carport is lighted by a light at the entrance to a *dwelling unit*, additional carport lighting is not required.

9.34.2.7. Public and Service Areas

(1) Every public or service area in *buildings*, including a *recreational camp* and a *camp for housing of workers*, shall have lighting outlets with fixtures controlled by a wall switch or panel to illuminate such areas.

(2) When provided by incandescent lighting, illumination required in Sentence (1) shall conform to Table 9.34.2.7.

(3) When other types of lighting are used, illumination equivalent to that shown in Table 9.34.2.7. shall be provided.

r3 **Table 9.34.2.7.**
Lighting for Public Areas
Forming Part of Sentences 9.34.2.7.(2) and (3)

Room or Space	Minimum Illumination, lx	Minimum Lighting Power Density, W/m² of *floor area* (incandescent lighting)
Storage rooms	50	5
Service rooms and laundry areas	200	20
Garages	50	5
Public water closet rooms	100	10
Service hallways and stairways	50	5
Recreation rooms	100	10
Hallways, corridors, stairways and sleeping areas in *recreational camps* and *camps for housing of workers*	100	10
Kitchen in *recreational camps* and *camps for housing of workers*	500	50
All other rooms in *recreational camps* and *camps for housing of workers*	250	25
Column 1	2	3

9.34.3. Emergency Lighting

9.34.3.1. Emergency Lighting

(1) Emergency lighting shall conform to Subsection 9.9.12.

r11 ## 9.34.4. Reserved

Section 9.35. Garages and Carports

9.35.1. Scope

9.35.1.1. Application

r6 **(1)** This Section applies to garages and carports serving a *house* or an individual *dwelling unit*.

9.35.1.2. Construction Requirements

(1) The construction of a garage or carport shall conform to the requirements for other *buildings* in this Part except as provided in this Section.

9.35.2. General

9.35.2.1. Carport Considered to be Garage

(1) Where a roofed enclosure used for the storage or parking of motor vehicles has more than 60 percent of the total perimeter enclosed by walls, doors or windows, the enclosure shall be considered a garage.

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1.3.3.4. Occupancy Permit — Certain Buildings of Residential Occupancy

(1) No person shall occupy or permit to be occupied a *building* described in Sentence (3), or part of it, unless the *chief building official* or a person designated by the *chief building official* has issued a permit authorizing occupation of the *building* or part of it in accordance with Sentence (4).

(2) This Article does not apply in respect of the *occupancy* of an existing *building*, or part of it, that has been subject to extension or material alteration or repair.

(3) A *building* referred to in Sentence (1) is a *building* intended for *residential occupancy* that,
(a) is of three or fewer *storeys* in *building height* and has a *building area* not exceeding 600 m^2,
(b) has no accommodation for tourists,
(c) does not have a *dwelling unit* above another *dwelling unit*,
(d) does not have any *dwelling units* sharing a common *means of egress*, and
r6 (e) does not contain a *retirement home*.

(4) The *chief building official* or a person designated by the *chief building official* shall issue a permit authorizing occupation of a *building* described in Sentence (3), where,
(a) the structure of the *building* with respect to the *dwelling unit* to be occupied is substantially complete and ready to be used for its intended purpose,
(b) the *building* envelope, including, but not limited to, cladding, roofing, windows, doors, assemblies requiring *fire-resistance ratings*, *closures*, insulation, *vapour barriers* and air barriers, with respect to the *dwelling unit* to be occupied, is substantially complete,
(c) the walls enclosing the *dwelling unit* to be occupied conform to Sentence 9.25.2.3.(7) of Division B,
(d) required electrical supply is provided for the *dwelling unit* to be occupied,
(e) required firefighting access routes to the *building* have been provided and are accessible,
(f) the following *building* components and systems are complete and operational for the *dwelling unit* to be occupied:
r5 (i) required *exits*, floor access and egress systems, handrails, *guards*, *smoke alarms*, carbon monoxide alarms and *fire separations,* including, but not limited to, *fire stops*,
(ii) required exhaust fume barriers and self-closing devices on doors between an attached or built-in garage and the *dwelling unit*,
(iii) water supply, sewage disposal, lighting and heating systems, and
(iv) protection of foamed plastics required by Article 9.10.17.10. of Division B,
(g) the following *building* components and systems are complete, operational and tested for the *dwelling unit* to be occupied:
(i) *water system*,
(ii) *building drain* and *building sewer*, and
(iii) *drainage system* and *venting system*,
(h) required *plumbing fixtures* in the *dwelling unit* to be occupied are substantially complete and operational, and
(i) where applicable, the *building* conforms to Article 9.1.1.7. of Division B with respect to the *dwelling unit* to be occupied.

(5) Where a *registered code agency* has been appointed to perform the functions described in clause 4.1(4)(b) or (c) of the Act in respect of the *construction* of a *building* described in Sentence (3), the *chief building official* or a person designated by the *chief building official* shall issue the permit referred to in Sentence (4) after receipt of a *certificate for the occupancy of a building described in Sentence 1.3.3.4.(3) of Division C* issued by the *registered code agency* in respect of the *building*.

r5 1.3.3.5. Occupancy Permit — Buildings Within the Scope of Article 3.2.2.43A. or 3.2.2.50A.

(1) No person shall occupy or permit to be occupied a *building* within the scope of Article 3.2.2.43A. or 3.2.2.50A. of Division B, or part of it, unless the *chief building official* or a person designated by the *chief building official* has issued a permit authorizing occupation of the *building* or part of it in accordance with Sentence (3).

(2) This Article does not apply in respect of the occupancy of an existing *building*, or part of it, that has been subject to extension or material alteration or repair.

(3) The *chief building official* or a person designated by the *chief building official* shall issue a permit authorizing occupation of a *building* described in Sentence (1), where,

(a) the structure of the *building* is completed to the roof,
(b) the *building* envelope, including, but not limited to, cladding, roofing, windows, doors, assemblies requiring *fire-resistance ratings*, *closures*, insulation, *vapour barriers* and air barriers, is complete,
(c) the walls enclosing the space to be occupied are completed, including balcony *guards*,
(d) all required *fire separations* and *closures* are completed,
(e) all required *exits* are completed, including all *fire separations*, doors, door hardware, self-closing devices, *guards* and handrails,
(f) all shafts including *closures* are completed,
(g) measures have been taken to prevent access to parts of the *building* and site that are incomplete or still under construction,
(h) floors, halls, lobbies and required *means of egress* are free of loose materials and other hazards,
(i) if *service rooms* should be in operation, required *fire separations* and *closures* are completed,
(j) all *building drains*, *building sewers*, *water systems*, *drainage systems* and *venting systems* are complete and tested as operational for the *storeys* to be occupied,
(k) required lighting, heating and electrical supply are provided for the *suites*, rooms and common areas to be occupied,
(l) required lighting in corridors, stairways and *exits* is completed and operational,
(m) required standpipe, sprinkler and fire alarm systems are complete and operational, together with required pumper connections for such standpipes and sprinklers,
(n) required *smoke alarms* and carbon monoxide alarms are complete and operational,
(o) required fire extinguishers have been installed,
(p) main garbage rooms, chutes and ancillary services are completed to all *storeys* to be occupied,
(q) required firefighting access routes have been provided and are accessible, and
(r) the *sewage system* has been completed and is operational.

(4) Where a *registered code agency* has been appointed to perform the functions described in clause 4.1(4)(b) or (c) of the Act in respect of the *construction* of a *building* described in Sentence (1), the *chief building official* or a person designated by the *chief building official* shall issue the permit referred to in Sentence (3) after receipt of a *certificate for the occupancy of a building described in Sentence 1.3.3.5.(1) of Division C* issued by the *registered code agency* in respect of the *building*.

r10 1.3.3.6. Occupancy Permit — Buildings in the Lower Don Area of Toronto

(1) Except as provided in Sentence (2), this Article applies to *buildings* constructed on land in the City of Toronto being the land outlined in red on a map numbered 230 and filed at the Toronto office of the Ministry of Municipal Affairs and Housing located at 777 Bay Street.

(2) This Article does not apply to a *building* that complies with,

(a) the official plan of the City of Toronto approved under section 17 of the *Planning Act* as the official plan read on the day Ontario Regulation 388/18 is filed, or
(b) a by-law made by the City of Toronto under section 34 of the *Planning Act* as the by-law read on the day Ontario Regulation 388/18 is filed.

(3) No person shall occupy or permit to be occupied a *building* or part of it to which this Article applies, unless the *chief building official* or a person designated by the *chief building official* has issued a permit authorizing occupation of the *building* or part of it in accordance with Sentence (4).

(4) The *chief building official* or a person designated by the *chief building official* shall not issue a permit authorizing occupation of a *building* or part of it unless,

(a) hydraulic modelling carried out by or on behalf of the Toronto Region Conservation Authority demonstrates that the lot or parcel of land on which the *building* is constructed is no longer susceptible to flooding due to the completion of the flood protection features described in Section 4.5 of WT, "Port Lands Flood Protection and Enabling Infrastructure Due Diligence Report", and

(b) the *construction* of the *building* or part of it is in compliance with Clauses 1.3.3.1.(3)(a) to (q), 1.3.3.2.(1)(a) to (d), 1.3.3.4.(4)(a) to (i) or 1.3.3.5.(3)(a) to (r), as applicable.

1.3.4. Fire Department Inspection

1.3.4.1. Fire Department Approval

(1) Subject to Sentence (2), if the council of a *municipality* assigns specific responsibility for the enforcement of any portion of this Code respecting fire safety matters to an *inspector* who is the chief of the fire department of the *municipality*, the *chief building official* shall not issue a permit to *construct* a *building* unless the *inspector* approves the drawings submitted with the application for the permit as complying with that portion of this Code.

(2) If a *registered code agency* has been appointed under clause 4.1(4)(a) or (c) of the Act,

(a) a *municipality* shall not assign responsibility under Sentence (1) to the chief of the fire department with respect to a *building* for which the *registered code agency* has been appointed, and

(b) any assignment of responsibility under Sentence (1) with respect to a *building* for which the *registered code agency* is appointed shall be cancelled as of the date of the appointment.

1.3.5. Notices and Inspections

1.3.5.1. Prescribed Notices

(1) This Article sets out the notices that are required under section 10.2 of the Act.

(2) The person to whom a permit under section 8 of the Act is issued shall notify the *chief building official* or, where a *registered code agency* is appointed under the Act in respect of the *construction* to which the notice relates, the *registered code agency* of,

(a) readiness to *construct* footings,

(b) substantial completion of footings and *foundations* prior to commencement of backfilling,

(c) substantial completion of structural framing and ductwork and piping for heating and *air-conditioning* systems, if the *building* is within the scope of Part 9 of Division B,

(d) substantial completion of structural framing and roughing-in of heating, ventilation, *air-conditioning* and air-contaminant extraction equipment, if the *building* is not a *building* to which Clause (c) applies,

(e) substantial completion of insulation and *vapour barriers*,

(f) substantial completion of *air barrier systems*,

(g) substantial completion of all required *fire separations* and *closures* and all fire protection systems including standpipe, sprinkler, fire alarm and emergency lighting systems,

(h) substantial completion of fire access routes,

(i) readiness for inspection and testing of,
  (i) *building sewers* and *building drains*,
  (ii) *water service pipes*,
  (iii) *fire service mains*,
  (iv) *drainage systems* and *venting systems*,
  (v) the *water distribution system*, and
  (vi) *plumbing* fixtures and *plumbing* appliances,

(j) readiness for inspection of suction and gravity outlets, covers and suction piping serving outlets of an *outdoor pool* described in Clause 1.3.1.1.(1)(j) of Division A, a *public pool* or a *public spa*,

(k) substantial completion of the circulation / *recirculation system* of an *outdoor pool* described in Clause 1.3.1.1.(1)(j) of Division A, a *public pool* or *public spa* and substantial completion of the pool before it is first filled with water,

(l) readiness to *construct* the *sewage system*,

(m) substantial completion of the installation of the *sewage system* before the commencement of backfilling,

(n) substantial completion of installation of *plumbing* not located in a structure, before the commencement of backfilling,

(o) completion of *construction* and installation of components required to permit the issue of an occupancy permit under Sentence 1.3.3.1.(3) or to permit occupancy under Sentence 1.3.3.2.(1), if the *building* or part of the *building* to be occupied is not fully completed, and

r5 (p) completion of *construction* and installation of components required to permit the issue of an occupancy permit under Sentence 1.3.3.4.(4) or 1.3.3.5.(3).

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2012 Building Code Compendium

Volume 2

May 2, 2019 update
(Containing O. Reg. 79/18, O. Reg. 388/18, O. Reg. 87/19 and O. Reg. 88/19)

COMMENCEMENT

Supplementary Standards SA-1, SB-1 to SB-13 and SC-1 come into force on the 1st day of January, 2014.

See "Code Amendment History" page in the Preface of Volume 1 for information concerning amendments to Supplementary Standards issued through Minister's Rulings.

a1 Amendment made to Appendix A or B issued for January 1st, 2014.
a2 Amendment made to Appendix A or B issued for January 1st, 2014.
a2.1 Amendment made to Appendix A or B issued for January 1st, 2015.
a3 Amendment made to Appendix A or B issued for January 1st, 2015.
a4 Amendment made to Appendix A or B issued for July 7th, 2016.
a5 Amendment made to Appendix A or B issued for July 1st, 2017.
a5.1 Amendment made to Appendix A or B issued for January 1st, 2018.
a6 Amendment made to Appendix A or B issued for January 18, 2018.
a7 Amendment made to Appendix A or B issued for May 4, 2018.
a8 Amendment made to Appendix A or B issued for June 29, 2018.
a9 Amendment made to Appendix A or B issued for July 20, 2018.
a10 Amendment made to Appendix A or B issued for May 2, 2019.
a10.1 Amendment made to Appendix A or B issued for January 1, 2020.
a10.2 Amendment made to Appendix A or B issued for January 1, 2022.

EDITORIAL

e1 Editorial correction issued for January 1st, 2014.
e2 Editorial correction issued for January 1st, 2014.
e2.1 Editorial correction issued for January 1st, 2015.
e3 Editorial correction issued for January 1st, 2015.
e4 Editorial correction issued for July 7th, 2016.
e5 Editorial correction issued for January 1st, 2017.
e6 Editorial correction issued for January 1st, 2018.
e7 Editorial correction issued for January 1st, 2020.
e7.1 Editorial correction issued for January 1st, 2022.

COVER PHOTO CREDITS

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ISBN 978-1-4868-0569-3 (set)
ISBN 978-1-4868-0575-4 (vol. 2)
ISBN 978-1-4868-3643-7 (May 2, 2019 update – Print)
ISBN 978-1-4868-3644-4 (May 2, 2019 update – PDF)

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Appendix A Explanatory Information

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- **SB-3 Fire and Sound Resistance of Building Assemblies**
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- **SB-13 Glass in Guards**
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Forms

Public Heritage Building

This definition addresses smaller heritage buildings that are to be made available to the public for viewing as examples of an architectural period or periods in the past, depicting how our forebears lived, worked or played, and what artifacts, objects or clothing were in use at that time. These buildings are not considered museums as such, and therefore would not be subject to the more stringent requirements of assembly occupancies for that use.

Service Room

Typical examples of service rooms include boiler rooms, furnace rooms, incinerator rooms, garbage handling rooms, and rooms to accommodate air-conditioning or heating appliances, pumps, compressors and electrical equipment. Rooms such as elevator machine rooms and common laundry rooms are not considered as service rooms.

Suite

Tenancy in the context of the term "suite" applies to both rental and ownership tenure. In a condominium arrangement, for example, dwelling units are considered separate suites even though they are individually owned. In order to be of complementary use, a series of rooms that constitute a suite are in reasonably close proximity to each other and have access to each other either directly by means of a common doorway or indirectly by a corridor, vestibule or other similar arrangement.

The term "suite" does not apply to rooms such as service rooms, common laundry rooms and common recreational rooms that are not leased or under a separate tenure in the context of the Code. Similarly, the term suite is not normally applied in the context of buildings such as schools and hospitals, since the entire building is under a single tenure. A rented room in a long-term care home could be considered as a suite if the room was under a separate tenure. A hospital bedroom on the other hand is not considered to be under a separate tenure, since the patient has little control of that space, even though he pays the hospital a per diem rate for the privilege of using the hospital facilities, which include the sleeping areas.

For certain requirements in the Code, the expression "room or suite" is used (e.g. travel distance). This means that the requirement applies within the rooms of suites as well as to the suite itself and to rooms that may be located outside the suite. In other places the expression "suite, and rooms not located within a suite" is used (e.g. for the installation of smoke and heat detectors). This means that the requirement applies to individual suites as defined, but not to each room within the suite. The rooms "not within a suite" would include common laundry rooms, common recreational rooms and service rooms, that are not considered as tenant occupied space.

a8 A-1.4.1.3. Applicable Law.

Applicants for building permits are required to establish compliance with applicable law. The following table lists contact information for those agencies responsible for the statutory provisions defined in Sentence 1.4.1.3.(1):

Applicable Law Provision	Responsible Agency	Contact
City of Toronto Act, 2006: Subsection 102 (3) of the *City of Toronto Act, 2006* By-laws made under section 108 of the *City of Toronto Act, 2006* but only with respect to the issuance of a permit for the construction of a green roof. Section 114 of the *City of Toronto Act, 2006*, with respect to the approval by the City of Toronto or the Ontario Municipal Board of plans and drawings.	City of Toronto	General Inquiry: ph: 311 or 416-392-2489

Applicable Law Provision	Responsible Agency	Contact
Clean Water Act, 2006: Clause 59(1)(b) of the *Clean Water Act, 2006* with respect to the issuance of a notice by the risk management official for the construction of a building.	Ministry of the Environment, Conservation and Parks	General Inquiry: ph: 416-325-4000 or 800-565-4923
Conservation Authorities Act: Clause 28(1)(c) under the *Conservation Authorities Act*, with respect to the permission of the authority for the construction of a building if the control of flooding, erosion, dynamic beaches or pollution may be affected by the development.	Local Conservation Authority	
Child Care and Early Years Act, 2014: Section 14 of Regulation 137/15, under the *Child Care and Early Years Act, 2014,* with respect to the approval of plans for a new building to be erected or an existing building to be used, altered or renovated for use as a child care centre or for alterations or renovations to be made to premises used by a child care centre.	Ministry of Children, Community and Social Services	General Inquiry: ph: 416-212-7432 Central East Regional Office ph: 905-868-8900 Central West Regional Office ph: 905-567-7177 or 877-832-2818 Eastern Regional Office ph: 613-234-1188 or 800-267-5111 Hamilton/Niagara Regional Office ph: 905-521-7280 North East Regional Office ph: 705-474-3540 or 800-461-6977 Northern Regional Office ph: 705-564-6699 or 800-265-1222 South East Regional Office ph: 613-545-0539 or 800-646-3209 South West Regional Office ph: 519-438-5111 or 800-265-4197 Toronto Regional Office ph: 416-325-0500
Development Charges Act, 1997: Sections 28 and 53 under the *Development Charges Act, 1997*.	Local Municipality	
Education Act: *Education Act*, Section 194, with respect to the approval of the Minister for the demolition of a building.	Ministry of Education	General Inquiry ph: 416-325-2929 or 800-387-5514
Education Act: Sections 257.83 and 257.93 under the *Education Act*.	Local Municipality	
Elderly Persons Centres Act: Section 6 of Regulation 314, of the *Elderly Persons Centres Act*, with respect to the approval of the Minister for the construction of a building project.	Ministry of Health and Long-Term Care	General Inquiry: ph: 416-327-4327 or 800-268-1153

Applicable Law Provision	Responsible Agency	Contact
Environmental Assessment Act: Section 5 of the *Environmental Assessment Act,* with respect to the approval of the Ministry or the Environmental Review Tribunal to proceed with an undertaking. Subsection 5(4) of the *Environmental Assessment Act*	Ministry of the Environment, Conservation and Parks	General Inquiry: ph: 416-325-4000 or 800-565-4923 Environmental Approvals Branch ph: 416-314-8001 or 800-461-6290
Environmental Protection Act: Section 46 of the *Environmental Protection Act* with respect to the approval of the Minister to use land or land covered by water that has been used for the disposal of waste. Section 47.3 of the *Environmental Protection Act*, with respect to the issuance of a renewable energy approval. Section 168.3.1 of the *Environmental Protection Act*, with respect to the construction of a building to be used in connection with a change of use of a property. Paragraph 2 of Subsection 168.6(1) of the *Environmental Protection Act*, if a certificate of property use has been issued in respect of the property under subsection 168.6(1) of the Act.	Ministry of the Environment, Conservation and Parks	General Inquiry: ph: 416-325-4000 or 800-565-4923 Central Region ph: 416-326-6700 or 800-810-8048 Eastern Region ph: 613-549-4000 or 800-267-0974 Northern Region ph: 807-475-1205 or 800-875-7772 Southwestern Region ph: 519-873-5000 or 800-265-7672 West Central Region ph: 905-521-7640 or 800-668-4557
Milk Act Section 14 of the *Milk Act*, with respect to the permit from the Director for the construction or alteration of any building intended for use as a plant.	Ministry of Agriculture, Food and Rural Affairs	General Inquiry ph: 519-826-3100 or 888-466-2372
Municipal Act, *2001* Subsection 133(4) of the *Municipal Act*, *2001.*	Local Municipality	
Niagara Escarpment Planning and Development Act: Subsection 24(3) of the *Niagara Escarpment Planning and Development Act.*	Ministry of Natural Resources and Forestry	General Inquiry ph: 800-667-1940 Niagara Escarpment Commission ph: 905-877-5191
Nutrient Management Act, 2002: Section 11.1 of O. Reg. 267/03 of the *Nutrient Management Act, 2002*, with respect to a proposed building or structure to house farm animals or store nutrients if that Regulation requires the preparation and approval of a nutrient management strategy before construction of the proposed building or structure.	Ministry of Agriculture, Food and Rural Affairs	General Inquiry ph: 519-826-3100 or 888-466-2372

Applicable Law Provision	Responsible Agency	Contact
Ontario Heritage Act: Subsection 27 (3) of the *Ontario Heritage Act*, with respect to a notice to the council of a municipality to the demolition or removal of a building from a registered property. Subsection 30 (2) of the *Ontario Heritage Act*, with respect to a consent of the council of a municipality to the alteration or demolition of a building. Section 33 of the *Ontario Heritage Act*, with respect to the consent of the council of a municipality for the alteration of a property. Section 34 of the *Ontario Heritage Act*, with respect to the consent of the council of a municipality for the demolition of a building. By-laws made under Section 40.1 of the *Ontario Heritage Act* Section 42 of the *Ontario Heritage Act*, with respect to the permit given by the council of a municipality for the erection, alteration, or demolition of a building.	Local Municipality	
Ontario Heritage Act: Section 34.5 of the *Ontario Heritage Act,* with respect to a consent of the Minister to the alteration or demolition of a designated building Subsection 34.7(2) of the *Ontario Heritage Act*, with respect to a consent of the Minister to the alteration or demolition of a designated building	Ministry of Tourism, Culture and Sport	General Inquiry: ph: 416-326-9326
Ontario Planning and Development Act, 1994, Section 14 *Ontario Planning and Development* *Act, 1994*, with respect to any conflict between a development plan made under that Act and a zoning by-law that affects the proposed building or structure. Subsection 17(1) *Ontario Planning and Development Act, 1994* with respect to orders made under that Act.	Ministry of Municipal Affairs and Housing	General Inquiry: ph: 416-585-7041 Central Municipal Services Office ph: 416-585-6226 or 800-668-0230 Eastern Municipal Services Office ph: 613-545-2100 or 800-267-9438 Northeastern Municipal Services Office ph: 705-564-0120 or 800-461-1193 Northwestern Municipal Services Office ph: 807-475-1651 or 800-465-5027 Southwestern Municipal Services Office ph: 519-873-4020 or 800-265-4736

Applicable Law Provision	Responsible Agency	Contact
Planning Act: Section 33 of the *Planning Act*, except where in the case of demolition of a residential property, a permit to demolish the property is obtained under that Section By-laws made under Sections 34 or 38 of the *Planning Act*. Section 41 of the *Planning Act*, with respect to the approval by the council of the municipality of the Municipal Board of plans and drawings. Section 42 of the *Planning Act*, with respect to the payment of money to the Municipality. Section 46 of the *Planning Act*. By-laws made under O. Reg. 608/06 (Development Permits) made under the *Planning Act*. By-laws made under O. Reg. 246/01 (Development Permits) made under the *Planning Act*.	Local Municipality	
Planning Act: Section 47 of the *Planning Act,* with respect to orders made under that Act.	Ministry of Municipal Affairs and Housing	General Inquiry: ph: 416-585-7041 Central Municipal Services Office ph: 416-585-6226 or 800-668-0230 Eastern Municipal Services Office ph: 613-545-2100 or 800-267-9438 Northeastern Municipal Services Office ph: 705-564-0120 or 800-461-1193 Northwestern Municipal Services Office ph: 807-475-1651 or 800-465-5027 Southwestern Municipal Services Office ph: 519-873-4020 or 800-265-4736
Public Lands Act: Section 2 of O. Reg. 453/96 of the *Public Lands Act*, with respect to the work permit from the Minister authorizing the construction or placement of a building on public land.	Ministry of Natural Resources and Forestry	General Inquiry ph: 800-667-1940
Public Transportation and Highway Improvement Act: Section 34 or 38 of the *Public Transportation and Highway Improvement Act*, with respect to the permit from the Minister for the placement, erection or alteration of any building or other structure or the use of land.	Ministry of Transportation	General Inquiry ph: 800-268-4686 Central Region: ph: 416-235-5412 Eastern Region: ph: 800-267-0295 Northeastern Region: ph: 705-472-7900 or 800-461-9547 Northwestern Region: ph: 807-473-2000 or 800-465-5034 Southwestern Region: ph: 519-873-4335 or 800-265-6072

A-1.5.1.1.(1) Application of Referenced Documents.

Documents referenced in the Building Code may contain provisions covering a wide range of issues, including issues that are unrelated to the objectives and functional statements stated in Parts 2 and 3 of Division A respectively; e.g. aesthetic issues such as colour-fastness or uniformity. Sentence 1.5.1.1.(1) is intended to make it clear that, whereas referencing a document in the Building Code generally has the effect of making the provisions of that document part of the Code, provisions that are unrelated to buildings or to the objectives and functional statements attributed to the provisions in Division B where the document is referenced are excluded.

Furthermore, many documents referenced in the Building Code contain references to other documents, which may also, in turn, refer to other documents. These secondary and tertiary referenced documents may contain provisions that are unrelated to buildings or to the objectives and functional statements of the Building Code: such provisions - no matter how far down the chain of references they occur - are not included in the intent of Sentence 1.5.1.1.(1) of Division A.

A-2.2.1.1.(1) Objectives.

Listing of Objectives

Any gaps in the numbering sequence of the objectives are due to the fact that there is a master list of objectives covering the Building Code, Fire Code and the three principal model National Code Documents (National Building Code of Canada 2010, National Plumbing Code of Canada 2010 and National Fire Code of Canada 2010) but not all objectives are pertinent to all Codes.

The Building

Where the term “the building” is used in the wording of the objectives, it refers to the building for which compliance with the Building Code is being assessed.

Emergency

The term “emergency" - in the context of safety in buildings - is often equated to the term “fire emergency”; however, the wording of objectives OS3.7 and OS5.9 makes it clear that the Code addresses any type of emergency that would require the rapid evacuation of the building, such as the release of hazardous substances or the presence of intruders.

A-3.2.1.1.(1) Functional Statements.

Listing of Functional Statements

The numbered functional statements are grouped according to functions that deal with closely related subjects. For example, the first group deals with fire risks, the second group deals with emergency egress and response, etc. There are gaps in the numbering sequence for the following reasons:

- Each group has unused numbers which allows for the possible future creation of additional functional statements within any one group.

- There is a master list of functional statements covering the Building Code, Fire Code and the three principal model National Code Documents (National Building Code of Canada 2010, National Plumbing Code of Canada 2010 and National Fire Code of Canada 2010) but not all functional statements are pertinent to all Codes.

	Name	Address	Contact
	FINA	Fédération Internationale de Natation Avenue de l'Avant-Poste No 4 CH-1005 Lausanne, Switzerland	ph: (+41-21) 310-47-10 fax: (+41-21) 312-66-10 web site: www.fina.org
	HC	Health Canada Address Locator 0900C2 Ottawa, Ontario K1A 0K9	ph: 866-225-0709 fax: 613-941-5366 web site: www.hc-sc.gc.ca
	HI	Hydronics Institute Division of GAMA 35 Russo Place P.O. Box 218 Berkeley Heights, New Jersey 07922 USA *The Hydronics Institute was formally merged into GAMA in 2004.*	ph: 866-408-3831 908-464-8200 fax: 908-464-7818 web site: www.gamanet.org
	HRAI	Heating, Refrigerating and Air-Conditioning Institute of Canada 2800 Skymark Avenue Building 1, Suite 201 Mississauga, Ontario L4W 5A6	ph: 905-602-4700 800-267-2231 fax: 905-602-1197 web site: www.hrai.ca
	HVI	Home Ventilating Institute 1000 N. Rand Rd. Suite 214 Wauconda, Illinois 60084 USA	ph: 847-526-2010 fax: 847-526-3993 web site: www.hvi.org
a5	IAPMO	International Association of Plumbing and Mechanical Officials 4755 E. Philadelphia St. Ontario, California 91761 USA	ph: 909-472-4100 fax: 909-472-4150 web site: iampo.org
	IESNA	Illuminating Engineering Society of North America 120 Wall Street, Floor 17 New York, New York 10005-4001 USA	ph: 212-248-5000 fax: 212-248-5017 web site: www.iesna.org
	ISO	International Organization for Standardization ISO Central Secretariat 1, ch. de la Voie-Creuse CP 56 CH-1211 Geneva 20, Switzerland	ph: 41-22-749-01-11 fax: 41-22-733-34-30 web site: www.iso.org
	HUD	U.S. Department of Housing and Urban Development *HUD established HUD USER as the primary source of US government technical housing publications.* HUD USER P.O. Box 23268 Washington, DC 20026-3268 USA	ph: 202-708-3178 800-245-2691 fax: 202-708-9981 web site: www.huduser.org
a8	MMA (now MMAH)	Ontario Ministry of Municipal Affairs (Ontario Ministry of Municipal Affairs and Housing) 777 Bay Street, 17th Floor Toronto, Ontario M5G 2E5	ph: 416-585-7041 fax: 416-585-6470 web site: www.ontario.ca/buildingcode
a8	MOE (now MECP)	Ontario Ministry of the Environment (Ontario Ministry of the Environment and Climate Change) (Ontario Ministry of the Environment, Conservation and Parks) 135 St Clair Avenue West Toronto, Ontario M4V 1P5	ph: 416-325-4000 fax: 416-314-6713 web site: www.ontario.ca/ministry-environment-conservation-parks

Name	Address	Contact
NFPA	National Fire Protection Association 1 Batterymarch Park Quincy, Massachusetts 02169-7471 USA	617-770-3000 fax: 617-770-0700 web site: www.nfpa.org
NLGA	National Lumber Grades Authority #302 -960 Quayside Drive, New Westminster, British Columbia V3M 6G2	ph: 604-524-2393 fax: 604-524-2893 web site: www.nlga.org
NRCan	Natural Resources Canada Office of Energy Efficiency 580 Booth St., 18th Floor Ottawa, Ontario K1A 0E4	ph: 613-995-2943 800-387-2000 web site: www.nrcan-rncan.gc.ca
NSF	NSF International P.O. Box 130140 789 N. Dixboro Road Ann Arbor, Michigan 48113-0140 USA	ph: 734-769-8010 fax: 734-769-0109 web site: www.nsf.org
SMACNA	Sheet Metal and Air Conditioning Contractors National Association Inc. 4201 Lafayette Center Drive Chantilly, Virginia 20151-1219 USA	ph: 703-803-2980 fax: 703-803-3732 web site: www.smacna.org
TC	Transport Canada 330 Sparks Street Ottawa, Ontario K1A 0N5	ph: 613-990-2309 866-995-9737 fax: 613-954-4731 web site: www.tc.gc.ca
TPIC	Truss Plate Institute of Canada c/o Jager Metal Products, #220 6223 2nd Street East, Calgary, Alberta T2H 1J5 *The TPIC, "Truss Design Procedures and Specifications for Light Metal Plate Connected Wood Trusses" is available on-line at: the TPIC web site at: www.tpic.ca.*	web site: www.tpic.ca.
UL	Underwriters Laboratories Inc. 333 Pfingsten Road Northbrook, Illinois 60062-2096 USA	ph: 847-272-8800 web site: www.ul.com
ULC	Underwriters' Laboratories of Canada 7 Underwriters Road Toronto, Ontario M1R 3A9	ph: 866-937-3852 fax: 416-757-8727 web site: www.ulc.ca
USDA	United States Department of Agriculture 1400 Independence Ave., S.W. Washington, DC 20250 USA	web site: www.usda.gov
WEF	Water Environment Federation 601 Wythe Street Alexandria, Virginia 22314-1994 USA	ph: 800-666-0206 fax: 703-684-2492 web site: www.wef.org
WT	Waterfront Toronto 20 Bay Street, Suite 1310 Toronto, Ontario M5J 2N8	ph: 416-214-1344 fax: 416-244-4591 web site: info@waterfrontoronto.ca

a9

fact, restricted to concrete or masonry. Sentences 3.1.10.2.(3) and (4) are intended to retain both of the characteristics of firewalls, while permitting greater flexibility in the use of materials and designs. The fire-resistance rating and damage protection attributes of a firewall may be provided by a single fire- and damage-resistant material such as concrete or masonry, by a fire- and damage-resistant membrane on a structural frame, or by separate components - one that provides the fire-resistance rating and another one that protects the firewall against damage.

If the firewall is composed of separate components, the fire-resistance rating of the fire-resistive component needs to be determined for this assembly on its own. In addition, if the damage protection component is physically attached to the fire-resistive component (for example, as a sacrificial layer), then, for the purposes of determining the overall performance of the assembly, it is also necessary to determine through testing whether failure of the damage protection component during a fire affects the performance of the fire-resistive component.

a3 A-3.1.11.5.(1) Fire Blocks in Combustible Construction.

Combustible construction referred to in Sentence 3.1.11.5.(1) includes all types of construction that do not comply with the requirements for noncombustible construction. All of the elements within the concealed space can be combustible, unless required to be of noncombustible materials (e.g., certain categories of pipework and ducts). However, the value of the flame-spread rating of the combustible materials determines the permitted extent of the concealed space between fire blocks. The materials to be considered should include all construction materials regulated by this Code, including the framing and building services that are located in the concealed space. Consideration should be given when designing fire blocking to avoid restricting venting capabilities within concealed spaces. (See also A-5.6.2.1.)

A-3.1.11.7.(6) Integrity of Fire Blocks.

Sentence 3.1.11.7.(6) together with Article 3.1.9.1., is intended to ensure that the integrity of fire blocks in maintained at areas where they are penetrated. This requirement is satisfied by the use of generic fire stops such as mineral wool, gypsum plaster or Portland cement mortar, as well as rated fire stops.

A-3.1.13.2.(2) Folding Partition.

Folding partitions used to divide a space into separate rooms are not considered as doors for the purposes of this Sentence.

A-3.1.15.1.(1) Roof Covering.

The tests described in CAN/ULC-S107 are intended to measure the relative fire-performance of roof coverings when exposed to a fire originating from sources outside the building. When metal deck or a similar noncombustible rigid roof surface is directly exposed to the exterior (a covering material on its exterior surface has not been provided), the requirements of this Sentence need not apply.

a10 A-3.1.21.1. Reserved.

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a5.1 A-7.6.3.4.(5) Water System Pipe Size.

Where separate water service piping connects into private water supply piping, the private water supply piping will be governed by Article 7.1.5.5.

e6 A-7.6.4.2.(4) Plumbing Fixtures.

Heritage buildings including homes, may contain sanitary drainage piping that is sized in accordance with the flush cycle of period plumbing fixtures. Operational difficulties maybe encountered when these fixtures are replaced with one having a lower flush cycle.

A-7.6.5. Hot Water Temperature.

Hot water delivered at 60°C will severely burn human skin in 1 to 5 seconds. At 49°C the time for a full thickness scald burn to occur is 10 minutes. Children, the elderly and persons with disabilities are particularly at risk of scald burns. Compliance with Article 7.6.5.2. will reduce the risk of scalding in showers and bathtubs and reduce the risk of thermal shock in wall mounted showers. Devices installed to achieve compliance must conform to the applicable standard referenced in the Code.

Since a scald risk also exists at other fixtures, such as lavatories, sinks and bathtubs, the water outlet temperature at those fixtures is addressed by Articles 7.6.5.1. and 7.6.5.3.

A-8.1.3.1.(1) Sanitary Sewage.

Sanitary sewage of domestic origin is as described in (b) of the definition in Sentence 1.4.1.2.(1) of Division A. The addition of public swimming pool drainage to the definition of sanitary sewage is not intended to allow the discharge of the pool drainage water to an on-site sewage system.

A-8.1.3.1.(3) Evaluation of Waste from Industrial Processes.

When evaluating whether industrial process waste can go to an on-site sewage system, the total contaminant levels in the whole waste stream must be looked at. Heavy metals, pesticides and solvents are not found in domestic sewage and those levels must be brought down if present. The BOD_5 and suspended solids should be consistent with the levels found in domestic sanitary sewage. Slaughterhouses and milking operations have wastes that are similar to domestic sewage in chemical composition, but are characterized by high organic, highly nitrogenous and biologically degradable suspended and dissolved solids and grease in high concentrations. These wastes are not suitable for discharge to an on-site sewage system.

A-8.2.1.2.(1) Site Evaluation Information.

The evaluation required in Sentence (1) usually includes at least the following and is required on permit application

(a) date the evaluation was done,
(b) name, address, telephone number, and signature of the person who prepared the evaluation,
(c) a scaled plan of the site showing
  (i) the legal description of the property, property lines and easements,
  (ii) the location of items in Column 1 of Tables 8.2.1.6.A. and 8.2.1.6.B.,
  (iii) the proposed location of the sewage system,
  (iv) the location of any unsuitable, disturbed or compacted areas, and
  (v) the access route for tank maintenance,
(d) depth to bedrock,
(e) evidence of high ground water,
(f) soil properties,
(g) soil conditions,
(h) utility corridors,
(i) permeability, and
(j) potential for flooding.

A-8.2.1.2.(2) Alternative Tests.

Other tests to determine percolation time may be suitable depending on the soil type(s) encountered on a site. The results of tests other than those described in this Code may be used by relying on provisions governing the use of alternative solutions (such as Clause 1.2.1.1.(l)(b) of Division A).

A-8.2.1.2.(3) Test Procedure.

Where a field percolation test is required, it is performed in the following manner:

(a) Make an excavation in the soil layer which is to be assessed for a percolation time. The excavation shall be:

(i) between 100 and 300 mm in diameter

(ii) be at least 200 mm in depth below the upper level of the soil layer being assessed.

(b) All loose material and smeared clay shall be removed from the sides and bottom of the excavation.

(c) Cover the bottom of the excavation with 50 mm of sand or fine gravel.

(d) Fill the hole with water to a depth of 300 mm (or to the surface) and determine the time it takes for the water to seep away; repeat, and if the second filling seeps away in 10 minutes or less proceed as follows:

1. Establish a fixed reference point, add water to a depth of 150 mm above the sand or fine gravel, and measure the water drop every 10 minutes for one hour. If for one hour the first 150 mm seeps away in 10 minutes or less, use a shorter time interval between readings.
2. Refill to the 150 mm level when necessary and start another series of readings. Continue readings until the last two series of readings show a similar drop pattern (approximately equal drop in the same number of readings) or, alternatively, until the difference in the maximum and minimum drops in 3 consecutive readings is less than 5 mm. In either case use the average drop of the last 3 readings in computing "T"

(e) If the initial fillings to 300 mm take more than 10 minutes to seep away, follow with this procedure:

1. Maintain at least 300 mm of water in the hole for at least 4 hours, or until the soil being tested has become swollen and saturated with water. At least 12 hours should be allowed for swelling in clay soils, although dry clay soils may require longer periods to obtain a stabilized percolation rate.
2. After swelling remove any loose material from the top of the sand or fine gravel.
3. Using a fixed reference point, adjust the water level to 150 mm above the sand or gravel and measure the water drop every 30 minutes for four hours or until a stable rate of drop is reached. If the first 150 mm seeps away in less than 30 minutes, use a 10 minute interval and run the test for one hour or until the drop rate is stabilized. A drop of 5 mm or less in a 30 minute interval is indicative of a soil of "T" close to or greater than 50 min/cm. If it is to be assessed increase the reading interval to 60 minutes.
4. Refill with water to the 150 mm level when necessary. Take readings until a stable rate of drop is reached. This may be when the drop in two successive readings does not vary by more than 1.5 mm or when the difference between the maximum and minimum readings of the last four readings does not exceed 5 mm. Once a stable rate is reached use the average drop of the last 3 readings in computing the percolation time.

(f)

$$\text{Percolation time} = \frac{\text{Time Interval (minutes)}}{\text{Average drop of last 3 readings (cm)}}$$

A-8.2.1.3.(1) and (2) Balancing Tanks.

Where variable daily flows or peak flows occur, the flows to the sewage system may be balanced. The sewage system and any pump(s) that are installed to move the sanitary sewage, should be sized to accommodate a daily design sanitary sewage flow at least equal to the average daily sanitary sewage flow for the week. Balancing tanks should be sized in accordance with good engineering practice to ensure that peak flows can be accommodated.

A-8.2.1.4. Clearance Requirements.

Where coarse natural soils exist it may be necessary to require greater clearance distances to wells or surface water than those listed in the Tables. This is of greater importance when applied to the shoreline properties of sensitive lakes, where it is desired to prevent phosphates from entering the lakes.

a7 A-8.6.2.2. Other Treatment Units.

Article 8.6.2.2. sets out the acceptable solution to achieve Building Code compliance for residential treatment units. Sentences (1) and (2) of Article 8.6.2.2. are the performance requirements that set out the maximum concentrations of suspended solids and CBOD5 for different classifications of treatment units.

As set out in Sentence (5), treatment units that are certified to CAN/BNQ 3680-600, "Onsite Residential Wastewater Treatment Technologies" using a temperature condition listed under option a) or b) of Clause 8.2.2. of that standard are deemed to comply with the requirements of Sentences (1) and (2).

CAN/BNQ 3680-600 uses slightly different terminology than the Building Code. Note (1) to Table 8.6.2.2., which forms part of Sentences 8.6.2.2. (1) and (2), states that the classifications of treatment units specified in Column 1 correspond to the levels of treatment described in CAN/BNQ 3680-600. A Building Code Level II treatment unit corresponds to a treatment Class B-II in CAN/BNQ 3680-600, a Level III corresponds to Class B-III, and Level IV corresponds to a Class B-IV.

CAN/BNQ 3680-600 -2009 requires:

- 12 continuous months of testing in a climate representative of Ontario conditions as specified in Annex B.3. of the standard
- A minimum of weekly sampling
- 30-day average concentrations in treated effluent that do not exceed the maximum concentrations set out in Table 8.6.2.2.
- A minimum of 80% of sample results that do not exceed the maximum concentrations set out in Table 8.6.2.2.
- Influent wastewater quality that meets the requirements described in Table 5 of the standard
- Influent wastewater temperature that is:
  - Non-controlled, or
  - Controlled so that the influent wastewater is heated to no more than 11°C ±1°C,
- Hydraulic loading as specified in Clause 8.2.2.1. of NSF/ANSI Standard 40 and Annex B.4.2.2. of the standard
- Stress loading in accordance with the procedures outlined in CAN/BNQ 3680-600, which includes wash-day stress, power/equipment failure stress, and working parent stress.

Installation of a CAN/BNQ 3680-600 certified residential treatment unit provides a clear and direct method of demonstrating compliance with the effluent quality criteria in Sentences (1) and (2). No further information is required by a principal authority to determine compliance with the effluent quality criteria in Sentences (1) and (2) of this provision.

It is also possible to achieve compliance for residential treatment units which do not have BNQ certification as Sentences (1) and (2) establish performance requirements.

If a residential treatment unit has not been certified to CAN/BNQ 3680-600, the treatment unit must be designed so that the effluent does not exceed, for the level of the treatment unit set out in Column 1 of Table 8.6.2.2., the maximum concentrations set out in Column 2 and 3 of Table 8.6.2.2. The treatment unit would need to be designed so that the effluent will not exceed the maximum concentrations in climatic conditions in the part of Ontario in which the system is to be installed.

The building permit applicant would need to demonstrate to the principal authority that the treatment unit complies with Sentences (1) and (2) for the particular climatic conditions where the unit would be used. It is the responsibility of the principal authority to review and determine compliance to the level of treatment required by Sentences (1) and (2).

Compliance would typically be demonstrated by providing the principal authority with test methods, engineering reports and other relevant documentation similar to that described above for CAN/BNQ 3680-600. Documents that could assist with demonstrating compliance could include:

- name of accredited testing organization,
- trade name of the on-site residential wastewater treatment technology being tested,
- the hydraulic capacity of the treatment unit,

- stress loading in accordance with the procedures outlined in standards such as CAN/BNQ 3680-600,
- the specific model and configuration chosen for the testing, and a comparison to the specific model and configuration being proposed in the permit application and associated scaling factors,
- installation, operation and maintenance manuals,
- the dates of testing and a summary of the results of the tests for all appropriate parameters for the type of treatment for the minimum duration of 12 continuous months, including but not limited to influent and effluent wastewater characteristics such as temperature and pH, number of samples, median, standard deviation, minimum and maximum, and
- an engineering letter, sealed and stamped.

CAN/BNQ 3680-600 only applies to residential systems. For non-residential onsite sewage systems that include treatment units, the applicant would need to demonstrate compliance with Sentences (1) and (2) of Article 8.6.2.2. Non-residential treatment units, therefore, must follow the second approach described above because BNQ certification is only available for residential treatment units. Compliance would typically be demonstrated by providing the principal authority with similar information as noted above.

a7 A-8.6.2.2.(5) Temperature Conditions for Testing of Treatment Units.

The temperature options that apply to the testing of treatment units which are certified to BNQ 3680-600 standard are referenced in Sentence 8.6.2.2.(5) of the Code and are set out in option a) and option b) of Clause 8.2.2. of the BNQ standard as follows:

a) non-controlled temperature

b) controlled temperature so that the influent wastewater is heated to 11°C ±1°C, whenever necessary to assure a minimum temperature of 10°C.

Note - this option is based on a temperature of 10°C, which is a typical temperature at the outlet of the septic tank and, as well, it is required for testing nitrogen reduction treatment technologies.

Additional treatment options that are available in this standard, but are not currently required by the Building Code, are as follows:

Class of Treatment	Fecal Coliforms or E. Coli (CFU/100 mL)(1)
D-I	50 000
D-II	200
D-III	ND(2)

Notes to Table:
(1) Maximum concentration in CFU/100 mL based on 30 day average.
(2) ND means non-detectable (median < 10 CFU/100 mL)

Class of Treatment	Total Phosphorus(1), mg/L	Total Nitrogen Reduction
P-I	1.0	—
P-II	0.30	—
N-I	—	50%
N-II	—	75%

Notes to Table:
(1) Maximum concentration in mg/L based on 30 day average.

A-8.7.4.2.(1) Fill Material.

Any leaching bed fill added to meet the requirements of 8.7.4.2.(1) shall be regarded as part of the sewage system and this fill must be contained on the lot or parcel of land in which the sewage system is located.

A-8.7.5.3.(2) Spacing of Distribution Pipes.

In order to evenly apply the effluent when a filter bed is used, the maximum spacing of distribution pipes should not be greater than 1.2 m.

A-8.7.6.1. Trench Construction.

Care must be taken when constructing a shallow buried trench system. Soils have to be dry and protected to ensure smearing of the trench does not take place. If smearing does take place additional measure will need to be undertaken to ensure that the permeability of the soil is not affected in the trench.

a3 A-8.7.7.1.(5) Extension of Sand Layer.

Where the underlying soil has a percolation time greater than 15 minutes, Sentence (5) requires the sand layer described in Sentence (4) be extended 15 m beyond the perimeter of the treatment unit in any direction that the effluent may move horizontally. Consideration may be given to whether the top 300 mm of native soil has the properties required in Sentence (4) prior to removing the existing soil and replacing with sand.

This would also apply to the additional loading area required in Clause (5)(b) of QT/400.

a3 A-8.7.7.1.(8) Open Bottom Treatment Units.

Where an open bottom treatment unit is used in conjunction with a Type A dispersal bed, the placement of the unit is important to achieve even distribution and consideration may be given to the following:

1) the treatment unit is placed in the centre of the stone layer where the topography is flat, or
2) uphill of the centre of the stone layer on sloping topography.

A-8.7.8.3. Type B Dispersal Beds.

The design of a Type B dispersal bed may be based on the use of Table 2-8 of the BCMOH Sewerage System Standard Practice Manual. The Building Code requires the effluent to be of Level IV effluent for a Type B dispersal bed. The loading rates to be used pertain to Type 2 effluent within Table 2-8. The percolation time given in this Table is in min/2.54 cm (inch) not min/cm and must be converted by dividing by 2.54.

A-9.1.1.9. Factory-Built Buildings.

Manufactured buildings intended for residential occupancy must comply with all appropriate Code requirements. Only those building components that are designed and constructed in manufacturing plants in accordance with the specified standards (CSA Z240.2.1 and CSA A277) are deemed to comply with the Code. Building components designed and constructed outside the place of manufacture (e.g. masonry chimneys, basement stairs, foundations, etc.) must conform to the requirements of the Code. The Code also applies to the site installation of manufactured buildings in terms of tie-down, spatial separation, grading, plumbing connections to street services, etc.

CSA standard CSA A277, "Procedures for Factory Certification of Buildings", describes a procedure whereby an independent certification agency can review the quality control procedures of a housing factory and make periodic, unannounced inspections of its products and thus, through suitable labelling, provide assurance to authorities at the final site that the components that cannot be inspected on site comply with the code indicated on the label. It is not a building code, only a procedure for certifying compliance of factory-built components with a building code or other standard. If a factory-built house bears the label of a creditable certification agency indicating that compliance with the National Building Code has been certified using the A277 procedure, the accepting authority will have some assurance that the hidden components do not need to be inspected again on site.

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A-9.33.1.1. Combustion Air and Tight Houses.

The operation of an air exhaust system or of a fuel-burning appliance removes the air from a house, creating a slight negative pressure inside. In certain cases the natural flow of air up a chimney can be reversed, leading to a possible danger of carbon monoxide poisoning for the inhabitants.

Newer houses are generally more tightly constructed than older ones because of improved construction practices, including tighter windows, weather stripping and caulking. This fact increases the probability that infiltration may not be able to supply enough air to compensate for simultaneous operation of exhaust fans, fireplaces, clothes dryers, furnaces and space heaters. It is necessary, therefore, to introduce outside air to the space containing the fuel-burning appliance. Information regarding combustion air requirements for various types of appliances can be found in the installation standards referenced in Articles 6.2.1.4. and 9.33.1.2. In the case of solid-fuel burning stoves, ranges and space heaters, CAN/CSA-B365, "Installation Code for Solid-Fuel-Burning Appliances and Equipment" suggests that the minimum size of openings be determined by trial and error to accommodate the flue characteristics, the firing rate, the building characteristics, etc., and that, as a guide, the combustion air opening should be 0.5 times the flue collar area.

Further information is available in Canadian Building Digest 222, "Airtight Houses and Carbon Monoxide Poisoning", from the Institute for Research in Construction, National Research Council of Canada, Ottawa K1A 0R6.

A-9.33.1.2.(1) Design, Construction and Installation Standard for Solid-Fuel-Burning Appliances.

CAN/CSA-B365, "Installation Code for Solid-Fuel-Burning Appliances and Equipment" is essentially an installation standard, and covers such issues as accessibility, air for combustion and ventilation, chimney and venting, mounting and floor protection, wall and ceiling clearances, installation of ducts, pipes, thimbles and manifolds, and control and safety devices. But the standard also includes a requirement that solid-fuel-burning appliances and equipment satisfy the requirements of one of a series of standards, depending on the appliance or equipment, therefore also making it a design and construction standard. It is required that stoves, ranges, central furnaces and other space heaters be designed and built in conformity with the relevant referenced standard.

a2 A-9.33.1.2.(2) Emissions Limits.

Referenced standards CSA B415.1-00 and the US EPA Standard require that catalytic wood burning devices have a particulate emission of 4.1 g/h and non-catalytic wood burning devices have a particulate emission of 7.5 g/h. Many products are tested to the CSA B415.1-10 standard which has lower particulate emissions than the EPA standard and the 2000 version of the CSA Standard. Products tested to the CSA B415.1-10 standard would be compliant with the referenced standards. Both CSA and EPA test particulate emissions using the same testing methods. These standards do not cover site-built masonry fireplaces or heaters or factory-built fireplaces with a minimum burn rate greater than or equal to 5 kg/h.

A-9.33.4. Carbon Monoxide Alarms.

Carbon monoxide (CO) is a colourless, odourless gas that can build up to lethal concentrations in an enclosed space without the occupants being aware of it. Thus, where an enclosed space incorporates or is near a potential source of CO, it is prudent to provide some means of detecting its presence.

Dwelling units have two common potential sources of CO:

- fuel-fired space- or water-heating equipment within the dwelling unit or in adjacent spaces within the building, and
- attached storage garages.

Most fuel-fired heating appliances do not normally produce CO and, even if they do, it is normally conveyed outside the building bv the appliance's venting system. Nevertheless, appliances can malfunction and venting systems can fail. Therefore, the provision of appropriately placed CO alarms in the dwelling unit is a relatively low-cost back-up safety measure. Similarly, although Article 9.10.9.16. requires that the walls and floor/ceiling assemblies separating attached garages from dwelling units incorporate an air barrier system, there have been several instances of CO from garages being drawn into houses, which indicates that a fully gas-tight barrier is difficult to achieve. The likelihood of preventing the entry of all CO is decreased if the dwelling unit is depressurized in relation to the garage. This can readily occur due to the operation of exhaust equipment or simply due to the stack effect created by heating the dwelling unit. Again, CO alarms in the dwelling unit provide a relatively low-cost back-up safety measure.

a10 **A-9.34.4.1. Reserved.**

A-9.39. Cold Room Slabs.

Design Assumptions

1. Density of Reinforced Concrete = 23.5 kN/m^3.

2. Live Loads - As per Sentence 9.4.2.3 (1) of the Building Code, the live load is the lesser of the following:
   - 1.9 kPa,
   - Specified roof snow load, which for Ontario is up to 2.9 kPa.

Therefore a specified design load of 3.0 kPa is appropriate; however, the slab specified is capable of carrying higher live loads since the crack control requirements of CSA A23.3 and cover requirements as given below govern the design of the slab.

3. Design Standards: CSA A23.3-94, "Design of Concrete Structures".

4. Exposure and Cover for Reinforcing Steel:
   - The slab is considered to be exposed to weather and de-icing chemicals.
   - Minimum top cover is 60 mm as per CSA A23.3 Clause A15.1.7.1 plus a 12 mm tolerance on placement.
   - Minimum bottom cover is 30 mm as per CSA A23.3 Clause A12.6.2 (slab cast against formwork).
   - For 10M reinforcing bars the minimum slab thickness is 72 mm cover + 11.3 mm bar + 11.3 mm bar + 30 mm cover = 125 mm.

5. Design Assumptions:
   - Concrete compressive strength of 32 MPa at 28 days as per Sentence 9.3.1.6.(1) of the Building Code.
   - Reinforcing steel yield strength of 400 Mpa.
   - Slab design is based on a one-way slab simply supported on foundation walls along the edges. Since the slab can be square or rectangular, the same steel is provided in both directions.
   - Maximum span is limited to 20 times the slab thickness as per CSA A23.3 Table 9.1.

A-10 Change of Use.

The successful application of Code requirements to a change of use of an existing building or parts thereof without any proposed construction becomes a matter of balancing the cost of implementing a requirement with the relative importance of that requirement to the overall Code objectives. In general, the degree to which any particular requirement can be relaxed without affecting the intended level of safety of the Code requires considerable judgment on the part of both the designer and the authority having jurisdiction. Therefore, this Part sets out a minimum performance level which the change of use must maintain.

A-11.2.1.1.(1)(a) Construction Index.

The scale of 1 (lowest) to 8 (highest) was formulated for existing buildings, to be used to determine their existing performance level; the numbers, or indices, were established based on the requirements of 3.2.2.20. to 3.2.2.83. Classification of existing buildings will now be in accord with Table 11.2.1.1.A. rather than Subsection 3.2.2. The construction index is established by evaluating all floors and roofs of the existing building.

A-11.2.1.1.(1)(b) Hazard Index.

While the construction index refers to construction of the existing building, hazard index refers to the proposed major occupancy or use of the building; the scales of 1 (lowest hazard) to 8 (highest hazard) are compatible with those of the construction index. In effect, a building with a C.I. of say 3, will support a major occupancy with a H.I. of 3 or lower; if you wish to change to a major occupancy with a H.I. higher than 3, then you must increase the fire protection construction of the building to support that higher hazard according to Table 11.2.1.1.A., or provide the additional upgrading in accordance with Column 4 of Table 11.4.3.4.A.

A-11.3.1.1.(1) Performance Level.

States the philosophy and intent of this Article: "after construction, the performance level of the building may remain the same, or be made better, but may not be made worse".

Important Notice

Pending Amendments –
Keep in a Secure Place.

These changes come into effect January 1, 2020.

These pages, which have date bars at the bottom, are to replace or add to the existing corresponding pages on January 1, 2020.

Farm Building Code of Canada" if it is designed and constructed in conformance with MMAH Supplementary Standard SB-11, "Construction of Farm Buildings".

(5) A *liquid manure* storage tank shall comply with the requirements of Part 4 of Division B of this Code and the requirements of Part 4 of the CCBFC NRCC 38732, "National Farm Building Code of Canada".

(6) A *permanent solid nutrient storage facility* shall comply with the requirements of Part 4 of Division B of this Code.

r12 **(7)** Where a *floor area* or portion of a *floor area* within a *farm building* is intended to contain a *hazardous extraction* operation involving cannabis, the *floor area* or portion of the *floor area* shall be designed and constructed to comply with,

(a) the requirements for locking, latching and other fastening devices for doors set out in Article 2.7.2.2. of Division B of the Fire Code made under the *Fire Protection and Prevention Act, 1997*,

(b) the ventilation requirements set out in Articles 4.1.7.2. to 4.1.7.6. of Division B of the Fire Code, where the *hazardous extraction* operation is intended to involve the use of *flammable liquids* or *combustible liquids*, and

(c) the ventilation requirements set out in Clauses 5.1.4.2.(1)(a) to (d) and (g) of Division B of the Fire Code, where the *hazardous extraction* operation is intended to involve the use of flammable gases.

Section 1.4. Terms and Abbreviations

1.4.1. Definitions of Words and Phrases

1.4.1.1. Non-defined Terms

(1) Definitions of words and phrases used in this Code that are not included in the list of definitions in Articles 1.4.1.2., 1.4.1.3. and 1.4.1.4. and are not defined in another provision of this Code shall have the meanings that are commonly assigned to them in the context in which they are used, taking into account the specialized use of terms by the various trades and professions to which the terminology applies.

1.4.1.2. Defined Terms

(1) Each of the words and terms in italics in this Code has,

(a) the same meaning as in subsection 1(1) of the Act, if not defined in Clause (b) or (c),

(b) the same meaning as in each of the following provisions for the purposes described in the provision:

(i) Sentences 1.4.1.3.(1) and (2) of Division A, and

r11.1 (ii) Sentences 3.13.1.2.(1), 5.10.4.1.(1), 7.1.3.1.(1), 8.1.1.2.(1) and 11.1.1.2.(1) of Division B, or

(c) the following meaning for the purposes of this Code:

r6.1 *Absorption trench* means an excavation in *soil*, as defined in Part 8 of Division B, or in *leaching bed fill*, being part of a *leaching bed*, in which a *distribution pipe* or *leaching chamber* is laid that allows infiltration of the *effluent* into the *soil*, as defined in Part 8 of Division B, or *leaching bed fill*.

Acceptable solution means a requirement stated in Parts 3 to 12 of Division B.

Accessible means, when applied to a *fixture*, connection, *plumbing appliance*, valve, *cleanout* or equipment, to be accessible with or without having to first remove an access panel, door or similar obstruction, but a *fixture*, connection, *plumbing appliance*, valve, *cleanout* or equipment is not accessible if access can be gained only by cutting or breaking materials.

Access to exit means that part of a *means of egress* within a *floor area* that provides access to an *exit* serving the *floor area*.

r4 *Adaptable seating* means a fixed seat or seats designed to facilitate a side transfer from a wheelchair. (See Appendix A.)

Additional circuit vent means a *vent pipe* that is installed between a *circuit vent* and a *relief vent* to provide additional air circulation.

Adfreezing means the adhesion of *soil* to a *foundation unit* resulting from the freezing of *soil* water.

Air admittance valve means a one-way valve designed to allow air to enter the *drainage system* when the pressure in the *plumbing system* is less than the atmospheric pressure.

Air barrier system means an assembly installed to provide a continuous barrier to the movement of air.

Air break means the unobstructed vertical distance between the lowest point of an *indirectly connected waste pipe* and the *flood level rim* of the *fixture* into which it discharges.

Air-conditioning is the process of treating air in a space to control simultaneously its temperature, humidity, cleanliness, and distribution to meet the comfort requirements of the occupants of the space.

Air gap means the unobstructed vertical distance through air between the lowest point of a water supply outlet and the *flood level rim* of the *fixture* or device into which the outlet discharges.

Air-supported structure means a structure consisting of a pliable membrane that achieves and maintains its shape and support by internal air pressure.

Alarm signal means an audible signal transmitted throughout one or more zones of a *building* or throughout a *building* to advise occupants that a fire emergency exists.

Alert signal means an audible signal to advise designated persons of a fire emergency.

Allowable bearing pressure means the maximum pressure that may be safely applied to a *soil* or *rock* by the *foundation unit* considered in design under expected loading and subsurface conditions.

Allowable load means the maximum load that may be safely applied to a *foundation unit* considered in design under expected loading and subsurface conditions.

Alternative solution means a substitute for an *acceptable solution*.

r11.1 *Apparent sound transmission class* means a single number rating of the airborne sound attenuation of *building* assemblies separating two adjoining spaces, taking into account both the direct and flanking sound transmission paths, and "*ASTC*" has a corresponding meaning.

Appliance means a device to convert fuel into energy and includes all components, controls, wiring and piping required to be part of the device by the applicable standard referred to in this Code.

Architect means the holder of a licence, a certificate of practice or a temporary licence under the *Architects Act*.

Area affected by a significant drinking water threat means an area described in Clause 1.10.2.3.(2)(b) of Division C.

Artesian groundwater means a confined body of water under pressure in the ground.

As constructed plans means *construction* plans and specifications that show the *building* and the location of the *building* on the property as the *building* has been constructed.

Assembly occupancy means the *occupancy* or the use of a *building* or part of a *building* by a gathering of persons for civic, political, travel, religious, social, educational, recreational or similar purposes or for the consumption of food or drink.

Attic or roof space means the space between the roof and the ceiling of the top *storey* or between a dwarf wall and a sloping roof.

Auxiliary water supply means, when applied to premises, any water supply on or available to the premises other than the primary *potable* water supply for the premises.

Backflow means a flowing back or reversal of the normal direction of the flow.

Backflow preventer means a device or a method that prevents *backflow* in a *water distribution system*.

Back-siphonage means *backflow* caused by a negative pressure in the supply system.

Back-siphonage preventer means a device or a method that prevents *back-siphonage* in a *water distribution system*.

Back vent means a pipe that is installed to vent a *trap* off the horizontal section of a *fixture* drain or the *vertical leg* of a water closet or other *fixture* that has an integral siphonic flushing action and "*back vented*" has a corresponding meaning.

Backwater valve means a *check valve* designed for use in a gravity *drainage system*.

Barrier-free means, when applied to a *building* and its facilities, that the *building* and its facilities can be approached, entered and used by persons with physical or sensory disabilities.

Basement means one or more *storeys* of a *building* located below the *first storey*.

Bathroom group means a group of plumbing *fixtures* installed in the same room, consisting of one domestic-type lavatory, one water closet and either one bathtub, with or without a shower, or one one-headed shower.

Bearing surface means the contact surface between a *foundation unit* and the *soil* or *rock* on which the *foundation unit* bears.

Boarding, lodging or rooming house means a *building*,
(a) that has a *building height* not exceeding three *storeys* and a *building area* not exceeding 600 m^2,
(b) in which lodging is provided for more than four persons in return for remuneration or for the provision of services or for both, and
(c) in which the lodging rooms do not have both bathrooms and kitchen facilities for the exclusive use of individual occupants.

Boiler means an *appliance* intended to supply hot water or steam for space heating, processing or power purposes.

Bottle trap means a *trap* that retains water in a closed chamber and that seals the water by submerging the inlet pipe in the liquids or by a partition submerged in the liquids.

Branch means a *soil* or *waste pipe* that is connected at its upstream end to the junction of two or more *soil* or *waste pipes* or to a *soil* or *waste stack* and that is connected at its downstream end to another *branch*, a sump, a *soil* or *waste stack* or a *building drain*.

Branch vent means a *vent pipe* that is connected at its lower end to the junction of two or more *vent pipes* and that, at its upper end, is connected to another *branch vent*, a *stack vent*, a *vent stack* or a *header*, or terminates in *open air*.

Breeching means a *flue pipe* or chamber for receiving *flue* gases from one or more *flue* connections and for discharging these gases through a single *flue* connection.

Building area means the greatest horizontal area of a *building* above *grade*,
(a) within the outside surface of exterior walls, or
(b) within the outside surface of exterior walls and the centre line of *firewalls*.

Building Code website means the website at www.ontario.ca/buildingcode.

Building control valve means the valve on a *water system* that controls the flow of *potable* water from the *water service pipe* to the *water distribution system*.

Building drain means the lowest horizontal piping, including any vertical *offset*, that conducts *sewage*, *clear water waste* or storm water by gravity to a *building sewer*.

Building height means the number of *storeys* contained between the roof and the floor of the *first storey*.

Building sewer means a *sanitary building sewer* or *storm building sewer*.

Building trap means a *trap* that is installed in a *sanitary building drain* or *sanitary building sewer* to prevent circulation of air between the *sanitary drainage system* and a public sewer.

Business and personal services occupancy means the *occupancy* or use of a *building* or part of a *building* for the transaction of business or the provision of professional or personal services.

Camp for housing of workers means a camp in which *buildings* or other structures or premises are used to accommodate five or more employees.

Campground means land or premises used as an overnight camping facility that is not a *recreational camp*.

Canopy means a roof-like structure projecting more than 300 mm from the exterior face of the *building*.

Carbon dioxide equivalent means a measure used to compare the impact of various greenhouse gases based on their global warming potential.

Care and treatment occupancy (Group B, Division 2) means an *occupancy* in which persons receive special care and treatment.

r6 *Care occupancy* (Group B, Division 3) means an *occupancy*, other than a *retirement home*, in which special care is provided by a facility, directly through its staff or indirectly through another provider, to residents of the facility,

(a) who require special care because of cognitive or physical limitations, and

(b) who, as a result of those limitations, would be incapable of evacuating the *occupancy*, if necessary, without the assistance of another person.

Cavity wall means a construction of masonry units laid with a cavity between the wythes, where the wythes are tied together with metal ties or bonding units and are relied on to act together in resisting lateral loads.

Certificate for the occupancy of a building described in Sentence 1.3.3.4.(3) of Division C means a certificate described in Sentence 3.7.4.3.(6) of Division C.

r5 *Certificate for the occupancy of a building described in Sentence 1.3.3.5.(1) of Division C* means a certificate described in Sentence 3.7.4.3.(7) of Division C.

Certificate for the occupancy of a building not fully completed means a certificate described in Sentence 3.7.4.3.(5) of Division C.

r6.1 *Chamber* means a structure in a *shallow buried trench* that is constructed with an open bottom and that contains a pressurized *distribution pipe*.

Check valve means a valve that permits flow in only one direction and prevents a return flow.

r6 *Child care centre* means a child care centre as defined in subsection 2(1) of the *Child Care and Early Years Act, 2014*.

Chimney means a shaft that is primarily vertical and that encloses at least one *flue* for conducting *flue* gases to the outdoors.

Chimney liner means a conduit containing a *chimney flue* used as a lining of a *masonry or concrete chimney*.

Circuit vent means a *vent pipe* that serves a number of *fixtures* and connects to the *fixture drain* of the most upstream *fixture*, and "*circuit vented*" has a corresponding meaning.

Class 1 fire sprinkler/standpipe system means an assembly of pipes and fittings that conveys water from the *water service pipe* or *fire service main* to the sprinkler/standpipe system's outlets, is *directly connected* to the public water supply main only, has no pumps or reservoirs and in which the sprinkler drains discharge to the atmosphere, to dry wells or to other safe outlets.

Class 2 fire sprinkler/standpipe system means a *Class 1 fire sprinkler/standpipe system* that includes a booster pump in its connection to the public water supply main.

Class 3 fire sprinkler/standpipe system means an assembly of pipes and fittings that conveys *potable* water from the *water service pipe* or *fire service main* to the sprinkler/standpipe system's outlets and that is *directly connected* to the public water supply main and to one or more of the following storage facilities, which are filled from the public water supply main only: elevated water storage, fire pumps supplying water from aboveground covered reservoirs or pressure tanks.

Class 4 fire sprinkler/standpipe system means an assembly of pipes and fittings that conveys water from the *water service pipe* or *fire service main* to the sprinkler/standpipe system's outlets and is *directly connected* to the public water supply main (similar to *Class 1* and *Class 2 fire sprinkler/standpipe systems*) and to an auxiliary water supply dedicated to fire department use that is located within 520 m of a pumper connection.

Class 5 fire sprinkler/standpipe system means an assembly of pipes and fittings that conveys water from the *water service pipe* or *fire service main* to the sprinkler/standpipe system's outlets, is *directly connected* to the public water supply main and is interconnected with an *auxiliary water supply*.

Class 6 fire sprinkler/standpipe system means an assembly of pipes and fittings that conveys water from the *water service pipe* or *fire service main* to the sprinkler/standpipe system's outlets and acts as a combined industrial water supply and fire protection system that is supplied from the public water supply main only, with or without gravity storage or pump suction tanks.

Cleanout means a fitting access in a *drainage system* or *venting system* that is installed to provide access for cleaning and inspection and that is provided with a readily replaceable air tight cover.

Clean water means water that has passed through a *recirculation system*.

Clear water waste means waste water containing no impurities or contaminants that are harmful to a person's health, plant or animal life or that impair the quality of the natural environment.

Closed container means a container so sealed by means of a lid or other device that neither liquid nor vapour will escape from it at ordinary temperatures.

r11.1 *Closure* means a device or assembly for closing an opening through a *fire separation* or an exterior wall, such as a door, a shutter, a damper, wired glass and glass block, and includes all components such as hardware, closing devices, frames and anchors.

Combustible means that a material fails to meet the acceptance criteria of CAN/ULC-S114, "Test for Determination of Non-Combustibility in Building Materials".

Combustible construction means a type of construction that does not meet the requirements for *noncombustible construction*.

Combustible fibres means finely divided combustible vegetable or animal fibres and thin sheets or flakes of such materials which, in a loose, unbaled condition, present a flash fire hazard, and includes cotton, wool, hemp, sisal, jute, kapok, paper and cloth.

Combustible liquid means any liquid having a *flash point* at or above 37.8°C and below 93.3°C.

Compliance alternative means a substitute for a requirement in another Part of Division B that is listed in Part 10 or 11 of Division B, and "*C.A.*" has a corresponding meaning.

Compressed gas means,

(a) any contained mixture or material having a vapour pressure exceeding one or both of the following,
  (i) 275.8 kPa (absolute) at 21°C, or
  (ii) 717 kPa (absolute) at 54°C, or
(b) any liquid having a vapour pressure exceeding 275.8 kPa (absolute) at 37.8°C.

Computer room means a room,

(a) that contains electronic computer or data processing equipment such as main frame type,
(b) that is separated from the remainder of the *building* for the purpose of controlling the air quality in the room by a self-contained climate control system, and
(c) that has an *occupant load* of not more than one person for each 40 m² of the room.

Conditioned space means space within a *building* in which the temperature is controlled to limit variation in response to the exterior ambient temperature or interior differential temperatures by the provision, either directly or indirectly, of heating or cooling over substantial portions of the year.

Construction index means a level on a scale of 1 to 8 determined in accordance with Table 11.2.1.1.A. of Division B designating the expected *performance level* of the *building* structure with respect to the type of *construction* and fire protection of an existing *building*, and "*C.I.*" has a corresponding meaning.

Contained use area means a supervised area containing one or more rooms in which occupant movement is restricted to a single room by security measures not under the control of the occupant.

r5 *Continuous vent* means a *vent pipe* that is an extension of a vertical section of a *branch* or *fixture drain*.

Cooktop means a cooking surface having one or more burners or heating elements.

Critical level means the level of submergence at which a *back-siphonage preventer* ceases to prevent *back-siphonage*.

r11.1 *Dangerous goods* means those products or substances that are,

(a) regulated by the *Transportation of Dangerous Goods Regulations* made under the *Transportation of Dangerous Goods Act, 1992* (Canada), or
(b) classified as controlled products under the *Hazardous Products Regulations* made under the *Hazardous Products Act* (Canada).

Day camp means a camp or resort that admits persons for a continuous period not exceeding 24 hours.

Dead end means a pipe that terminates with a closed fitting.

Dead load means the weight of all permanent structural and nonstructural components of a *building*.

Deep foundation means a *foundation unit* that provides support for a *building* by transferring loads either by end-bearing to a *soil* or *rock* at considerable depth below the *building* or by adhesion or friction, or both, in the *soil* or *rock* in which it is placed. *Piles* are the most common type of *deep foundation*.

Design activities means the activities described in subsection 15.11(5) of the Act.

Design bearing pressure means the pressure applied by a *foundation unit* to *soil* or *rock*, which pressure is not greater than the *allowable bearing pressure*.

Design capacity means, in the definition of *sewage system*, the total daily design *sanitary sewage* flow determined in accordance with Article 8.2.1.3. of Division B.

Designer means the person responsible for the design.

Design load means the load applied to a *foundation unit*, which load is not greater than the *allowable load*.

Detention occupancy (Group B, Division 1) means an *occupancy* in which persons are under restraint or are incapable of self preservation because of security measures not under their control.

Developed length means, when applied to a pipe and fittings, the length along the centre line of the pipe and fittings.

Directly connected means physically connected in such a way that neither water nor gas can escape from the connection.

Distilled beverage alcohol means a beverage that is produced by fermentation and contains more than 20% by volume of water-miscible alcohol.

Distillery means a *process plant* where *distilled beverage alcohols* are produced, concentrated or otherwise processed, and includes facilities on the same site where the concentrated products may be blended, mixed, stored or packaged.

Distributing pipe means a pipe or piping in a *water distribution system*.

r6.1 *Distribution box* means a device for ensuring that *effluent* from a *treatment unit* is distributed in equal amounts to each line of *distribution pipe* or *leaching chamber* in a *leaching bed*.

Distribution pipe means a line or lines of perforated or open jointed pipe or tile installed in a *leaching bed* for the purpose of distributing *effluent* from a *treatment unit* to the *soil*, as defined in Part 8 of Division B, or *leaching bed fill* in the *leaching bed*.

Diving board means a flexible board.

Diving platform means a rigid platform that is not a *starting platform*.

Drainage system means an assembly of pipes, fittings, *fixtures* and appurtenances on a property that is used to convey *sewage* and *clear water waste* to a main sewer or a *private sewage disposal system*, and includes a *private sewer*, but does not include *subsoil drainage piping*.

Drinking water system has the same meaning as in subsection 2(1) of the *Safe Drinking Water Act, 2002*.

Drum trap means a *trap* whose inlet and outlet are in the sides of the cylindrical body of the *trap*.

Dual vent means a *vent pipe* that serves two *fixtures* and connects at the junction of the *trap arms*.

Dwelling unit means a *suite* operated as a housekeeping unit, used or intended to be used by one or more persons and usually containing cooking, eating, living, sleeping and sanitary facilities.

Earth pit privy means a latrine consisting of an excavation in the ground surmounted by a superstructure.

Effluent means *sanitary sewage* that has passed through a *treatment unit*.

Electric space heating means an electric energy source that provides more than 10 per cent of the heating capacity provided for a *building* and includes,

(a) electric resistance unitary baseboard heating,
(b) electric resistance unitary cabinet heating,
(c) electric resistance ceiling cable or floor cable heating,
(d) electric resistance central furnace heating,
(e) electric hot water space heating, and
(f) air source heat pumps in combination with electric resistance backup heating.

Excavation means the space created by the removal of *soil*, *rock* or *fill* for the purposes of construction.

Exhaust duct means a duct through which air is conveyed from a room or space to the outdoors.

Exit means that part of a *means of egress*, including doorways, that leads from the *floor area* it serves to a separate *building*, an open public thoroughfare or an exterior open space protected from fire exposure from the *building* and having access to an open public thoroughfare. (See Appendix A.)

Exit level means the level of an *exit* stairway in a *building* at which an exterior *exit* door or *exit* passageway leads to the exterior.

Exit storey means a *storey* having an exterior *exit* door in a *building* governed by Subsection 3.2.6. of Division B.

Exposing building face means that part of the exterior wall of a *building* that faces one direction and is located between ground level and the ceiling of its top *storey* or, where the *building* is divided into *fire compartments*, the exterior wall of a *fire compartment* that faces one direction.

Exterior cladding means those components of a *building* that are exposed to the outdoor environment and are intended to provide protection against wind, water or vapour.

Factory-built chimney means a *chimney* consisting entirely of factory-made parts, each designed to be assembled with the other without requiring fabrication on site.

Farm building means all or part of a *building*,

(a) that does not contain any area used for *residential occupancy*,
(b) that is associated with and located on land devoted to the practice of farming, and
(c) that is used essentially for the housing of equipment or livestock or the production, storage or processing of agricultural and horticultural produce or feeds.

(See Appendix A.)

Fill means *soil*, *rock*, rubble, industrial waste such as slag, organic material or a combination of these that is transported and placed on the natural surface of a *soil* or *rock* or organic terrain; it may or may not be compacted.

Fire block means a material, component or system that restricts the spread of fire within a concealed space or from a concealed space to an adjacent space.

Fire compartment means an enclosed space in a *building*,

(a) that is separated from all other parts of the *building* by enclosing construction that provides a *fire separation*, and
(b) that may be required to have a *fire-resistance rating*.

Fire damper means a *closure* that consists of a normally held open damper installed in an air distribution system or in a wall or floor assembly and designed to close automatically in the event of a fire in order to maintain the integrity of the *fire separation*.

Fire detector means a device that detects a fire condition and automatically initiates an electrical signal to actuate an *alert signal* or *alarm signal* and includes *heat detectors* and *smoke detectors*.

Fire load means, when applied to *occupancy*, the *combustible* contents of a room or *floor area* expressed in terms of the average weight of *combustible* materials per unit area, from which the potential heat liberation may be calculated based on the calorific value of the materials, and includes the furnishings, finished floor, wall and ceiling finishes, trim and temporary and movable *partitions*.

Fire-protection rating means the time in minutes or hours that a *closure* will withstand the passage of flame when exposed to fire under specified conditions of test and performance criteria, or as otherwise prescribed in this Code.

Fire-resistance rating means the time in minutes or hours that a material or assembly of materials will withstand the passage of flame and the transmission of heat when exposed to fire under specified conditions of test and performance criteria, or as determined by extension or interpretation of information derived from that test and performance as prescribed in this Code.

Fire-retardant treated wood means wood or a wood product that has been impregnated with fire-retardant chemicals to reduce its surface-burning characteristics such as flame spread, rate of fuel contribution and the density of smoke developed.

Fire separation means a construction assembly that acts as a barrier against the spread of fire. (See Appendix A.)

Fire service main means a pipe and its appurtenances that are connected to a source of water and that are located on a property,

(a) between the source of water and the base of the riser of a water-based fire protection system,
(b) between the source of water and inlets to foam making systems,

(c) between the source of water and the base elbow of private hydrants or monitor nozzles,
(d) as fire pump suction and discharge piping not within a *building*, or
(e) beginning at the inlet side of the check valve on a gravity or pressure tank.

Fire stop means a system consisting of a material, component and means of support, used to fill gaps between *fire separations* or between *fire separations* and other assemblies, or used around items that wholly or partially penetrate a *fire separation*.

Fire stop flap means a device,
(a) that is intended for use in horizontal assemblies that are required to have a *fire-resistance rating* and incorporate protective ceiling membranes, and
(b) that operates to close off a duct opening through the membrane in the event of a fire.

Firewall means a type of *fire separation* of *noncombustible construction* that subdivides a *building* or separates adjoining *buildings* to resist the spread of fire and that has a *fire-resistance rating* as prescribed in this Code and the structural stability to remain intact under fire conditions for the required fire-rated time.

First storey means the *storey* that has its floor closest to *grade* and its ceiling more than 1.8 m above *grade*.

Fixture means a receptacle, *plumbing appliance*, apparatus or other device that discharges *sewage* or *clear water waste*, and includes a floor drain.

Fixture drain means the pipe that connects a *trap* serving a *fixture* to another part of a *drainage system*.

Fixture outlet pipe means a pipe that connects the waste opening of a *fixture* to the *trap* serving the *fixture*.

Fixture unit means, when applied to a *drainage system*, the unit of measure based on the rate of discharge, time of operation and frequency of use of a *fixture* that expresses the hydraulic load that is imposed by that *fixture* on the *drainage system*.

Fixture unit means, when applied to a *water distribution system*, the unit of measure based on the rate of supply, time of operation and frequency of use of a *fixture* or outlet that expresses the hydraulic load that is imposed by that *fixture* or outlet on the supply system.

Flame-spread rating means an index or classification indicating the extent of the spread of flame on the surface of a material or an assembly of materials, as determined in a standard fire test prescribed in this Code.

Flammable liquid means any liquid having a *flash point* below 37.8°C and having a vapour pressure not more than 275.8 kPa (absolute) at 37.8°C as determined by ASTM D323, "Vapor Pressure of Petroleum Products (Reid Method)".

Flash point means the minimum temperature at which a liquid within a container gives off vapour in sufficient concentration to form an ignitable mixture with air near the surface of the liquid.

Flood level rim means the top edge at which water can overflow from a *fixture* or device.

Floor area means the space on any *storey* of a *building* between exterior walls and required *firewalls*, including the space occupied by interior walls and *partitions*, but not including *exits*, *vertical service spaces* and their enclosing assemblies.

Flow control roof drain means a *roof drain* that restricts the flow of *storm water* into the *storm drainage system*.

Flue means an enclosed passageway for conveying *flue* gases.

Flue collar means the portion of a fuel-fired *appliance* designed for the attachment of the *flue pipe* or *breeching*.

Flue pipe means the pipe connecting the *flue collar* of an *appliance* to a *chimney*.

Food premises means a *floor area* where food or drink for human consumption, or an ingredient of food or drink for human consumption, is manufactured, processed, prepared, stored, displayed, handled, served, distributed, sold or offered for sale, but does not include,
(a) a private residence,
(b) a boarding house that provides meals for fewer than 10 boarders,
r11.1 (c) a *building* to which Ontario Regulation 502/17 (Camps in Unorganized Territory) or Ontario Regulation 503/17 (Recreational Camps) made under the *Health Protection and Promotion Act* applies,
(d) a plant, as defined in the *Milk Act*, that is required to be operated under the authority of a licence issued under that Act,

Medium hazard industrial occupancy (Group F, Division 2) means an *industrial occupancy* in which the *combustible* content is more than 50 kg/m^2 or 1 200 MJ/m^2 of *floor area* and that is not classified as a *high hazard industrial occupancy*.

Mercantile occupancy means the *occupancy* or use of a *building* or part of a *building* for the displaying or selling of retail goods, wares or merchandise.

Mezzanine means an intermediate floor assembly between the floor and ceiling of any room or *storey* and includes an interior balcony.

r4 *Mobility assistive device* means a mobility assistive device as defined in section 2 of Ontario Regulation 191/11 (Integrated Accessibility Standards) made under the *Accessibility for Ontarians with Disabilities Act, 2005*.

Modified pool means a *public pool* that has a basin-shaped floor sloping downward and inward toward the interior from the rim.

Modified stack venting means a *stack venting* arrangement in which the *stack vent* above the connection of the highest *stack vented fixture* is reduced in diameter.

Municipal drinking water system has the same meaning as in subsection 2(1) of the *Safe Drinking Water Act*, *2002*.

Nominally horizontal means at an angle of less than 45° with the horizontal.

Nominally vertical means at an angle of not more than 45° with the vertical.

Noncombustible means that a material meets the acceptance criteria of CAN/ULC-S114, "Test for Determination of Non-Combustibility in Building Materials".

Noncombustible construction means a type of construction in which a degree of fire safety is attained by the use of *noncombustible* materials for structural members and other building assemblies.

Objective means an objective set out in Article 2.2.1.1.

Occupancy means the use or intended use of a *building* or part of a *building* for the shelter or support of persons, animals or property.

Occupant load means the number of persons for which a *building* or part of a *building* is designed.

Offset means the piping that connects the ends of two pipes that are parallel.

Offset relief vent means a *relief vent* that provides additional air circulation upstream and downstream of an *offset* in a *soil* or *waste stack*.

Open air means the atmosphere outside a *building*.

Open-air storey means a *storey* in which at least 25 percent of the total area of its perimeter walls is open to the outdoors in a manner that will provide cross ventilation to the entire *storey*.

Outdoor pool means a *public pool* that is not an *indoor pool*.

Pail privy means a latrine in which the receptacle for human waste consists of a removable container surmounted by a superstructure.

Partition means an interior wall, one *storey* or part-*storey* in height, that is not *loadbearing*.

Party wall means a wall,

(a) that is jointly owned and jointly used by two parties under an easement agreement or by a right in law, and
(b) that is erected at or upon a line separating two parcels of land each of which is, or is capable of being, a separate real estate entity.

Perched groundwater means a free standing body of water in the ground extending to a limited depth.

Percolation time means the average time in minutes that is required for water to drop one centimetre during a percolation test or as determined by a *soil* evaluation or analysis.

Performance level means the level of performance under which all or part of an existing *building* functions with respect to its *building systems*.

Permanent solid nutrient storage facility has the same meaning as in subsection 1(1) of Ontario Regulation 267/03 (General) made under the *Nutrient Management Act, 2002*.

Pharmacy means the premises in a *building* or the part of the premises in which prescriptions are compounded and dispensed for the public or in which drugs are sold by retail.

Pile means a slender *deep foundation unit*,

(a) that is made of materials such as wood, steel or concrete or a combination of them, and
(b) that is either pre-manufactured and placed by driving, jacking, jetting or screwing, or cast-in-place in a hole formed by driving, excavating or boring.

Plenum means a chamber forming part of an air duct system.

Plumbing appliance means a receptacle or equipment that receives or collects water, liquids or *sewage* and discharges water, liquid or *sewage* directly or indirectly to a *plumbing system*.

Plumbing system means a system of connected piping, fittings, valves, equipment, *fixtures* and appurtenances contained in *plumbing*. (See Appendix A.)

Point of entry treatment unit has the same meaning as in subsection 1(1) of Ontario Regulation 170/03 (Drinking Water Systems) made under the *Safe Drinking Water Act, 2002*.

Pool deck means the area immediately surrounding a *public pool*.

Portable privy means a portable latrine in which the receptacle for human body waste and the superstructure are combined structurally into one unit.

Post-disaster building means a *building* that is essential to the provision of services in the event of a disaster, and includes,

(a) hospitals, emergency treatment facilities and blood banks,
(b) telephone exchanges,
(c) power generating stations and electrical substations,
(d) control centres for land transportation,
(e) public water treatment and storage facilities,
(f) water and sewage pumping stations,
(g) emergency response facilities,
(h) fire, rescue and police stations,
(i) storage facilities for vehicles or boats used for fire, rescue and police purposes, and
(j) communications facilities, including radio and television stations.

Potable means fit for human consumption.

Potable water system means the *plumbing* that conveys *potable* water.

Pressurized distribution system means a *leaching bed* in which the *effluent* is distributed through the use of pressurized *distribution pipes*.

Private sewage disposal system means a *sewage system* or a *sewage works* that is not owned and operated by the Crown, a municipality or an organization acceptable to the Director responsible for issuing an environmental compliance approval required under section 53 of the *Ontario Water Resources Act*.

r6 *Private sewer* means a sewer other than a *building sewer* that,

r11.1 (a) is not owned or operated by a municipality, the Ministry of the Environment, Conservation and Parks or another public agency,
(b) receives drainage from more than one *sanitary building drain* either directly or through more than one *sanitary building sewer* or receives drainage from more than *one storm building drain* either directly or through one or more *storm building sewers*, and connects to a main sewer, or
(c) serves as a place of disposal on the property,

but does not include,

(d) a sewer that carries only the sanitary waste or *storm sewage* from semi-detached houses each containing not more than two *dwelling units*,
(e) a sewer that carries only the sanitary waste or *storm sewage* from one main *building* that is of *care*, *care and treatment*, *detention*, commercial or *industrial occupancy* and one ancillary *building*, or
(f) a sewer that carries only the sanitary waste or *storm sewage* from a row housing complex having five or fewer *dwelling units*.

Sewage means *sanitary sewage* or *storm sewage*.

Sewage system means,

(a) a chemical toilet, an incinerating toilet, a recirculating toilet, a self-contained portable toilet and all forms of privy, including a *portable privy*, an *earth pit privy*, a *pail privy*, a *privy vault* and a composting toilet system,
(b) a *greywater* system,
(c) a cesspool,
(d) a *leaching bed* system, or
(e) a system that requires or uses a *holding tank* for the retention of *hauled sewage* at the site where it is produced before its collection by a *hauled sewage system*,

where these,

(f) have a *design capacity* of 10,000 litres per day or less,
(g) have, in total, a *design capacity* of 10,000 litres per day or less, where more than one of these are located on a lot or parcel of land, and
(h) are located wholly within the boundaries of the lot or parcel of land on which is located the *building* or *buildings* they serve.

Sewage works means sewage works as defined in subsection 1(1) of the *Ontario Water Resources Act*.

r3 *Sewer lateral extension* means the portion of a *storm building sewer* or *sanitary building sewer* that extends from the public sewer up to 1.5 m into the property.

r6.1 *Shallow buried trench* means an *absorption trench* that contains a *chamber* or *leaching chamber*.

Shallow foundation means a *foundation unit* that derives its support from *soil* or *rock* located close to the lowest part of the *building* that it supports.

Shelf and rack storage system means a self-contained structural system within a *building*, having one or more elevated platforms or walkway levels for personnel access that may also support conveyors and other material handling, storage and distribution equipment.

Significant drinking water threat has the same meaning as in subsection 2(1) of the *Clean Water Act, 2006*.

Size means the nominal diameter by which a pipe, fitting, *trap* or other similar item is commercially designated.

Smoke alarm means a combined *smoke detector* and audible alarm device designed to sound an alarm within the room or *suite* in which it is located on the detection of smoke within that room or *suite*.

Smoke detector means a *fire detector* designed to operate when the concentration of airborne combustion products exceeds a pre-determined level.

Soil means, except for the purposes of Part 8 of Division B, a portion of the earth's crust that is fragmentary or such that individual particles of a dried sample may be readily separated by agitation in water, and includes boulders, cobbles, gravel, sand, silt, clay and organic matter.

Soil pipe means a *sanitary drainage pipe* that carries the discharge of a *sanitary unit*, with or without the discharge from any other *fixture*.

Soil stack means a vertical *soil pipe* that passes through one or more *storeys* and includes any *offset* that is part of the stack.

r11.1 *Solid masonry* means a single-wythe or multi-wythe construction made of *solid masonry units* or semi-solid, cored or hollow masonry units, the cells of which may or may not be filled with mortar or grout. In multi-wythe masonry construction, the space between the wythes consists of a mortar-filled collar joint or grout-filled space and the wythes may or may not be constructed of the same masonry materials.

r11.1 *Solid masonry unit* means a concrete block or brick unit, a clay brick unit or a calcium silicate brick unit, the net solid area of which is at least 75% of its gross area.

r11.1 *Sound transmission class* means a single number rating of the airborne sound attenuation of a *building* assembly separating two adjoining spaces, taking into account only the direct sound transmission path, and "STC" has a corresponding meaning.

Source protection area has the same meaning as in subsection 2(1) of the *Clean Water Act, 2006*.

Source protection plan has the same meaning as in subsection 2(1) of the *Clean Water Act, 2006*.

Space heater means a *space-heating appliance* for heating the room or space within which it is located, without the use of ducts.

Space-heating appliance means an *appliance*,
(a) that is intended to supply heat directly to a room or space, such as a *space heater*, fireplace and *unit heater*, or
(b) that is intended to supply heat to rooms or spaces of a *building* through a heating system, such as a central *furnace* or *boiler*.

Sprinklered means equipped with a system of automatic sprinklers.

Stack vent means a *vent pipe* that connects the top of a *soil stack* or *waste stack* to a *header* or *open air* and "*stack vented*" has a corresponding meaning.

Stack venting means, when used with reference to *fixtures*, an arrangement such that the connections of the drainage piping from the *stack vented fixtures* to the stack provide venting to the *fixture traps* so that no additional *vent pipe* is required.

Stage means a space that is designed primarily for theatrical performances with provision for quick change scenery and overhead lighting, including environmental control for a wide range of lighting and sound effects, and that is traditionally, but not necessarily, separated from the audience by a proscenium wall and curtain opening.

Starting platform means a rigid platform located entirely on a *pool deck* that consists of a top that, if projected horizontally over the water surface, would be less than 1 000 mm in vertical height above the surface and that is designed to be used by a swimmer to dive from at the start of a swimming race.

Storage garage means a *building* or part of a *building* that is intended for the storage or parking of motor vehicles and that contains no provision for the repair or servicing of motor vehicles.

Storage-type service water heater means a *service water heater* with an integral hot water storage tank.

Storey means, except for the purposes of Part 7 of Division B, the portion of a *building*,
(a) that is situated between the top of any floor and the top of the floor next above it, or
(b) that is situated between the top of the floor and the ceiling above the floor, if there is no floor above it.

Storm building drain means a *building drain* that conducts storm water and is connected at its upstream end to a leader, sump or catch basin, and at its downstream end to a *building sewer* or a designated storm water disposal location.

Storm building sewer means a *building sewer* that conveys *storm sewage* to a place of disposal and commences 1 000 mm from the *building*.

Storm drainage pipe means all the connected piping that conveys *storm sewage* to a place of disposal and includes the *storm building drain*, *storm building sewer*, rain water *leader*, catch basin and area drain installed to collect water from the property and the piping that drains water from a swimming pool, other than a *public pool*, or from water cooled *air-conditioning* equipment, but does not include,
(a) a *subsoil drainage pipe*, or
(b) a private sewage treatment and disposal facility designed for the treatment or retention of *storm sewage* prior to discharge to the natural environment.

Storm drainage system means a *drainage system* that conveys *storm sewage*.

Storm sewage means water that is discharged from a surface as a result of rainfall, snow melt or snowfall.

Storm sewer means a sewer that conveys *storm sewage*.

Stove means an *appliance* intended for cooking or space heating or both.

Street means any highway, road, boulevard, square or other improved thoroughfare that is 9 m or more in width, that has been dedicated or deeded for public use and that is accessible to fire department vehicles and equipment.

Subsoil drainage pipe means a pipe that is installed underground to intercept and convey subsurface water, and includes foundation drain pipes.

Subsurface investigation means the appraisal of the general subsurface conditions at a *building* site by analysis of information gained by methods such as geological surveys, in situ testing, sampling, visual inspection, laboratory testing of samples of the subsurface materials and *groundwater* observations and measurements.

Suite means a single room or series of rooms of complementary use, operated under a single tenancy, and includes,
(a) *dwelling units*,
(b) individual guest rooms in motels, hotels, boarding houses, rooming houses and dormitories, and
(c) individual stores and individual or complementary rooms for *business and personal services occupancies*.
(See Appendix A.)

Supply duct means a duct for conveying air from a heating, ventilating or *air-conditioning appliance* to a space to be heated, ventilated or air-conditioned.

Surface water means water on the surface of the ground.

Tarion Warranty Corporation means Tarion Warranty Corporation as designated under section 2 of the *Ontario New Home Warranties Plan Act*.

Theatre means a place of public assembly intended for the production and viewing of the performing arts or the screening and viewing of motion pictures, and consisting of an auditorium with permanently fixed seats intended solely for a viewing audience.

Trap means a fitting or device that is designed to hold a liquid seal that will prevent the passage of gas but will not materially affect the flow of a liquid.

Trap arm means that portion of a *fixture drain* between the *trap weir* and the *vent pipe* fitting.

Trap dip means the lowest part of the upper interior surface of a *trap*.

Trap seal depth means the vertical distance between the *trap dip* and the *trap weir*.

Trap standard means the *trap* for a *fixture* that is integral with the support for the *fixture*.

Trap weir means the highest part of the lower interior surface of a *trap*.

Treatment unit means a device that, when designed, installed and operated in accordance with its design specifications, provides a specific degree of *sanitary sewage* treatment to reduce the contaminant load from that of *sanitary sewage* to a given *effluent* quality.

Tribunal means the Licence Appeal Tribunal established under the *Licence Appeal Tribunal Act, 1999*.

r6.1 *Type A dispersal bed* means a *leaching bed* that receives *effluent* from a Level IV *treatment unit* as described in Table 8.6.2.2. of Division B and that is comprised of a stone layer or *leaching chambers* installed over an unsaturated sand layer as described in Subsection 8.7.7. of Division B.

Type B dispersal bed means a *leaching bed* comprised of a *pressurized distribution system* that uniformly distributes *effluent* from a Level IV *treatment unit* as described in Table 8.6.2.2. of Division B to the underlying *soil*, as defined in Part 8 of Division B, through a set of *distribution pipes* installed in a bed comprised of septic stone.

Unit heater means a suspended *space heater* with an integral air circulating fan.

Unprotected opening means, when applied to an *exposing building face,*
(a) a doorway, window or opening, other than one equipped with a closure having the required *fire-protection rating*, or
(b) any part of a wall forming part of the *exposing building face* that has a *fire-resistance rating* less than required for the *exposing building face*.

Unstable liquid means a liquid, including *flammable liquids* and *combustible liquids*, that is chemically reactive to the extent that it will vigorously react or decompose at or near normal temperature and pressure conditions or that is chemically unstable when subjected to impact.

Vacuum breaker means *back-siphonage preventer*.

Vapour barrier means the elements installed to control the diffusion of water vapour.

Vent connector means, when applied to a heating or cooling system, the part of a venting system that conducts the *flue* gases or vent gases from the *flue collar* of a gas *appliance* to the *chimney* or *gas vent*, and may include a draft control device.

Vent pipe means a pipe that is part of a *venting system*.

Vent stack means a *vent pipe* that is connected at its upper end to a *header* or is terminated in *open air* and that is used to limit pressure differential in a *soil* or *waste stack*.

Venting system means an assembly of pipes and fittings that connects a *drainage system* with *open air* for circulation of air and the protection of *trap* seals in the *drainage system*.

Vertical leg means the vertical portion of a *fixture* drain and includes the portion of a drain from the outlet of a water closet bowl to the point where the connecting piping changes to horizontal.

Vertical service space means a shaft that is oriented essentially vertically and that is provided in a *building* to facilitate the installation of *building* services, including mechanical, electrical and plumbing installations and facilities such as elevators, refuse chutes and linen chutes.

Vulnerable area has the same meaning as in subsection 2(1) of the *Clean Water Act, 2006*.

Walkway means a covered or roofed pedestrian thoroughfare used to connect two or more *buildings*.

Waste pipe means a *sanitary drainage pipe* that carries the discharge from a *fixture* directly to a *waste stack*, *soil stack*, *sanitary building drain*, *branch* or *sewage system*.

Waste stack means a vertical *waste pipe* that passes through one or more *storeys* and includes any offset that is part of the stack that conducts liquid waste from *fixtures* other than *sanitary units*.

Water distribution system means an assembly of pipes, fittings, valves and appurtenances that conveys *potable water* to water supply outlets, *fixtures*, *plumbing appliances* and devices from the *water service pipe* or from a *point of entry treatment unit* located in the *building*.

Water purveyor means the owner or operator of a *drinking water system*.

Water service pipe means a pipe on the property that conveys *potable* water from a *drinking water system* or a *private water supply* to the inside of the *building*.

Water system means a *water service pipe*, a *private water supply*, a *water distribution system*, a *fire service main* or any part of any of them.

Wave action pool means a *public pool* equipped with a means for inducing wave motion in the water.

Wet vent means a *waste pipe* that also serves as a *vent pipe*.

Working capacity means the volume of liquid that a *treatment unit* or *holding tank* is capable of holding without overflowing while it is in its working position, but does not include the volume of liquid contained in a compartment in which a pump or siphon is installed.

X-ray equipment includes x-ray imaging systems, processing equipment and equipment directly related to the production of images for diagnosis or directly related to irradiation with x-rays for therapy.

X-ray machine means an electrically-powered device producing x-rays,

(a) for the irradiation of a human being or an animal for a therapeutic or diagnostic purpose, or
(b) for industrial use.

Yoke vent means a *vent pipe* that is connected at its lower end to a *soil* or *waste stack* and at its upper end to a *vent stack* or a *branch vent* that is connected to a *vent stack*.

1.4.1.3. Definition of Applicable Law (See Appendix A.)

(1) For the purposes of clause 8(2)(a) of the Act, *applicable law* means,

(a) the statutory requirements in the following provisions with respect to the following matters:

r6 (0.i) section 14 of Ontario Regulation 137/15 (General) made under the *Child Care and Early Years Act, 2014* with respect to the approval of plans for a new *building* to be erected or an existing *building* to be used, altered or renovated for use as a *child care centre* or for alterations or renovations to be made to premises used by a *child care centre*,

r9 (i) section 114 of the *City of Toronto Act, 2006* with respect to the approval by the City of Toronto or the Local Planning Appeal Tribunal of plans and drawings,

(ii) section 59 of the *Clean Water Act, 2006* with respect to the issuance of a notice by the risk management official for the *construction* of a *building*,

r6 (iii) reserved,

(iv) section 194 of the *Education Act* with respect to the approval of the Minister for the *demolition* of a *building*,

r11 (v) reserved,

(vi) section 5 of the *Environmental Assessment Act* with respect to the approval of the Minister or the Environmental Review Tribunal to proceed with an undertaking,

(vii) section 46 of the *Environmental Protection Act* with respect to the approval of the Minister to use land or land covered by water that has been used for the disposal of waste,

(viii) section 47.3 of the *Environmental Protection Act* with respect to the issuance of a renewable energy approval,

(ix) section 168.3.1 of the *Environmental Protection Act* with respect to the *construction* of a *building* to be used in connection with a change of use of a property,

(x) paragraph 2 of subsection 168.6(1) of the *Environmental Protection Act* if a certificate of property use has been issued in respect of the property under subsection 168.6(1) of that Act,

(xi) section 14 of the *Milk Act* with respect to the permit from the Director for the *construction* or alteration of any *building* intended for use as a plant,

(xii) section 11.1 of Ontario Regulation 267/03 (General), made under the *Nutrient Management Act*, *2002*, with respect to a proposed *building* or structure to house farm animals or store nutrients if that Regulation requires the preparation and approval of a nutrient management strategy before *construction* of the proposed *building* or structure,

(xiii) subsection 30(2) of the *Ontario Heritage Act* with respect to a consent of the council of a *municipality* to the alteration or *demolition* of a *building* where the council of the *municipality* has given a notice of intent to designate the *building* under subsection 29(3) of that Act,

(xiv) section 33 of the *Ontario Heritage Act* with respect to the consent of the council of a *municipality* for the alteration of property,

(xv) section 34 of the *Ontario Heritage Act* with respect to the consent of the council of a *municipality* for the *demolition* of a *building*,

(xvi) section 34.5 of the *Ontario Heritage Act* with respect to the consent of the Minister to the alteration or *demolition* of a designated *building*,

(xvii) subsection 34.7(2) of the *Ontario Heritage Act* with respect to a consent of the Minister to the alteration or *demolition* of a *building* where the Minister has given a notice of intent to designate the *building* under section 34.6 of that Act,

(xviii) section 42 of the *Ontario Heritage Act* with respect to the permit given by the council of a *municipality* for the erection, alteration or *demolition* of a *building*,

r7 (xviii.1) section 17.4 of the *Ontario New Home Warranties Plan Act* with respect to the provision of a confirmation by the Registrar for the *construction* of a residential condominium conversion project,

(xix) section 14 of the *Ontario Planning and Development Act*, *1994* with respect to any conflict between a development plan made under that Act and a zoning by-law that affects the proposed *building* or structure,

r9 (xx) section 41 of the *Planning Act* with respect to the approval by the council of the *municipality* or the Local Planning Appeal Tribunal of plans and drawings,

(xxi) section 42 of the *Planning Act* with respect to the payment of money or making arrangements satisfactory to the council of a *municipality* for the payment of money, where the payment is required under subsection 42(6) of that Act,

r3 (xxii) section 2 of Ontario Regulation 239/13 (Activities on Public Lands and Shore Lands — Work Permits and Exemptions), made under the *Public Lands Act*, with respect to the work permit authorizing the *construction* or placement of a *building* on public land,

r3 (xxii.1) section 5 of Ontario Regulation 239/13 with respect to the exemption from the requirement to obtain a work permit authorizing the *construction* or placement of a *building* within an unpatented mining claim,

(xxiii) section 34 or 38 of the *Public Transportation and Highway Improvement Act* with respect to the permit from the Minister for the placement, erection or alteration of any *building* or other structure or the use of land,

(b) the following provisions of Acts and regulations:

(i) subsection 102(3) of the *City of Toronto Act, 2006*,

(ii) sections 28 and 53 of the *Development Charges Act*, *1997*,

(iii) sections 257.83 and 257.93 of the *Education Act*,

(iv) subsection 5(4) of the *Environmental Assessment Act*,

(v) subsection 133(4) of the *Municipal Act*, *2001*,

(vi) subsection 24(3) of the *Niagara Escarpment Planning and Development Act*,

(vii) subsection 27(3) of the *Ontario Heritage Act*,

(viii) section 33 of the *Planning Act* except where, in the case of the *demolition* of a residential property, a permit to *demolish* the property is obtained under that section,

(ix) section 46 of the *Planning Act*,

r6 (b.1) by-laws made by a *municipality* under an agreement entered into under section 5.81 of the *Aeronautics Act* (Canada),

(c) regulations made by a conservation authority under clause 28(1)(c) of the *Conservation Authorities Act* with respect to permission of the authority for the *construction* of a *building* or structure if, in the opinion of the authority, the control of flooding, erosion, dynamic beaches or pollution or the conservation of land may be affected by the development,

(d) by-laws made under section 108 of the *City of Toronto Act, 2006*, but only with respect to the issuance of a permit for the *construction* of a green roof if the *construction* of the roof is prohibited unless a permit is obtained,

(e) by-laws made under section 40.1 of the *Ontario Heritage Act*,

(f) by-laws made under section 34 or 38 of the *Planning Act*,

r6 (g) subject to Clause (h), by-laws made under Ontario Regulation 173/16 (Community Planning Permits) made under the *Planning Act*,

(h) by-laws referred to in Clause (g) in relation to the development of land, but only with respect to the issuance of a development permit if the development of land is prohibited unless a development permit is obtained,

r6 (i) by-laws made under Ontario Regulation 246/01 (Development Permits) made under the *Planning Act* which continue in force despite the revocation of that Regulation by reason of section 19 of Ontario Regulation 173/16 (Community Planning Permits) made under that Act,

(j) orders made by the Minister under section 47 of the *Planning Act* or subsection 17(1) of the *Ontario Planning and Development Act*, *1994*, and

(k) by-laws made under any private Act that prohibit the proposed *construction* or *demolition* of the *building* unless the by-law is complied with.

(2) For the purposes of clause 10(2)(a) of the Act, *applicable law* means any general or special Act, and all regulations and by-laws enacted under them that prohibit the proposed use of the *building* unless the Act, regulation or by-law is complied with.

1.4.1.4. Other Definitions for the Purposes of the Act

(1) For the purposes of the Act, *architect*, *as constructed plans* and *professional engineer* have the same meaning as that set out in Clause 1.4.1.2.(1)(c).

1.4.2. Symbols and Other Abbreviations

1.4.2.1. Symbols and Other Abbreviations

(1) In this Code, a symbol or abbreviation listed in Column 1 of Table 1.4.2.1. has the meaning listed opposite it in Column 2.

Division B

Acceptable Solutions

Part 1

General

1.1. General

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Part 1

General

Section 1.1. General

1.1.1. Application

1.1.1.1. Application

(1) This Part applies to all *buildings* covered in this Code.

1.1.2. Climatic Data

1.1.2.1. Climatic and Seismic Design Values

(1) The climatic and seismic values required for the design of *buildings* under this Code shall be in conformance with the climatic and seismic values provided in MMAH Supplementary Standard SB-1, "Climatic and Seismic Data".

(2) The outside winter design temperatures determined from MMAH Supplementary Standard SB-1, "Climatic and Seismic Data", shall be those listed for the January 2.5% values. (See Appendix A.)

1.1.2.2. Depth of Frost Penetration

(1) Depth of frost penetration shall be established on the basis of local experience.

Section 1.2. Reserved

Section 1.3. Referenced Documents and Organizations

1.3.1. Referenced Documents

1.3.1.1. Effective Date

r11.1 **(1)** Unless otherwise specified in this Code, the documents referenced in this Code shall include all amendments, revisions and supplements effective to June 30, 2017.

1.3.1.2. Applicable Editions

(1) Where documents are referenced in this Code, they shall be in the editions designated in Column 2 of Table 1.3.1.2.

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Table 1.3.1.2.
Documents Referenced in the Building Code
Forming Part of Sentence 1.3.1.2.(1)

Issuing Agency	Document Number	Title of Document(1)	Code Reference
ACGIH	2013, 28th Edition	Industrial Ventilation Manual	6.2.1.1.(1)
AISI	S201-12	North American Standard for Cold Formed Steel Framing – Product Data	9.24.1.2.(1)
ANSI	A208.1-2009	Particleboard	9.23.14.2.(3) 9.29.9.1.(1) 9.30.2.2.(1)
ANSI/ASHRAE	62.1-2010	Ventilation for Acceptable Indoor Air Quality	6.2.2.1.(2) 6.2.3.8.(15) 6.2.3.21A.(1)
ANSI/ASHRAE/ IESNA	90.1-2013	Energy Standard for Buildings Except Low-Rise Residential Buildings	6.2.1.1.(1)
ANSI/CSA	ANSI Z21.22-2015 / CSA 4.4-2015	Relief Valves for Hot Water Supply Systems	7.2.10.11.(1)
APHA/AWWA/ WEF	2012, 22nd Edition	Standard Methods for the Examination of Water and Wastewater	8.9.2.4.(1)
ASCE	ASCE/SEI 49-12	Wind Tunnel Testing for Buildings and Other Structures	4.1.7.12.(1)
ASHRAE	2017	Fundamentals	5.2.1.3.(1) 6.2.1.1.(1)
ASHRAE	2015	HVAC Applications	6.2.1.1.(1)
ASHRAE	2016	HVAC Systems and Equipment	6.2.1.1.(1)
ASHRAE	2018	Refrigeration	6.2.1.1.(1)
ASHRAE	Guideline 12-2000	Minimizing the Risk of Legionellosis Associated with Building Water Systems	6.2.3.14.(3) 6.2.3.14A.(3)
ASME	A112.19.8-2007	Suction Fittings for Use in Swimming Pools, Wading Pools, Spas, and Hot Tubs	3.12.4.1.(9)
ASME	B16.3-2016	Malleable Iron Threaded Fittings: Classes 150 and 300	7.2.6.6.(1)
ASME	B16.4-2011	Gray Iron Threaded Fittings: Classes 125 and 250	7.2.6.5.(1) Table 7.2.11.2.
ASME	B16.5-2017	Pipe Flanges and Flanged Fittings: NPS ½ through NPS 24 Metric/Inch Standard	7.2.6.12.(1)
ASME	B16.9-2012	Factory-Made Wrought Buttwelding Fittings	7.2.6.11.(1) 7.2.6.14.(1)
ASME	B16.12-2009	Cast Iron Threaded Drainage Fittings	7.2.6.3.(1)
ASME	B16.15-2013	Cast Copper Alloy Threaded Fittings: Classes 125 and 250	7.2.7.3.(1)
ASME	B16.18-2012	Cast Copper Alloy Solder Joint Pressure Fittings	7.2.7.6.(1) 7.2.7.6.(2) Table 7.2.11.2.
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Table 1.3.1.2. (Cont'd)
Documents Referenced in the Building Code
Forming Part of Sentence 1.3.1.2.(1)

Issuing Agency	Document Number	Title of Document(1)	Code Reference
ASME	B16.22-2013	Wrought Copper and Copper Alloy Solder Joint Pressure Fittings	7.2.7.6.(1) Table 7.2.11.2.
ASME	B16.23-2016	Cast Copper Alloy Solder Joint Drainage Fittings: DWV	7.2.7.5.(1)
ASME	B16.24-2016	Cast Copper Alloy Pipe Flanges and Flanged Fittings: Classes 150, 300, 600, 900, 1500 and 2500	7.2.7.2.(1)
ASME	B16.26-2013	Cast Copper Alloy Fittings for Flared Copper Tubes	7.2.7.7.(1) 7.2.7.7.(2) Table 7.2.11.2.
ASME	B16.29-2012	Wrought Copper and Wrought Copper Alloy Solder Joint Drainage Fittings - DWV	7.2.7.5.(1)
ASME	ANSI/ASME B18.6.1-1981	Wood Screws (Inch Series)	Table 5.10.1.1. 9.23.3.1.(3)
ASME	B31.9-2014	Building Services Piping	7.3.2.8.(1)
ASME	B36.19M-2004	Stainless Steel Pipe	7.2.6.10.(1)
ASME/CSA	ASME A17.1-2010 / CSA B44-10	Safety Code for Elevators and Escalators	3.5.2.2.(1) Table 4.1.5.11. Table 4.1.8.18. 7.4.3.6.(1)
ASME/CSA	ASME A112.3.4-2013 / CSA B45.9-13	Plumbing Fixtures with Pumped Waste and Macerating Toilet Systems	7.2.2.2.(8)
ASME/CSA	ASME A112.18.1-2012 / CSA B125.1-12	Plumbing Supply Fittings	7.2.10.6.(1) 7.6.5.2.(1)
ASME/CSA	ASME A112.18.2-2015 / CSA B125.2-15	Plumbing Waste Fittings	7.2.3.3.(1) 7.2.10.6.(2)
ASME/CSA	ASME A112.19.1-2013 / CSA B45.2-13	Enamelled Cast Iron and Enamelled Steel Plumbing Fixtures	7.2.2.2.(3) 7.2.2.2.(4)
ASME/CSA	ASME A112.19.2-2013 / CSA B45.1-13	Ceramic Plumbing Fixtures	7.2.2.2.(2)
ASME/CSA	ASME A112.19.3-2017 / CSA B45.4-17	Stainless Steel Plumbing Fixtures	7.2.2.2.(5)
ASME/CSA	ASME A112.19.7-2012 / CSA B45.10-12	Hydromassage Bathtub Systems	7.2.2.2.(7)
ASPE	2005	Data Books	7.6.3.1.(2) 7.7.4.1.(1)
ASSE	ANSI/ASSE 1010-2004	Water Hammer Arresters	7.2.10.15.(1)
ASSE	1051-2009	Individual and Branch Type Air Admittance Valves for Sanitary Drainage Systems	7.2.10.16.(1)
ASTM	A53 / A53M-12	Pipe, Steel, Black and Hot-Dipped, Zinc-Coated Welded and Seamless	7.2.6.7.(4)
ASTM	A123 / A123M-13	Zinc (Hot Dip Galvanized) Coatings on Iron and Steel Products	Table 5.10.1.1. Table 9.20.16.1.
ASTM	A153 / A153M-09	Zinc Coating (Hot-Dip) on Iron and Steel Hardware	Table 5.10.1.1. Table 9.20.16.1.
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Table 1.3.1.2. (Cont'd)
Documents Referenced in the Building Code
Forming Part of Sentence 1.3.1.2.(1)

Issuing Agency	Document Number	Title of Document(1)	Code Reference
ASTM	A182 / A182M-16a	Forged or Rolled Alloy and Stainless Steel Pipe Flanges, Forged Fittings, and Valves and Parts for High-Temperature Service	7.2.6.12.(1) 7.2.6.13.(1)
ASTM	A252-10	Welded and Seamless Steel Pipe Piles	4.2.3.8.(1)
ASTM	A269-15a	Seamless and Welded Austenitic Stainless Steel Tubing for General Service	7.2.6.14.(1)
ASTM	A283 / A283M-13	Low and Intermediate Tensile Strength Carbon Steel Plates	4.2.3.8.(1)
ASTM	A312 / A312M-17	Seamless, Welded, and Heavily Cold Worked Stainless Steel Pipes	7.2.6.10.(1)
ASTM	A351 / A351M-16	Castings, Austenitic, for Pressure-Containing Parts	7.2.6.13.(1)
ASTM	A403 / A403M-16	Wrought Austenitic Stainless Steel Piping Fittings	7.2.6.11.(1)
ASTM	A518 / A518M-99	Corrosion-Resistant High-Silicon Iron Castings	7.2.8.1.(1)
ASTM	A653 / A653M-13	Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process	Table 5.10.1.1. 9.3.3.2.(1)
ASTM	A792 / A792M-10	Steel Sheet, 55% Aluminum-Zinc Alloy-Coated by the Hot-Dip Process	9.3.3.2.(1)
ASTM	A1008 / A1008M-13	Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, Solution Hardened, and Bake Hardenable	4.2.3.8.(1)
ASTM	A1011 / A1011M-14	Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, and Ultra-High Strength	4.2.3.8.(1)
ASTM	B32-08	Solder Metal	7.2.9.2.(1)
ASTM	B42-15a	Seamless Copper Pipe, Standard Sizes	7.2.7.1.(1)
ASTM	B43-15	Seamless Red Brass Pipe, Standard Sizes	7.2.7.1.(2)
ASTM	B68 / B68M-11	Seamless Copper Tube, Bright Annealed	7.2.7.4.(3)
ASTM	B88-16	Seamless Copper Water Tube	7.2.7.4.(1) 7.2.7.4.(3) Table 7.2.11.2.
ASTM	B306-13	Copper Drainage Tube (DWV)	7.2.7.4.(1)
ASTM	B813-16	Liquid and Paste Fluxes for Soldering of Copper and Copper Alloy Tube	7.2.9.2.(3)
ASTM	B828-16	Making Capillary Joints by Soldering of Copper and Copper Alloy Tube and Fittings	7.3.2.4.(1)
ASTM	C4-04	Clay Drain Tile and Perforated Clay Drain Tile	Table 5.10.1.1. 9.14.3.1.(1)
ASTM	C27-98	Fireclay and High-Alumina Refractory Brick	9.21.3.4.(1)
ASTM	C73-10	Calcium Silicate Brick (Sand-Lime Brick)	Table 5.10.1.1. 9.20.2.1.(1)
ASTM	C126-13	Ceramic Glazed Structural Clay Facing Tile, Facing Brick, and Solid Masonry Units	Table 5.10.1.1. 9.20.2.1.(1)
ASTM	C212-14	Structural Clay Facing Tile	Table 5.10.1.1. 9.20.2.1.(1)
ASTM	C260 / C260M-10a	Air-Entraining Admixtures for Concrete	9.3.1.8.(1)
ASTM	C411-11	Hot-Surface Performance of High-Temperature Thermal Insulation	6.2.3.4.(3) 6.2.9.2.(2)
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Table 1.3.1.2. (Cont'd)
Documents Referenced in the Building Code
Forming Part of Sentence 1.3.1.2.(1)

Issuing Agency	Document Number	Title of Document(1)	Code Reference
ASTM	C412M-11	Concrete Drain Tile (Metric)	Table 5.10.1.1. 9.14.3.1.(1)
ASTM	C444M-03	Perforated Concrete Pipe (Metric)	Table 5.10.1.1. 9.14.3.1.(1)
ASTM	C494 / C494M-13	Chemical Admixtures for Concrete	9.3.1.8.(1)
ASTM	C553-13	Mineral Fiber Blanket Thermal Insulation for Commercial and Industrial Applications	Table 5.10.1.1.
ASTM	C612-14	Mineral Fiber Block and Board Thermal Insulation	Table 5.10.1.1.
ASTM	C700-13	Vitrified Clay Pipe, Extra Strength, Standard Strength and Perforated	Table 5.10.1.1. 9.14.3.1.(1)
ASTM	C726-12	Mineral Wool Roof Insulation Board	Table 5.10.1.1. 9.25.2.2.(1)
ASTM	C834-10	Latex Sealants	Table 5.10.1.1. 9.27.4.2.(2)
ASTM	C840-13	Application and Finishing of Gypsum Board	Table 5.10.1.1.
ASTM	C920-14	Elastomeric Joint Sealants	Table 5.10.1.1. 9.27.4.2.(2)
ASTM	C954-11	Steel Drill Screws for the Application of Gypsum Panel Products or Metal Plaster Bases to Steel Studs from 0.033 in. (0.84 mm) to 0.112 in. (2.84 mm) in Thickness	9.24.1.4.(1)
ASTM	C991-08e1	Flexible Fibrous Glass Insulation for Metal Buildings	Table 5.10.1.1.
ASTM	C1002-07	Steel Self-Piercing Tapping Screws for the Application of Gypsum Panel Products or Metal Plaster Bases to Wood Studs or Steel Studs	Table 5.10.1.1. 9.24.1.4.(1) 9.29.5.7.(1)
ASTM	C1053-00	Borosilicate Glass Pipe and Fittings for Drain, Waste and Vent (DWV) Applications	7.2.8.1.(1)
ASTM	C1177 / C1177M-13	Glass Mat Gypsum Substrate for Use as Sheathing	3.1.5.12.(6) 3.1.5.12A.(4) Table 5.10.1.1. Table 9.23.16.2.A.
ASTM	C1178 / C1178M-13	Coated Glass Mat Water-Resistant Gypsum Backing Panel	3.1.5.12.(6) 3.1.5.12A.(4) Table 5.10.1.1. 9.29.5.2.(1)
ASTM	C1184-13	Structural Silicone Sealants	Table 5.10.1.1. 9.27.4.2.(2)
ASTM	C1311-10	Solvent Release Sealants	Table 5.10.1.1. 9.27.4.2.(2)
ASTM	C1330-02	Cylindrical Sealant Backing for Use with Cold Liquid-Applied Sealants	Table 5.10.1.1. 9.27.4.2.(3)
ASTM	C1396 / C1396M-14	Gypsum Board	3.1.5.12.(6) 3.1.5.12A.(4) Table 5.10.1.1. Table 9.23.16.2.A. 9.29.5.2.(1) Table 9.29.5.3.
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Table 1.3.1.2. (Cont'd)
Documents Referenced in the Building Code
Forming Part of Sentence 1.3.1.2.(1)

Issuing Agency	Document Number	Title of Document(1)	Code Reference
ASTM	C1658 / C1658M-13	Glass Mat Gypsum Panels	3.1.5.12.(6) Table 5.10.1.1.
ASTM	D323-08	Vapor Pressure of Petroleum Products (Reid Method)	1.4.1.2.(1) of Division A
ASTM	D374-99	Thickness of Solid Electrical Insulation	3.15.4.1.(1)
ASTM	D568-77	Rate of Burning and/or Extent and Time of Burning of Flexible Plastics in a Vertical Position	3.15.4.1.(1)
ASTM	D635-06	Rate of Burning and/or Extent and Time of Burning of Plastics in a Horizontal Position	3.15.4.1.(1)
ASTM	D1227-95	Emulsified Asphalt Used as a Protective Coating for Roofing	Table 5.10.1.1. 9.13.2.2.(2) 9.13.3.2.(2)
ASTM	D2178 / D2178M-13a	Asphalt Glass Felt Used in Roofing and Waterproofing	Table 5.10.1.1.
ASTM	D2898-10	Accelerated Weathering of Fire-Retardant-Treated Wood for Fire Testing	3.1.5.5.(3) 3.1.5.25.(1) 3.2.3.7.(5) 3.2.3.7.(7)
ASTM	D3019-08	Lap Cement Used with Asphalt Roll Roofing, Non-Fibered, Asbestos-Fibered, and Non-Asbestos-Fibered	Table 5.10.1.1. 9.13.3.2.(2) Table 9.26.2.1.B.
ASTM	D3261-16	Butt Heat Fusion Polyethylene (PE) Plastic Fittings for Polyethylene (PE) Plastic Pipe and Tubing	7.2.5.5.(3)
ASTM	D4479 / D4479M-07e1	Asphalt Roof Coatings - Asbestos-Free	Table 5.10.1.1. 9.13.2.2.(2) 9.13.3.2.(2) Table 9.26.2.1.B.
ASTM	D4637 / D4637M-12	EPDM Sheet Used In Single-Ply Roof Membrane	Table 5.10.1.1. 9.13.3.2.(2) Table 9.26.2.1.B.
ASTM	D4811 / D4811M-06	Nonvulcanized (Uncured) Rubber Sheet Used as Roof Flashing	Table 5.10.1.1. 9.13.3.2.(2) Table 9.26.2.1.B.
ASTM	D5456-10a	Evaluation of Structural Composite Lumber Products	3.1.11.7.(4)
ASTM	D6878 / D6878M-11a	Thermoplastic Polyolefin Based Sheet Roofing	Table 5.10.1.1. 9.13.3.2.(2) Table 9.26.2.1.B.
ASTM	E84-18a	Surface Burning Characteristics of Building Materials	Table 5.10.1.1.
ASTM	E90-09	Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements	5.8.1.2.(1) 5.8.1.4.(2) 9.11.1.2.(1)
ASTM	E96 / E96M-13	Water Vapor Transmission of Materials	5.5.1.2.(3) 9.13.2.2.(2) 9.25.4.2.(1) 9.25.5.1.(1)
ASTM	E283-04	Determining Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen	5.10.4.4.(2)
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Table 1.3.1.2. (Cont'd)
Documents Referenced in the Building Code
Forming Part of Sentence 1.3.1.2.(1)

Issuing Agency	Document Number	Title of Document(1)	Code Reference
ASTM	E331-00	Water Penetration of Exterior Windows, Skylights, Doors, and Curtain Walls by Uniform Static Air Pressure Difference	5.10.4.5.(2)
ASTM	E336-11	Measurement of Airborne Sound Attenuation Between Rooms in Buildings	5.8.1.2.(2) 5.8.1.4.(8) 9.11.1.2.(2)
ASTM	E413-10	Classification for Rating Sound Insulation	5.8.1.2.(1) 5.8.1.2.(2) 5.8.1.4.(8) 5.8.1.5.(4) 9.11.1.2.(1) 9.11.1.2.(2)
ASTM	E547-00	Water Penetration of Exterior Windows, Skylights, Doors, and Curtain Walls by Cyclic Static Air Pressure Difference	5.10.4.5.(2)
ASTM	E1300-12ae1	Determining Load Resistance of Glass in Buildings	4.3.6.1.(1)
ASTM	E2178-13	Air Permeance of Building Materials	5.4.1.2.(1)
ASTM	E2190-10	Insulating Glass Unit Performance and Evaluation	Table 5.10.1.1. 9.6.1.2.(1)
ASTM	F476-14	Security of Swinging Door Assemblies	9.7.5.2.(2)
ASTM	F628-12e2	Acrylonitrile-Butadiene-Styrene (ABS) Schedule 40 Plastic Drain, Waste, and Vent Pipe With a Cellular Core	7.2.5.10.(1) 7.2.5.12.(1) 7.2.5.12.(2)
ASTM	F714-13	Polyethylene (PE) Plastic Pipe (DR-PR) Based on Outside Diameter	7.2.5.6.(1)
ASTM	F1667-13	Driven Fasteners: Nails, Spikes and Staples	9.23.3.1.(1) 9.26.2.3.(1) 9.29.5.6.(1)
AWS	ANSI/AWS A5.8M / A5.8: 2011	Filler Metals for Brazing and Braze Welding	7.2.9.2.(4)
AWWA	ANSI/AWWA C104 / A21.4-2013	Cement-Mortar Lining for Ductile-Iron Pipe and Fittings	7.2.6.4.(2) Table 7.2.11.2.
AWWA	ANSI/AWWA C110 / A21.10-2012	Ductile-Iron and Gray-Iron Fittings	7.2.6.4.(3) Table 7.2.11.2.
AWWA	ANSI/AWWA C111 / A21.11-2012	Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings	7.2.6.4.(4) Table 7.2.11.2.
AWWA	ANSI/AWWA C151 / A21.51-2009	Ductile-Iron Pipe, Centrifugally Cast	7.2.6.4.(1) Table 7.2.11.2.
AWWA	ANSI/AWWA C228-08	Stainless-Steel Pipe Flanges For Water Service - Sizes 2 in. through 72 in. (50 mm through 1,800 mm)	7.2.6.12.(1)
BCMOH	Version 2, 21st Sept, 2007	Sewerage System Standard Practice Manual	8.7.8.3.(2) 8.7.8.3.(3)
BNQ	BNQ 3624-115-2016	Polyethylene (PE) Pipe and Fittings - Flexible Pipes for Drainage - Characteristics and Test Methods	Table 5.10.1.1. 9.14.3.1.(1)
BNQ	CAN/BNQ 3680-600-2009	Onsite Residential Wastewater Treatment Technologies	8.6.2.2.(5) Table 8.6.2.2.
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Table 1.3.1.2. (Cont'd)
Documents Referenced in the Building Code
Forming Part of Sentence 1.3.1.2.(1)

Issuing Agency	Document Number	Title of Document(1)	Code Reference
CCBFC	NRCC 38726 1995	National Building Code of Canada	1.3.1.2.(3) of Division A
CCBFC	NRCC 38732 1995	National Farm Building Code of Canada	1.3.1.2.(1) to (5) of Division A
CCBFC	NRCC 56190 2015, including all amendments, revisions and supplements effective to September 28, 2018	National Building Code of Canada	2.4.2.1.(2) of Division C
CCBFC	NRCC 56191 2015	National Energy Code of Canada for Buildings	6.2.1.1.(1)
CCBFC	NRCC 56192 2015, including all amendments, revisions and supplements effective to September 28, 2018	National Fire Code of Canada	3.3.1.2.(1) 3.3.5.2.(1) 6.2.2.5.(1)
CCBFC	NRCC 56193 2015, including all amendments, revisions and supplements effective to September 28, 2018	National Plumbing Code of Canada	2.4.2.1.(2) of Division C
CGSB	CAN/CGSB-1.501-M89	Method of Permeance of Coated Wallboard	5.5.1.2.(2) 9.25.4.2.(5)
CGSB	CAN/CGSB-7.2-94	Adjustable Steel Columns	9.17.3.4.(1)
CGSB	CAN/CGSB-10.3-92	Air Setting Refractory Mortar	9.21.3.4.(2) 9.21.3.9.(1) 9.22.2.2.(2)
CGSB	CAN/CGSB-11.3-M87	Hardboard	Table 5.10.1.1. 9.27.9.1.(2) 9.29.7.1.(1) 9.30.2.2.(1)
CGSB	CAN/CGSB-11.5-M87	Hardboard, Precoated, Factory Finished, for Exterior Cladding	Table 5.10.1.1. 9.27.9.1.(1)
CGSB	CAN/CGSB-12.1-M90	Tempered or Laminated Safety Glass	3.3.1.18.(2) 3.4.6.15.(1) 3.4.6.15.(3) Table 5.10.1.1. 9.6.1.2.(1) 9.6.1.4.(1) 9.8.8.7.(1)
CGSB	CAN/CGSB-12.2-M91	Flat, Clear Sheet Glass	Table 5.10.1.1. 9.6.1.2.(1)
CGSB	CAN/CGSB-12.3-M91	Flat, Clear Float Glass	Table 5.10.1.1. 9.6.1.2.(1)
CGSB	CAN/CGSB-12.4-M91	Heat Absorbing Glass	Table 5.10.1.1. 9.6.1.2.(1)
Column 1	2	3	4

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Table 1.3.1.2. (Cont'd)
Documents Referenced in the Building Code
Forming Part of Sentence 1.3.1.2.(1)

Issuing Agency	Document Number	Title of Document(1)	Code Reference
CGSB	CAN/CGSB-12.5-M86	Mirrors, Silvered	9.6.1.2.(3)
CGSB	CAN/CGSB-12.8-97	Insulating Glass Units	Table 5.10.1.1. 9.6.1.2.(1)
CGSB	CAN/CGSB-12.10-M76	Glass, Light and Heat Reflecting	Table 5.10.1.1. 9.6.1.2.(1)
CGSB	CAN/CGSB-12.11-M90	Wired Safety Glass	3.3.1.18.(2) 3.4.6.15.(1) 3.4.6.15.(3) Table 5.10.1.1. 9.6.1.2.(1) 9.6.1.4.(1) 9.8.8.7.(1)
CGSB	CAN/CGSB-12.20-M89	Structural Design of Glass for Buildings	4.3.6.1.(1)
CGSB	CAN/CGSB-19.22-M89	Mildew Resistant Sealing Compound for Tubs and Tile	9.29.10.5.(1)
CGSB	37-GP-9Ma-1983	Primer, Asphalt, Unfilled, for Asphalt Roofing, Dampproofing and Waterproofing	Table 5.10.1.1. 9.13.3.2.(2) Table 9.26.2.1.A.
CGSB	CAN/CGSB-37.50-M89	Hot-Applied, Rubberized Asphalt for Roofing and Waterproofing	Table 5.10.1.1. 9.13.3.2.(2) Table 9.26.2.1.B.
CGSB	CAN/CGSB-37.51-M90	Application for Hot-Applied Rubberized Asphalt for Roofing and Waterproofing	9.26.15.1.(1)
CGSB	CAN/CGSB-37.54-95	Polyvinyl Chloride Roofing and Waterproofing Membrane	Table 5.10.1.1. 9.13.3.2.(2) Table 9.26.2.1.B.
CGSB	37-GP-55M-1979	Application of Sheet Applied Flexible Polyvinyl Chloride Roofing Membrane	9.26.16.1.(1)
CGSB	37-GP-56M-1985	Membrane, Modified, Bituminous, Prefabricated, and Reinforced for Roofing	Table 5.10.1.1. 9.13.3.2.(2) Table 9.26.2.1.B.
CGSB	CAN/CGSB-37.58-M86	Membrane, Elastomeric, Cold-Applied Liquid, for Non-Exposed Use in Roofing and Waterproofing	Table 5.10.1.1. 9.13.3.2.(2) Table 9.26.2.1.B.
CGSB	CAN/CGSB-41.24-95	Rigid Vinyl Siding, Soffits and Fascia	Table 5.10.1.1. 9.27.12.1.(1)
CGSB	CAN/CGSB-51.25-M87	Thermal Insulation, Phenolic, Faced	Table 9.23.16.2.A. 9.25.2.2.(1)
CGSB	51-GP-27M-1979	Thermal Insulation, Polystyrene, Loose Fill	9.25.2.2.(1)
CGSB	CAN/CGSB-51.32-M77	Sheathing, Membrane, Breather Type	Table 5.10.1.1. 9.20.13.9.(1) 9.26.2.1.(1) 9.27.3.2.(1) Table 9.26.2.1.A.
CGSB	CAN/CGSB-51.33-M89	Vapour Barrier, Sheet, Excluding Polyethylene, for Use in Building Construction	Table 5.10.1.1. 9.25.4.2.(4)
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CGSB	CAN/CGSB-51.34-M86	Vapour Barrier, Polyethylene Sheet for Use in Building Construction	Table 5.10.1.1. 9.13.2.2.(1) 9.13.4.3.(1) 9.18.6.2.(1) 9.25.3.2.(2) 9.25.4.2.(3)
CGSB	CAN/CGSB-82.6-M86	Doors, Mirrored Glass, Sliding or Folding, Wardrobe	9.6.1.2.(2)
CGSB	CAN/CGSB-93.1-M85	Sheet, Aluminum Alloy, Prefinished Residential	Table 5.10.1.1. 9.27.11.1.(4)
CGSB	CAN/CGSB-93.2-M91	Prefinished Aluminum Siding, Soffits and Facsia for Residential Use	3.2.3.6.(4) Table 5.10.1.1. 9.27.11.1.(3)
CGSB	CAN/CGSB-93.3-M91	Prefinished Galvanized and Aluminum-Zinc Alloy Steel Sheet for Residential Use	Table 5.10.1.1. 9.27.11.1.(2)
CGSB	CAN/CGSB-93.4-92	Galvanized Steel and Aluminum-Zinc Alloy Coated Steel Siding, Soffits and Fascia, Prefinished, Residential	Table 5.10.1.1. 9.27.11.1.(1)
CSA	CAN/CSA-6.19-01	Residential Carbon Monoxide Alarming Devices	6.2.12.3.(1) 9.33.4.3.(1)
CSA	A23.1-14	Concrete Materials and Methods of Concrete Construction	4.2.3.6.(1) 4.2.3.9.(1) Table 5.10.1.1. 9.3.1.1.(1) 9.3.1.1.(4) 9.3.1.3.(1) 9.3.1.4.(1) 9.39.1.4.(1)
CSA	A23.3-14	Design of Concrete Structures	Table 4.1.8.9. 4.3.3.1.(1)
CSA	A60.1-M1976	Vitrified Clay Pipe	7.2.5.4.(1)
CSA	A60.3-M1976	Vitrified Clay Pipe Joints	7.2.5.4.(2)
CSA	CAN/CSA-A82-14	Fire Masonry Brick Made from Clay or Shale	Table 5.10.1.1. 9.20.2.1.(1)
CSA	CAN/CSA-A82.27-M91	Gypsum Board	3.1.5.12.(6) 3.1.5.12A.(4) 9.29.5.2.(1)
CSA	A82.30-M1980	Interior Furring, Lathing and Gypsum Plastering	9.29.4.1.(1)
CSA	A82.31-M1980	Gypsum Board Application	3.2.3.6.(4) 3.2.3.16.(1) 9.10.12.4.(3) 9.29.5.1.(2)
CSA	CAN3-A93-M82	Natural Airflow Ventilators for Buildings	Table 5.10.1.1. 9.19.1.2.(5)
CSA	A123.1-05 / A123.5-05	Asphalt Shingles Made from Organic Felt and Surfaced with Mineral Granules / Asphalt Shingles Made from Glass Felt and Surfaced with Mineral Granules	Table 5.10.1.1. Table 9.26.2.1.B.
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CSA	CAN/CSA-A123.2-03	Asphalt Coated Roofing Sheets	Table 5.10.1.1. 9.13.3.2.(2) Table 9.26.2.1.B
CSA	A123.3-05	Asphalt Saturated Organic Roofing Felt	Table 5.10.1.1. Table 9.26.2.1.B.
CSA	CAN/CSA-A123.4-04	Asphalt for Constructing Built-Up Roof Coverings and Waterproofing Systems	Table 5.10.1.1. 9.13.2.2.(2) 9.13.3.2.(2) Table 9.26.2.1.B.
CSA	A123.17-05	Asphalt Glass Felt Used in Roofing and Waterproofing	Table 5.10.1.1. 9.13.3.2.(2) Table 9.26.2.1.B.
CSA	A123.21-10	Dynamic Wind Uplift Resistance of Membrane-Roofing Systems	5.2.2.2.(4)
CSA	A123.22-08	Self-Adhering Polymer Modified Bituminous Sheet Materials Used as Steep Roofing Underlayment for Ice Dam Protection	Table 9.26.2.1.B.
CSA	CAN3-A123.51-M85	Asphalt Shingle Application on Roof Slopes 1:3 and Steeper	Table 5.10.1.1. 9.26.1.2.(1)
CSA	CAN3-A123.52-M85	Asphalt Shingle Application on Roof Slopes 1:6 to Less than 1:3	Table 5.10.1.1. 9.26.1.2.(1)
CSA	A165.1-14	Concrete Block Masonry Units	Table 5.10.1.1. 9.15.2.2.(1) 9.17.5.1.(1) 9.20.2.1.(1) 9.20.2.6.(1)
CSA	A165.2-14	Concrete Brick Masonry Units	Table 5.10.1.1. 9.20.2.1.(1)
CSA	A165.3-14	Prefaced Concrete Masonry Units	Table 5.10.1.1. 9.20.2.1.(1)
CSA	A179-14	Mortar and Grout for Unit Masonry	Table 5.10.1.1. 9.15.2.2.(3) 9.20.3.1.(1)
CSA	CAN/CSA-A220 Series-06	Concrete Roof Tiles	Table 5.10.1.1. Table 9.26.2.1.B.
CSA	CAN/CSA-A220.1-06	Installation of Concrete Roof Tiles	9.26.17.1.(1)
CSA	A257 Series-14	Standards for Concrete Pipe and Manhole Sections	7.2.5.3.(1)
CSA	A257.4-14	Precast Reinforced Circular Concrete Manhole Sections, Catch Basins, and Fittings	7.2.5.3.(5)
CSA	A277-08	Procedure for Factory Certification of Buildings	9.1.1.9.(1) 3.1.1.1.(2) of Division C 3.2.4.1.(3) of Division C
CSA	CAN/CSA-A324-M88	Clay Flue Liners	9.21.3.3.(1)
CSA	A371-14	Masonry Construction for Buildings	Table 5.10.1.1. 9.15.2.2.(3) 9.20.3.2.(7) 9.20.15.2.(1)
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CSA	CAN/CSA-A405-M87	Design and Construction of Masonry Chimneys and Fireplaces	9.21.3.5.(1) 9.22.1.4.(7) 9.22.5.2.(2)
CSA	AAMA/WDMA/CSA 101/I.S.2/A440-11	NAFS – North American Fenestration Standard/Specification for Windows, Doors, and Skylights	5.10.2.2.(1) Table 9.7.3.3. 9.7.4.1.(1) 9.7.4.2.(1) 9.7.4.3.(2) 9.7.5.1.(1) 9.7.5.3.(1)
CSA	A440S1-17	Canadian Supplement to AAMA/WDMA/CSA 101/I.S.2/A440-11, NAFS - North American Fenestration Standard/Specification for Windows, Doors, and Skylights	5.10.2.2.(1) 5.10.4.5.(3) 9.7.4.2.(1) 9.7.4.3.(1)
CSA	A440.2-14	Fenestration Energy Performance	12.3.1.2.(1)
CSA	A440.2-14 / A440.3-14	Fenestration Energy Performance / User Guide to CSA A440.2-14, Fenestration Energy Performance	Table 9.7.3.3.
CSA	CAN/CSA-A440.4-07	Window, Door, and Skylight Installation	9.7.6.1.(1)
CSA	A660-10	Certification of Manufacturers of Steel Building Systems	4.3.4.3.(1)
CSA	A3001-13	Cementitious Materials for Use in Concrete	Table 5.10.1.1. 9.3.1.2.(1) 9.28.2.1.(1)
CSA	CAN/CSA-B45.0-02	General Requirements for Plumbing Fixtures	7.6.4.2.(1)
CSA	B52-13	Mechanical Refrigeration Code	6.2.2.4.(4)
CSA	B64.0-11	Definitions, General Requirements, and Test Methods for Vacuum Breakers and Backflow Preventers	7.2.10.10.(1)
CSA	B64.1.1-11	Atmospheric Vacuum Breakers (AVB)	7.2.10.10.(1)
CSA	B64.1.2-11	Pressure Vacuum Breakers (PVB)	7.2.10.10.(1)
CSA	B64.1.3-11	Spill-Resistant Pressure Vacuum Breakers (SRPVB)	7.2.10.10.(1)
CSA	B64.1.4-11	Vacuum Breaker, Air Space Type (ASVB)	7.2.10.10.(1)
CSA	B64.2-11	Hose Connection Vacuum Breakers (HCVB)	7.2.10.10.(1)
CSA	B64.2.1-11	Hose Connection Vacuum Breakers (HCVB) with Manual Draining Feature	7.2.10.10.(1)
CSA	B64.2.1.1-11	Hose Connection Dual Check Vacuum Breakers (HCDVB)	7.2.10.10.(1)
CSA	B64.2.2-11	Hose Connection Vacuum Breakers (HCVB) with Automatic Draining Feature	7.2.10.10.(1)
CSA	B64.3-11	Dual Check Valve Backflow Preventers with Atmospheric Port (DCAP)	7.2.10.10.(1) 7.6.2.5.(4)
CSA	B64.3.1-11	Dual Check Valve Backflow Preventers with Atmospheric Port for Carbonators (DCAPC)	7.2.10.10.(1)
CSA	B64.4-11	Reduced Pressure Principle (RP) Backflow Preventers	7.2.10.10.(1)
CSA	B64.4.1-11	Reduced Pressure Principle Backflow Preventers for Fire Protection Systems (RPF)	7.6.2.4.(2) Table 7.6.2.4. 7.6.2.4.(4)
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CSA	B64.5-11	Double Check Valve (DCVA) Backflow Preventers	7.2.10.10.(1)
CSA	B64.5.1-11	Double Check Valve Backflow Preventers for Fire Protection Systems (DCVAF)	7.6.2.4.(2) Table 7.6.2.4.
CSA	B64.6-11	Dual Check Valve (DuC) Backflow Preventers	7.2.10.10.(1) 7.6.2.6.(3) 7.7.1.1.(3)
CSA	B64.6.1-11	Dual Check Valve Backflow Preventers for Fire Protection Systems (DuCF)	7.6.4.2.(2) Table 7.6.2.4.
CSA	B64.7-11	Laboratory Faucet Vacuum Breakers (LFVB)	7.2.10.10.(1)
CSA	B64.8-11	Dual Check Valve Backflow Preventers with Intermediate Vent (DuCV)	7.2.10.10.(1)
CSA	B64.9-11	Single Check Valve Backflow Preventers for Fire Protection Systems (SCVAF)	7.6.2.4.(2) Table 7.6.2.4.
CSA	B64.10-17	Selection and Installation of Backflow Preventers	7.2.10.10.(1) 7.6.2.3.(1) Table 7.6.2.4. 7.6.2.6.(1)
CSA	B66-10	Design, Material, and Manufacturing Requirements for Prefabricated Septic Tanks and Sewage Holding Tanks	8.2.2.2.(1) 8.2.2.2.(2) 8.2.2.2.(3) 8.2.2.3.(7) 8.2.2.3.(11)
CSA	CAN/CSA-B70-12	Cast Iron Soil Pipe, Fittings and Means of Joining	7.2.6.1.(1) 7.4.6.4.(2)
CSA	CAN/CSA-B70.1-03	Frames and Covers for Maintenance Holes and Catchbasins	7.2.6.1.(3)
CSA	B111-1974	Wire Nails, Spikes and Staples	9.23.3.1.(1) 9.26.2.3.(1) 9.29.5.6.(1)
CSA	B125.3-12	Plumbing Fittings	7.2.10.6.(1) 7.2.10.10.(2) 7.6.5.2.(2)
CSA	CAN/CSA-B128.1-06	Design and Installation of Non-Potable Water Systems	7.7.2.1.(2) 7.7.4.1.(1)
CSA	B137.1-17	Polyethylene (PE) Pipe, Tubing and Fittings for Cold Water Pressure Services	7.2.5.5.(1) Table 7.2.11.2.
CSA	B137.2-17	Polyvinylchloride (PVC) Injection-Moulded Gasketed Fittings for Pressure Applications	7.2.5.8.(1) 7.2.5.10.(1) Table 7.2.11.2.
CSA	B137.3-17	Rigid Polyvinylchloride (PVC) Pipe and Fittings for Pressure Applications	7.2.5.8.(1) 7.2.5.10.(1) Table 7.2.11.2.
CSA	B137.5-17	Crosslinked Polyethylene (PEX) Tubing Systems for Pressure Applications	7.2.5.7.(1) Table 7.2.11.2.
CSA	B137.6-17	Chlorinated Polyvinylchloride (CPVC) Pipe, Tubing, and Fittings for Hot- and Cold-Water Distribution Systems	7.2.5.9.(1) Table 7.2.11.2.
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CSA	B137.9-17	Polyethylene/Aluminum/Polyethylene (PE-AL-PE) Composite Pressure-Pipe Systems	7.2.5.13.(1) Table 7.2.11.2.
CSA	B137.10-17	Crosslinked Polyethylene/Aluminum Crosslinked Polyethylene (PEX-AL-PEX) Composite Pressure-Pipe Systems	7.2.5.13.(4) 7.2.5.14.(1) Table 7.2.11.2.
CSA	B137.11-17	Polypropylene (PP-R) Pipe and Fittings for Pressure Applications	7.2.5.15.(1)
CSA	B158.1-1976	Cast Brass Solder Joint Drainage, Waste and Vent Fittings	7.2.10.1.(1)
CSA	CAN/CSA-B181.1-15	Acrylonitrile-Butadiene-Styrene (ABS) Drain, Waste, and Vent Pipe and Pipe Fittings	7.2.5.10.(1) 7.2.5.11.(1) 7.2.5.12.(1) 7.2.5.12.(2) 7.2.10.1.(2) 7.4.6.4.(2)
CSA	CAN/CSA-B181.2-15	Polyvinylchloride (PVC) and Chlorinated Polyvinylchloride (CPVC) Drain, Waste, and Vent Pipe and Pipe Fittings	7.2.5.10.(1) 7.2.5.11.(1) 7.2.5.12.(1) 7.2.5.12.(2) 7.2.10.1.(3) 7.4.6.4.(2)
CSA	CAN/CSA-B181.3-15	Polyolefin and Polyvinylidene Fluoride (PVDF) Laboratory Drainage Systems	7.2.8.1.(1)
CSA	CAN/CSA-B182.1-15	Plastic Drain and Sewer Pipe and Pipe Fittings	Table 5.10.1.1. 7.2.5.10.(1) 7.2.5.12.(2) 7.4.6.4.(2) 9.14.3.1.(1)
CSA	CAN/CSA-B182.2-15	PSM Type Polyvinylchloride (PVC) Sewer Pipe and Fittings	7.2.5.10.(1) 7.2.5.12.(2)
CSA	CAN/CSA-B182.4-15	Profile Polyvinylchloride (PVC) Sewer Pipe and Fittings	7.2.5.10.(1)
CSA	CAN/CSA-B182.6-15	Profile Polyethylene (PE) Sewer Pipe and Fittings for Leak-Proof Sewer Applications	7.2.5.10.(1)
CSA	CAN/CSA-B182.8-15	Profile Polyethylene (PE) Storm Sewer and Drainage Pipe and Fittings	7.2.5.10.(1)
CSA	B214-16	Installation Code for Hydronic Heating Systems	6.2.1.4.(6)
CSA	B242-05	Groove- and Shoulder-Type Mechanical Pipe Couplings	7.2.10.4.(1)
CSA	B272-93	Prefabricated Self-Sealing Roof Vent Flashings	7.2.10.14.(2)
CSA	B355-09	Lifts for Persons with Physical Disabilities	3.8.3.5.(1)
CSA	CAN/CSA-B356-10	Water Pressure Reducing Valves for Domestic Water Supply Systems	7.2.10.12.(1)
CSA	B365-17	Installation Code for Solid-Fuel-Burning Appliances and Equipment	6.2.1.4.(1) 6.2.1.4.(5) 9.21.1.3.(1) 9.22.10.2.(1) 9.33.1.2.(1)
CSA	B366.1-11	Solid-Fuel-Fired Central Heating Appliances	6.2.1.4.(2)
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CSA	B415.1-10	Performance Testing of Solid-Fuel-Burning Heating Appliances	6.2.1.4.(7) 9.33.1.2.(2)
CSA	B481.0-12	Material, Design, and Construction Requirements for Grease Interceptors	7.2.3.2.(4)
CSA	B481.1-12	Testing and Rating of Grease Interceptors Using Lard	7.2.3.2.(3) 8.1.3.1.(8)
CSA	B481.2-12	Testing and Rating of Grease Interceptors Using Oil	7.2.3.2.(3) 8.1.3.1.(8)
CSA	B481.3-12	Sizing, Selection, Location, and Installation of Grease Interceptors	7.2.3.2.(4)
CSA	B481.4-12	Maintenance of Grease Interceptors	8.9.3.3.(1)
CSA	CAN/CSA-B483.1-07	Drinking Water Treatment Systems	7.2.10.17.(1)
CSA	B602-16	Mechanical Couplings for Drain, Waste, and Vent Pipe and Sewer Pipe	7.2.5.3.(2) 7.2.10.4.(2)
CSA	C22.2 No. 0.3-09	Test Methods for Electrical Wires and Cables	3.1.4.3.(1) 3.1.4.3.(2) 3.1.5.18.(1) 3.1.5.18.(2) 3.1.5.21.(1) 3.1.5.21.(2) 3.6.4.3.(1) 9.34.1.5.(1)
CSA	C22.2 No.113-10	Fans and Ventilators	9.32.3.9.(6)
CSA	C22.2 No. 141-10	Emergency Lighting Equipment	3.2.7.4.(2) 3.4.5.1.(3) 9.9.11.3.(3) 9.9.12.3.(7)
CSA	C22.2 No. 211.0-03	General Requirements and Methods of Testing for Nonmetallic Conduit	3.1.5.20.(1)
CSA	CAN/CSA-C22.2 No. 262-04	Optical Fiber Cable and Communication Cable Raceway Systems	3.1.5.20.(1)
CSA	CAN/CSA-C22.3 No. 1-10	Overhead Systems	3.1.19.1.(2)
CSA	CAN/CSA-C88-M90	Power Transformers and Reactors	3.6.2.7.(10)
CSA	CAN/CSA-C260-M90	Rating for the Performance of Residential Mechanical Ventilating Equipment	9.32.3.9.(1) 9.32.3.9.(2) Table 9.32.3.9.
CSA	C282-15	Emergency Electrical Power Supply for Buildings	3.2.7.5.(1)
CSA	CAN/CSA-C439-09	Rating the Performance of Heat/Energy-Recovery Ventilators	9.32.3.11.(2)
CSA	CAN/CSA-C448.1-13	Design and Installation of Earth Energy Systems for Commercial and Institutional Buildings	6.2.1.4.(4)
CSA	CAN/CSA-C448.2-13	Design and Installation of Earth Energy Systems for Residential and Other Small Buildings	6.2.1.4.(3)
CSA	F280-12	Determining the Required Capacity of Residential Space Heating and Cooling Appliances	6.2.1.1.(1) 9.33.2.2.(3)
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CSA	CAN/CSA-F326-M91	Residential Mechanical Ventilation Systems	6.2.1.1.(1)
CSA	CAN/CSA-F379.1-09	Packaged Solar Domestic Hot Water Systems (Liquid-to-Liquid Heat Transfer) for All-Season Use	7.2.10.13.(1) 7.6.2.5.(3) 7.6.2.5.(4)
CSA	CAN/CSA-F383-08	Installation of Packaged Solar Domestic Hot Water Systems	7.6.1.13.(2)
CSA	G30.18-09	Carbon Steel Bars for Concrete Reinforcement	9.3.1.1.(4) 9.39.1.3.(1)
CSA	G40.21-13	Structural Quality Steel	4.2.3.8.(1) Table 5.10.1.1. 9.23.4.3.(2)
CSA	CAN/CSA-G164-M92	Hot Dip Galvanizing of Irregularly Shaped Articles	4.4.4.1.(4)
CSA	CAN/CSA-G401-14	Corrugated Steel Pipe Products	Table 5.10.1.1. 7.2.6.8.(1) 9.14.3.1.(1)
CSA	CAN/CSA-O80 Series-08	Wood Preservation	3.1.4.5.(1) 4.2.3.2.(1) 4.2.3.2.(2) Table 5.10.1.1.
CSA	CAN/CSA-O80.1-08	Specification of Treated Wood	9.3.2.9.(6)
CSA	CAN/CSA-O80.2-08	Processing and Treatment	4.2.3.2.(1)
CSA	CAN/CSA-O80.3-08	Preservative Formulations	4.2.3.2.(1)
CSA	O80.15-97	Preservative Treatment of Wood for Building Foundation Systems, Basements and Crawl Spaces by Pressure Processes	4.2.3.2.(1)
CSA	O86-14	Engineering Design in Wood	Table 4.1.8.9. 4.3.1.1.(1)
CSA	O118.1-08	Western Red Cedar Shakes and Shingles	Table 5.10.1.1. Table 9.26.2.1.B. 9.27.7.1.(1)
CSA	O118.2-08	Eastern White Cedar Shingles	Table 5.10.1.1. Table 9.26.2.1.B. 9.27.7.1.(1)
CSA	O121-08	Douglas Fir Plywood	Table 5.10.1.1. 9.23.14.2.(1) 9.23.15.2.(1) Table 9.23.16.2.A. 9.27.8.1.(1) 9.30.2.2.(1) Table A-13 Table A-14 Table A-15
CSA	CAN/CSA-O122-16	Structural Glued-Laminated Timber	Table A-11 Table A-16
CSA	CAN/CSA-O132.2 Series-90	Wood Flush Doors	9.7.4.3.(4)
CSA	O141-05	Softwood Lumber	Table 5.10.1.1. 9.3.2.6.(1)
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Table 1.3.1.2. (Cont'd)
Documents Referenced in the Building Code
Forming Part of Sentence 1.3.1.2.(1)

Issuing Agency	Document Number	Title of Document(1)	Code Reference
CSA	O151-09	Canadian Softwood Plywood	Table 5.10.1.1. 9.23.14.2.(1) 9.23.15.2.(1) Table 9.23.16.2.A. 9.27.8.1.(1) 9.30.2.2.(1) Table A-13 Table A-14 Table A-15
CSA	O153-13	Poplar Plywood	Table 5.10.1.1. 9.23.14.2.(1) 9.23.15.2.(1) Table 9.23.16.2.A. 9.27.8.1.(1) 9.30.2.2.(1)
CSA	O177-06	Qualification Code for Manufacturers of Structural Glued-Laminated Timber	4.3.1.2.(1) Table A-11 Table A-16
CSA	O325-07	Construction Sheathing	Table 5.10.1.1. 9.23.14.2.(1) 9.23.14.4.(2) Table 9.23.14.5.B. 9.23.15.2.(1) 9.23.15.3.(2) Table 9.23.15.7.B. Table 9.23.16.2.B. 9.29.9.1.(2) 9.29.9.2.(5) Table A-13 Table A-14 Table A-15
CSA	O437.0-93	OSB and Waferboard	Table 5.10.1.1. 9.23.14.2.(1) 9.23.14.4.(2) 9.23.15.2.(1) 9.23.15.3.(2) Table 9.23.16.2.A. 9.27.10.1.(1) 9.29.9.1.(2) 9.30.2.2.(1) Table A-13 Table A-14 Table A-15
CSA	S16-14	Design of Steel Structures	Table 4.1.8.9. 4.3.4.1.(1)
CSA	S37-13	Antennas, Towers, and Antenna-Supporting Structures	4.1.6.15.(1) 4.1.7.11.(1)
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Table 1.3.1.2. (Cont'd)
Documents Referenced in the Building Code
Forming Part of Sentence 1.3.1.2.(1)

Issuing Agency	Document Number	Title of Document(1)	Code Reference
CSA	S136-16	North American Specification for the Design of Cold Formed Steel Structural Members (using the Appendix B provisions applicable to Canada)	4.1.8.1.(5) Table 4.1.8.9. 4.3.4.2.(1)
CSA	CAN/CSA-S157-05 / S157.1-05	Strength Design in Aluminum / Commentary on CSA S157-05, Strength Design in Aluminum	4.3.5.1.(1)
CSA	S304-14	Design of Masonry Structures	Table 4.1.8.9. 4.3.2.1.(1)
CSA	S307-M1980	Load Test Procedure for Wood Trusses for Houses and Small Buildings	9.23.13.11.(5)
CSA	S367-12	Air-, Cable-, and Frame-Supported Membrane Structures	4.4.1.1.(1)
CSA	S406-16	Permanent Wood Foundations for Housing and Small Buildings	9.13.2.7.(1) 9.15.2.4.(1) 9.16.5.1.(1)
CSA	S413-14	Parking Structures	4.4.2.1.(1)
CSA	S478-95	Guideline on Durability in Buildings	5.1.4.2.(3)
CSA	Z32-09	Electrical Safety and Essential Electrical Systems in Health Care Facilities	3.2.7.3.(4) 3.2.7.6.(1) 3.7.5.1.(1)
CSA	CAN/CSA-Z91-02	Health and Safety Code for Suspended Equipment Operations	4.4.4.1.(1)
CSA	Z240 MH Series-09	Manufactured Homes	3.1.1.1.(2) of Division C 3.2.4.1.(3) of Division C
CSA	Z240.2.1-09	Structural Requirements for Manufactured Homes	9.1.1.9.(1) 9.12.2.2.(6) 9.15.1.3.(1)
CSA	Z240.10.1-16	Site Preparation, Foundation, and Installation of Buildings	9.15.1.3.(1) 9.23.6.3.(1)
CSA	CAN/CSA-Z241 Series-03	Park Model Trailers	9.38.1.1.(1) 9.38.2.1.(1) 3.1.1.1.(2) of Division C 3.2.4.1.(3) of Division C
CSA	CAN/CSA-Z317.2-10	Special Requirements for Heating, Ventilation and Air Conditioning (HVAC) Systems in Health Care Facilities	6.2.1.1.(1) 6.2.3.14.(1)
CSA	CAN/CSA-Z662-15	Oil and Gas Pipeline Systems	3.2.3.21.(1)
CSA	Z7396.1-12	Medical Gas Piping Systems - Part 1: Pipelines for Medical Gases, Medical Vacuum, Medical Support Gases, and Anaesthetic Gas Scavenging Systems	3.7.5.2.(1)
CSA / IAPMO	CSA B45.5-11 / IAPMO Z124-2011	Plastic Plumbing Fixtures	7.2.2.2.(6)
CWC	2014	Engineering Guide for Wood Frame Construction	9.4.1.1.(1)
DBR	Technical Paper No. 194, May 1965	Fire Endurance of Protected Steel Columns and Beams	Table 11.5.1.1.A. Table 11.5.1.1.B. Table 11.5.1.1.C. Table 11.5.1.1.D/E. Table 11.5.1.1.F.
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Table 1.3.1.2. (Cont'd)
Documents Referenced in the Building Code
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Issuing Agency	Document Number	Title of Document(1)	Code Reference
DBR	Technical Paper No. 207, October 1965	Fire Endurance of Unit Masonry Walls	Table 11.5.1.1.A. Table 11.5.1.1.B. Table 11.5.1.1.C. Table 11.5.1.1.D/E. Table 11.5.1.1.F.
DBR	Technical Paper No. 222, June 1966	Fire Endurance of Light-Framed and Miscellaneous Assemblies	Table 11.5.1.1.A. Table 11.5.1.1.B. Table 11.5.1.1.C. Table 11.5.1.1.D/E. Table 11.5.1.1.F.
EPA	625/R-92/016 (1994)	Radon Prevention in the Design and Construction of Schools and Other Large Buildings	6.2.1.1.(1)
FINA	2009	Rules and Regulations - FINA Facilities Rules 2009-2013 - FR5 Diving Facilities	3.11.4.1.(17)
HI	2005	Hydronics Institute Manuals	6.2.1.1.(1)
HPVA	ANSI/HPVA HP-1-2009	Hardwood and Decorative Plywood	Table 5.10.1.1. 9.27.8.1.(1) 9.30.2.2.(1)
HRAI	2005	Digest	6.2.1.1.(1) 6.2.3.5.(1) 6.2.4.3.(13)
HUD	Rehabilitation Guidelines 2000	Guideline on Fire Ratings of Archaic Materials and Assemblies	Table 11.5.1.1.A. Table 11.5.1.1.B. Table 11.5.1.1.C. Table 11.5.1.1.D/E. Table 11.5.1.1.F.
HVI	HVI 915-2013	Loudness Testing and Rating Procedure	9.32.3.9.(2) Table 9.32.3.9.
HVI	HVI 916-2013	Airflow Test Procedure	9.32.3.9.(1)
IAPMO	PS 63-2014	Plastic Leaching Chambers	8.7.2.3.(3)
ISO	3864-1: 2011	Graphical Symbols – Safety Colours and Safety Signs – Part 1: Design Principles for Safety Signs and Safety Markings	3.4.5.1.(2) 9.9.11.3.(2)
ISO	7010: 2011	Graphical Symbols - Safety Colours and Safety Signs - Registered Safety Signs	3.4.5.1.(2) 9.9.11.3.(2)
ISO	8201: 1987(E)	Acoustics - Audible Emergency Evacuation Signal	3.2.4.20.(2)
ISO	10848:2006	Acoustics - Laboratory Measurement of the Flanking Transmission of Airborne and Impact Sound Between Adjoining Rooms	5.8.1.4.(3) 5.8.1.4.(4) 5.8.1.5.(3) 5.8.1.5.(4)
ISO	15712-1:2005	Building Acoustics - Estimation of Acoustic Performance of Buildings From the Performance of Elements - Part 1: Airborne Sound Insulation Between Rooms	5.8.1.4.(2) 5.8.1.4.(3) 5.8.1.4.(5) 5.8.1.4.(6) 5.8.1.4.(7) 5.8.1.5.(2) 5.8.1.5.(3) 5.8.1.4.(6) 5.8.1.4.(7)
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Table 1.3.1.2. (Cont'd)
Documents Referenced in the Building Code
Forming Part of Sentence 1.3.1.2.(1)

Issuing Agency	Document Number	Title of Document(1)	Code Reference
ISO	23599: 2012	Assistive Products for Blind and Vision-Impaired Persons – Tactile Walking Surface Indicators	3.8.3.18.(1)
MMAH	Supplementary Standard SA-1, January 15, 2019	Objectives and Functional Statements Attributed to the Acceptable Solutions	1.2.1.1.(1) of Division A 1.2.1.1.(2) of Division A
MMAH	Supplementary Standard SB-1, January 15, 2019	Climatic and Seismic Data	1.1.2.1.(1) 1.1.2.1.(2) 3.2.6.2.(2) 3.3.1.7.(1) 5.2.1.1.(1) 5.2.1.1.(2) 6.2.1.1.(1) 6.2.1.7.(1) 7.4.10.4.(1) 9.4.1.1.(3) 9.4.2.2.(1) Tables 9.6.1.3.A. to 9.6.1.3.G. Table 9.25.5.2. Table 9.32.3.10.A. 9.33.3.2.(1)
MMAH	Supplementary Standard SB-2, January 15, 2019	Fire Performance Ratings	3.1.5.23.(1) 3.1.7.1.(2) 3.1.8.14.(2) 3.1.9.5.(1) 3.1.12.1.(3) 3.2.3.12.(1) 3.2.3.13.(4) 3.13.2.1.(8) 3.13.3.5.(1) 3.13.3.6.(2) 3.13.4.2.(7) 9.10.3.1.(1) 9.10.3.2.(1) 9.10.5.1.(4) 9.10.9.9.(1)
MMAH	Supplementary Standard SB-3, January 15, 2019	Fire and Sound Resistance of Building Assemblies	5.8.1.3.(1) 5.8.1.3.(2) 9.10.3.1.(1) 9.10.5.1.(4) 9.11.1.3.(1) 9.11.1.3.(2) Table 9.11.1.4. 9.29.5.9.(5)
MMAH	Supplementary Standard SB-4, January 15, 2019	Measures for Fire Safety in High Buildings	3.2.6.2.(1) 3.2.6.2.(6) 3.2.6.5.(3) 3.2.6.9.(1) Table 11.5.1.1.C. Table 11.5.1.1.D/E. Table 11.5.1.1.F.
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Table 1.3.1.2. (Cont'd)
Documents Referenced in the Building Code
Forming Part of Sentence 1.3.1.2.(1)

Issuing Agency	Document Number	Title of Document(1)	Code Reference
MMAH	Supplementary Standard SB-6, September 14, 2012	Percolation Times and Soil Descriptions	8.2.1.2.(2)
MMAH	Supplementary Standard SB-7, September 14, 2012	Guards for Housing and Small Buildings	9.8.8.2.(5)
MMAH	Supplementary Standard SB-8, September 14, 2012	Design, Construction and Installation of Anchorage Systems for Fixed Access Ladders	3.6.1.5.(1)
MMAH	Supplementary Standard SB-9, September 14, 2012	Requirements for Soil Gas Control	9.13.4.1.(1) 9.13.4.2.(3) 9.13.4.2.(4)
MMA	Supplementary Standard SB-10, December 22, 2016	Energy Efficiency Requirements	Table 9.7.3.3. 12.2.1.1.(2) 12.2.1.2.(2) 12.2.2.1.(1) 12.2.3.1.(1)
MMAH	Supplementary Standard SB-11, September 14, 2012	Construction of Farm Buildings	1.3.1.2.(4) of Division A
MMA	Supplementary Standard SB-12, July 7, 2016	Energy Efficiency for Housing	Table 9.7.3.3. Table 11.5.1.1.C. 12.2.1.1.(3) 12.2.1.2.(3)
MMAH	Supplementary Standard SB-13, September 14, 2012	Glass in Guards	3.1.20.1.(1)
MMAH	Supplementary Standard SC-1, September 14, 2012	Code of Conduct for Registered Code Agencies	3.7.4.1.(2) of Division C
MOE	PIBS 6879 2008	Design Guidelines for Sewage Works	7.1.5.5.(2)
MOE	PIBS 6881e 2008	Design Guidelines for Drinking-Water Systems	7.1.5.5.(1)
NFPA	2017 Publication	National Fire Codes	6.2.1.1.(1)
NFPA	13-2013	Installation of Sprinkler Systems	3.1.9.1.(4) 3.2.4.9.(2) 3.2.4.17.(1) 3.2.5.13.(1) 3.2.8.4.(7) 3.3.2.12.(3) 3.16.1.1.(3) 3.16.1.1.(4) 3.16.1.6.(2) 3.16.1.6.(8) 3.16.1.7.(2) 3.16.2.1.(1) 3.16.2.2.(1) 3.16.3.1.(1) 9.10.9.6.(11)
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Table 1.3.1.2. (Cont'd)
Documents Referenced in the Building Code
Forming Part of Sentence 1.3.1.2.(1)

Issuing Agency	Document Number	Title of Document(1)	Code Reference
NFPA	13D-2016	Installation of Sprinkler Systems in One- and Two-Family Dwellings and Manufactured Homes	3.2.5.13.(3)
NFPA	13R-2013	Installation of Sprinkler Systems in Low-Rise Residential Occupancies	3.2.5.13.(2)
NFPA	14-2013	Installation of Standpipe and Hose Systems	3.2.9.2.(1)
NFPA	20-2016	Installation of Stationary Pumps for Fire Protection	3.2.4.10.(4) 3.2.5.19.(1)
NFPA	24-2013	Installation of Private Fire Service Mains and Their Appurtenances	7.2.11.1.(1)
NFPA	68-2013	Explosion Protection by Deflagration Venting	3.3.6.3.(1) 3.3.6.4.(2) 3.3.6.4.(4)
NFPA	72-2016	National Fire Alarm and Signaling Code	3.2.4.22.(13) 9.10.19.1.(2) 9.10.19.3.(4)
NFPA	80-2013	Fire Doors and Other Opening Protectives	3.1.8.5.(2) 3.1.8.10.(2) 3.1.8.14.(1) 3.1.9.1.(5) 3.13.3.1.(2) 9.10.9.6.(13) 9.10.13.1.(1)
NFPA	82-2014	Incinerators and Waste and Linen Handling Systems and Equipment	6.2.6.1.(1) 9.10.10.5.(2)
NFPA	91-2010	Exhaust Systems for Air Conveying of Vapors, Gases, Mists and Noncombustible Particulate Solids	6.2.13.4.(1)
NFPA	96-2014	Ventilation Control and Fire Protection of Commercial Cooking Operations	3.2.4.9.(2) 3.6.3.5.(1) 6.2.2.6.(1)
NFPA	105-2013	Smoke Door Assemblies and other Opening Protectives	3.1.8.5.(3) 3.1.8.5.(6)
NFPA	130-2010	Fixed Guideway Transit and Passenger Rail Systems	3.13.7.1.(1)
NFPA	211-2016	Chimneys, Fireplaces, Vents and Solid Fuel-Burning Appliances	6.3.1.2.(2) 6.3.1.3.(1)
NFPA	214-2011	Water-Cooling Towers	6.2.3.14.(5) 6.2.3.14A.(4)
NFPA	701-2010	Fire Tests for Flame Propagation of Textiles and Films	3.14.1.6.(1) 3.14.2.5.(1)
NFRC	100-2014	Determining Fenestration Product U-Factors	12.3.1.2.(1)
NFRC	200-2014	Determining Fenestration Product Solar Heat Gain Coefficient and Visible Transmittance at Normal Incidence	12.3.1.2.(1)
NLGA	2014	Standard Grading Rules for Canadian Lumber	1.4.1.2.(1) of Division A 9.3.2.1.(1) Table 9.3.2.1. Tables A-1 to A-10
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Table 1.3.1.2. (Cont'd)
Documents Referenced in the Building Code
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Issuing Agency	Document Number	Title of Document(1)	Code Reference
NRCan	January 2005, including all amendments, revisions and supplements effective to May 31, 2006	EnerGuide for New Houses: Administrative and Technical Procedures	12.2.1.1.(3)
NSF	NSF/ANSI 46-2010	Evaluation of Components and Devices Used in Wastewater Treatment Systems	8.6.2.1.(2)
NSF	NSF/ANSI 61-2013	Drinking Water System Components - Health Effects	7.2.10.7.(1)
SMACNA	ANSI/SMACNA 006-2006	HVAC Duct Construction Standards - Metal and Flexible	6.2.4.2.(3) 6.2.4.3.(11) 6.2.4.3.(12)
SPRI	ANSI/GRHC/SPRI VR-1-2011	Procedure for Investigating Resistance to Root Penetration on Vegetative Roofs	5.6.1.2.(4)
TPIC	2014	Truss Design Procedures and Specifications for Light Metal Plate Connected Wood Trusses	9.23.13.11.(6)
UL	ANSI/UL 300-2005	Fire Extinguishing Systems for Protection of Commercial Cooking Equipment	6.2.2.6.(2)
UL	ANSI/UL-1784-04	Air Leakage Tests of Door Assemblies and Other Opening Protectives	3.1.8.4.(4)
UL	UL 2034-2008	Single and Multiple Station Carbon Monoxide Alarms	6.2.12.3.(1) 9.33.4.3.(1)
ULC	CAN/ULC-S101-14	Fire Endurance Tests of Building Construction and Materials	3.1.5.5A.(2) 3.1.5.12.(5) 3.1.5.12.(6) 3.1.5.12A.(3) 3.1.5.12A.(4) 3.1.7.1.(1) 3.1.11.7.(1) 3.2.3.8.(1) 3.2.6.5.(6) 9.10.16.3.(1)
ULC	CAN/ULC-S102-10	Test for Surface Burning Characteristics of Building Materials and Assemblies	3.1.5.25.(1) 3.1.12.1.(1) Table 5.10.1.1. Table 9.23.16.2.A.
ULC	CAN/ULC-S102.2-10	Test for Surface Burning Characteristics of Flooring, Floor Coverings, and Miscellaneous Materials and Assemblies	3.1.12.1.(2) 3.1.13.4.(1)
ULC	CAN/ULC-S102.3-07	Fire Test of Light Diffusers and Lenses	3.1.13.4.(1)
ULC	CAN/ULC-S102.4-10	Test for Fire and Smoke Characteristics of Electrical Wiring, Cables and Non-Metallic Raceways	3.6.4.3.(1)
ULC	CAN/ULC-S104-15	Fire Tests of Door Assemblies	3.1.8.4.(1) 3.2.6.5.(3)
ULC	CAN/ULC-S105-16	Fire Door Frames Meeting the Performance Required by CAN/ULC-S104	9.10.13.6.(1)
ULC	CAN/ULC-S106-15	Fire Tests of Window and Glass Block Assemblies	3.1.8.4.(1)
ULC	CAN/ULC-S107-10	Fire Tests of Roof Coverings	3.1.15.1.(1)
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Table 1.3.1.2. (Cont'd)
Documents Referenced in the Building Code
Forming Part of Sentence 1.3.1.2.(1)

Issuing Agency	Document Number	Title of Document(1)	Code Reference
ULC	CAN/ULC-S109-14	Flame Tests of Flame-Resistant Fabrics and Films	3.1.16.1.(1) 3.14.1.6.(1) 3.14.2.5.(1) 6.2.3.16.(1) 6.2.3.17.(1) 6.2.4.9.(1)
ULC	CAN/ULC-S110-13	Test for Air Ducts	6.2.3.2.(2) 6.2.3.2.(4)
ULC	CAN/ULC-S111-13	Fire Tests for Air Filter Units	6.2.3.13.(1) 6.2.4.14.(1)
ULC	CAN/ULC-S112-10	Fire Test of Fire-Damper Assemblies	3.1.8.4.(1)
ULC	CAN/ULC-S112.1-10	Leakage Rated Dampers for Use in Smoke Control Systems	3.1.8.4.(3) 6.2.3.9.(3)
ULC	CAN/ULC-S112.2-07	Fire Test of Ceiling Firestop Flap Assemblies	3.1.9.5.(2) 3.6.4.3.(2) 9.10.13.14.(1)
ULC	CAN/ULC-S113-16	Wood Core Doors Meeting the Performance Required by CAN/ULC-S104 for Twenty Minute Fire Rated Closure Assemblies	9.10.13.2.(1)
ULC	CAN/ULC-S114-05	Test for Determination of Non-Combustibility in Building Materials	1.4.1.2.(1) of Division A
ULC	CAN/ULC-S115-11	Fire Tests of Firestop Systems	3.1.5.16.(3) 3.1.9.1.(1) 3.1.9.1.(2) 3.1.9.1.(3) 3.1.9.3A.(1) 3.1.9.4.(3) 3.1.9.4.(7) 9.10.9.6.(2) 9.10.9.7.(3)
ULC	CAN/ULC-S124-06	Test for the Evaluation of Protective Coverings for Foamed Plastic	3.1.5.12A.(2)
ULC	CAN/ULC-S126-14	Test for Fire Spread Under Roof-Deck Assemblies	3.1.14.1.(1) 3.1.14.2.(1)
ULC	CAN/ULC-S134-13	Fire Test of Exterior Wall Assemblies	3.1.5.5.(1) 3.2.3.7.(3) 3.2.3.7.(6)
ULC	S135-04	Test Method for the Determination of Combustibility Parameters of Building Materials Using an Oxygen Consumption Calorimeter (Cone Calorimeter)	3.1.5.1.(2)
ULC	CAN/ULC-S138-06	Test for Fire Growth of Insulated Building Panels in a Full-Scale Room Configuration	3.1.5.5A.(1) 3.1.5.5A.(3)
ULC	CAN/ULC-S139-12	Fire Test for Evaluation of Integrity of Electrical Power, Data and Optical Fibre Cables	3.2.7.10.(2) 3.2.7.10.(3)
ULC	CAN/ULC-S143-14	Fire Tests for Non-Metallic Electrical and Optical Fibre Cable Raceway Systems	3.1.5.20.(1)
ULC	CAN/ULC-S144-12	Fire Resistance Test - Grease Duct Assemblies	3.6.3.5.(2)
ULC	S505-1974	Fusible Links for Fire Protection Service	3.1.8.9.(1)
ULC	S513-1978	Threaded Couplings for 38 mm and 65 mm Fire Hose	3.2.9.2.(7)
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Table 1.3.1.2. (Cont'd)
Documents Referenced in the Building Code
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Issuing Agency	Document Number	Title of Document(1)	Code Reference
ULC	CAN/ULC-S524-14	Installation of Fire Alarm Systems	3.1.8.9A.(3) 3.1.8.12.(3) 3.2.4.5.(1) 3.2.4.22.(6) 3.2.4.22.(11) 9.10.19.4.(3) 9.10.19.6.(2)
ULC	CAN/ULC-S531-14	Smoke Alarms	3.2.4.22.(1) 9.10.19.1.(1)
ULC	CAN/ULC-S537-13	Verification of Fire Alarm Systems	3.2.4.5.(2) 3.2.4.22.(6)
ULC	CAN/ULC-S540-13	Residential Fire and Life Safety Warning Systems: Installation, Inspection, Testing and Maintenance	3.2.4.22A.(1) 9.10.19.8.(1)
ULC	CAN/ULC-S543-09	Internal Lug Quick Connect Couplings for Fire Hose	3.2.9.2.(7)
ULC	CAN/ULC-S553-14	Installation of Smoke Alarms	3.2.4.22.(9) 9.10.19.3.(3)
ULC	CAN/ULC-S561-13	Installation and Services for Fire Signal Receiving Centres and Systems	3.2.4.8.(4) 3.13.5.4.(1)
ULC	CAN/ULC-S572-17	Photoluminescent and Self-Luminous Exit Signs and Path Marking Systems	3.4.5.1.(5) 9.9.11.3.(3)
ULC	CAN/ULC-S610-M87	Factory-Built Fireplaces	9.22.8.1.(1)
ULC	S628-93	Fireplace Inserts	9.22.10.1.(1)
ULC	CAN/ULC-S629-16	650ºC Factory-Built Chimneys	9.21.1.2.(1)
ULC	CAN/ULC-S639-M87	Steel Liner Assemblies for Solid Fuel-Burning Masonry Fireplaces	9.22.2.3.(1)
ULC	CAN/ULC-S701.1-17	Thermal Insulation, Polystyrene Boards	Table 5.10.1.1. 9.15.4.1.(1) Table 9.23.16.2.A. 9.25.2.2.(1) 9.25.2.2.(4)
ULC	CAN/ULC-S702-14	Mineral Fibre Thermal Insulation for Buildings	Table 5.10.1.1. Table 9.23.16.2.A. 9.25.2.2.(1)
ULC	CAN/ULC-S703-09	Cellulose Fibre Insulation for Buildings	Table 5.10.1.1. 9.25.2.2.(1)
ULC	CAN/ULC-S704-11	Thermal Insulation, Polyurethane and Polyisocyanurate Boards, Faced	Table 5.10.1.1. Table 9.23.16.2.A. 9.25.2.2.(1)
ULC	CAN/ULC-S705.1-15	Thermal Insulation – Spray Applied Rigid Polyurethane Foam, Medium Density - Material – Specification	Table 5.10.1.1. 9.25.2.2.(1)
ULC	CAN/ULC-S705.2-05	Thermal Insulation – Spray Applied Rigid Polyurethane Foam, Medium Density – Application	Table 5.10.1.1. 9.25.2.5.(1)
ULC	CAN/ULC-S706.1-16	Wood Fibre Insulating Boards for Buildings	Table 5.10.1.1. 9.23.15.7.(3) Table 9.23.16.2.A. 9.25.2.2.(1) 9.29.8.1.(1)
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Table 1.3.1.2. (Cont'd)
Documents Referenced in the Building Code
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Issuing Agency	Document Number	Title of Document(1)	Code Reference
ULC	CAN/ULC-S710.1-11	Thermal Insulation – Bead-Applied One Component Polyurethane Air Sealant Foam, Part 1: Material Specification	Table 5.10.1.1.
ULC	CAN/ULC-S711.1-11	Thermal Insulation – Bead-Applied Two Component Polyurethane Air Sealant Foam, Part 1: Material Specification	Table 5.10.1.1.
ULC	CAN/ULC-S716.1-12	Exterior Insulation and Finish Systems (EIFS) – Materials and Systems	5.10.3.1.(1) 9.27.13.1.(1) 9.27.13.2.(1)
ULC	CAN/ULC-S716.2-12	Exterior Insulation and Finish Systems (EIFS) – Installation of EIFS Components and Water Resistive Barrier	9.27.13.3.(2)
ULC	CAN/ULC-S716.3-12	Exterior Insulation and Finish Systems (EIFS) – Design Application	9.27.13.3.(1)
ULC	CAN/ULC-S741-08	Air Barrier Materials – Specification	5.4.1.2.(1)
ULC	CAN/ULC-S1001-11	Integrated Systems Testing of Fire Protection and Life Safety Systems	3.2.10.1.(1) 9.10.18.10.(1)
ULC	ULC/ORD-C199P-2002	Combustible Piping for Sprinkler Systems	3.2.5.14.(2) 3.2.5.14.(5)
ULC	ULC/ORD-C263.1-99	Sprinkler-Protected Window Systems	3.1.8.18.(1)
ULC	ULC/ORD-C1254.6-1995	Fire Testing of Restaurant Cooking Area Fire Extinguishing System Units	6.2.2.6.(2)
USDA	October 1993	Soil Survey Manual	8.2.1.2.(2)
WT	October 20, 2016	Port Lands Flood Protection and Enabling Infrastructure Due Diligence Report	1.3.3.6.(4) of Division C
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Notes to Table 1.3.1.2.:
(1) Some titles have been abridged to omit superfluous wording.

1.3.2. Abbreviations

1.3.2.1. Abbreviations of Proper Names (See Appendix A.)

(1) In this Code, an abbreviation of proper names listed in Column 1 of Table 1.3.2.1. has the meaning assigned opposite it in Column 2.

Table 1.3.2.1.
Abbreviations of Proper Names
Forming Part of Sentence 1.3.2.1.(1)

Abbreviation	Meaning
ACGIH	American Conference of Governmental Industrial Hygienists
AISI	American Iron and Steel Institute
ANSI	American National Standards Institute
APHA	American Public Health Association
ASHRAE	American Society of Heating, Refrigerating and Air-Conditioning Engineers
ASME	The American Society of Mechanical Engineers
ASPE	American Society of Plumbing Engineers
ASSE	American Society of Sanitary Engineering
ASTM	American Society for Testing and Materials
AWPA	American Wood-Preservers' Association
AWS	American Welding Society
AWWA	American Water Works Association
BCMOH	British Columbia Ministry of Health
BNQ	Bureau de Normalisation du Québec
CAN	National Standard of Canada designation The number or name following the CAN designation represents the agency under whose auspices the standard is issued. CAN1 designates CGA, CAN2 designates CGSB, CAN3 designates CSA, and CAN4 designates ULC.
CCBFC	Canadian Commission on Building and Fire Codes
CGSB	Canadian General Standards Board
CSA	Canadian Standards Association
CWC	Canadian Wood Council
DBR	Division of Building Research, known as the Institute for Research in Construction since 1985
EPA	Environmental Protection Agency
FINA	Fédération Internationale de Natation
HI	Hydronics Institute
HRAI	Heating, Refrigerating and Air-Conditioning Institute of Canada
HUD	U.S. Department of Housing and Urban Development
HVI	Home Ventilating Institute
Column 1	2

Table 1.3.2.1. (Cont'd)
Abbreviations of Proper Names
Forming Part of Sentence 1.3.2.1.(1)

	Abbreviation	Meaning
r5	IAPMO	International Association of Plumbing and Mechanical Officials
	IESNA	Illuminating Engineering Society of North America
	ISO	International Organization for Standardization
r6	MMA	Ontario Ministry of Municipal Affairs
	MMAH	Ontario Ministry of Municipal Affairs and Housing
	MOE	Ontario Ministry of the Environment
	NFPA	National Fire Protection Association
	NLGA	National Lumber Grades Authority
	NRCan	Natural Resources Canada
	NSF	NSF International, formerly called National Sanitation Federation
	SMACNA	Sheet Metal and Air Conditioning Contractors National Association Inc.
	TC	Transport Canada
	TPIC	Truss Plate Institute of Canada
	UL	Underwriters Laboratories Inc.
	ULC	Underwriters' Laboratories of Canada
	USDA	United States Department of Agriculture
	WEF	World Environment Federation
r10	WT	Waterfront Toronto
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Part 3

Fire Protection, Occupant Safety and Accessibility

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(1) A restaurant is permitted to be classified as a Group E *major occupancy* provided the restaurant is designed to accommodate not more than 30 persons consuming food or drink.

3.1.2.7. Storage of Combustible Fibres

(1) *Buildings* or parts of them used for the storage of baled *combustible fibres* shall be classified as *medium hazard industrial occupancies*.

3.1.3. Multiple Occupancy Requirements

3.1.3.1. Separation of Major Occupancies

r5 **(1)** Except as provided by Sentences (2) to (5), *major occupancies* shall be separated from adjoining *major occupancies* by *fire separations* having *fire-resistance ratings* conforming to Table 3.1.3.1.

(2) In a *building* not more than 3 *storeys* in *building height*, if not more than two *dwelling units* are contained together with a Group E *major occupancy*, the *fire-resistance rating* of the *fire separation* between the two *major occupancies* need not be more than 1 h.

r5 **Table 3.1.3.1.**
Major Occupancy Fire Separations(1)
Forming Part of Sentence 3.1.3.1.(1)

Major Occupancy	Minimum *Fire-Resistance Rating* of *Fire Separation*, h(1)												
	Adjoining *Major Occupancy*												
	A-1	A-2	A-3	A-4	B-1	B-2	B-3	C	D	E	F-1	F-2	F-3
A-1	N/A	1	1	1	2	2	2	1	1	2	N/A	2	1
A-2	1	N/A	1	1	2	2	2	1(2)	1(3)	2	N/A	2	1
A-3	1	1	N/A	1	2	2	2	1	1	2	N/A	2	1
A-4	1	1	1	N/A	2	2	2	1	1	2	N/A	2	1
B-1	2	2	2	2	N/A	2	2	2	2	2	N/A	2	2
B-2	2	2	2	2	2	N/A	1	2	2	2	N/A	2	2
B-3	2	2	2	2	2	1	N/A	2	2	2	N/A	2	2
C	1	1(2)	1	1	2	2	2	N/A	1	2(4)	N/A	2	1
D	1	1(3)	1	1	2	2	2	1	N/A	N/A	3	N/A	N/A
E	2	2	2	2	2	2	2	2(4)	N/A	N/A	3	N/A	N/A
F-1	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	3	3	N/A	2	2
F-2	2	2	2	2	2	2	2	2	N/A	N/A	2	N/A	N/A
F-3	1	1	1	1	2	2	2	1	N/A	N/A	2	N/A	N/A
Column 1	2	3	4	5	6	7	8	9	10	11	12	13	14

Notes to Table 3.1.3.1.:

(1) Section 3.3. contains requirements for the separation of *occupancies* and tenancies that are in addition to the requirements for the separation of *major occupancies*.
(2) See Sentence 3.1.3.1.(3).
(3) See Sentence 3.1.3.1.(4).
(4) See Sentence 3.1.3.1.(2).

r5 **(3)** In a *building* within the scope of Article 3.2.2.43A., a *fire separation* with a 2 h *fire-resistance rating* is required between the Group C and Group A, Division 2 *major occupancies*.

r5 **(4)** In a *building* within the scope of Article 3.2.2.50A., a *fire separation* with a 2 h *fire-resistance rating* is required between the Group D and Group A, Division 2 *major occupancies*.

r5 **(5)** The *fire separations* required between *major occupancies* in Sentence (1) are permitted to be penetrated by floor openings protected in conformance with Subsection 3.2.8., except for *fire separations* for Group F, Division 1 *major occupancies* and for *mezzanines* described in Sentence 3.2.8.2.(1).

3.1.3.2. Prohibition of Occupancy Combinations

(1) No *major occupancy* of Group F, Division 1 shall be contained within a *building* with any *occupancy* classified as Group A, B or C.

(2) Except as provided in Sentence (4) and Sentence 3.10.2.4.(9), not more than one *suite* of *residential occupancy* shall be contained within a *building* classified as a Group F, Division 2 *major occupancy*.

(3) A sleeping room or sleeping area shall not open directly into a room or area where food is intended to be stored, prepared, processed, distributed, served, sold or offered for sale. (See Appendix A.)

(4) A Group F, Division 2 *major occupancy* is permitted in a *building* containing only *live/work units* if the *occupancy* is for the exclusive use of the occupants of the *live/work units*.

r5 **(5)** A *building* within the scope of Article 3.2.2.43A. or 3.2.2.50A. shall not contain,
(a) a Group A, Division 1 or 3, Group B, or Group F, Division 1 or 2 *major occupancy*,
(b) a Group A, Division 2 or a Group E *major occupancy* above the second *storey*,
r6 (b.1) a *retirement home*, or
(c) except as permitted by Sentence (6), a Group F, Division 3 *major occupancy*.

r5 **(6)** A *storage garage* below the third *storey* is permitted in a *building* within the scope of Article 3.2.2.43A. or 3.2.2.50A.

3.1.4. Combustible Construction

3.1.4.1. Combustible Materials Permitted

r5 **(1)** Except as required by this Part, a *building* permitted to be of *combustible construction* is permitted to be constructed of combustible materials, with or without noncombustible components. (See Appendix A.)

3.1.4.2. Protection of Foamed Plastics (See Appendix A.)

r11.1 **(1)** Except as permitted in Sentence (3), foamed plastics that form part of a wall or ceiling assembly in *combustible construction* shall be protected from adjacent spaces in the *building*, other than adjacent concealed spaces within *attic or roof spaces*, crawl spaces, and wall and ceiling assemblies, by any of the following:
(a) one of the interior finishes described in Subsections 9.29.4. to 9.29.9.,
(b) provided the *building* does not contain a Group A, Group B or Group C *major occupancy*, sheet metal that,
  (i) is mechanically fastened to the supporting assembly independent of the insulation,
  (ii) is not less than 0.38 mm thick, and
  (iii) has a melting point not less than 650°C, or
(c) any thermal barrier that meets the requirements of Sentence 3.1.5.12A.(2). (See Appendix A.)

(See Appendix A.)

(2) The *flame-spread rating* on any exposed surface of *combustible* insulation, or any surface that would be exposed by cutting through it in any direction, shall be not more than 500.

r11.1 **(3)** A walk-in cooler or freezer consisting of factory-assembled wall, floor or ceiling panels containing foamed plastics is permitted to be used in a *building* permitted to be of *combustible construction*, provided the panels,

(a) are protected on both sides by sheet metal not less than 0.38 mm thick having a melting point not less than 650°C,

(b) do not contain an air space, and

(c) when a sample panel with an assembled joint typical of field installation is subjected to the applicable test described in Subsection 3.1.12., have a *flame-spread rating* not more than that permitted for the space in which they are located, the space that they bound, or the walls of the *building* to which the cooler or freezer is attached, as applicable.

(See Appendix A.)

r11.1 **(4)** The *flame-spread rating* of doors containing foamed plastics shall comply with Sentences 3.1.13.2.(1) to (3).

3.1.4.3. Wires and Cables (See Appendix A.)

(1) Except as permitted by Sentences (2) and (3), optical fibre cables and electrical wires and cables with *combustible* insulation, jackets or sheathes installed in a *building* permitted to be of *combustible construction* shall,

(a) not convey flame or continue to burn for more than 1 min when tested in conformance with the Vertical Flame Test in Clause 4.11.1. of CSA C22.2 No. 0.3, "Test Methods for Electrical Wires and Cables (FT1 Rating)", or

(b) be located in,

(i) totally enclosed *noncombustible* raceways, (See Appendix A.)

(ii) concealed spaces in walls,

(iii) concrete slabs, or

(iv) totally enclosed nonmetallic raceways conforming to Clause 3.1.5.20(1)(b).

(2) The requirement in Clause (1)(a) is considered to be met where the wires and cables,

(a) exhibit a vertical char of not more than 1.5 m when tested in conformance with the Vertical Flame Test – Cables in Cabletrough in Clause 4.11.4. of CSA C22.2 No. 0.3, "Test Methods for Electrical Wires and Cables" (FT4 Rating), or

(b) exhibit a flame-spread of not more than 1.5 m, a smoke density of not more than 0.5 at peak optical density and a smoke density not more than 0.15 at average optical density when tested in conformance with the Flame and Smoke Test in the Appendix to CSA C22.2 No. 0.3, "Test Methods for Electrical Wires and Cables" (FT6 Rating).

(3) Service-entrance cables for communication and community antennae distribution systems need not conform to Sentence (1) provided,

(a) the service-entrance cables are located in a *building* permitted to be of *combustible construction* and are not more than 3 m in length from the point of entry into the *building* or from the point of leaving protection as required in Clause (1)(b), or

(b) the service-entrance cables enter into an electrical or telephone *service room* separated from the remainder of the *building* by a *fire separation* having a *fire-resistance rating* not less than 1 h.

3.1.4.4. Nonmetallic Raceways

(1) Totally enclosed nonmetallic raceways used in a *plenum* in a *building* permitted to be of *combustible construction* shall meet the requirements of Clause 3.1.5.20.(1)(a).

3.1.4.5. Fire-Retardant Treated Wood

(1) If *fire-retardant treated wood* is specified in this Part, the wood shall,

r11.1 (a) be pressure impregnated with fire-retardant chemicals in conformance with CAN/CSA-O80 Series, "Wood Preservation", and

(b) have a *flame-spread rating* not more than 25.

3.1.4.6. Heavy Timber Construction Alternative

(1) If *combustible construction* is permitted and is not required to have a *fire-resistance rating* more than 45 min, *heavy timber construction* is permitted to be used.

(2) If *heavy timber construction* is permitted, it shall conform to Article 3.1.4.7.

3.1.4.7. Heavy Timber Construction

(1) Wood elements in *heavy timber construction* shall be arranged in heavy solid masses and with essentially smooth flat surfaces to avoid thin sections and sharp projections.

(2) Except as permitted by Sentences (3) to (6) and (12), the minimum dimensions of wood elements in *heavy timber construction* shall conform to Table 3.1.4.7.

Table 3.1.4.7.
Heavy Timber Dimensions
Forming Part of Sentence 3.1.4.7.(2)

Supported Assembly	Structural Element	Solid Sawn (width × depth), mm × mm	Glued-Laminated (width × depth), mm × mm	Round (diam), mm
Roofs only	Columns	140 × 191	130 × 190	180
	Arches supported on the tops of walls or abutments	89 × 140	80 × 152	---
	Beams, girders and trusses	89 × 140	80 × 152	---
	Arches supported at or near the floor line	140 × 140	130 × 152	---
Floors, floors plus roofs	Columns	191 × 191	175 × 190	200
	Beams, girders, trusses and arches	140 × 241 or 191 × 191	130 × 228 or 175 × 190	---
Column 1	2	3	4	5

(3) Where splice plates are used at splices of roof arches supported on the tops of walls or abutments, roof trusses, roof beams and roof girders in *heavy timber construction*, they shall be not less than 64 mm thick.

(4) Floors in *heavy timber construction* shall be of glued-laminated or solid sawn plank not less than,
(a) 64 mm thick, splined or tongued and grooved, or
(b) 38 mm wide and 89 mm deep set on edge and well-spiked together.

(5) Floors in *heavy timber construction* shall be laid,
(a) so that no continuous line of end joints will occur except at points of support, and covered with,
  (i) tongued and grooved flooring not less than 19 mm thick laid cross-wise or diagonally, or
  (ii) tongued and grooved phenolic-bonded plywood, strandboard or waferboard not less than 12.5 mm thick, and
(b) not closer than 15 mm to the walls to provide for expansion, with the gap covered at the top or bottom.

r11.1 **(6)** Roofs in *heavy timber construction* shall be of tongued and grooved phenolic-bonded plywood, strandboard or waferboard not less than 28 mm thick, or glued-laminated or solid sawn plank that is,
(a) not less than 38 mm thick, splined or tongued and grooved, or
(b) not less than 38 mm wide and 64 mm deep set on edge and laid so that no continuous line of end joints will occur except at the points of support.

(7) Wood columns in *heavy timber construction* shall be continuous or superimposed throughout all *storeys*.

(8) Superimposed wood columns in *heavy timber construction* shall be connected by,
(a) reinforced concrete or metal caps with brackets,
(b) steel or iron caps with pintles and base plates, or
(c) timber splice plates fastened to the columns by metal connectors housed within the contact faces.

(9) Where beams and girders in *heavy timber construction* enter masonry, wall plates, boxes of the self-releasing type or hangers shall be used.

(10) Wood girders and beams in *heavy timber construction* shall be closely fitted to columns, and adjoining ends shall be connected by ties or caps to transfer horizontal loads across the joints.

(11) In *heavy timber construction*, intermediate wood beams used to support a floor shall be supported on top of the girders or on metal hangers into which the ends of the beams are closely fitted.

(12) Roof arches supported on the tops of walls or abutments, roof trusses, roof beams and roof girders in *heavy timber construction* are permitted to be not less than 64 mm wide provided,
(a) where two or more spaced members are used, the intervening spaces are,
  (i) blocked solidly throughout, or
  (ii) tightly closed by a continuous wood cover plate not less than 38 mm thick secured to the underside of the members, or
(b) the space below the roof deck or sheathing is *sprinklered*.

r5 3.1.4.8. Cladding

(1) Except as permitted by Sentence 3.2.3.7.(6), cladding for a *building* within the scope of Article 3.2.2.43A. or 3.2.2.50A. that exceeds 4 *storeys* in *building height* or cladding for a *fire compartment* in such a *building* shall be *noncombustible*.

r5 3.1.4.9. Combustible Piping

(1) Except as provided by Sentence (2), *combustible* piping and tubing and associated adhesives used in a *building* within the scope of Article 3.2.2.43A. or 3.2.2.50A. shall have a *flame-spread rating* not more than 25.

(2) Sentence (1) does not apply to,
(a) *combustible* sprinkler piping and associated adhesives,
(b) *combustible* tubing for pneumatic controls and associated adhesives, provided the tubing has an outside diameter not more than 10 mm,
(c) *combustible* piping and tubing and associated adhesives used in *public pools* and *public spas*, and
(d) *combustible* piping and tubing and associated adhesives concealed in a concrete floor slab.

3.1.5. Noncombustible Construction

3.1.5.1. Noncombustible Materials

(1) Except as permitted by Sentences (2) to (4) and Articles 3.1.5.2. to 3.1.5.25., 3.1.13.4. and 3.2.2.16., a *building* or part of a *building* required to be of *noncombustible construction*, shall be constructed with *noncombustible* materials.

r11.1 **(2)** Notwithstanding the definition for *noncombustible* materials stated in Article 1.4.1.2. of Division A, a material is permitted to be used in *noncombustible construction* provided that, when tested in accordance with ULC S135, "Test Method for the Determination of Combustibility Parameters of Building Materials Using an Oxygen Consumption Calorimeter (Cone Calorimeter)", at a heat flux of 50 kW/m^2,

(a) its average total heat release is not more than 3 MJ/m^2,
(b) its average total smoke extinction area is not more than 1.0 m^2, and
(c) the test duration is extended beyond the time stipulated in the referenced standard until it is clear that there is no further release of heat or smoke.

(3) If a material referred to in Sentence (2) consists of a number of discrete layers and testing reveals that the surface layer or layers protect the underlying layers such that the complete combustion of the underlying layers does not occur, the test shall be repeated by removing the outer layers sequentially until all layers have been exposed during testing, or until complete combustion has occurred.

(4) The acceptance criteria for a material tested in accordance with Sentence (3) shall be based on the cumulative emissions from all layers, which must not exceed the criteria stated in Clauses (2)(a) and (b).

3.1.5.2. Minor Combustible Components

(1) The following minor *combustible* components are permitted in a *building* required to be of *noncombustible construction*:

(a) paint,
r11.1 (b) self-adhesive tapes, mastics and caulking materials applied to provide flexible seals between the major components of exterior wall construction,
(c) *fire stops* conforming to Sentence 3.1.9.1.(1) and *fire blocks* conforming to Article 3.1.11.7.,
(d) tubing for pneumatic controls provided it has an outside diameter not more than 10 mm,
(e) adhesives, *vapour barriers* and sheathing papers,
(f) electrical outlet and junction boxes,
(g) wood blocking within wall assemblies intended for the attachment of handrails, fixtures, and similar items mounted on the surface of the wall, and
(h) similar minor components.

3.1.5.3. Combustible Roofing Materials

(1) *Combustible* roof covering that has an A, B or C classification determined in conformance with Subsection 3.1.15. is permitted on a *building* required to be of *noncombustible construction*.

(2) *Combustible* roof sheathing and roof sheathing supports installed above a concrete deck are permitted on a *building* required to be of *noncombustible construction* provided,

(a) the concrete deck is not less than 50 mm thick,
(b) the height of the roof space above the deck is not more than 1 000 mm,
(c) the roof space is divided into compartments by *fire blocks* in conformance with Article 3.1.11.5.,
(d) openings through the concrete deck, other than for *noncombustible roof drains* and plumbing piping, are protected by masonry or concrete shafts,
  (i) constructed as *fire separations* having a *fire-resistance rating* not less than 1 h, and
  (ii) extending from the concrete deck to not less than 150 mm above the adjacent roof sheathing,
(e) the perimeter of the roof is protected by a *noncombustible* parapet extending from the concrete deck to not less than 150 mm above the adjacent sheathing, and
(f) except as permitted by Clause (d), the roof space does not contain any *building* services.

(3) *Combustible* cant strips, roof curbs, nailing strips and similar components used in the installation of roofing are permitted on a *building* required to be of *noncombustible construction*.

(4) Wood nailer facings to parapets, not more than 600 mm high, are permitted on a *building* required to be of *noncombustible construction*, if the facings and any roof membranes covering the facings are protected by sheet metal.

3.1.5.4. Combustible Glazing and Skylights

(1) *Combustible* skylight assemblies are permitted in a *building* required to be of *noncombustible construction* if the assemblies have a *flame-spread rating* not more than,

(a) 150, provided the assemblies,
  (i) have an individual area not more than 9 m^2,
  (ii) have an aggregate horizontal projected area of the openings through the ceiling not more than 25% of the area of the ceiling of the room or space in which they are located, and
  (iii) are spaced not less than 2 500 mm from adjacent assemblies and 1 200 mm from required *fire separations*, or

(b) 75, provided the assemblies,
  (i) have an individual area not more than 27 m^2,
  (ii) have an aggregate horizontal projected area of the openings through the ceiling not more than 33% of the area of the ceiling of the room or space in which they are located, and
  (iii) are spaced not less than 1 200 mm from adjacent assemblies and from required *fire separations*.

(See Appendix A.)

(2) *Combustible* vertical glazing installed no higher than the second *storey* is permitted in a *building* required to be of *noncombustible construction*.

(3) Except as permitted by Sentence (4), the *combustible* vertical glazing permitted by Sentence (2) shall have a *flame-spread rating* not more than 75.

(4) The *flame-spread rating* of *combustible* glazing in Sentence (2) is permitted to be not more than 150 if the aggregate area of glazing is not more than 25% of the wall area of the *storey* in which it is located, and,

(a) the glazing is installed in a *building* not more than 1 *storey* in *building height*,
(b) the glazing in the *first storey* is separated from the glazing in the second *storey* in accordance with the requirements of Article 3.2.3.17. for opening protection, or
(c) sprinklers are installed in,
  (i) any *storey* with *combustible* glazing, and
  (ii) the *storey* immediately above the *storey* with *combustible* glazing.

(5) *Combustible* window sashes and frames are permitted in a *building* required to be of *noncombustible construction* provided,

r11.1 (a) each window in an exterior wall face is an individual unit separated by a wall of *noncombustible construction* from every other opening in the exterior wall,
(b) windows in exterior walls in contiguous *storeys* are separated by not less than 1 000 mm of *noncombustible construction*, and
(c) the aggregate area of openings in an exterior wall face of a *fire compartment* is not more than 40% of the area of the wall face.

r11.1 3.1.5.5. Combustible Components for Exterior Walls

(1) Except as provided in Sentences (2) and (4), *combustible* components are permitted to be used for an exterior non-*loadbearing* wall assembly in a *building* required to be of *noncombustible construction*, provided that,

(a) the *building* is,
  (i) not more than 3 *storeys* in *building height*, or
  (ii) not more than 6 *storeys* in *building height* if *sprinklered*,
(b) when tested in accordance with CAN/ULC-S134, "Fire Test of Exterior Wall Assemblies", the wall assembly satisfies the following criteria for testing and conditions of acceptance:
  (i) flaming on or in the wall assembly does not spread more than 5 m above the opening, and (See Appendix A.)
  (ii) the heat flux during the flame exposure on the wall assembly is not more than 35 kW/m^2 measured at 3.5 m above the opening, and (See Appendix A.)
(c) the interior surfaces of the wall assembly are protected by a thermal barrier conforming to Sentence 3.1.5.12.(5).

(See Appendix A.)

(2) Except as permitted by Articles 3.2.3.10. and 3.2.3.11., where the *limiting distance* in Tables 3.2.3.1.B. to 3.2.3.1.E. permits an area of *unprotected openings* of not more than 10% of the *exposing building face*, the construction requirements of Table 3.2.3.7. shall be met.

(3) A wall assembly permitted by Sentence (1) that includes *combustible* cladding of *fire-retardant treated wood* shall be tested for fire exposure after the cladding has been subjected to an accelerated weathering test as specified in ASTM D2898, "Accelerated Weathering of Fire-Retardant-Treated Wood for Fire Testing".

(4) The requirements of this Article do not apply where foamed plastic insulation is used in an exterior wall assembly of a *building* and the insulation is protected in conformance with Sentences 3.2.3.8.(1) and (2).

r11.1 3.1.5.5A. Factory-Assembled Panels

(1) Except as permitted in Sentence (2), factory-assembled wall and ceiling panels containing foamed plastic insulation with a *flame-spread rating* not more than 500 are permitted to be used in a *building* required to be of *noncombustible construction*, provided that,

(a) the *building*,
  (i) is *sprinklered*,
  (ii) is not more than 18 m high, measured from *grade* to the underside of the roof, and
  (iii) does not contain a Group A, Group B or Group C *major occupancy*, and

(b) the panels,
  (i) do not contain an air space,
  (ii) when tested in accordance with CAN/ULC-S138, "Test for Fire Growth of Insulated Building Panels in a Full-Scale Room Configuration", meet the criteria set out in that document, and
  (iii) when a sample panel with an assembled joint typical of field installation is subjected to the applicable test described in Subsection 3.1.12., have a *flame-spread rating* not more than that permitted for the room or space that they bound.

(2) Factory-assembled exterior wall panels containing thermosetting foamed plastic insulation are permitted to be used in a *building* required to be of *noncombustible construction*, provided that,

(a) the *building*,
  (i) is not more than 18 m high, measured from *grade* to the underside of the roof, and
  (ii) does not contain a Group B or Group C *major occupancy*, and

(b) the wall panels,
  (i) do not contain an air space,
  (ii) are protected on both sides by sheet steel not less than 0.38 mm thick,
  (iii) remain in place for not less than 10 min when tested in accordance with CAN/ULC-S101, "Fire Endurance Tests of Building Construction and Materials", where the exposed surface includes typical vertical and horizontal joints, and
  (iv) when a sample panel with an assembled joint typical of field installation is subjected to the applicable test described in Subsection 3.1.12., have a *flame-spread rating* not more than that permitted for the room or space that they bound.

(3) A walk-in cooler or freezer consisting of factory-assembled wall, floor or ceiling panels containing foamed plastic insulation with a *flame-spread rating* not more than 500 is permitted to be used in a *building* required to be of *noncombustible construction*, provided that,

(a) the *building* is *sprinklered*,

(b) the panels,
  (i) are protected on both sides by sheet metal not less than 0.38 mm thick with a melting point not less than 650°C,
  (ii) do not contain an air space,
  (iii) when tested in accordance with CAN/ULC-S138, "Test for Fire Growth of Insulated Building Panels in a Full-Scale Room Configuration", meet the criteria set out in that document, and

(iv) when a sample panel with an assembled joint typical of field installation is subjected to the applicable test described in Subsection 3.1.12., have a *flame-spread rating* not more than that permitted for the space in which they are located, the space that they bound, or the walls of the *building* to which the cooler or freezer is attached, as applicable.

(See A-3.1.4.2.(3) in Appendix A.)

3.1.5.6. Nailing Elements

(1) Wood nailing elements attached directly to or set into a continuous *noncombustible* backing for the attachment of interior finishes, are permitted in a *building* required to be of *noncombustible construction* provided the concealed space created by the wood elements is not more than 50 mm thick.

3.1.5.7. Combustible Millwork

(1) *Combustible* millwork, including interior trim, doors and door frames, show windows together with their frames, aprons and backing, handrails, shelves, cabinets and counters, is permitted in a *building* required to be of *noncombustible construction*.

3.1.5.8. Combustible Flooring Elements

(1) *Combustible stage* flooring supported on *noncombustible* structural members is permitted in a *building* required to be of *noncombustible construction*.

(2) Wood members more than 50 mm but not more than 375 mm high applied directly to or set into a *noncombustible* floor slab are permitted for the construction of a raised platform in a *building* required to be of *noncombustible construction* provided the concealed spaces created are divided into compartments by *fire blocks* in conformance with Sentence 3.1.11.3.(2).

(3) The floor system for the raised platform referred to in Sentence (2) is permitted to include *combustible* subfloor and *combustible* finished flooring.

(4) *Combustible* finished flooring is permitted in a *building* required to be of *noncombustible construction*.

3.1.5.9. Combustible Stairs in Dwelling Units

(1) *Combustible* stairs are permitted in a *dwelling unit* in a *building* required to be of *noncombustible construction*.

r11.1 3.1.5.10. Combustible Interior Finish

(1) Except as provided in Sentences (2) and (3), *combustible* interior wall and ceiling finishes described in Clause 3.1.13.1.(1)(b) that are not more than 1 mm thick are permitted in a *building* required to be of *noncombustible construction*.

(2) *Combustible* interior wall finishes, other than foamed plastics, that are not more than 25 mm thick are permitted in a *building* required to be of *noncombustible construction*, provided they have a *flame-spread rating* not more than 150 on any exposed surface or any surface that would be exposed by cutting through the material in any direction.

(3) Except as provided in Sentence (4), *combustible* interior ceiling finishes, other than foamed plastics, that are not more than 25 mm thick are permitted in a *building* required to be of *noncombustible construction*, provided that,

(a) they have a *flame-spread rating* not more than 25 on any exposed surface or on any surface that would be exposed by cutting through the material in any direction, and

(b) not more than 10% of the ceiling area within each *fire compartment* where such finishes are installed has a *flame-spread rating* not more than 150.

(4) *Combustible* interior ceiling finishes made of *fire-retardant treated wood* are permitted in a *building* required to be of *noncombustible construction*, provided they are not more than 25 mm thick or are exposed *fire-retardant treated wood* battens.

3.1.5.11. Gypsum Board

(1) Gypsum board with a tightly adhering paper covering not more than 1 mm thick is permitted in a *building* required to be of *noncombustible construction* provided the *flame-spread rating* of the surface is not more than 25.

r11.1 3.1.5.12. Combustible Insulation

(1) Foamed plastic insulation shall conform to Article 3.1.5.12A.

(2) *Combustible* insulation with a *flame-spread rating* not more than 25 on any exposed surface, or any surface that would be exposed by cutting through the material in any direction, is permitted in a *building* required to be of *noncombustible construction*.

(3) *Combustible* insulation is permitted to be installed above roof decks, outside of *foundation* walls below ground level and beneath concrete slabs-on-ground of *buildings* required to be of *noncombustible construction*.

(4) Except as provided in Sentences (5) and (6), *combustible* insulation with a *flame-spread rating* more than 25 but not more than 500 on any exposed surface, or any surface that would be exposed by cutting through the material in any direction, is permitted in a *building* required to be of *noncombustible construction*, provided the insulation is protected from adjacent space in the *building*, other than adjacent concealed spaces within wall assemblies, by a thermal barrier consisting of,

(a) not less than 12.7 mm thick gypsum board mechanically fastened to a supporting assembly independent of the insulation,
(b) lath and plaster, mechanically fastened to a supporting assembly independent of the insulation,
(c) masonry, or
(d) concrete.

(5) *Combustible* insulation with a *flame-spread rating* more than 25 but not more than 500 on any exposed surface, or any surface that would be exposed by cutting through the material in any direction, is permitted in the exterior walls of a *building* required to be of *noncombustible construction*, that is not *sprinklered* and is more than 18 m high, measured from *grade* to the underside of the roof, provided the insulation is protected from adjacent space in the *building*, other than adjacent concealed spaces within wall assemblies, by a thermal barrier that,

(a) consists of gypsum board not less than 12.7 mm thick, mechanically fastened to a supporting assembly independent of the insulation and with all joints either backed or taped and filled,
(b) consists of lath and plaster, mechanically fastened to a supporting assembly independent of the insulation,
(c) consists of masonry or concrete not less than 25 mm thick, or
(d) when tested in conformance with CAN/ULC-S101, "Fire Endurance Tests of Building Construction and Materials", does not develop an average temperature rise more than 140°C or a maximum temperature rise more than 180°C at any point on its unexposed face within 10 min.

(6) *Combustible* insulation with a *flame-spread rating* more than 25 but not more than 500 on any exposed surface, or any surface that would be exposed by cutting through the material in any direction, is permitted in the interior walls, within ceilings and within roof assemblies of a *building* required to be of *noncombustible construction*, that is not *sprinklered* and is more than 18 m high, measured from *grade* to the underside of the roof, provided the insulation is protected from adjacent space in the *building*, other than adjacent concealed spaces within wall assemblies, by a thermal barrier that,

(a) consists of Type X gypsum board not less than 15.9 mm thick, mechanically fastened to a supporting assembly independent of the insulation and with all joints either backed or taped and filled, conforming to,
  (i) ASTM C1177 / C1177M, "Glass Mat Gypsum Substrate for Use as Sheathing",
  (ii) ASTM C1178 / C1178M, "Coated Glass Mat Water-Resistant Gypsum Backing Panel",
  (iii) ASTM C1396 / C1396M, "Gypsum Board",
  (iv) ASTM C1658 / C1658M, "Glass Mat Gypsum Panels", or
  (v) CAN/CSA-A82.27-M, "Gypsum Board",
(b) consists of non-*loadbearing* masonry or concrete not less than 50 mm thick,
(c) consists of *loadbearing* masonry or concrete not less than 75 mm thick, or
(d) when tested in conformance with CAN/ULC-S101, "Fire Endurance Tests of Building Construction and Materials",
  (i) does not develop an average temperature rise more than 140°C or a maximum temperature rise more than 180°C at any point on its unexposed face within 20 min, and
  (ii) remains in place for not less than 40 min.

r11.1 3.1.5.12A. Foamed Plastic Insulation

(1) Foamed plastic insulation is permitted to be installed above roof decks, outside of *foundation* walls below ground level and beneath concrete slabs-on-ground of a *building* required to be of *noncombustible construction*.

(2) Except as provided in Sentences (3) and (4), foamed plastic insulation with a *flame-spread rating* not more than 500 on any exposed surface, or any surface that would be exposed by cutting through the material in any direction, is permitted in a *building* required to be of *noncombustible construction*, provided the insulation is protected from adjacent space in the *building*, other than adjacent concealed spaces within wall assemblies, by a thermal barrier that,
(a) consists of not less than 12.7 mm thick gypsum board mechanically fastened to a supporting assembly independent of the insulation,
(b) consists of lath and plaster, mechanically fastened to a supporting assembly independent of the insulation,
(c) consists of masonry,
(d) consists of concrete, or
(e) meets the requirements of classification B when tested in conformance with CAN/ULC-S124, "Test for the Evaluation of Protective Coverings for Foamed Plastic". (See Appendix A.)

(3) Foamed plastic insulation with a *flame-spread rating* more than 25 but not more than 500 on any exposed surface, or any surface that would be exposed by cutting through the material in any direction, is permitted in the exterior walls of a *building* required to be of *noncombustible construction*, that is not *sprinklered* and is more than 18 m high, measured from *grade* to the underside of the roof, provided the insulation is protected from adjacent space in the *building*, other than adjacent concealed spaces within wall assemblies, by a thermal barrier that,
(a) consists of gypsum board not less than 12.7 mm thick, mechanically fastened to a supporting assembly independent of the insulation and with all joints either backed or taped and filled,
(b) consists of lath and plaster, mechanically fastened to a supporting assembly independent of the insulation,
(c) consists of masonry or concrete not less than 25 mm thick, or
(d) when tested in conformance with CAN/ULC-S101, "Fire Endurance Tests of Building Construction and Materials", does not develop an average temperature rise more than 140°C or a maximum temperature rise more than 180°C at any point on its unexposed face within 10 min.

(4) Foamed plastic insulation with a *flame-spread rating* more than 25 but not more than 500 on any exposed surface, or any surface that would be exposed by cutting through the material in any direction, is permitted in the interior walls, within ceilings and within roof assemblies of a *building* required to be of *noncombustible construction*, that is not *sprinklered* and is more than 18 m high, measured from *grade* to the underside of the roof, provided the insulation is protected from adjacent space in the *building*, other than adjacent concealed spaces within wall assemblies, by a thermal barrier that,
(a) consists of Type X gypsum board not less than 15.9 mm thick, mechanically fastened to a supporting assembly independent of the insulation and with all joints either backed or taped and filled, conforming to,
  (i) ASTM C1177 / C1177M, "Glass Mat Gypsum Substrate for Use as Sheathing",
  (ii) ASTM C1178 / C1178M, "Coated Glass Mat Water-Resistant Gypsum Backing Panel",
  (iii) ASTM C1396 / C1396M, "Gypsum Board", or
  (iv) CAN/CSA-A82.27-M, "Gypsum Board",

(b) consists of non-*loadbearing* masonry or concrete not less than 50 mm thick,
(c) consists of *loadbearing* masonry or concrete not less than 75 mm thick, or
(d) when tested in conformance with CAN/ULC-S101, "Fire Endurance Tests of Building Construction and Materials",
(i) does not develop an average temperature rise more than 140°C or a maximum temperature rise more than 180°C at any point on its unexposed face within 20 min, and
(ii) remains in place for not less than 40 min.

3.1.5.13. Combustible Elements in Partitions

(1) Except as permitted by Sentence (2), solid lumber *partitions* not less than 38 mm thick and wood framing in *partitions* located in a *fire compartment* not more than 600 m^2 in area are permitted to be used in a *building* required to be of *noncombustible construction* in a *floor area* that is not *sprinklered* provided the *partitions,*
(a) are not required *fire separations*, and
r6 (b) are not located in a *care*, *care and treatment* or *detention occupancy* or in a *retirement home*.

r6 **(2)** *Partitions* installed in a *building* required to be of *noncombustible construction* are permitted to contain wood framing provided,
(a) the *building* is not more than 3 *storeys* in *building height*,
r6 (b) the *partitions* are not located in a *care*, *care and treatment* or *detention occupancy* or in a *retirement home*, and
(c) the *partitions* are not installed as enclosures for *exits* or *vertical service spaces*.

(3) Solid lumber *partitions* not less than 38 mm thick and *partitions* that contain wood framing are permitted to be used in a *building* required to be of *noncombustible construction* provided,
(a) the *floor area* containing the *partitions* is *sprinklered*, and
(b) the *partitions* are not,
r6 (i) located in a *care*, *care and treatment* or *detention occupancy* or in a *retirement home*,
(ii) installed as enclosures for *exits* or *vertical service spaces*, or
(iii) used to satisfy the requirements of Clause 3.2.8.1.(1)(a).

3.1.5.14. Storage Lockers in Residential Buildings

r6 **(1)** Except in a *retirement home,* storage lockers in storage rooms are permitted to be constructed of wood in a *building* of *residential occupancy* required to be of *noncombustible construction*.

3.1.5.15. Combustible Ducts

(1) Except as required by Sentence 3.6.4.3.(1), *combustible* ducts, including *plenums* and duct connectors, are permitted to be used in a *building* required to be of *noncombustible construction* provided these ducts and duct connectors are used only in horizontal runs.

(2) *Combustible* duct linings, duct coverings, duct insulation, vibration isolation connectors, duct tape, pipe insulation and pipe coverings are permitted to be used in a *building* required to be of *noncombustible construction* provided they conform to the appropriate requirements of Part 6.

(3) In a *building* required to be of *noncombustible construction*, *combustible* ducts need not comply with the requirements of Part 6 provided the ducts are,
(a) part of a duct system conveying only ventilation air, and
(b) contained entirely within a *dwelling unit*.

3.1.5.16. Combustible Piping Materials

(1) Except as permitted by Sentences (2) and (3) and by Clause 3.1.5.2.(1)(d) and Article 3.1.5.22., *combustible* piping and tubing and associated adhesives are permitted to be used in a *building* required to be of *noncombustible construction* provided that, except when concealed in a wall or concrete floor slab, they,
(a) have a *flame-spread rating* not more than 25, and
(b) if used in a *building* described in Subsection 3.2.6., have a smoke developed classification not more than 50.

(2) *Combustible* sprinkler piping is permitted to be used within a *sprinklered floor area* in a *building* required to be of *noncombustible construction*.

(3) Polypropylene pipes and fittings are permitted to be used for drain, waste and vent piping for the conveyance of highly corrosive materials and for piping used to distribute distilled or dialyzed water in laboratory and hospital facilities in a *building* required to be of *noncombustible construction*, provided,
(a) the *building* is *sprinklered*,
(b) the piping is not located in a vertical shaft, and
(c) piping that penetrates a *fire separation* is sealed at the penetration by a *fire stop* that has an FT rating not less than the *fire-resistance rating* of the *fire separation* when subjected to the fire test method in CAN/ULC-S115, "Fire Tests of Firestop Systems", with a pressure differential of 50 Pa between the exposed and unexposed sides, with the higher pressure on the exposed side.

3.1.5.17. Combustible Plumbing Fixtures

(1) *Combustible plumbing fixtures* are permitted in a *building* required to be of *noncombustible construction* if they are constructed of material having a *flame-spread rating* and smoke developed classification permitted in Subsection 3.1.13.

3.1.5.18. Wires and Cables

(1) Except as permitted by Sentence (2) and Articles 3.1.5.19. and 3.1.5.21., optical fibre cables and electrical wires and cables with *combustible* insulation, jackets or sheathes are permitted in a *building* required to be of *noncombustible construction*, provided,
(a) the wires and cables exhibit a vertical char of not more than 1.5 m when tested in conformance with the Vertical Flame Test – Cables in Cabletrough in Clause 4.11.4. of CSA C22.2 No. 0.3, "Test Methods for Electrical Wires and Cables", (FT4 Rating),
(b) the wires and cables are located in,
  (i) totally enclosed *noncombustible* raceways,
  (ii) concealed spaces in walls,
  (iii) concrete slabs,
  (iv) a *service room* separated from the remainder of the *building* by a *fire separation* having a *fire-resistance rating* not less than 1 h, or
  (v) totally enclosed nonmetallic raceways conforming to Clause 3.1.5.20.(1)(b), or
(c) the wires and cables are communication cables used at the service entry to a *building* and are not more than 3 m long.
(See Appendix A.)

(2) The requirement in Clause (1)(a) is considered to be met where the wires and cables exhibit a flame-spread of not more than 1.5 m, a smoke density of not more than 0.5 at peak optical density and a smoke density not more than 0.15 at average optical density when tested in conformance with the Flame and Smoke Test in the Appendix to CSA C22.2 No. 0.3, "Test Methods for Electrical Wires and Cables", (FT6 Rating).

3.1.5.19. Combustible Travelling Cables for Elevators

(1) *Combustible* travelling cables are permitted on elevating devices in a *building* required to be of *noncombustible construction*.

3.1.5.20. Nonmetallic Raceways

(1) Except as provided by Subclause 3.6.4.3.(1)(a)(iv) and subject to limits on size for penetrations of *fire separations* as required by Sentence 3.1.9.3.(2), within a *fire compartment* of a *building* required to be of *noncombustible construction*, totally enclosed nonmetallic raceways not more than 175 mm in outside diameter, or an equivalent rectangular area, are permitted to be used to enclose optical fibre cables and electrical wires and cables, provided, where,

(a) the wires and cables in the raceways meet or exceed the requirements of Clause 3.1.5.18.(1)(a), the nonmetallic raceways meet the requirements for at least an FT4 rating in,
   (i) CAN/CSA-C22.2 No. 262, "Optical Fiber Cable and Communication Cable Raceway Systems", or
   (ii) CAN/ULC-S143, "Fire Tests for Non-Metallic Electrical and Optical Fibre Cable Raceway Systems", and

(b) the wires and cables in the raceways do not meet or exceed the requirements of Clause 3.1.5.18.(1)(a), the nonmetallic raceways exhibit a vertical char not more than 1.5 m when tested in conformance with the Vertical Flame Test (FT4) – Conduit or Tubing on Cable Tray in Clause 6.16 of CSA C22.2 No. 211.0, "General Requirements and Methods of Testing for Nonmetallic Conduit".

3.1.5.21. Wires in Computer Room Floors

(1) Optical fibre cables and electrical wires and cables with *combustible* insulation, jackets or sheathes, located in the space below a raised floor in a *computer room*, are permitted in a *building* required to be of *noncombustible construction* provided they do not convey flame or continue to burn for more than 1 min when tested in conformance with the Vertical Flame Test in Clause 4.11.1. of CSA C22.2 No. 0.3, "Test Methods for Electrical Wires and Cables", (FT1 Rating).

(2) The requirement in Sentence (1) is considered to be met where the wires and cables,

(a) exhibit a vertical char of not more than 1.5 m when tested in conformance with the Vertical Flame Test – Cables in Cabletrough in Clause 4.11.4. of CSA C22.2 No. 0.3, "Test Methods for Electrical Wires and Cables", (FT4 Rating), or

(b) exhibit a flame-spread of not more than 1.5 m, a smoke density of not more than 0.5 at peak optical density and a smoke density not more than 0.15 at average optical density when tested in conformance with the Flame and Smoke Test in the Appendix to CSA C22.2 No. 0.3, "Test Methods for Electrical Wires and Cables", (FT6 Rating).

3.1.5.22. Combustible Components in Public Pools and Public Spas

(1) *Combustible* fittings and components in a *public pool* or *public spa*, including main drains, piping, skimmers, return inlets, steps, ladder rungs and liners, are permitted in a *building* required to be of *noncombustible construction*.

3.1.5.23. Marquees Having Combustible Elements

(1) Except as permitted in Sentence (2), exterior *marquees*, not greater than 7.5 m from ground level to the top of the *marquee*, having *combustible* elements, other than fabrics or films conforming to Sentence 3.1.16.1.(1), are permitted on a *building* required to be of *noncombustible construction*, provided every opening in the exposed wall of the *building* above the *marquee* is protected with wired glass in accordance with MMAH Supplementary Standard SB-2, "Fire Performance Ratings" where these openings are within,

(a) 4.5 m horizontally of the *marquee*, and

(b) 9 m vertically above the *marquee*.

(2) The protection required by Sentence (1) is permitted to be waived if the *building* is *sprinklered*.

3.1.5.24. Combustible Mezzanines

(1) In a *building* required to be of *noncombustible construction*, a *mezzanine* located within a *live/work unit* is permitted to be of *combustible construction*, provided the area of the *mezzanine* is not more than 25% of the *floor area* of the *live/work unit* or 20 m^2, whichever is less, and has no obstructions more than 1 070 mm above the floor.

3.1.5.25. Wood Decorative Cladding

(1) Wood decorative cladding is permitted to be used on exterior *marquee* fascias, of a *storey* having direct access to a *street* or access route, of a *building* required to be of *noncombustible construction*, provided the cladding is *fire-retardant treated wood* that, before testing to CAN/ULC-S102, "Test for Surface Burning Characteristics of Building Materials and Assemblies", has been conditioned in conformance with ASTM D2898, "Accelerated Weathering of Fire-Retardant-Treated Wood for Fire Testing".

3.1.5.26. Combustible Solar Collector Systems

(1) A *combustible* solar collector system is permitted to be installed above the roof of a *building* required to be of *noncombustible construction*.

3.1.6. Reserved

3.1.7. Fire-Resistance Ratings

3.1.7.1. Determination of Ratings

r11.1 **(1)** Except as permitted by Sentence (2) and Articles 3.1.7.2. and 3.6.3.5., the rating of a material, assembly of materials or a structural member that is required to have a *fire-resistance rating*, shall be determined on the basis of the results of tests conducted in conformance with CAN/ULC-S101, "Fire Endurance Tests of Building Construction and Materials".

(2) A material, assembly of materials or a structural member is permitted to be assigned a *fire-resistance rating* on the basis of MMAH Supplementary Standard SB-2, "Fire Performance Ratings".

3.1.7.2. Exception for Exterior Walls

(1) The limit on the rise of temperature on the unexposed surface of an assembly as required by the tests referred to in Sentence 3.1.7.1.(1) shall not apply to an exterior wall that has a *limiting distance* of 1.2 m or more, provided correction is made for radiation from the unexposed surface in accordance with Sentence 3.2.3.1.(9).

3.1.7.3. Exposure Conditions for Rating

(1) Floor, roof and ceiling assemblies shall be rated for exposure to fire on the underside.

(2) *Firewalls* and interior vertical *fire separations* shall be rated for exposure to fire on each side.

(3) Exterior walls shall be rated for exposure to fire from inside the *building*.

3.1.7.4. Minimum Fire-Resistance Rating

(1) The use of materials or assemblies having a greater *fire-resistance rating* than required shall impose no obligation to exceed in whole or in part the minimum *fire-resistance ratings* required by this Part.

3.1.7.5. Rating of Supporting Construction

(1) Except as permitted by Sentence (2) and by Articles 3.2.2.20. to 3.2.2.83. for mixed types of construction, all *loadbearing* walls, columns and arches in the *storey* immediately below a floor or roof assembly required to have a *fire-resistance rating* shall have a *fire-resistance rating* not less than that required for the supported floor or roof assembly.

(2) *Loadbearing* walls, columns and arches supporting a *service room* or *service space* need not conform to Sentence (1).

r5 **(3)** Except for *noncombustible construction* required by Subclauses 3.2.2.43A.(2)(c)(i) and 3.2.2.50A.(2)(c)(i), if an assembly is required to be of *noncombustible construction* and have a *fire-resistance rating*, it shall be supported by *noncombustible construction*.

3.1.8. Fire Separations and Closures

3.1.8.1. General Requirements

(1) Any wall, *partition* or floor assembly required to be a *fire separation* shall,
(a) except as permitted by Sentence (2), be constructed as a continuous element, and
(b) as required in this Part, have a *fire-resistance rating* as specified. (See Appendix A.)

(2) Openings in a *fire separation* shall be protected with *closures*, shafts or other means in conformance with Articles 3.1.8.4. to 3.1.8.18. and Subsections 3.1.9. and 3.2.8. (See Appendix A.)

3.1.8.2. Combustible Construction Support

(1) *Combustible construction* that abuts on or is supported by a *noncombustible fire separation* shall be constructed so that its collapse under fire conditions will not cause the collapse of the *fire separation*.

3.1.8.3. Continuity of Fire Separations

(1) Except as permitted by Sentence 3.6.4.2.(2), a *horizontal service space* or other concealed space located above a required vertical *fire separation*, including the walls of a vertical shaft, shall be divided at the *fire separation* by an equivalent *fire separation* within the *service space*.

(2) The *fire separation* required by Sentence (1) shall terminate so that smoke-tight joints are provided where it abuts on or intersects,
(a) a floor,
(b) a roof slab, or
(c) a roof deck.

(3) Except as required by Subsection 3.6.3. for a shaft penetrating a roof assembly, a shaft, including an *exit* enclosure, that penetrates a *fire separation*, shall,
(a) extend through any *horizontal service space* or any other concealed space, and
(b) terminate so that smoke-tight joints are provided where the shaft abuts on or intersects,
  (i) a floor,
  (ii) a roof slab, or
  (iii) a roof deck.

(4) The continuity of a *fire separation* shall be maintained where it abuts another *fire separation*, a floor, a ceiling, or an exterior wall assembly. (See Appendix A.)

r11.1 ### 3.1.8.4. Determination of Ratings

(1) Except as permitted by Sentences (2) and 3.1.8.14.(1), the *fire-protection rating* for a *closure* shall be determined in accordance with,
(a) CAN/ULC-S104, "Fire Tests of Door Assemblies",
(b) CAN/ULC-S106, "Fire Tests of Window and Glass Block Assemblies", or
(c) CAN/ULC-S112, "Fire Test of Fire Damper Assemblies".

(2) Except as permitted by Sentence 3.1.8.10.(1), the *fire-protection rating* of a *closure* shall conform to Table 3.1.8.4. for the required *fire-resistance rating* of the *fire separation*.

(3) The leakage rate of smoke dampers and combination smoke and *fire dampers* shall,
(a) be determined in accordance with the applicable provisions in CAN/ULC-S112.1, "Leakage Rated Dampers for Use in Smoke Control Systems", and
(b) conform to Class I, II or III of that standard.

(4) The leakage rate of a door assembly shall be determined in accordance with ANSI/UL-1784, "Air Leakage Tests of Door Assemblies and Other Opening Protectives".

Table 3.1.8.4.
Fire-Protection Rating of Closure
Forming Part of Sentence 3.1.8.4.(2) and Clause 3.1.9.1.(1)(a)

Fire-Resistance Rating of *Fire Separation*	Required *Fire-Protection Rating* of *Closure*
30 min	20 min
45 min	45 min
1 h	45 min
1.5 h	1 h
2 h	1.5 h
3 h	2 h
4 h	3 h
Column 1	2

3.1.8.5. Installation of Closures

(1) Except where *fire dampers*, window assemblies and glass block are used as *closures*, *closures* of the same *fire-protection rating* installed on opposite sides of the same opening are deemed to have a *fire-protection rating* equal to the sum of the *fire-protection ratings* of the *closures*.

r11.1 **(2)** Except as otherwise specified in this Part, every door, *fire damper*, window assembly or glass block used as a *closure* in a required *fire separation,*
(a) shall be installed in conformance with NFPA 80, "Fire Doors and Other Opening Protectives", and
(b) where required to have a *fire-protection rating*, shall have labels or classification marks to identify the testing laboratory.

r11.1 **(3)** Except as otherwise specified in this Part, every smoke damper used as a *closure* in a required *fire separation* shall be installed in conformance with NFPA 105, "Smoke Door Assemblies and Other Opening Protectives".

r11.1 **(4)** If a door is installed so that it could damage the integrity of a *fire separation* if its swing is unrestricted, door stops shall be installed to prevent the damage.

r11.1 **(5)** A leakage-rated door assembly rated in accordance with Sentence 3.1.8.4.(4) shall,
(a) be installed in *fire separations* in protected *floor areas* described in Clause 3.3.1.7.(1)(b),
(b) be installed in *fire separations* in *care* or *care and treatment occupancies* referred to in Sentence 3.3.3.5.(4) and installed in *fire separations* in *retirement homes* referred to in Sentence 3.3.4.11.(4),
(c) except as provided in Sentence (7), be installed in *fire separations* of *public corridors* serving *dwelling units* in *storeys* that are not *sprinklered*, and
(d) be installed in *firewalls* that are a *horizontal exit* referred to in Sentence 3.3.3.5.(3).

r11.1 **(6)** Leakage-rated door assemblies required by Sentence (5) shall conform to NFPA 105, "Smoke Door Assemblies and Other Opening Protectives".

r11.1 **(7)** A leakage-rated door assembly need not be installed where a *dwelling unit* served by a *public corridor* has,
(a) a second and separate *means of egress*, or
(b) an open-air balcony that is sized to accommodate the number of occupants for which the *dwelling unit* is intended.

3.1.8.6. Maximum Openings

(1) The size of an opening in an interior *fire separation* required to be protected with a *closure* shall be not more than 11 m^2, with no dimension more than 3.7 m, if a *fire compartment* on either side of the *fire separation* is not *sprinklered*.

(2) The size of an opening in an interior *fire separation* required to be protected with a *closure* shall be not more than 22 m^2, with no dimension more than 6 m, provided the *fire compartments* on both sides of the *fire separation* are *sprinklered*.

r11.1 3.1.8.7. Location of Fire Dampers and Smoke Dampers

(1) Except as provided in Article 3.1.8.8., a *fire damper* having a *fire-protection rating* conforming to Sentence 3.1.8.4.(2) shall be installed in conformance with Article 3.1.8.9. in ducts or air-transfer openings that penetrate an assembly required to be a *fire separation*.

(2) Except as provided in Article 3.1.8.8A., a smoke damper or a combination smoke and *fire damper* shall be installed in conformance with Article 3.1.8.9A. in ducts or air-transfer openings that penetrate an assembly required to be a *fire separation*, where the *fire separation*,
(a) separates a *public corridor*,
(b) contains an egress door referred to in Sentence 3.4.2.4.(2),
(c) serves an *assembly*, *care*, *care and treatment*, *detention* or *residential occupancy*, or
(d) is installed to meet the requirements of Clause 3.3.1.7.(1)(b) or Sentence 3.3.3.5.(4) or 3.3.4.11.(4).

r11.1 3.1.8.8. Fire Dampers Waived

(1) Except as permitted in Sentences (2) to (4), the requirement for *fire dampers* described in Sentence 3.1.8.7.(1) is permitted to be waived for,
(a) ducts that serve commercial cooking equipment,
(b) continuous *noncombustible* ducts having a melting point above 760°C that penetrate a vertical *fire separation* required by Sentence 3.3.1.1.(1) between *suites* of *assembly*, *mercantile*, *low hazard industrial*, *medium hazard industrial* or *high hazard industrial occupancy*,
(c) ducts or air-transfer openings that penetrate a vertical *fire separation* not required to have a *fire-resistance rating*, and
(d) *noncombustible* ducts or air-transfer openings that penetrate a horizontal *fire separation* not required to have a *fire-resistance rating*.

(2) The requirement for *fire dampers* described in Sentence 3.1.8.7.(1) is permitted to be waived for *noncombustible* branch ducts having a melting point above 760°C that penetrate a *fire separation*,
(a) provided the ducts,
  (i) have a cross-sectional area not more than 130 cm^2 and serve only *air-conditioning* units or combined *air-conditioning* and heating units discharging air not more than 1.2 m above the floor, or
  (ii) extend not less than 500 mm inside *exhaust duct* risers that are under negative pressure and in which the airflow is upward as required by Article 3.6.3.4., or
(b) provided the *fire separation* separates a *vertical service space* from the remainder of the *building* and provided each individual duct exhausts directly to the outdoors at the top of the *vertical service space*.

(3) In elementary and secondary schools, a continuous *noncombustible* duct having a melting point above 760°C that pierces a *fire separation* having a *fire-resistance rating* of 30 min need not be equipped with a *fire damper* at the *fire separation*.

(4) In a Group B, Division 3 *occupancy* which contains sleeping accommodation for not more than 10 persons, which has not more than six occupants who require assistance in evacuation in case of an emergency and which is equipped with a fire alarm system, a duct need not be equipped with a *fire damper* at a *fire separation*, provided duct-type *smoke detectors* have been installed to control smoke circulation as described in Article 3.2.4.13.

r11.1

3.1.8.8A. Smoke Dampers Waived

(1) Except as permitted in Sentence (2), the requirement for smoke dampers or combination smoke and *fire dampers* described in Sentence 3.1.8.7.(2) is permitted to be waived for ducts,

(a) that serve commercial cooking equipment,
(b) in which all inlet and outlet openings serve not more than one *fire compartment*, or
(c) that penetrate a vertical *fire separation* referred to in Clause 3.3.1.7.(1)(b) or in Sentence 3.3.3.5.(4), provided,
  (i) the movement of air is continuous, and
  (ii) the configuration of the air-handling system prevents the recirculation of exhaust or return air under fire emergency conditions.

(2) The requirement for smoke dampers or combination smoke and *fire dampers* described in Sentence 3.1.8.7.(2) is permitted to be waived for *noncombustible* branch ducts having a melting point above 760°C that penetrate a *fire separation*,

(a) provided the ducts,
  (i) have a cross-sectional area not more than 130 cm^2 and serve only *air-conditioning* units or combined *air-conditioning* and heating units discharging air not more than 1.2 m above the floor,
  (ii) extend not less than 500 mm inside *exhaust duct* risers that are under negative pressure and in which the airflow is upward as required by Article 3.6.3.4., or
  (iii) are required to function as part of a smoke control system, or
(b) provided the *fire separation* separates a *vertical service space* from the remainder of the *building* and provided each individual duct exhausts directly to the outdoors at the top of the *vertical service space*.

3.1.8.9. Installation of Fire Dampers

(1) A *fire damper* shall be arranged to close automatically upon the operation of a fusible link conforming to ULC-S505, "Fusible Links for Fire Protection Service", or other heat-actuated or smoke-actuated device.

(2) A heat-actuated device referred to in Sentence (1) shall,

(a) be located where it is readily affected by an abnormal rise of temperature in the duct, and
(b) have a temperature rating approximately 30°C above the maximum temperature that would exist in the system either with the system in operation or shut down.

(3) A *fire damper* shall be installed in the plane of the *fire separation* so as to stay in place should the duct be dislodged during a fire. (See Appendix A.)

r11.1 **(4)** A *fire damper* shall be installed in the vertical or horizontal position in which it was tested.

(5) A tightly fitted access door shall be installed for each *fire damper* to provide access for the inspection of the damper and the resetting of the release device. (See Appendix A.)

r11.1 ## 3.1.8.9A. Installation of Smoke Dampers

(1) Where smoke dampers are used as a *closure* in an air-transfer opening, they shall be installed in the plane of the *fire separation*.

(2) Where combination smoke and *fire dampers* are used as a *closure* in a duct, they shall be installed within 610 mm of the plane of the *fire separation*, provided there is no inlet or outlet opening between the *fire separation* and the damper.

(3) Except as required by a smoke control system, smoke dampers and combination smoke and *fire dampers* shall be configured so as to close automatically upon a signal from an adjacent *smoke detector* located as described in CAN/ULC-S524, "Installation of Fire Alarm Systems", within 1.5 m horizontally of the duct or air-transfer opening in the *fire separation*,
(a) on both sides of the air-transfer opening, or
(b) in the duct downstream of the smoke damper or combination smoke and *fire damper*.

(4) Smoke dampers or combination smoke and *fire dampers* shall be installed in the vertical or horizontal position in which they were tested.

(5) A tightly fitted access door shall be installed for each smoke damper and combination smoke and *fire damper* to provide access for their inspection and the resetting of the release device.

3.1.8.10. Twenty-Minute Closures

(1) A door assembly having a *fire-protection rating* not less than 20 min is permitted to be used as a *closure* in,
(a) a *fire separation* not required to have a *fire-resistance rating* more than 1 h, located between,
  (i) a *public corridor* and a *suite*,
  (ii) a corridor and adjacent sleeping rooms, or
  (iii) a corridor and adjacent classrooms, offices and libraries in Group A, Division 2 *major occupancies*, or
(b) a *fire separation* not required to have a *fire-resistance rating* more than 45 min, located in a *building* not more than 3 *storeys* in *building height*.

(2) The requirements for *noncombustible* sills and *combustible* floor coverings in NFPA 80, "Fire Doors and Other Opening Protectives", do not apply to a door described in Sentence (1).

(3) A door described in Sentence (1) shall have a clearance not more than 6 mm at the bottom and not more than 3 mm at the sides and top.

(4) In elementary and secondary schools, a door assembly conforming to Articles 9.10.13.2. and 9.10.13.3. is permitted to be used as a *closure* in a *fire separation* having a *fire-resistance rating* of 30 min.

3.1.8.11. Self-Closing Devices

(1) Except as provided in Sentences (2) to (5) and 3.3.3.2.(5), every door in a *fire separation* shall be equipped with a self-closing device designed to return the door to the closed position after each use.

(2) Self-closing devices need not be provided on doors to freight elevators and dumbwaiters.

(3) In a *building* that is not more than 3 *storeys* in *building height*, a self-closing device is not required on a door that is located between a classroom and a corridor providing *access to exit* from the classroom, except that a self-closing device is required on a door between a *hazardous classroom* and the corridor in an elementary or secondary school.

(4) In a *building* that is not more than 3 *storeys* in *building height*, a self-closing device is not required on a door between a *public corridor* and an adjacent room or *suite* of *business and personal services occupancy* if the door is not located in,
(a) a dead-end portion of the corridor, or
(b) a corridor that serves a *hotel*.

(5) Within a *fire compartment* in a hospital or long-term care home that complies with the requirements of Article 3.3.3.5., a self-closing device is not required on a door that is located between,
(a) a patient's or resident's sleeping room and a corridor serving the patient's or resident's sleeping room, or
(b) a patient's or resident's sleeping room and an adjacent room that serves the patient's or resident's sleeping room.

r11.1 ## 3.1.8.12. Hold-Open Devices

(1) Except as provided in Sentences 3.1.8.9.(1) and 3.1.8.9A.(3), a hold-open device is permitted to be used on a *closure* in a required *fire separation*, other than on an *exit* stair door in a *building* more than 3 *storeys* in *building height* and on a door for a vestibule required by Article 3.3.5.7., provided the device is designed to release the *closure* in conformance with this Article.

(2) Except as provided in Sentences (5) and (6), where the *building* is provided with a fire alarm system, a hold-open device permitted by Sentence (1) shall release,
(a) in a single-stage system, upon any signal from the fire alarm system, and
(b) in a two-stage system,
  (i) upon any *alert signal* from the fire alarm system, or
  (ii) upon actuation of any adjacent *smoke detectors*.

(3) Where the *building* is provided with a fire alarm system, a hold-open device permitted by Sentence (1) shall release upon a signal from a *smoke detector* connected to the fire alarm system and located as described in CAN/ULC-S524, "Installation of Fire Alarm Systems", where the hold-open device is used on,
(a) an *exit* door,
(b) a door opening into a *public corridor*,
(c) an egress door referred to in Sentence 3.4.2.4.(2),
(d) a door serving an *assembly*, *care*, *care and treatment*, *detention*, or *residential occupancy*,
(e) a door in a *fire separation* referred to in Clause 3.3.1.7.(1)(b) or in Sentence 3.3.3.5.(4) or 3.3.4.11.(4), or
(f) a door required to function as part of a smoke control system.

(4) Where the *building* is not provided with a fire alarm system, a hold-open device permitted by Sentence (1) shall release upon a signal from a *smoke alarm* located on either side of the *fire separation* at ceiling level within 1.5 m horizontally of the *closure* opening in the *fire separation*, where the hold-open device is used on *closures* described in Clauses (3)(a) to (e).

(5) Where a hold-open device is used on *closures* other than those described in Sentences (3) and (4), it is permitted to be released upon actuation of a heat-actuated device.

(6) A hold-open device used on a door located between a corridor used by the public and an adjacent sleeping room in a *care and treatment occupancy* need not release automatically as described in Sentence (2).

3.1.8.13. Door Latches

(1) Except as permitted by Sentence 3.3.3.2.(5) and Article 3.3.3.5., a swing-type door in a *fire separation* shall be equipped with a positive latching mechanism designed to hold the door in the closed position after each use.

3.1.8.14. Wired Glass and Glass Block

(1) Except as permitted by Articles 3.1.8.16. and 3.1.8.17. for the separation of *exits*, an opening in a *fire separation* having a *fire-resistance rating* not more than 1 h is permitted to be protected with fixed wired glass assemblies or glass blocks installed in conformance with NFPA 80, "Fire Doors and Other Opening Protectives".

(2) Wired glass assemblies permitted by Sentence (1) and described in MMAH Supplementary Standard SB-2, "Fire Performance Ratings", are permitted to be used as *closures* in vertical *fire separations* without being tested in accordance with Sentence 3.1.8.4.(1).

(3) Glass blocks permitted by Sentence (1) shall be installed in accordance with Subsection 4.3.2. and reinforced with steel reinforcement in each horizontal joint.

3.1.8.15. Temperature Rise Limit for Doors

(1) Except as permitted by Article 3.1.8.17., the maximum temperature rise on the opaque portion of the unexposed side of a door used as a *closure* in a *fire separation* in a location shown in Table 3.1.8.15., shall conform to the Table when tested in conformance with Sentence 3.1.8.4.(1).

Table 3.1.8.15.
Restrictions on Temperature Rise and Glazing for Closures
Forming Part of Articles of 3.1.8.15. and 3.1.8.16.

Location	Minimum Required *Fire-Protection Rating* of Door	Maximum Temperature Rise on Opaque Portion of Unexposed Side of Door, °C	Maximum Area of Wired Glass in Door, m^2	Maximum Aggregate Area of Glass Block and Wired Glass Panels not in Door, m^2
Between a dead-end corridor and an adjacent *occupancy* where the corridor provides the only *access to exit* and is required to have a *fire-resistance rating*	Less than 45 min	No limit	No limit	No limit
	45 min	250 after 30 min	0.0645	0.0645
Between an *exit* enclosure and the remainder of the *floor area* in *buildings* not more than 3 *storeys* in *building height*	All ratings	No limit	0.8	0.8
Between an *exit* enclosure and the remainder of the *floor area* (except as permitted above)	45 min	250 after 30 min	0.0645	0.0645
	1.5 h	250 after 1 h	0.0645	0.0645
	2 h	250 after 1 h	0.0645	0.0645
In a *firewall*	1.5 h	250 after 30 min	0.0645	0
	3 h	250 after 1 h	0	0
Column 1	2	3	4	5

3.1.8.16. Area Limits for Wired Glass and Glass Block

(1) Except as permitted by Article 3.1.8.17., the maximum area of wired glass in a door used in the locations shown in Table 3.1.8.15. shall conform to the Table. (See Appendix A.)

(2) Except as permitted by Article 3.1.8.17., the maximum area of glass block and wired glass panels not in a door, used in the locations shown in Table 3.1.8.15., shall conform to the Table.

3.1.8.17. Temperature Rise and Area Limits Waived

(1) The temperature rise limits and glass area limits required by Articles 3.1.8.15. and 3.1.8.16. are waived for a *closure* between an *exit* enclosure and an enclosed vestibule or corridor provided,

(a) the vestibule or corridor is separated from the remainder of the *floor area* by a *fire separation* having a *fire-resistance rating* not less than 45 min,

(b) the *fire separation* required by Clause (a) contains no wired glass or glass block within 3 m of the *closure* into the *exit* enclosure, and

(c) the vestibule or corridor contains no *occupancy*.

(See Appendix A.)

3.1.8.18. Sprinkler Protected Glazed Wall Assembly

(1) A sprinkler protected glazed wall assembly shall be constructed in accordance with the requirements of ULC/ORD C263.1, "Sprinkler-Protected Windows Systems".

(2) A sprinkler protected glazed wall assembly shall not be installed in,

e2 (a) *fire separations* requiring a *fire-resistance rating* of more than two hours,

(b) a *firewall*,

(c) a *high hazard industrial occupancy*, or

r1 (d) any part of an *exit* serving,

(i) a *floor area* subject to the requirements of Subsection 3.2.6.,

(ii) a *care occupancy*,

(iii) a *care and treatment occupancy*,

(iv) a *detention occupancy*, or

(v) a *residential occupancy*.

(3) Where a sprinkler protected glazed wall assembly is installed in an *exit fire separation* permitted in Sentence (2),

(a) the *building* shall be *sprinklered*, and

(b) the *exits* protected with the sprinkler protected glazed wall assemblies shall not comprise more than one-half of the required number of *exits* from any *floor area*.

3.1.9. Penetrations in Fire Separations and Fire-Rated Assemblies

(See Appendix A.)

3.1.9.1. Fire Stops

r11.1 **(1)** Except as provided in Sentences (2) to (5) and Article 3.1.9.3A., penetrations of a *fire separation* or a membrane forming part of an assembly required to have a *fire-resistance rating* shall be,

r3 (a) sealed by a *fire stop* that, when subjected to the fire test method in CAN/ULC-S115, "Fire Tests of Firestop Systems", has an F rating not less than the *fire-protection rating* required for *closures* in the *fire separation* in conformance with Table 3.1.8.4., or

(b) tightly fitted. (See Appendix A.)

(2) Penetrations of a *firewall* or a horizontal *fire separation* that is required to have a *fire-resistance rating* in conformance with Article 3.2.1.2. shall be sealed at the penetration by a *fire stop* that, when subjected to the fire test method in CAN/ULC-S115, "Fire Tests of Firestop Systems", has an FT rating not less than the *fire-resistance rating* required for the *fire separation*.

(3) Penetrations of a *fire separation* in conformance with Sentence 3.6.4.2.(2) shall be sealed by a *fire stop* that, when subjected to the fire test method in CAN/ULC-S115, "Fire Tests of Firestop Systems", has an FT rating not less than the *fire-resistance rating* required for the *fire separation* of the assembly.

(4) Sprinklers are permitted to penetrate a *fire separation* or a membrane forming part of an assembly required to have a *fire-resistance rating* without having to meet the *fire stop* requirements of Sentence (1), (2) or (3), provided the annular space created by the penetration of a fire sprinkler is covered by a metal escutcheon plate in accordance with NFPA 13, "Installation of Sprinkler Systems".

(5) Unless specifically designed with a *fire stop, fire dampers* are permitted to penetrate a *fire separation* or a membrane forming part of an assembly required to have a *fire-resistance rating* without having to meet the *fire stop* requirements of Sentence (1), (2) or (3), provided the *fire damper* is installed in conformance with NFPA 80, "Fire Doors and Other Opening Protectives".

3.1.9.2. Combustibility of Service Penetrations

(1) Except as permitted by Articles 3.1.9.3. and 3.1.9.4., pipes, ducts, electrical outlet boxes, totally enclosed raceways or other similar service equipment that penetrate an assembly required to have a *fire-resistance rating* shall be *noncombustible* unless the assembly has been tested incorporating that service equipment. (See Appendix A.)

3.1.9.3. Penetration by Wires, Cables and Outlet Boxes

(1) Optical fibre cables and electrical wires and cables in totally enclosed *noncombustible* raceways are permitted to penetrate an assembly required to have a *fire-resistance rating* without being incorporated in the assembly at the time of testing as required by Article 3.1.9.2.

(2) Except as permitted by Sentence (3), totally enclosed nonmetallic raceways conforming to Article 3.1.5.20., optical fibre cables, and electrical wires and cables, single or grouped, with *combustible* insulation, jackets or sheathes that conform to the requirements of Clause 3.1.5.18.(1)(a) and that are not installed in totally enclosed *noncombustible* raceways are permitted to penetrate an assembly required to have a *fire-resistance rating* without being incorporated in the assembly at the time of testing as required by Article 3.1.9.2., provided the overall diameter of the single or grouped wires or cables, or the raceways is not more than 25 mm.

(3) Single conductor metal sheathed cables with *combustible* jacketing that are more than 25 mm in overall diameter are permitted to penetrate a *fire separation* required to have a *fire-resistance rating* without being incorporated in the assembly at the time of testing as required by Article 3.1.9.2., provided the cables are not grouped and are spaced a minimum of 300 mm apart.

(4) *Combustible* totally enclosed raceways that are embedded in a concrete floor slab are permitted in an assembly required to have a *fire-resistance rating* without being incorporated in the assembly at the time of testing as required by Article 3.1.9.2., provided the concrete cover between the raceway and the bottom of the slab is not less than 50 mm.

(5) *Combustible* electrical outlet boxes are permitted in an assembly required to have a *fire-resistance rating* without being incorporated in the assembly at the time of testing as required by Article 3.1.9.2., provided the opening through the membrane into the box is not more than 160 cm^2.

(6) *Noncombustible* electrical outlet boxes that penetrate a *fire separation* or a membrane forming part of an assembly required to have a *fire-resistance rating* need not meet the requirements of Article 3.1.9.1. provided,

(a) they do not exceed,
  (i) 100 cm^2 each in area, and
  (ii) an aggregate area of 650 cm^2 in any 9.3 m^2 of surface area, and
(b) the annular space between the membrane and the box does not exceed 3 mm.

(7) Unless provided with a *fire stop* in accordance with CAN/ULC-S115, "Fire Tests of Firestop Systems", electrical outlet boxes on opposite sides of a vertical *fire separation* required to have a *fire-resistance rating* shall be,

(a) separated by a horizontal distance of not less than 600 mm, or
(b) installed in adjacent stud cavities.

r11.1 ### 3.1.9.3A. Penetration by Outlet Boxes (See Appendix A.)

(1) Except as provided in Sentences (2) and (3), outlet boxes are permitted to penetrate the membrane of an assembly required to have a *fire-resistance rating*, provided they are sealed at the penetration by a *fire stop* that has an FT rating not less than the *fire-resistance rating* of the *fire separation* when subjected to the fire test method in CAN/ULC-S115, "Fire Tests of Firestop Systems".

(2) Except as provided in Sentences 3.1.9.1.(2) and (3), *noncombustible* outlet boxes that penetrate a vertical *fire separation* or a membrane forming part of an assembly required to have a *fire-resistance rating* need not conform to Sentence (1), provided,

(a) they do not exceed,
  (i) 160 cm^2 in area, and
  (ii) an aggregate area of 650 cm^2 in any 9.3 m^2 of surface area, and

(b) the annular space between the membrane and *noncombustible* electrical outlet boxes does not exceed 3 mm.

(3) In addition to the requirements of Sentence (2), outlet boxes on opposite sides of a vertical *fire separation* having a *fire-resistance rating* shall be separated by,

(a) a horizontal distance of not less than 600 mm, or
(b) a *fire block* conforming to Article 3.1.11.7.

3.1.9.4. Combustible Piping Penetrations

(1) Except as permitted by Sentences (3) to (8), *combustible* piping shall not be used if any part of the piping system penetrates,

(a) a *fire separation* required to have a *fire-resistance rating*, or
(b) a membrane that forms part of an assembly required to have a *fire-resistance rating*.

(See Appendix A.)

(2) *Combustible* piping that is part of a system described in Sentence (1) shall not be located in a *vertical service space*.

(3) Except as provided by Sentences (4) to (7), *combustible* piping is permitted to penetrate a *fire separation* required to have a *fire-resistance rating* or is permitted to penetrate a membrane that forms part of an assembly required to have a *fire-resistance rating*, provided the piping is sealed at the penetration by a *fire stop* that has an F rating not less than the *fire-resistance rating* required for the *fire separation* when subjected to the fire test method in CAN/ULC-S115, "Fire Tests of Firestop Systems", with a pressure differential of 50 Pa between the exposed and unexposed sides, with the higher pressure on the exposed side.

(4) Except as required by Sentence (7), *combustible* drain piping is permitted to penetrate a horizontal *fire separation*, provided it leads directly from a *noncombustible* water closet through a concrete floor slab and the piping is sealed at the penetration by a *fire stop* in conformance with Clause 3.1.9.1.(1)(a).

(5) Except as required by Sentence (7), *combustible* piping is permitted to penetrate a vertical or horizontal *fire separation*, provided the *fire compartments* on each side of the *fire separation* are *sprinklered* and the piping is sealed at the penetration by a *fire stop* in conformance with Clause 3.1.9.1.(1)(a).

(6) Except as required by Sentence (7), *combustible* piping not more than 25 mm in diameter containing chlorine gas is permitted to penetrate a *fire separation* between a chlorine gas *service room* built in conjunction with a *public pool* or *public spa* and the remainder of the *building*, provided the piping is sealed at the penetration by a *fire stop* in conformance with Clause 3.1.9.1.(1)(a).

(7) Where *combustible* piping penetrates a *firewall* or a horizontal *fire separation* described in Sentence 3.2.1.2.(1), the piping shall be sealed at the penetration by a *fire stop* that has an FT rating not less than the *fire-resistance rating* required for the *firewall* or horizontal *fire separation* when subjected to the fire test method in CAN/ULC-S115, "Fire Tests of Firestop Systems", and,

(a) the *fire stop* shall have been tested with a pressure differential of 50 Pa between the exposed and unexposed sides, with the higher pressure on the exposed side, or
(b) the *fire compartments* on each side of the *firewall* or horizontal *fire separation* shall be *sprinklered*.

(8) *Combustible* piping for central vacuum cleaning systems is permitted to penetrate a *fire separation*, provided the installation conforms to the requirements that apply to *combustible* piping specified in Sentence (3).

3.1.9.5. Openings Through a Membrane Ceiling

(1) A membrane ceiling forming part of an assembly assigned a *fire-resistance rating* on the basis of MMAH Supplementary Standard SB-2, "Fire Performance Ratings", is permitted to be penetrated by openings leading into ducts within the ceiling space provided,
(a) the ducts are sheet steel, and
(b) the amount of openings and their protection conform to the requirements of MMAH Supplementary Standard SB-2, "Fire Performance Ratings".

(2) *Fire stop flaps* in ceiling membranes required in Sentence (1) shall conform to CAN/ULC-S112.2, "Fire Test of Ceiling Firestop Flap Assemblies".

3.1.9.6. Plenums

(1) A ceiling assembly used as a *plenum* shall conform to Article 3.6.4.3.

3.1.10. Firewalls

3.1.10.1. Prevention of Firewall Collapse

(1) Except as permitted by Sentence (2), the connections and supports for structural framing members that are connected to or supported on a *firewall* and have a *fire-resistance rating* less than that required for the *firewall*, shall be designed so that the failure of the framing systems during a fire will not affect the integrity of the *firewall* during the fire.

(2) Sentence (1) does not apply to a *firewall* consisting of two separate wall assemblies each tied to its respective *building* frame but not to each other, provided each wall assembly is,
(a) a *fire separation* having one-half of the *fire-resistance rating* required for the *firewall* by Sentences 3.1.10.2.(1) and (2), and
(b) designed so that the collapse of one wall assembly will not cause the collapse of the other.

(3) A *firewall* is permitted to be supported on the structural frame of a *building* of *noncombustible construction* provided the supporting frame has a *fire-resistance rating* not less than that required for the *firewall*.

(4) Piping, ducts and totally enclosed *noncombustible* raceways shall be installed so that their collapse will not cause the collapse of the *firewall*.

3.1.10.2. Rating of Firewalls

(1) A *firewall* that separates a *building* or *buildings* with *floor areas* containing a Group E or a Group F, Division 1 or 2 *major occupancy* shall be constructed as a *fire separation* of *noncombustible construction* having a *fire-resistance rating* not less than 4 h, except that where the upper portion of a *firewall* separates *floor areas* containing other than Group E or Group F, Division 1 or 2 *major occupancies*, the *fire-resistance rating* of the upper portion of the *firewall* is permitted to be not less than 2 h.

(2) A *firewall* that separates a *building* or *buildings* with *floor areas* containing *major occupancies* other than Group E or Group F, Division 1 or 2 shall be constructed as a *fire separation* of *noncombustible construction* having a *fire-resistance rating* not less than 2 h.

(3) Except as permitted by Sentence (4), the required *fire-resistance rating* of a *firewall,* except for *closures,* shall be provided by masonry or concrete.

(4) A *firewall* permitted to have a *fire-resistance rating* not more than 2 h need not be constructed of masonry or concrete provided,

(a) the assembly providing the *fire-resistance rating* is protected against damage that would compromise the integrity of the assembly,

(b) the design conforms to Article 4.1.5.17.,

(c) the level of performance of the *firewall* is not less than of masonry or concrete in the areas of,

  (i) performance during fire conditions,

  (ii) mechanical damage during the normal use of the *building*, and

  (iii) resistance to damage from moisture,

(d) the *firewall* separates *buildings* or *buildings* with *floor areas* that do not contain,

  (i) a Group B, Division 1 *major occupancy*, or

  (ii) a Group B, Division 2 *major occupancy*, and

r5 (e) the *firewall* does not separate a *building* regulated by the provisions of Subsection 3.2.6. or a *building* within the scope of Article 3.2.2.43A. or 3.2.2.50A. from another *building* unless the *buildings* on both sides of the *firewall* are *sprinklered*.

(See Appendix A.)

3.1.10.3. Continuity of Firewalls

(1) A *firewall* shall extend from the ground continuously through, or adjacent to, all *storeys* of a *building* or *buildings* so separated, except that a *firewall* located above a *basement storage garage* conforming to Article 3.2.1.2. is permitted to commence at the floor assembly immediately above the *storage garage*.

(2) A *firewall* is permitted to terminate on the underside of a reinforced concrete roof slab provided,

(a) the roof slab on both sides of the *firewall* has a *fire-resistance rating* not less than,

  (i) 1 h if the *firewall* is required to have a *fire-resistance rating* not less than 2 h, or

  (ii) 2 h if the *firewall* is required to have a *fire-resistance rating* not less than 4 h, and

(b) there are no concealed spaces within the roof slab in that portion immediately above the *firewall*.

3.1.10.4. Parapets

(1) Except as permitted by Sentences (2) and 3.1.10.3.(2), a *firewall* shall extend above the roof surface to form a parapet not less than,

(a) 150 mm high for a *firewall* required to have a *fire-resistance rating* not less than 2 h, and

(b) 900 mm high for a *firewall* required to have a *fire-resistance rating* not less than 4 h.

(2) A *firewall* that separates two *buildings* with roofs at different elevations need not extend above the upper roof surface to form a parapet, provided the difference in elevation between the roofs is more than 3 m.

3.1.10.5. Maximum Openings

(1) Openings in a *firewall* shall conform to the size limits described in Article 3.1.8.6. and the aggregate width of openings shall be not more than 25% of the entire length of the *firewall*.

3.1.10.6. Exposure Protection for Adjacent Walls

(1) The requirements of Article 3.2.3.14. shall apply to the external walls of two *buildings* that meet at a *firewall* at an angle less than 135°.

3.1.10.7. Combustible Projections

(1) *Combustible* material shall not extend across the end of a *firewall* but is permitted to extend across a roof above a *firewall* that is terminated in conformance with Sentence 3.1.10.3.(2).

(2) If *buildings* are separated by a *firewall*, *combustible* projections on the exterior of one *building*, including balconies, platforms, *canopies*, eave projections and stairs, that extend outward beyond the end of the *firewall*, shall not be permitted within 2.4 m of *combustible* projections and window or door openings of the adjacent *building*.

3.1.11. Fire Blocks in Concealed Spaces

3.1.11.1. Separation of Concealed Spaces

(1) Concealed spaces in interior wall, ceiling and crawl spaces shall be separated from concealed spaces in exterior walls and *attic or roof spaces* by *fire blocks* conforming to Article 3.1.11.7.

3.1.11.2. Fire Blocks in Wall Assemblies

(1) Except as permitted by Sentence (2), *fire blocks* conforming to Article 3.1.11.7. shall be provided to block off concealed spaces within a wall assembly,
(a) at every floor level,
(b) at every ceiling level where the ceiling forms part of an assembly required to have a *fire-resistance rating*, and
(c) so that the maximum horizontal dimension is not more than 20 m and the maximum vertical dimension is not more than 3 m.

(2) *Fire blocks* conforming to Sentence (1) are not required provided,
(a) the wall space is filled with insulation,
(b) the exposed construction materials and any insulation within the wall space are *noncombustible*,
(c) the exposed materials within the wall space, including insulation but not including wiring, piping or similar services, have a *flame-spread rating* not more than 25 on any exposed surface, or on any surface that would be exposed by cutting through the material in any direction, and *fire blocks* are installed so that the vertical distance between them is not more than 10 m, or
(d) the insulated wall assembly contains not more than one concealed air space and the horizontal thickness of that air space is not more than 25 mm.

3.1.11.3. Fire Blocks Between Nailing and Supporting Elements

(1) In a *building* required to be of *noncombustible construction*, a concealed space in which there is an exposed ceiling finish with a *flame-spread rating* more than 25, shall be provided with *fire blocks* conforming to Article 3.1.11.7. between wood nailing elements, so that the maximum area of the concealed space is not more than 2 m^2.

(2) In a *building* required to be of *noncombustible construction*, *fire blocks* conforming to Article 3.1.11.7. shall be provided in the concealed spaces created by the wood members permitted by Sentence 3.1.5.8.(2), so that the maximum area of a concealed space is not more than 10 m^2.

3.1.11.4. Fire Blocks Between Vertical and Horizontal Spaces

(1) *Fire blocks* conforming to Article 3.1.11.7. shall be provided,
(a) at all interconnections between concealed vertical and horizontal spaces in interior coved ceilings, drop ceilings and soffits in which the exposed construction materials within the space have a *flame-spread rating* more than 25, and
(b) at the end of each run and at each floor level in concealed spaces between stair stringers in which the exposed construction materials within the space have a *flame-spread rating* more than 25.

3.1.11.5. Fire Blocks in Horizontal Concealed Spaces

(1) Except for a crawl space conforming to Sentence 3.1.11.6.(1), a horizontal concealed space within a floor assembly or roof assembly of *combustible construction*, in which sprinklers are not installed, shall be separated by construction conforming to Article 3.1.11.7. into compartments not more than,

(a) 600 m^2 in area with no dimension more than 60 m, if the exposed construction materials within the space have a *flame-spread rating* not more than 25, and

(b) 300 m^2 in area with no dimension more than 20 m, if the exposed construction materials within the space have a *flame-spread rating* more than 25.

(See Appendix A.)

(2) A concealed space in an exterior cornice, a mansard style roof, a balcony or a *canopy* in which exposed construction materials within the space have a *flame-spread rating* more than 25, shall be separated by construction conforming to Article 3.1.11.7.,

(a) at locations where the concealed space extends across the ends of required vertical *fire separations*, and

(b) so that the maximum dimension in the concealed space is not more than 20 m.

r5 **(3)** Except as provided by Sentence (4), a horizontal concealed space within a floor assembly or roof assembly of *combustible construction* in a *building* within the scope of Article 3.2.2.43A. or 3.2.2.50A. shall be separated by construction conforming to Article 3.1.11.7. into compartments not more than,

(a) 600 m^2 in area with no dimension more than 60 m, if the exposed construction materials within the space have a *flame-spread rating* not more than 25, and

(b) 300 m^2 in area with no dimension more than 20 m, if the exposed construction materials within the space have a *flame-spread rating* more than 25.

(See Appendix A.)

r5 **(4)** Sentence (3) does not apply if the horizontal concealed space within the floor assembly or roof assembly is entirely filled with *noncombustible* insulation such that any air gap between the top of the insulation and the underside of the floor or roof deck does not exceed 50 mm.

3.1.11.6. Fire Blocks in Crawl Spaces

(1) A crawl space that is not considered as a *basement* by Article 3.2.2.9. and in which sprinklers are not installed, shall be separated by construction conforming to Article 3.1.11.7. into compartments not more than 600 m^2 in area with no dimension more than 30 m.

3.1.11.7. Fire Block Materials

r11.1 **(1)** Except as permitted by Sentences (2) to (4) and (7) *fire blocks* shall remain in place and prevent the passage of flames for not less than 15 min when subjected to the standard fire exposure in CAN/ULC-S101, "Fire Endurance Tests of Building Construction and Materials".

(2) Gypsum board not less than 12.7 mm thick and sheet steel not less than 0.38 mm thick need not be tested in conformance with Sentence (1) provided all joints have continuous support.

(3) In a *building* required to be of *noncombustible construction*, wood nailing elements described in Article 3.1.5.6. need not be tested in conformance with Sentence (1).

r11.1 **(4)** In a *building* permitted to be of *combustible construction*, in a *combustible* roof system permitted by Sentence 3.1.5.3.(2), and in a raised platform permitted by Sentence 3.1.5.8.(2), *fire blocks* are permitted to be,

(a) solid lumber or a structural composite lumber product conforming to ASTM D5456, "Evaluation of Structural Composite Lumber Products", not less than 38 mm thick,

(b) phenolic bonded plywood, OSB or waferboard not less than 12.5 mm thick with joints supported, or

(c) two thicknesses of lumber or a structural composite lumber product conforming to ASTM D5456, "Evaluation of Structural Composite Lumber Products", each not less than 19 mm thick with joints staggered, where the width or height of the concealed space requires more than one piece of lumber or structural composite lumber product not less than 38 mm thick to block off the space.

r11.1 **(5)** Openings through *fire blocks* shall be protected to maintain the integrity of the construction.

r11.1 **(6)** Where *fire blocks* are penetrated by construction elements or by service equipment, a *fire stop* shall be used to seal the penetration. (See Appendix A.)

(7) In a *building* permitted to be of *combustible construction*, semi-rigid fibre insulation board, produced from glass, rock or slag, is permitted to be used to block the vertical space in a double wythe wall assembly formed at the intersection of the floor assembly and the walls, provided the insulation board,
(a) has a density not less than 45 kg/m^3,
(b) is securely fastened to one set of studs,
(c) extends from below the bottom of the top plates in the lower *storey* to above the top of the bottom plate in the upper *storey*, and
(d) completely fills the portion of the vertical space between the headers and between the wall plates.

3.1.12. Flame-Spread Rating and Smoke Developed Classification

3.1.12.1. Determination of Ratings

(1) Except as required by Sentence (2) and as permitted by Sentence (3), the *flame-spread rating* and smoke developed classification of a material, assembly, or structural member shall be determined on the basis of no fewer than three tests conducted in conformance with CAN/ULC-S102, "Test for Surface Burning Characteristics of Building Materials and Assemblies".

(2) The *flame-spread rating* and smoke developed classification of a material or assembly shall be determined on the basis of no fewer than three tests conducted in conformance with CAN/ULC-S102.2, "Test for Surface Burning Characteristics of Flooring, Floor Coverings, and Miscellaneous Materials and Assemblies", if the material or assembly,
(a) is designed for use in a relatively horizontal position with only its top surface exposed to air,
(b) cannot be tested in conformance with Sentence (1) without the use of supporting material that is not representative of the intended installation, or
(c) is thermoplastic.

(3) A material, assembly, or structural member is permitted to be assigned a *flame-spread rating* and smoke developed classification on the basis of MMAH Supplementary Standard SB-2, "Fire Performance Ratings".

3.1.13. Interior Finish

3.1.13.1. Interior Finish Description

(1) Interior finish material shall include any material that forms part of the interior surface of a floor, wall, *partition* or ceiling, including,
(a) interior cladding of plaster, wood or tile,
(b) surfacing of fabric, paint, plastic, veneer or wallpaper,
(c) doors, windows and trim,
(d) lighting elements, such as light diffusers and lenses forming part of the finished surface of the ceiling, and
(e) carpet material that overlies a floor that is not intended as the finished floor.

3.1.13.2. Flame-Spread Rating

(1) Except as otherwise required or permitted by this Subsection, the *flame-spread rating* of interior wall and ceiling finishes, including glazing and skylights, shall be not more than 150 and shall conform to Table 3.1.13.2.

Table 3.1.13.2.
Flame-Spread Ratings
Forming Part of Sentence 3.1.13.2.(1)

Occupancy, Location or Element	Maximum *Flame-Spread Rating* for Walls and Ceilings	
	Sprinklered	Not *Sprinklered*
Group A, Division 1 *occupancies*, including doors, skylights, glazing and light diffusers and lenses	150	75
Group B *occupancies*	150	75(2)
Exits(1)	25	25
Lobbies described in Sentence 3.4.4.2.(2)	25	25
Covered vehicular passageways, except for roof assemblies of *heavy timber construction* in such passageways	25	25
Vertical service spaces	25	25
Column 1	2	3

Notes to Table 3.1.13.2.:
(1) See Articles 3.1.13.8. and 3.1.13.10.
(2) Group B *occupancies* are required to be *sprinklered*. See Part 11 for renovations of existing non-*sprinklered* Group B *occupancies*.

(2) Except as permitted by Sentence (3), doors, other than those in Group A, Division 1 *occupancies*, need not conform to Sentence (1) provided they have a *flame-spread rating* not more than 200. (See Appendix A.)

(3) Doors within a *dwelling unit* need not conform to Sentences (1) and (2).

(4) Up to 10% of the total wall area and 10% of the total ceiling area of a wall or ceiling finish that is required by Sentence (1) to have a *flame-spread rating* less than 150 is permitted to have a *flame-spread rating* not more than 150, except that up to 25% of the total wall area of lobbies described in Sentence 3.4.4.2.(2) is permitted to have a *flame-spread rating* not more than 150.

(5) Except in the case of Group A, Division 1 *occupancies*, *combustible* doors, skylights, glazing and light diffusers and lenses shall not be considered in the calculation of wall and ceiling areas described in Sentence (4).

3.1.13.3. Plumbing Fixtures and Bathrooms Finishes

(1) The *flame-spread rating* of interior wall and ceiling finishes for a bathroom in a *suite* of *residential occupancy* shall be not more than 200.

(2) *Plumbing fixtures* shall have a *flame-spread rating* not more than 200.

3.1.13.4. Light Diffusers and Lenses

(1) The *flame-spread rating* of *combustible* light diffusers and lenses in all *occupancies* other than Group A, Division 1 is permitted to be more than the *flame-spread rating* limits required elsewhere in this Subsection, provided the light diffusers and lenses,

(a) have a *flame-spread rating* not more than 250 and a smoke developed classification not more than 600 when tested in conformance with CAN/ULC-S102.2, "Test for Surface Burning Characteristics of Flooring, Floor Coverings, and Miscellaneous Materials and Assemblies",

(b) fall to the bottom of the test apparatus before igniting when tested in conformance with ULC-S102.3, "Fire Test of Light Diffusers and Lenses",

(c) are not prevented from falling from the ceiling by construction located beneath the elements, and

(d) are not used in a corridor that is required to be separated from the remainder of the *building* by a *fire separation* or in an *exit* shaft unless individual diffusers or lenses are not more than 1 m^2 in area and are not less than 1.2 m apart.

3.1.13.5. Skylights

(1) Individual *combustible* skylights in a corridor that is required to be separated from the remainder of the *storey* by a *fire separation* shall be not more than 1 m^2 in area and not less than 1.2 m apart.

3.1.13.6. Corridors

(1) Except as permitted by Sentences (2) and (3), the *flame-spread rating* shall be not more than 75 for the interior wall finish of,

(a) a *public corridor*,

(b) a corridor used by the public in,

(i) an *assembly occupancy*, or

r1 (ii) a *care*, *care and treatment* or *detention occupancy*,

(c) a corridor serving classrooms, or

r1 (d) a corridor serving sleeping rooms in a *care*, *care and treatment* or *detention occupancy*.

(2) The *flame-spread rating* limit specified in Sentence (1) does not apply to corridors referred to in Sentence (1) provided the *flame-spread rating* is not more than,

(a) 25 on the upper half of the wall, and

(b) 150 on the lower half of the wall.

(3) The *flame-spread rating* limits specified in Sentences (1) and (2) for corridors referred to in Sentence (1) do not apply to a corridor in which the *flame-spread rating* is not more than 150 provided the *floor area* is *sprinklered*.

(4) The *flame-spread rating* limits specified in Sentences (1) to (3) apply to *occupancies* in the corridor as well as to the corridor itself.

(5) Except in a *floor area* that is *sprinklered* and as permitted in Sentence (6), the interior ceiling finish of corridors and *occupancies* referred to in Sentences (1) and (4) shall have a *flame-spread rating* not more than 25.

(6) The *flame-spread rating* limits specified in Sentence (5) do not apply to a corridor in which the *flame-spread rating* is not more than 150 provided the *floor area* is *sprinklered*.

3.1.13.7. High Buildings

(1) Except as permitted by Sentences (2) and (3), the interior wall, ceiling and floor finishes in a *building* regulated by the provisions of Subsection 3.2.6. shall conform to the *flame-spread rating* requirements in Articles 3.1.13.2. to 3.1.13.6. and to the *flame-spread rating* and smoke developed classification values in Table 3.1.13.7.

Table 3.1.13.7.
Flame-Spread Rating and Smoke Developed Classification in a High Building
Forming Part of Sentences 3.1.13.7.(1) and (2)

Location or Element	Maximum *Flame-Spread Rating*			Maximum Smoke Developed Classification		
	Wall Surface	Ceiling Surface(1)	Floor Surface	Wall Surface	Ceiling Surface(1)	Floor Surface
Exit stairways, vestibules to *exit* stairs and lobbies described in Sentence 3.4.4.2.(2)	25	25	25	50	50	50
Corridors not within *suites*	(2)	(2)	300	100	50	500
Elevator cars	75	75	300	450	450	450
Elevator vestibules	25	25	300	100	100	300
Service spaces and *service rooms*	25	25	25	50	50	50
Other locations and elements	(2)	(2)	No limit	300	50	No limit
Column 1	2	3	4	5	6	7

Notes to Table 3.1.13.7.:
(1) See Sentence 3.1.13.4.(1) for lighting elements.
(2) Other requirements of this Part apply.

(2) Except for a *building* of Group B *major occupancy* and elevator cars, the *flame-spread rating* and smoke developed classification of interior wall, floor and ceiling finishes need not conform to the values in Table 3.1.13.7., provided the *building* is *sprinklered* and the sprinkler system is electrically supervised in conformance with Sentences 3.2.4.10.(3) and 3.2.4.17.(1).

(3) Trim, millwork and doors in an *exit* stairway, a vestibule to an *exit* stairway, a lobby described in Sentence 3.4.4.2.(2), or a corridor not within a *suite* need not conform to the *flame-spread rating* and smoke developed classification requirements of Sentence (1), provided they have,
(a) a *flame-spread rating* not more than 150,
(b) a smoke developed classification not more than 300, and
(c) an aggregate area not more than 10% of the area of the wall or ceiling on which they occur.

(4) Except as permitted in Sentences (5) to (7), *plumbing fixtures* in a *building* regulated by the provisions of Subsection 3.2.6. shall have a smoke developed classification not more than 300.

(5) A *plumbing fixture* that is not located in a Group B *occupancy* need not comply with Sentence (4) if the *building* is *sprinklered*.

(6) A *plumbing fixture* may have a smoke developed classification more than 300 but not more than 500 if,
(a) it is in a room where the wall surfaces have a smoke developed classification not more than 200, and
(b) it is located in,
  (i) a Group C *occupancy*, or
  (ii) a Group B *occupancy* and the *building* is *sprinklered*.

(7) A therapeutic bathing system in a Group B *occupancy* need not comply with Sentence (4) if the room in which it is located,
(a) does not open directly into patients' or residents' sleeping rooms, and
(b) is *sprinklered*.

3.1.13.8. Noncombustible Construction

(1) In a *building* required to be of *noncombustible construction*,
(a) the *flame-spread ratings* required by Subsection 3.1.5. shall apply in addition to the requirements in this Subsection, and
(b) the *flame-spread ratings* for *exits* in this Subsection shall also apply to any surface in the *exit* that would be exposed by cutting through the material in any direction, except that this requirement does not apply to doors, *heavy timber construction* in a *sprinklered building* and *fire-retardant treated wood*.

3.1.13.9. Underground Walkways

r5 **(1)** Except for paint, the interior wall and ceiling finishes of an underground *walkway* shall be of *noncombustible* materials.

3.1.13.10. Exterior Exit Passageway

(1) The wall and ceiling finishes of an exterior *exit* passageway that provides the only *means of egress* from the rooms or *suites* it serves, including the soffit beneath and the *guard* on the passageway, shall have a *flame-spread rating* not more than 25, except that a *flame-spread rating* not more than 150 is permitted for up to 10% of the total wall area and for up to 10% of the total ceiling area.

3.1.13.11. Elevator Cars

(1) The wall and ceiling surfaces of elevator cars shall have a *flame-spread rating* not more than 75.

(2) The wall, ceiling and floor surfaces of elevator cars shall have a smoke developed classification not more than 450.

3.1.14. Roof Assemblies

3.1.14.1. Fire-Retardant Treated Wood Roof Systems

(1) If a *fire-retardant treated wood* roof system is used to comply with the requirements of Subsection 3.2.2., the roof deck assembly shall meet the conditions of acceptance of CAN/ULC-S126, "Test for Fire Spread Under Roof-Deck Assemblies".

(2) Supports for the roof deck assembly referred to in Sentence (1) shall consist of,
(a) *fire-retardant treated wood*,
(b) *heavy timber construction*,
(c) *noncombustible construction*, or
(d) a combination of the items described in Clauses (a) to (c).

3.1.14.2. Metal Roof Deck Assemblies

(1) Except as permitted by Sentence (2), a metal roof deck assembly shall meet the conditions of acceptance of CAN/ULC-S126, "Test for Fire Spread Under Roof-Deck Assemblies", if,
(a) it supports a *combustible* material above the deck that could propagate a fire beneath the roof deck assembly, and
(b) the deck is used to comply with the requirements of Sentences 3.2.2.25.(2), 3.2.2.32.(2), 3.2.2.53.(2), 3.2.2.59.(2), 3.2.2.70.(2) and 3.2.2.76.(2) for *noncombustible construction*.

(2) The requirements of Sentence (1) are waived provided,

(a) the *combustible* material above the roof deck is protected,

(i) by not less than 12.7 mm thick gypsum board, mechanically fastened to a supporting assembly if located beneath the roof deck, or

r11.1 (ii) by a thermal barrier conforming to Clause 3.1.5.12.(4)(c) or (d) that is located on the underside of the *combustible* material or beneath the roof deck,

(b) the *building* is *sprinklered*, or

(c) the roof assembly has a *fire-resistance rating* not less than 45 min.

3.1.15. Roof Covering

3.1.15.1. Roof Covering Classification

(1) A roof covering classification shall be determined in conformance with CAN/ULC-S107, "Fire Tests of Roof Coverings". (See Appendix A.)

3.1.15.2. Roof Coverings

r5 **(1)** Except as provided by Sentences (2) and (3), every roof covering shall have a Class A, B or C classification as determined in accordance with Article 3.1.15.1.

r11.1 **(2)** A roof covering is not required to have a Class A, B or C classification for,

(a) a tent,

(b) an *air-supported structure*,

(c) a *building* of Group A, Division 2 *occupancy* not more than 2 *storeys* in *building height* and not more than 1 000 m^2 in *building area*, provided the roof covering is underlaid with *noncombustible* material, or

(d) a steel *building* system described in Article 4.3.4.3., provided the roof covering consists of metal sheets, metal shingles or other *noncombustible* roofing materials.

r5 **(3)** *Combustible* roof coverings on *buildings* within the scope of Article 3.2.2.43A. or 3.2.2.50A. shall have a Class A classification.

3.1.16. Fabrics

3.1.16.1. Fabric Awnings, Canopies and Marquees

(1) Fabrics used as part of an awning, *canopy* or *marquee* that is located within or attached to a *building* of any type of construction shall conform to CAN/ULC-S109, "Flame Tests of Flame-Resistant Fabrics and Films".

3.1.17. Occupant Load

3.1.17.1. Occupant Load Determination

(1) The *occupant load* of a *floor area* or part of a *floor area*, or of a *building* or part of a *building* not having a *floor area*, shall be based on,

(a) the number of seats in an *assembly occupancy* having fixed seats,

(b) two persons per sleeping room or sleeping area in a *dwelling unit* or *suite*, or

(c) the number of persons,

  (i) for which the area is designed, or

  (ii) determined from Table 3.1.17.1. for *occupancies* other than those described in Clauses (a) and (b).

(2) If a *floor area* or part of it has been designed for an *occupant load* other than that determined from Table 3.1.17.1., a permanent sign indicating that *occupant load* shall be posted in a conspicuous location.

(3) For the purposes of this Article, *mezzanines*, tiers and balconies shall be regarded as part of the *floor area*.

(4) If a room or group of rooms is intended for different *occupancies* at different times, the value to be used from Table 3.1.17.1. shall be the value that gives the greatest number of persons for the *occupancies* concerned.

(5) Except as provided by Sentence (6) or (7), in dining, alcoholic beverage and cafeteria spaces the *occupant load* shall be determined from Table 3.1.17.1.

(6) The *occupant load* in Sentence (5) is permitted to be the number of persons for which the space is designed.

(7) The *occupant load* in Sentence (6) shall be not more than that determined by using an area of 0.6 m^2 per person.

(4) Sentences (1) to (3) do not apply to a *building* containing electrical equipment and electrical installations used exclusively in the generation, transformation or transmission of electrical power or energy intended for sale or distribution to the public.

3.1.20. Glass in Guards

3.1.20.1. Glass

(1) Except as provided in Sentence 3.3.4.7.(1), glass in *guards* shall conform to MMAH Supplementary Standard SB-13, "Glass in Guards".

r11 ## 3.1.21. Reserved

Section 3.2. Building Fire Safety

3.2.1. General

3.2.1.1. Exceptions in Determining Building Height

e3 **(1)** A rooftop enclosure provided for elevator machinery, a stairway or a *service room* used for no purpose other than for service to the *building*, shall not be considered as a *storey* in calculating the *building height*.

(2) Space under tiers of seats in a *building* of the arena type shall not be considered as adding to the *building height* provided the space is used only for dressing rooms, concession stands and similar purposes incidental to the *major occupancy* of the *building*.

(3) Except as required by Sentence (5), the space above a *mezzanine* need not be considered as a *storey* in calculating *building height* provided,

(a) the aggregate area of *mezzanines* that are not superimposed does not exceed 40% of the open area of the room in which they are located, and (See Appendix A.)

(b) except as permitted in Sentence (8) and Sentence 3.3.2.11.(3) the space above the *mezzanine* is used as an open area without *partitions* or subdividing walls higher than 1 070 mm above the *mezzanine* floor.

(4) Except as required by Sentence (5), the space above a *mezzanine* need not be considered as a *storey* in calculating the *building height* provided,

e3 (a) the aggregate area of *mezzanines* that are not superimposed and do not meet the conditions of Sentence (3) does not exceed 10% of the *floor area* in which they are located, and

(b) the area of *mezzanine* in a *suite* does not exceed 10% of the area of that *suite*.

(5) Except as permitted by Sentences (6) and (7), each level of *mezzanine* that is partly or wholly superimposed above the first level of *mezzanine* shall be considered as a *storey* in calculating the *building height*.

(6) Platforms intended solely for periodic inspection and elevated catwalks need not be considered as floor assemblies or *mezzanines* for the purpose of determining *building height* provided,

(a) they are not used for storage,

(b) they are constructed with *noncombustible* materials unless the *building* is permitted to be of *combustible construction*, and

(c) where they are intended to be occupied, they have an *occupant load* of not more than four persons.

(7) *Mezzanines*, elevated walkways and platforms that are intended to be occupied in Group F, Division 2 or 3 *major occupancies* need not be considered as *storeys* in calculating *building height* provided,
(a) the *building* is of *noncombustible construction*, and
(b) the *occupant load* is not more than four persons.

(8) The space above a *mezzanine* conforming to Sentence (3) is permitted to include an enclosed space whose area does not exceed 10% of the open area of the room in which the *mezzanine* is located, provided the enclosed space does not obstruct visual communication between the open space above the *mezzanine* and the room in which it is located.

(9) A *service space* in which facilities are included to permit a person to enter and to undertake maintenance and other operations pertaining to *building* services from within the *service space* need not be considered a *storey* if it conforms to Articles 3.2.5.15. and 3.3.1.23. and Sentences 3.2.4.20.(12), 3.2.7.3.(2), 3.3.1.3.(7), 3.4.2.4.(3) and 3.4.4.4.(9). (See Appendix A.)

3.2.1.2. Storage Garage Considered as a Separate Building

r11.1 **(1)** A *basement* used primarily as a *storage garage* is permitted to be considered as a separate *building* for the purposes of Subsection 3.2.2. and Sentences 3.2.5.13.(2) and (3), provided the floor and roof assemblies above the *basement* and, except as permitted by Sentence (2), the exterior walls of the *basement* above the adjoining ground level are constructed as *fire separations* of,
(a) masonry or concrete having a *fire-resistance rating* not less than 2 h, or
(b) *noncombustible construction* having a *fire-resistance rating* of not less than 2 h, where the *building* conforms to Clauses 3.1.10.2.(4)(a) and (c) to (e).

(2) The exterior wall of a *basement* that is required to be a *fire separation* with a *fire-resistance rating* in accordance with Sentence (1) is permitted to be penetrated by openings that are not protected by *closures* provided,
(a) the *storage garage* is *sprinklered*,
(b) every opening in the exterior wall is separated from *storeys* above the opening by a projection of the floor or roof assembly above the *basement*, extending not less than,
  (i) 1 m beyond the exterior face of the *storage garage* if the upper *storeys* are required to be of *noncombustible construction*, or
  (ii) 2 m beyond the exterior face of the *storage garage* if the upper *storeys* are permitted to be of *combustible construction*, or
(c) the exterior walls of any *storeys* located above the floor or roof assembly referred to in Sentence (1) are recessed behind the outer edge of the assembly by not less than,
  (i) 1 m if the upper *storeys* are required to be of *noncombustible construction*, or
  (ii) 2 m if the upper *storeys* are permitted to be of *combustible construction*.

(3) The floor or roof assembly projection referred to in Clause (2)(b) shall have a *fire-resistance rating* not less than 2 h and shall have no openings within the projection

3.2.1.3. Roof Considered as a Wall

r3 **(1)** For the purposes of this Section any part of a roof that is pitched at an angle of 60° or more to the horizontal and is adjacent to a space intended for occupancy within a *building* shall be considered as part of an exterior wall of the *building*.

3.2.1.4. Floor Assembly Over Basement

(1) Except as permitted by Sentence 3.2.2.42.(3), 3.2.2.43.(3), 3.2.2.44.(3), 3.2.2.45.(3), 3.2.2.46.(3), 3.2.2.47.(3) or 3.2.2.48.(3), a floor assembly immediately above a *basement* shall be constructed as a *fire separation* having a *fire-resistance rating* conforming to the requirements of Articles 3.2.2.20. to 3.2.2.83. for a floor assembly, but not less than 45 min.

(2) All *loadbearing* walls, columns and arches supporting a floor assembly immediately above a *basement* shall have a *fire-resistance rating* not less than that required by Sentence (1) for the floor assembly.

3.2.1.5. Fire Containment in Basements

(1) Except as permitted by Sentences (2) and 3.2.2.15.(3), in a *building* in which an automatic sprinkler system is not required to be installed by Articles 3.2.2.20. to 3.2.2.83., every *basement* shall,
(a) be *sprinklered*, or
(b) be subdivided into *fire compartments* not more than 600 m^2 in area by a *fire separation* having a *fire-resistance rating* not less than that required for the floor assembly immediately above the *basement*.

(2) An *open-air storey* need not conform to Sentence (1).

3.2.1.6. Mezzanines

(1) The floor assembly of a *mezzanine* that is required to be considered as a *storey* in calculating *building height* shall be constructed in conformance with the *fire separation* requirements for floor assemblies in Articles 3.2.2.20. to 3.2.2.83.

3.2.2. Building Size and Construction Relative to Occupancy

3.2.2.1. Application

(1) Except as permitted by Article 3.2.2.3., a *building* shall be constructed in conformance with this Subsection to prevent fire spread and collapse caused by the effects of fire.

3.2.2.2. Special and Unusual Structures

(1) A structure that cannot be identified with the characteristics of a *building* in Articles 3.2.2.20. to 3.2.2.83. shall be protected against fire spread and collapse in conformance with good fire protection engineering practice. (See Appendix A.)

3.2.2.3. Exceptions to Structural Fire Protection

(1) Fire protection is not required for,
(a) steel lintels above openings not more than 2 m wide in *loadbearing* walls and not more than 3 m wide in non-*loadbearing* walls,
(b) steel lintels above openings more than 2 m wide in *loadbearing* walls and more than 3 m wide in non-*loadbearing* walls, provided the lintels are supported at intervals of not more than 2 m by structural members with the required *fire-resistance rating*,
(c) the bottom flanges of shelf angles and plates that are not a part of the structural frame,
(d) steel members for framework around elevator hoistway doorways, steel for the support of elevator and dumbwaiter guides, counterweights and other similar equipment, that are entirely enclosed in a hoistway and are not a part of the structural frame of the *building*,
(e) steel members of stairways and escalators that are not a part of the structural frame of a *building*,
(f) steel members of porches, exterior balconies, exterior stairways, fire escapes, cornices, *marquees* and other similar appurtenances, provided they are outside an exterior wall of a *building*, and
(g) *loadbearing* steel or concrete members wholly or partly outside a *building* face in a *building* not more than 4 *storeys* in *building height* and classified as Group A, B, C, D or F, Division 3 *major occupancy* provided the members are,
  (i) not less than 1 m away from any *unprotected opening* in an exterior wall, or
  (ii) shielded from heat radiation in the event of a fire within the *building* by construction that will provide the same degree of protection that would be necessary if the member was located inside the *building*, with the protection extending on either side of the member a distance equal to the projection of the member from the face of the wall.

3.2.2.4. Buildings with Multiple Major Occupancies

(1) The requirements restricting fire spread and collapse for a *building* of a single *major occupancy* classification are provided in this Subsection according to its *building height* and *building area*.

(2) If a *building* contains more than one *major occupancy*, classified in more than one Group or Division, the requirements of this Subsection concerning *building* size and construction relative to *major occupancy* shall apply according to Articles 3.2.2.5. to 3.2.2.8.

r6 **(3)** For the purposes of Sentences (1) and (2), a *retirement home* is deemed to be a separate *major occupancy*.

3.2.2.5. Applicable Building Height and Area

(1) In determining the fire safety requirements of a *building* in relation to each of the *major occupancies* contained in it, the *building height* and *building area* of the entire *building* shall be used.

r6 **(2)** For the purposes of Sentence (1), a *retirement home* is deemed to be a separate *major occupancy*.

3.2.2.6. Multiple Major Occupancies

r5 **(1)** Except as permitted by Articles 3.2.2.7. and 3.2.2.8. and Sentences 3.2.2.43A.(5) and 3.2.2.50A.(4), in a *building* containing more than one *major occupancy*, the requirements of this Subsection for the most restricted *major occupancy* contained shall apply to the whole *building*.

r6 **(2)** For the purposes of Sentence (1), a *retirement home* is deemed to be a separate *major occupancy*.

3.2.2.7. Superimposed Major Occupancies

r5 **(1)** Except as permitted by Article 3.2.2.8. and Sentences 3.2.2.43A.(5) and 3.2.2.50A.(4), in a *building* in which one *major occupancy* is located entirely above another *major occupancy*, the requirements in this Subsection for each portion of the *building* containing a *major occupancy* shall apply to that portion as if the entire *building* was of that *major occupancy*.

(2) If one *major occupancy* is located above another *major occupancy*, the *fire-resistance rating* of the floor assembly between the *major occupancies* shall be determined on the basis of the requirements of this Subsection for the lower *major occupancy*.

r6 **(3)** For the purposes of Sentences (1) and (2), a *retirement home* is deemed to be a separate *major occupancy*.

3.2.2.8. Exceptions for Major Occupancies

(1) In a *building* in which the aggregate area of all *major occupancies* in a particular Group or Division is not more than 10% of the *floor area* of the *storey* in which they are located, these *major occupancies* need not be considered as *major occupancies* for the purposes of this Subsection, provided they are not classified as Group F, Division 1 or 2 *occupancies*.

r6 **(1.1)** For the purposes of Sentence (1), a *retirement home* is deemed to be a separate *major occupancy*.

(2) A helicopter landing area on the roof of a *building* need not be considered a *major occupancy* for purposes of Subsection 3.2.2. where such landing area is not more than 10% of the area of the roof.

3.2.2.9. Crawl Spaces

(1) For the purposes of Articles 3.2.1.4. and 3.2.1.5., a crawl space shall be considered as a *basement* if it is,
(a) more than 1 800 mm high between the lowest part of the floor assembly and the ground or other surface below,
(b) used for any *occupancy*,
(c) used for the passage of *flue pipes*, or
(d) used as a *plenum* in *combustible construction*.

(2) A floor assembly immediately above a crawl space is not required to be constructed as a *fire separation* and is not required to have a *fire-resistance rating* provided the crawl space is not required to be considered as a *basement* by Sentence (1).

3.2.2.10. Streets

(1) Every *building* shall face a *street* located in conformance with the requirements of Articles 3.2.5.4 and 3.2.5.5 for access routes.

(2) For the purposes of Subsections 3.2.2. and 3.2.5. an access route conforming to Subsection 3.2.5. is permitted to be considered as a *street*.

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Table 3.2.3.1.D.
Unprotected Opening Limits for a Building or Fire Compartment that is Sprinklered
Forming Part of Article 3.2.3.1.

Exposing Building Face	Area of *Unprotected Opening* for Groups A, B, C, D and F, Division 3 *Occupancies*, *%*											
Maximum Area, m^2	*Limiting Distance*, m											
	0	1.2	1.5	2	2.5	3	4	5	6	7	8	9
10	0	16	24	42	66	100						
15	0	16	20	34	50	74	100					
20	0	16	20	30	42	60	100					
25	0	16	18	26	38	52	90	100				
30	0	14	18	24	34	46	78	100				
40	0	14	16	22	30	40	64	96	100			
50	0	14	16	20	28	36	56	82	100			
60	0	14	16	20	26	32	50	72	98	100		
80	0	14	16	18	22	28	42	58	80	100		
100	0	14	16	18	22	26	36	50	68	88	100	
150 or more	0	14	14	16	20	22	30	40	52	66	82	100
Column 1	2	3	4	5	6	7	8	9	10	11	12	13

Table 3.2.3.1.E.
Unprotected Opening Limits for a Building or Fire Compartment that is Sprinklered
Forming Part of Article 3.2.3.1.

Exposing Building Face	Area of *Unprotected Opening* for Groups E and F, Division 1 and 2 *Occupancies*, *%*																	
Maximum Area, m^2	*Limiting Distance*, m																	
	0	1.2	1.5	2	2.5	3	4	5	6	7	8	9	10	11	12	13	14	15
10	0	8	12	20	34	50	96	100										
15	0	8	10	16	26	36	68	100										
20	0	8	10	14	22	30	54	86	100									
25	0	8	10	14	18	26	44	70	100									
30	0	8	8	12	18	24	40	60	88	100								
40	0	8	8	12	16	20	32	48	68	94	100							
50	0	8	8	10	14	18	28	40	58	76	100							
60	0	8	8	10	12	16	24	36	50	66	86	100						
80	0	8	8	10	12	14	20	30	40	52	66	84	100					
100	0	8	8	8	10	12	18	26	34	44	56	70	84	100				
150	0	8	8	8	10	12	16	20	26	32	40	50	60	72	84	98	100	
200 or more	0	8	8	8	8	10	14	18	22	28	34	42	50	60	68	80	92	100
Column 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19

3.2.3.2. Area of Exposing Building Face

(1) Except as permitted by Sentences (2), and (3), the area of an *exposing building face* shall be calculated as the total area of exterior wall facing in one direction on any side of a *building* measured from the finished ground level to the uppermost ceiling.

(2) If a *building* is divided by *fire separations* into *fire compartments*, the area of *exposing building face* is permitted to be calculated for each *fire compartment* provided the *fire separations* have a *fire-resistance rating* not less than 45 min.

(3) In a *building* that contains an *interconnected floor space*, the area of the *exposing building face* for the *interconnected floor space* is permitted to be determined by considering each *storey* as a separate *fire compartment* notwithstanding openings through the floor assemblies.

3.2.3.3. Wall Enclosing Attic or Roof Space

(1) An exterior wall enclosing an *attic or roof space* and located above an *exposing building face*, shall be constructed in conformance with the requirements for the *exposing building face*.

3.2.3.4. Reserved

3.2.3.5. Wall With Limiting Distance Less Than 1.2 m

(1) Openings in a wall that has a *limiting distance* less than 1.2 m shall be protected by *closures* whose *fire-protection rating* is in conformance with the *fire-resistance rating* required for the wall.

(2) Wired glass or glass block shall not be used for a *closure* referred to in Sentence (1).

3.2.3.6. Combustible Projections

(1) Except for a *building* containing one or two *dwelling units* only, *combustible* projections on the exterior of a wall that could expose an adjacent *building* to fire spread and are more than 1 m above ground level, including balconies, platforms, *canopies* and stairs, shall not be permitted within,
(a) 1.2 m of a property line or the centre line of a *public way*, or
(b) 2.4 m of a *combustible* projection on another *building* on the same property.

r11.1 **(2)** Except as provided in Sentence (3.1), where the *exposing building face* has a *limiting distance* of not more than 0.45 m, projecting roof soffits shall not be *constructed* above the *exposing building face*. (See Appendix A.)

r11.1 **(3)** Except as provided in Sentence (3.1), where the *exposing building face* has a *limiting distance* of more than 0.45 m, the face of roof soffits above the *exposing building face* shall not project to less than 0.45 m from the property line.

r11.1 **(3.1)** Subject to Sentence (4), the face of a roof soffit is permitted to project to the property line, where it faces a *street*, lane or public thoroughfare.

(4) Where roof soffits project to less than 1.2 m from the centre line of a lane or public thoroughfare or from an imaginary line between two *buildings* or *fire compartments* on the same property, they shall,
(a) have no openings, and
(b) be protected by,
  (i) not less than 0.38 mm thick sheet steel,
  (ii) unvented aluminum conforming to CAN/CGSB-93.2-M, "Prefinished Aluminum Siding, Soffits and Fascia, for Residential Use",
  (iii) not less than 12.7 mm thick gypsum soffit board or gypsum ceiling board installed according to CSA A82.31-M, "Gypsum Board Application",

(iv) not less than 11 mm thick plywood,
(v) not less than 12.5 mm thick OSB or waferboard, or
(vi) not less than 11 mm thick lumber.

(5) For *buildings* of *combustible construction*, materials installed to provide the required protection of soffits may be covered with a *combustible* or *noncombustible* finish material.

3.2.3.7. Construction of Exposing Building Face

r5 **(1)** Except as provided by Sentences (3) to (6) and Articles 3.2.3.10. and 3.2.3.11, the *fire-resistance rating*, construction and cladding for *exposing building faces* of *buildings* or *fire compartments* shall comply with Table 3.2.3.7.

(2) Reserved

r11.1 **(3)** Except as provided by Sentences (4) to (6), cladding for *buildings* or *fire compartments* where the maximum permitted area of *unprotected openings* is more than 10% of the *exposing building face* need not be *noncombustible* where the wall assembly complies with the requirements of Sentence 3.1.5.5.(1) when tested in conformance with CAN/ULC-S134, "Fire Test of Exterior Wall Assemblies".

r5 **(4)** Except as provided by Sentence (6), cladding for *buildings* or *fire compartments* where the maximum permitted area of *unprotected openings* is more than 10% but not more than 25% of the *exposing building face* need not be *noncombustible* where the wall assembly complies with Article 3.1.5.5.

r5 **(5)** Except as provided by Sentence (6), cladding for *buildings* or *fire compartments* where the maximum permitted area of *unprotected openings* is more than 25% but not more than 50% of the *exposing building face* need not be *noncombustible* where,
(a) the *limiting distance* is greater than 5 m,
(b) the *building* or *fire compartment* and all *combustible attic or roof spaces* are *sprinklered,*
(c) the cladding,
  (i) conforms to Subsection 9.27.6., 9.27.7., 9.27.8., 9.27.9. or 9.27.10.,
  (ii) is installed without furring members, or on furring not more than 25 mm thick, over gypsum sheathing at least 12.7 mm thick or over masonry, and
  (iii) after conditioning in conformance with ASTM D2898, "Accelerated Weathering of Fire-Retardant-Treated Wood for Fire Testing", has a *flame-spread rating* not greater than 25 on the exterior face when tested in accordance with Sentence 3.1.12.1.(1),
(d) the cladding,
  (i) conforms to Subsection 9.27.12.,
  (ii) is installed with or without furring members over gypsum sheathing at least 12.7 mm thick or over masonry,
  (iii) has a *flame-spread rating* not greater than 25 when tested in accordance with Sentence 3.1.12.1.(2), and
  (iv) does not exceed 2 mm in thickness exclusive of fasteners, joints and local reinforcements, or
(e) the wall assembly complies with Article 3.1.5.5.

r11.1 **(6)** Subject to Sentence (7), cladding for *buildings* within the scope of Article 3.2.2.43A. or 3.2.2.50A. that exceed 4 *storeys* in *building height* or for *fire compartments* in such *buildings* where the maximum permitted area of *unprotected openings* is more than 10% of the *exposing building face* need not be *noncombustible* where the wall assembly complies with the requirements of Subclauses 3.1.5.5.(1)(b)(i) and (ii) when tested in accordance with CAN/ULC-S134, "Fire Test of Exterior Wall Assemblies".

r5 **(7)** A wall assembly described in Sentence (6) that includes *combustible* cladding of *fire-retardant treated wood* shall be tested for fire exposure after the cladding has been conditioned in conformance with ASTM D2898, "Accelerated Weathering of Fire-Retardant-Treated Wood for Fire Testing".

r5 **(8)** The construction requirements for the *exposing building face* that are listed in Table 3.2.3.7. shall be satisfied before the area of *unprotected openings* may be increased as permitted by Sentence 3.2.3.12.(1).

r5

Table 3.2.3.7.
Minimum Construction Requirements for Exposing Building Faces
Forming Part of Sentences 3.2.3.7.(1) and (8)

Occupancy Classification of *Building* or *Fire Compartment*	Maximum Area of *Unprotected Openings* Permitted, % of *Exposing Building Face* Area	Minimum Required *Fire-Resistance Rating*	Type of Construction Required	Type of Cladding Required
Group A, B, C, D, or Group F, Division 3	0 to 10	1 h	*Noncombustible*	*Noncombustible*
	> 10 to 25	1 h	*Combustible* or *Noncombustible*	*Noncombustible*
	> 25 to 50	45 min	*Combustible* or *Noncombustible*	*Noncombustible*
	> 50 to < 100	45 min	*Combustible* or *Noncombustible*	*Combustible* or *Noncombustible*(1)
Group E, or Group F, Division 1 or 2	0 to 10	2 h	*Noncombustible*	*Noncombustible*
	> 10 to 25	2 h	*Combustible* or *Noncombustible*	*Noncombustible*
	> 25 to 50	1 h	*Combustible* or *Noncombustible*	*Noncombustible*
	> 50 to < 100	1 h	*Combustible* or *Noncombustible*	*Combustible* or *Noncombustible*(1)
Column 1	2	3	4	5

Notes to Table 3.2.3.7.:
(1) Cladding for *buildings* over 4 *storeys* in *building height* within the scope of Article 3.2.2.43A. or 3.2.2.50A. or for *fire compartments* in such *buildings* is required to be *noncombustible*.

3.2.3.8. Protection of Exterior Building Face

(1) Except as permitted by Sentence (3) and in addition to the requirements of Sentence 3.2.3.7.(1) and where the maximum permitted area of *unprotected openings* is greater than 10% of the *exposing building face*, foamed plastic insulation used in an exterior wall of a *building* more than 3 *storeys* in *building height* shall be protected on its exterior surface by,
(a) concrete or masonry not less than 25 mm thick, or
(b) *noncombustible* material that complies with the criteria for testing and conditions of acceptance of Sentence (2) when tested in conformance with CAN/ULC-S101, "Fire Endurance Tests of Building Construction and Materials".

(2) The criteria for testing and the conditions of acceptance for a wall assembly to satisfy the requirements of Clause (1)(b) are that,
(a) the fire exposed area of the wall assembly shall be not less than 9.3 m^2 and have no dimension less than 2.75 m,
(b) the exposed surface will include typical vertical and horizontal joints,
(c) the test shall be continued for not less than 15 min and the standard time/temperature curve of the referenced standard shall be followed,
(d) the *noncombustible* protective material will remain in place and no through openings will develop that are visible when viewed normal to the face of the material, and
(e) the *noncombustible* protective material will not disintegrate in a manner that would permit fire to propagate along the surface of the test assembly.

(3) The requirements of Sentence (1) are waived for wall assemblies that comply with the requirements of Article 3.1.5.5.

occupancy or more than two patients' or residents' sleeping rooms in a Group B, Division 2 or 3 occupancy, the requirements in Sentence (1) do not apply.

(3) If an eave overhang is completely separated from the remainder of the *attic or roof space* by *fire blocks*, the requirements of Sentence (1) do not apply.

(4) The protection required by Sentence (1) for projections is permitted to be omitted if,
(a) the *fire compartments* behind the window and door openings are *sprinklered* in accordance with Article 3.2.5.13., and
(b) all rooms, including closets and bathrooms, having openings in the wall beneath the soffit are *sprinklered*, notwithstanding exceptions permitted in the standards referenced in Article 3.2.5.13. for the installation of automatic sprinkler systems.

3.2.3.17. Canopy Protection for Vertically Separated Openings

(1) Except as permitted by Sentences (2) and (3), if a *storey* classified as a Group E or Group F, Division 1 or 2 *major occupancy* is required to be separated from the *storey* above by a *fire separation*,
(a) every opening in the exterior wall of the lower *storey* that is located vertically below an opening in the *storey* above shall be separated from the *storey* above by a *canopy* projecting not less than 1 m from the face of the *building* at the intervening floor level, and
(b) the *canopy* required by Clause (a) shall have a *fire-resistance rating* not less than that required for the floor assembly but need not be more than 1 h, except as required elsewhere in this Subsection.

(2) Except as permitted by Sentence (3), the *canopy* required by Sentence (1) is permitted to be omitted if the exterior wall of the upper *storey* is recessed not less than 1 m behind the exterior wall containing the opening in the lower *storey*.

(3) The requirements of Sentences (1) and (2) are permitted to be waived if sprinklers are installed in,
(a) the lower *storey* referred to in Clause (1)(a), and
(b) the *storey* immediately above the lower *storey*.

3.2.3.18. Covered Vehicular Passageway

(1) A covered vehicular passageway designed as a receiving or shipping area shall be separated from every *building* or part of a *building* adjoining it by a *fire separation* having a *fire-resistance rating* not less than 1.5 h.

(2) A covered vehicular passageway constructed below *grade* shall be of *noncombustible construction*.

3.2.3.19. Walkway Between Buildings

(1) Except as required by Sentence 3.2.3.20.(2), if *buildings* are connected by a *walkway*, each *building* shall be separated from the *walkway* by a *fire separation* with a *fire-resistance rating* not less than 45 min.

(2) Except as permitted by Sentence (3), a *walkway* connected to a *building* required to be of *noncombustible construction* shall also be of *noncombustible construction*.

(3) A *walkway* connected to a *building* required to be of *noncombustible construction* is permitted to be of *heavy timber construction* provided,
(a) not less than 50% of the area of any enclosing perimeter walls is open to the outdoors, and
(b) the *walkway* is at ground level.

(4) A *walkway* of *noncombustible construction* used only as a pedestrian thoroughfare need not conform to the requirements of Articles 3.2.3.14. and 3.2.3.15.

(5) A *walkway* between *buildings* shall be not more than 9 m wide.

3.2.3.20. Underground Walkway

(1) An underground *walkway* shall not be designed or used for any purpose other than pedestrian travel unless,
(a) the purpose is permitted, and
(b) sprinklers are installed in any space in the *walkway* containing an *occupancy*.

(2) *Buildings* connected by an underground *walkway* shall be separated from the *walkway* by a *fire separation* with a *fire-resistance rating* not less than 1 h.

(3) An underground *walkway* shall be of *noncombustible construction* suitable for an underground location.

(4) In an underground *walkway,*
(a) smoke barrier doors shall be installed at intervals of not more than 100 m, or
(b) the travel distance from the door of an adjacent room or space to the nearest *exit* shall be not more than one and a half times the least allowable travel distance to an *exit* for any of the adjacent *occupancies* as permitted by Sentence 3.4.2.5.(1).

(5) An underground *walkway* between *buildings* shall be not more than 9 m wide.

r5 ### 3.2.3.21. Service Lines Under Buildings

r11.1 **(1)** A *building* shall not be constructed over an existing buried flammable gas main unless the gas main is encased in a gas-tight conduit in conformance with CAN/CSA-Z662, "Oil and Gas Pipeline Systems".

3.2.4. Fire Alarm and Detection Systems (See Appendix A.)

3.2.4.1. Determination of Requirement for a Fire Alarm System

(1) Reserved

(2) Except as permitted by Sentences (3) to (5) and Sentence 3.2.4.2.(4), a fire alarm system shall be installed in a *building* that contains,
(a) a *contained use area*,
(b) an *impeded egress zone*,
(c) more than 3 *storeys*, including *storeys* below the *first storey*,
(d) a total *occupant load* more than 300, other than in open air seating areas,
(e) an *occupant load* more than 150 above or below the *first storey*, other than in open air seating areas,
(f) a school, college or child care facility, with an *occupant load* more than 40,
(g) a licensed beverage establishment or a restaurant, with an *occupant load* more than 150,
r11.1 (h) a *low hazard industrial occupancy* with an *occupant load* more than 75 above or below the *first storey,*
r11.1 (h.1) a *medium hazard industrial occupancy* with an *occupant load* more than 75 above or below the *first storey*,
(i) a *residential occupancy* with sleeping accommodation for more than 10 persons,
(j) a *high hazard industrial occupancy* with an *occupant load* more than 25,
(k) an *occupant load* more than 300 below an open air seating area,
(l) an *interconnected floor space* required to conform to Articles 3.2.8.3. to 3.2.8.11,
(m) a *care and treatment occupancy* for more than 10 persons receiving care or treatment, or
(n) a *care occupancy* for more than 10 persons receiving care.

(3) If each dwelling unit has direct access to an exterior exit facility leading to ground level, a fire alarm system is not required in an apartment *building,*
(a) in which not more than four *dwelling units* share a common *means of egress*, or
(b) that is not more than 3 *storeys* in *building height*.

(4) A fire alarm system is not required in a *hotel* 3 *storeys* or less in *building height* provided each *suite* has direct access to an exterior *exit* facility leading to ground level.

(5) A fire alarm system is not required in a *storage garage* conforming to Article 3.2.2.83. provided there are no other *occupancies* in the *building*.

3.2.4.2. Continuity of Fire Alarm System

(1) Except as permitted by Sentence (6), if there are openings through a *firewall*, other than those for piping, tubing, wiring and totally enclosed *noncombustible* raceways, the requirements in this Subsection shall apply to the *floor areas* on both sides of the *firewall* as if they were in the same *building*.

(2) Except as permitted by Sentence (4), if a *building* contains more than one *major occupancy* and a fire alarm system is required, a single system shall serve all *occupancies*.

(3) Except as permitted by Sentence (4), if a fire alarm system is required in any portion of a *building*, it shall be installed throughout the *building*.

(4) Except as required by Sentence (5), the requirements in this Subsection are permitted to be applied to each portion of a *building* not more than 3 *storeys* in *building height*, in which a vertical *fire separation* having a *fire-resistance rating* not less than 1 h separates the portion from the remainder of the *building* as if it were a separate *building*, provided there are no openings through the *fire separation*, other than those for piping, tubing, wiring and totally enclosed *noncombustible* raceways.

(5) The permission in Sentence (4) to consider separated portions of a *building* as separate *buildings* does not apply to *service rooms* and storage rooms.

(6) *Buildings* interconnected by *walkways* permitted in Articles 3.2.3.19. and 3.2.3.20. or by vestibules provided in conformance with Article 3.2.6.3. shall be treated as separate *buildings* for the purpose of fire alarm installation required by this Subsection.

3.2.4.3. Types of Fire Alarm Systems

(1) A fire alarm system shall be,
(a) a single stage system in a Group F, Division 1 *occupancy*,
(b) a two stage system in a Group B *occupancy* other than those described in Clause (c),
(c) a single or two stage system in a *building* 3 *storeys* or less in *building height* that contains a Group B, Division 3 *occupancy*,
(d) a single stage system in elementary and secondary schools, except for a special needs facility, and
(e) a single or two stage system in all other cases.

3.2.4.4. Description of Fire Alarm Systems

(1) A single stage fire alarm system shall, upon the operation of any manual pull station or *fire detector*, cause an *alarm signal* to sound on all audible signal devices in the system. (See Appendix A.)

(2) A two stage fire alarm system shall,
(a) cause an *alert signal* to sound upon the operation of any manual pull station or *fire detector*,
(b) except for a Group B, Division 2 *occupancy*, automatically cause an *alarm signal* to sound if the *alert signal* is not acknowledged within 5 min of its initiation,
(c) have each manual pull station equipped so that the use of a key or other similar device causes an *alarm signal* to sound and continue to sound upon the removal of the key or similar device from the manual pull station, and (See Appendix A.)

(d) in a *building* containing a *hotel,*
  (i) cause an *alarm signal* to sound in the initiating fire zone in the *hotel*, and
  (ii) cause an *alert signal* to sound throughout the *hotel* and such parts of the *building* as is necessary to alert *hotel* staff.

(See Appendix A.)

(3) A two stage fire alarm system is permitted to be zone coded so that, upon the operation of any manual pull station or *fire detector*,
(a) a coded *alert signal* is sounded indicating the zone of alarm initiation,
(b) the coded *alert signal* is repeated in its entirety no fewer than four times, and
(c) a continuous *alert signal* is sounded upon completion of the coded signals referred to in Clause (b) and Sentence (4).

(4) If a second manual pull station or *fire detector* is operated in a fire alarm system with zone coding as permitted by Sentence (3), in a zone other than that for which the first *alert signal* was sounded, the coded *alert signal* for the first zone shall be completed before the coded *alert signal* for the second zone is repeated no fewer than four times.

3.2.4.5. Installation and Verification of Fire Alarm Systems

(1) Fire alarm systems, including those with voice communication capability, shall be installed in conformance with CAN/ULC-S524, "Installation of Fire Alarm Systems".

(2) A fire alarm system shall be verified in conformance with CAN/ULC-S537, "Verification of Fire Alarm Systems", to ensure satisfactory operation.

r11.1 ## 3.2.4.6. Reserved

3.2.4.7. Silencing of Alarm Signals

(1) Except as permitted by Sentence (3), a fire alarm system shall be designed so that when an *alarm signal* is actuated it cannot be silenced automatically before a period of time has elapsed that is not less than,
(a) 5 min for a *building* not required to be equipped with an annunciator, and
(b) 20 min for any other *building*.

r11.1 **(2)** Except as permitted by Sentences 3.2.4.20.(9) and 3.2.4.23.(2) and (3), a fire alarm system shall not incorporate manual silencing switches other than those installed inside the fire alarm control unit. (See Appendix A.)

r11.1 **(3)** Except as provided by Clause 3.2.4.23.(3)(a), in a *care and treatment occupancy* an *alert signal* is permitted to be silenced automatically after 1 min.

3.2.4.8. Signals to Fire Department

r1 **(1)** If a fire alarm system is required to be installed and a single stage system is provided, the system shall be designed to notify the fire department in conformance with Sentence (4) that an *alarm signal* has been initiated in,
(a) a Group A *occupancy* having an *occupant load* more than 300,
(b) a Group B *occupancy*,
(c) a Group F, Division 1 *occupancy*,
(d) a *building* regulated by the provisions of Subsection 3.2.6.,
(e) a *building* containing *interconnected floor space* required to conform to Articles 3.2.8.3. to 3.2.8.11., or
r6 (f) a *retirement home*.

(d) room in which hazardous substances are to be used or stored,
(e) elevator or dumbwaiter shaft,
(f) laundry room in a *building* of *residential occupancy*, but not one within a *dwelling unit*, and
(g) *hazardous classroom* and change room in an elementary or secondary school.

3.2.4.12. Smoke and Heat Detectors

(1) If a fire alarm system is required, *smoke detectors* shall be installed in,
(a) each sleeping room and each corridor serving as part of a *means of egress* from sleeping rooms in portions of a *building* classified as Group B *major occupancy,*
(b) each room in a *contained use area* and corridors serving those rooms,
(c) each corridor in portions of a *building* classified as Group A, Division 1 *major occupancy*,
(d) each *public corridor* in portions of a *building* classified as Group C *major occupancy*,
(e) each *exit* stair shaft,
(f) each corridor serving classrooms in elementary and secondary schools, and
(g) each elevator machine room or machinery space.
(See Appendix A.)

(2) Except as provided in Article 3.2.4.16., if a fire alarm system is required, *heat detectors* shall be installed in,
(a) every room in portions of *buildings* classified as Group A, Division 1,
(b) except in a *hotel*, in every *suite*, and every room not located within a *suite*, in portions of *buildings* classified as Group C *major occupancy* and more than 3 *storeys* in *building height*, and
(c) in a *floor area* containing a *hotel*, in every room in a *suite* and in every room not located in a *suite* other than washrooms within a *suite*, saunas, refrigerated areas and swimming pools.

r1 **(3)** *Smoke detectors* required in sleeping rooms of *care*, *care and treatment* or *detention occupancy* shall upon actuation provide an audible and visible signal to staff serving those rooms so that the room or location containing the *smoke detector* can be easily identified. (See Appendix A.)

(4) *Smoke detectors* required by Clause (1)(g) shall, upon actuation, recall the elevators served by machinery located in the machine room or machinery space in which the *smoke detector* is installed.

(5) Except as permitted by Sentences (6) and (7), where a *building* is required to be equipped with a fire alarm system, a *smoke detector* shall be located near the entrance to,
(a) a *walkway* described in Articles 3.2.3.19. and 3.2.3.20., or
(b) a vestibule provided in conformance with Article 3.2.6.3.

(6) *Smoke detectors* installed at the entrance to a *walkway* in conformance with Article 3.1.8.12. are deemed to meet the requirements of Sentence (5).

(7) *Fire detectors* are permitted to be installed in lieu of the *smoke detectors* required by Sentence (5) in Group F *occupancies* where the s*moke detectors* may be subjected to false alarms due to the activities within the *building*.

3.2.4.13. Prevention of Smoke Circulation

(1) If a fire alarm system is installed, an air handling system shall be designed to prevent the circulation of smoke upon a signal from a duct-type *smoke detector* if the air handling system,
(a) serves more than 1 *storey*,
(b) serves more than one *suite* in a *storey*,
r6 (c) serves more than one *fire compartment* required by Sentence 3.3.3.5.(2) or Sentence 3.3.4.11.(2), or
r11.1 (d) is not provided with *fire dampers* as permitted by Sentence 3.1.8.8.(4).

3.2.4.14. Vacuum Cleaning System Shutdown

(1) A central vacuum cleaning system serving more than one *suite* or *storey* in a *building* equipped with a fire alarm system shall be designed to shut down upon actuation of the fire alarm system.

3.2.4.15. Elevator Emergency Return

(1) Except as permitted by Sentence (3), in a *building* having elevators that serve *storeys* above the *first storey* and that are equipped with an automatic emergency recall feature, *smoke detectors* shall be installed in the elevator lobbies on the recall level so that when these *smoke detectors* are actuated, the elevators will automatically return directly to an alternate floor level.

(2) *Smoke detectors* required by Sentence (1) shall be designed as part of the *building* fire alarm system.

(3) The alternate floor recall feature required by Sentence (1) is not required if the *floor area* containing the recall level is *sprinklered*.

3.2.4.16. Sprinklers in Lieu of Fire Detectors

(1) *Fire detectors* required by Article 3.2.4.11. and *heat detectors* required by Sentence 3.2.4.12.(2) need not be provided within a *floor area* if the *floor area* is *sprinklered* and the sprinkler system is electrically supervised in conformance with Sentence 3.2.4.10.(3). (See Appendix A.)

3.2.4.17. System Monitoring

(1) An automatic sprinkler system shall be equipped with waterflow detecting devices and, if an annunciator is required by Article 3.2.4.9., shall be installed so that each device serves,
(a) not more than 1 *storey*, and
(b) an area on each *storey* that is not more than the system area limits as specified in NFPA 13, "Installation of Sprinkler Systems".

(2) If a fire alarm system is provided, waterflow indicating devices required by Sentence (1) shall be connected to the fire alarm system so that on actuation an *alert signal* or an *alarm signal* is initiated.

3.2.4.18. Manual Pull Stations

(1) Except as permitted by Sentences (2) and (3), if a fire alarm system is installed, a manual pull station shall be installed,
(a) near the principal entrance to the *building*, and
(b) near every required *exit*.
(See Appendix A.)

(2) In a *building* that is *sprinklered*, a manual pull station is not required at an exterior egress doorway from a *suite* that does not lead to an interior shared *means of egress* in a *hotel* not more than 3 *storeys* in *building height*, provided each *suite* is served by an exterior *exit* facility leading directly to ground level.

(3) In a *building* that is *sprinklered*, a manual pull station is not required at an exterior egress doorway from a *dwelling unit* that does not lead to an interior shared *means of egress* in a *building* not more than 3 *storeys* in *building height* containing only *dwelling units*, provided each *dwelling unit* is served by an exterior *exit* facility leading directly to ground level.

(4) In a *building* referred to in Sentence (2) or (3), manual pull stations shall be installed near doorways leading from shared interior corridors to the exterior.

r11.1 (d) the voice communication system referred to in Article 3.2.4.23. or 3.2.4.24. has a provision to override the automatic signal silence to allow the transmission of voice messages through silenced audible signal device circuits that serve the *dwelling units*.
(See Appendix A.)

(14) If a two stage fire alarm system has been installed with an automatic signal silence as described in Sentence (13), the system shall be designed so that any silenced audible signal devices serving *dwelling units* are reactuated whenever an *alarm signal* is required to be transmitted as part of the second stage.

3.2.4.21. Visual Signals

(1) Visual signal devices required by Sentences 3.2.4.19.(4) and 3.2.4.20.(7) and (8) shall be installed so that the signal from at least one device is visible throughout the *floor area* or portion of it in which they are installed. (See Appendix A.)

(2) Visual signal devices permitted by Sentence 3.2.4.19.(5) shall be installed so that the signal from at least one device is visible throughout the compartment in which they are installed. (See Appendix A.)

3.2.4.22. Smoke Alarms

r11.1 **(0.1)** Except as provided in Article 3.2.4.22A., *smoke alarms* shall be installed in accordance with this Article.

r1 **(1)** Except as permitted by Sentence (6), *smoke alarms* conforming to CAN/ULC-S531, "Smoke Alarms", shall be installed in each *dwelling unit* and, except for *care*, *care and treatment* or *detention occupancies* required to have a fire alarm system, in each sleeping room not within a *dwelling unit*.

(2) At least one *smoke alarm* shall be installed on each *storey* and *mezzanine* of a *dwelling unit*.

(3) On any *storey* of a *dwelling unit* containing sleeping rooms, a *smoke alarm* shall be installed in,
(a) each sleeping room, and
(b) a location between the sleeping rooms and the remainder of the *storey*, and if the sleeping rooms are served by a hallway, the *smoke alarm* shall be located in the hallway.

(4) A *smoke alarm* shall be installed on or near the ceiling.

(5) Except as permitted by Sentence (6), *smoke alarms* required by Sentence (1) shall,
(a) be installed with permanent connections to an electrical circuit,
(b) have no disconnect switch between the overcurrent device and the *smoke alarm*, and
(c) in case the regular power supply to the *smoke alarm* is interrupted, be provided with a battery as an alternative power source that can continue to provide power to the *smoke alarm* for a period of not less than seven days in the normal condition, followed by 4 min of alarm.
(See Appendix A.)

(6) *Suites* of *residential occupancy* are permitted to be equipped with *smoke detectors* in lieu of *smoke alarms*, provided the *smoke detectors*,
(a) are capable of independently sounding audible signals within the individual *suites*,
(b) except as provided by Sentence (7), are installed in conformance with CAN/ULC-S524, "Installation of Fire Alarm Systems", and verified in conformance with CAN/ULC-S537, "Verification of Fire Alarm Systems", and
(c) form part of the fire alarm system.

(7) *Smoke detectors* permitted to be installed in lieu of *smoke alarms* as provided in Sentence (6) are not required under Clause (6)(b) to sound an alarm throughout the rest of the *building*, provided they sound localized alarms within individual *suites* and otherwise meet the requirements of Clause (6)(b). (See Appendix A.)

(8) If more than one *smoke alarm* is required in a *dwelling unit*, the *smoke alarms* shall be wired so that the actuation of one *smoke alarm* will cause all *smoke alarms* within the *dwelling unit* to sound.

(9) A *smoke alarm* required by Sentence (1) shall be installed in conformance with CAN/ULC-S553, "Installation of Smoke Alarms".

(10) Except as permitted by Sentence (11), a manually operated silencing device shall be incorporated within the circuitry of a *smoke alarm* installed in a *dwelling unit* so that it will silence the signal emitted by the *smoke alarm* for a period of not more than 10 min, after which the *smoke alarm* will reset and again sound the alarm if the level of smoke in the vicinity is sufficient to reactuate the *smoke alarm*.

(11) *Suites* of *residential occupancy* equipped with *smoke detectors* installed in conformance with CAN/ULC-S524, "Installation of Fire Alarm Systems", as part of the fire alarm system in lieu of *smoke alarms* as permitted by Sentence (6), need not incorporate the manually operated silencing device required by Sentence (10).

(12) The sound patterns of *smoke alarms* shall,
(a) meet the temporal patterns of *alarm signals*, or
(b) be a combination of temporal pattern and voice relay.

r5 **(13)** *Smoke alarms* required by Sentence (1) shall have a visual signalling component conforming to the requirements in 18.5.3. (Light, Color and Pulse Characteristics) of NFPA 72, "National Fire Alarm and Signaling Code". (See Appendix A.)

r5 **(14)** The visual signalling component required by Sentence (13) need not,
(a) be integrated with the *smoke alarm* provided it is interconnected to it,
(b) be on battery backup, or
(c) have synchronized flash rates, when installed in a *dwelling unit*.

r5 **(15)** The luminous intensity for visual signalling components required by Sentence (13) that are installed in sleeping rooms shall be a minimum of 175 cd.

r6 **(16)** *Smoke alarms* required in *suites* in a *retirement home* or *smoke detectors* permitted to be installed in lieu of *smoke alarms* as provided in Sentence (6) shall upon actuation provide an audible and visual signal to staff serving those *suites*, so that the *suite* containing the actuated *smoke alarm* or *smoke detector* can be easily identified.

r11.1 3.2.4.22A. Residential Fire Warning Systems

(1) Except where a fire alarm system is installed or required in a *building*, *smoke detectors* forming part of a residential fire warning system installed in conformance with CAN/ULC-S540, "Residential Fire and Life Safety Warning Systems: Installation, Inspection, Testing and Maintenance", are permitted to be installed in lieu of all *smoke alarms* required by Article 3.2.4.22., provided that the system is,
(a) capable of sounding audible signals in accordance with Sentences 3.2.4.22.(8) and (12),
(b) provided with a visual signalling component in accordance with Sentences 3.2.4.22.(13) to (15),
(c) powered in accordance with Sentences 3.2.4.22.(5), and
(d) provided with a silencing device in accordance with Sentences 3.2.4.22.(10) and (11).

r11.1 3.2.4.23. Two-Way Voice Communication Systems

(1) A voice communication system required by Subsection 3.2.6., Clause 3.3.2.4.(14)(f) or Sentence 3.3.4.11.(12) shall,
(a) consist of a two-way means of communication with the central alarm and control facility and with the mechanical control centre from each *floor area*, and
(b) be capable of broadcasting pre-recorded, synthesized or live messages from the central alarm and control facility that are audible and intelligible in all parts of the *building*, except in elevator cars. (See Appendix A.)

(2) The voice communication system referred to in Sentence (1) shall include a means to silence the *alarm signal* in a single-stage fire alarm system while voice messages are being transmitted, but only after the *alarm signal* has initially sounded for not less than 30 s.

(3) The voice communication system referred to in Sentence (1) shall include a means to silence the *alert signal* and the *alarm signal* in a two-stage fire alarm system while voice messages are being transmitted, but only after the *alert signal* has initially sounded for not less than,
(a) 10 s in hospitals that have supervisory personnel on duty for twenty-four hours each day, or
(b) 30 s for all other *occupancies*.

(4) The voice communication system referred to in Sentence (1) shall be designed so that the *alarm signal* in a two-stage fire alarm system can be selectively transmitted to any zone or zones while maintaining an *alert signal* or selectively transmitting voice instructions to any other zone or zones in the *building*.

(5) The voice communication system referred to in Sentence (1) shall be designed so that visual signal devices are not interrupted while voice instructions are being transmitted.

(6) The voice communication system referred to in Sentence (1) shall be installed so that emergency communication devices are located in each *floor area* near *exit* stair shafts.

(7) A voice communication system referred to in Sentence (1) that is installed in a *building* that is not intended to be staffed, at times when the *building* will be occupied, with persons trained to provide instructions over the system shall include a pre-recorded message.

r11.1 3.2.4.24. One-Way Voice Communication Systems

(1) Except for Group B, Division 1 and Group F, Division 1 *major occupancies*, a one-way voice communication system shall be installed in a *building* where,
(a) a fire alarm system is required under Subsection 3.2.4.,
(b) a two-stage fire alarm system is installed, and
(c) the *occupant load* of the *building* exceeds 1 000.

(2) The voice communication system required by Sentence (1) shall consist of loudspeakers that are,
(a) operated from the central alarm and control facility or, in the absence of a central alarm and control facility, from a designated area, and
(b) designed and located so that transmitted messages are audible and intelligible in all parts of the *building*, except in elevator cars.

(3) A voice communication system required by Sentence (1) that is installed in a *building* that is not intended to be staffed, at times when the *building* will be occupied, with persons trained to provide instructions over loudspeakers described in Sentence (2) shall include a pre-recorded message.

(4) The voice communication system required by Sentence (1) shall meet the silencing and transmission requirements of Sentences 3.2.4.23.(2) to (5).

3.2.5. Provisions for Firefighting

3.2.5.1. Access to Above Grade Storeys

(1) Except for *storeys* below the *first storey*, direct access for firefighting shall be provided from the outdoors to every *storey* that is not *sprinklered* and whose floor level is less than 25 m above *grade*, by at least one unobstructed window or access panel for each 15 m of wall in each wall required to face a *street* by Subsection 3.2.2.

(2) An opening for access required by Sentence (1) shall,
(a) have a sill no higher than 1 070 mm above the inside floor, and
(b) be not less than 1 100 mm high by not less than,
  (i) 550 mm wide for a *building* not designed for the storage or use of *dangerous goods*, or
  (ii) 750 mm wide for a *building* designed for the storage or use of *dangerous goods*.

(3) Access panels above the *first storey* shall be readily openable from both inside and outside, or the opening shall be glazed with plain glass.

3.2.5.2. Access to Basements

(1) Direct access from at least one *street* shall be provided from the outdoors to each *basement,*
(a) that is not *sprinklered*, and
(b) that has horizontal dimension more than 25 m.

(2) The access required by Sentence (1) is permitted to be provided by,
(a) doors, windows or other means that provide an opening not less than 1 100 mm high and 550 mm wide, with a sill no higher than 900 mm above the inside floor, or
(b) an interior stairway immediately accessible from the outdoors

3.2.5.3. Roof Access

(1) On a *building* more than 3 *storeys* in *building height* where the slope of the roof is less than 1 in 4, all main roof areas shall be provided with direct access from the *floor areas* immediately below, either by,
(a) a stairway, or
(b) a hatch not less than 550 mm by 900 mm with a fixed ladder.

(2) Clearance and access around roof signs or other obstructions shall provide,
(a) a passage not less than 900 mm wide by 1 800 mm high, clear of all obstructions except for necessary horizontal supports not more than 600 mm above the roof surface,
  (i) around every roof sign, and
  (ii) through every roof sign at locations not more than 15 m apart, and
(b) a clearance of not less than 1 200 mm between any portion of a roof sign and any opening in the exterior wall face or roof of the *building* in which it is erected.

3.2.5.4. Access Routes

(1) A *building* that is more than 3 *storeys* in *building height* or more than 600 m^2 in *building area* shall be provided with access routes for fire department vehicles,
(a) to the *building* face having a principal entrance, and
(b) to each *building* face having access openings for firefighting as required by Articles 3.2.5.1. and 3.2.5.2.
(See Appendix A.)

3.2.5.5. Location of Access Routes

(1) Access routes required by Article 3.2.5.4. shall be located so that the principal entrance and every access opening required by Articles 3.2.5.1. and 3.2.5.2. are located not less than 3 m and not more than 15 m from the closest portion of the access route required for fire department use, measured horizontally from the face of the *building*.

(2) Access routes shall be provided to a *building* so that,
(a) for a *building* provided with a fire department connection, a fire department pumper vehicle can be located adjacent to the hydrants referred to in Article 3.2.5.16.,
(b) for a *building* not provided with a fire department connection, a fire department pumper vehicle can be located so that the length of the access route from a hydrant to the vehicle plus the unobstructed path of travel for the firefighter from the vehicle to the *building* is not more than 90 m, and
(c) the unobstructed path of travel for the firefighter from the vehicle to the *building* is not more than 45 m.

(3) The unobstructed path of travel for the firefighter required by Sentence (2) from the vehicle to the *building* shall be measured from the vehicle to the fire department connection provided for the *building*, except that if no fire department connection is provided, the path of travel shall be measured to the principal entrance of the *building*.

(4) If a portion of a *building* is completely cut off from the remainder of the *building* so that there is no access to the remainder of the *building*, the access routes required by Sentence (2) shall be located so that the unobstructed path of travel from the vehicle to one entrance of each portion of the *building* is not more than 45 m.

3.2.5.6. Access Route Design

(1) A portion of a roadway or yard provided as a required access route for fire department use shall,
(a) have a clear width not less than 6 m, unless it can be shown that lesser widths are satisfactory,
(b) have a centreline radius not less than 12 m,
(c) have an overhead clearance not less than 5 m,
(d) have a change of gradient not more than 1 in 12.5 over a minimum distance of 15 m,
(e) be designed to support the expected loads imposed by firefighting equipment and be surfaced with concrete, asphalt or other material designed to permit accessibility under all climatic conditions,
(f) have turnaround facilities for any dead-end portion of the access route more than 90 m long, and
(g) be connected with a public thoroughfare.
(See Appendix A.)

r5 **(2)** A *building* within the scope of Article 3.2.2.43A. or 3.2.2.50A. shall have no portion of the required access route more than 20 m below the floor level of the uppermost *storey* or *mezzanine* that is not a rooftop enclosure, provided for elevator machinery, a stairway or a *service room* used for no purpose other than for service to the *building*.

3.2.5.7. Water Supply (See Appendix A.)

(1) An adequate water supply for firefighting shall be provided for every *building*.

(2) Hydrants shall be located within 90 m horizontally of any portion of a *building* perimeter that is required to face a *street* in Subsection 3.2.2.

e6 3.2.5.8. to 3.2.5.12. Reserved

3.2.5.13. Automatic Sprinkler Systems

r1 **(1)** Except as provided by Sentences (2) to (4), an automatic sprinkler system shall be designed, constructed, installed and tested in conformance with NFPA 13, "Installation of Sprinkler Systems". (See Appendix A.)

r11.1 **(2)** NFPA 13R, "Installation of Sprinkler Systems in Low-Rise Residential Occupancies", is permitted to be used for the design, construction, installation and testing of an automatic sprinkler system installed in a *building,*
r6 (a) of *residential occupancy* that does not contain a *retirement home* and that is not more than 4 *storeys* in *building height*,
(b) of Group B, Division 3 *occupancy* that contains sleeping accommodation for not more than 10 persons and not more than six occupants require assistance in evacuation in case of an emergency,
r6 (c) that contains a *retirement home* constructed in accordance with Article 3.2.2.48D., or
r6 (d) that contains a *retirement home* constructed in accordance with Article 3.2.2.48E., where the *fire separation* required by Sentence 3.3.4.11.(2) on the *storey* immediately below the roof assembly is continuous to the underside of the roof deck.
(See Appendix A.)

r5 **(3)** Except as required by Sentence (9), NFPA 13D, "Installation of Sprinkler Systems in One- and Two-Family Dwellings and Manufactured Homes", is permitted to be used for the design, construction, installation and testing of an automatic sprinkler system installed in a *building* of *residential occupancy* that contains not more than two *dwelling units*.

(4) If a *building* contains fewer than nine sprinklers, the water supply for these sprinklers is permitted to be supplied from the domestic water system for the *building* provided the required flow for the sprinklers can be met by the domestic system.

(5) If a water supply serves both an automatic sprinkler system and a system serving other equipment, control valves shall be provided so that either system can be shut off independently.

r5 **(6)** Despite the requirements of the standards referenced in Sentences (1) and (2) for the installation of automatic sprinkler systems, sprinklers shall not be omitted in any room or closet in the *storey* immediately below a roof assembly if the *fire-resistance rating* of the roof assembly is waived as permitted by Article 3.2.2.17. (See Appendix A.)

r5 **(7)** Despite the requirements of the standards referenced in Sentences (1) and (2) for the installation of automatic sprinkler systems, sprinklers shall be provided for all balconies and decks forming part of a *building* within the scope of Article 3.2.2.43A. or 3.2.2.50A., other than,

e4 (a) balconies or decks that are not more than 610 mm in depth measured perpendicular to the exterior wall of the *building*, or

(b) decks on the uppermost roof of the *building*.

(See Appendix A.)

r5 **(8)** Sprinklers in elevator machine rooms shall have a temperature rating not less than that required for an intermediate temperature classification and shall be protected against physical damage. (See Appendix A.)

r6 **(9)** The sprinkler system described in Sentence (3) shall be provided with a minimum 20 min water supply when installed in a *retirement home*.

3.2.5.14. Combustible Sprinkler Piping

r11.1 **(1)** *Combustible* sprinkler piping shall be used only for sprinkler systems in *residential occupancies* and other light hazard *occupancies*. (See Appendix A.)

(2) *Combustible* sprinkler piping shall meet the requirements of ULC/ORD-C199P, "Combustible Piping for Sprinkler Systems".

(3) Except as permitted by Sentence (5), *combustible* sprinkler piping shall be separated from the area served by the sprinkler system, and from any other *fire compartment*, by ceilings, walls, or soffits consisting of, as a minimum,

(a) lath and plaster,

(b) gypsum board not less than 9.5 mm thick,

(c) plywood not less than 13 mm thick, or

(d) a suspended membrane ceiling with,

  (i) steel suspension grids, and

  (ii) lay-in panels or tiles having a mass not less than 1.7 kg/m^2.

(4) Except as permitted by Sentence (5), *combustible* sprinkler piping may be located above a ceiling, provided that the distance between the edge of any ceiling opening that is not protected in conformance with Sentence (3) and the nearest sprinkler is not more than 300 mm.

(5) The protection required by Sentences (3) and (4) is permitted to be waived where *combustible* sprinkler piping has been tested in conformance with ULC/ORD-C199P, "Combustible Piping for Sprinkler Systems", and has been shown to meet the requirements in that document without additional protection.

3.2.5.15. Sprinklered Service Space

(1) An automatic sprinkler system shall be installed in a *service space* referred to in Sentence 3.2.1.1.(9) if flooring for access within the *service space* is other than catwalks.

(2) The sprinkler system required by Sentence (1) shall be equipped with waterflow detecting devices, with each device serving not more than 1 *storey*.

(2) The fire department connection for an automatic sprinkler system shall be located so that the distance from the fire department connection to a hydrant is not more than 45 m and is unobstructed.

(3) The fire department connections required in Sentences (1) and (2) shall be,
(a) located on the outside of a *building* adjacent to a *street* or an access route, not less than 300 mm and not more than 900 mm above ground level, and
(b) provided with two 65 mm hose connections with female swivel hose couplings.

3.2.5.17. Portable Fire Extinguishers

(1) Portable fire extinguishers shall be installed in all *buildings*, except within *dwelling units*, in conformance with the provisions of Part 6 of Division B of the Fire Code made under the *Fire Protection and Prevention Act, 1997*.

(2) In a Group B, Division 1 *major occupancy*, portable fire extinguishers are permitted to be located in secure areas, or in lockable cabinets provided,
(a) identical keys for all cabinets are located at all supervisory or security stations, or
(b) electrical remote release devices are provided and are connected to an emergency power supply.

3.2.5.18. Protection from Freezing

(1) Equipment forming part of a fire protection system shall be protected from freezing if,
(a) it could be adversely affected by freezing temperatures, and
(b) it is located in an unheated area.

3.2.5.19. Fire Pumps

(1) A fire pump having a rated net head pressure greater than 280 kPa shall be installed in accordance with the requirements of NFPA 20, "Installation of Stationary Pumps for Fire Protection". (See Appendix A.)

3.2.6. Additional Requirements for High Buildings (See Appendix A.)

3.2.6.1. Application

(1) This Subsection applies to a *building*,
(a) of Group A, D, E or F *major occupancy* classification that is more than,
  (i) 36 m high, measured between *grade* and the floor level of the top *storey*, or
  (ii) 18 m high, measured between *grade* and the floor level of the top *storey*, and in which the cumulative or total *occupant load* on or above any *storey* above *grade*, other than the *first storey*, divided by 1.8 times the width in metres of all *exit* stairs at that *storey*, exceeds 300,
(b) containing a Group B *major occupancy* in which the floor level of the highest *storey* of that *major occupancy* is more than 18 m above *grade*,
(c) containing a *floor area* or part of a *floor area* located above the third *storey* designed or intended as a Group B, Division 2 or 3 *occupancy*,
r6 (d) containing a Group C *major occupancy* in which the floor level of the highest *storey* of that *major occupancy* is more than 18 m above *grade*, or
r6 (e) containing a *retirement home*, where the floor level of the highest *storey* of the *retirement home* is more than 18 m above *grade*.

3.2.6.2. Limits to Smoke Movement

r11.1 **(1)** A *sprinklered building* shall be designed in accordance with Sentences (2) to (5.1) and MMAH Supplementary Standard SB-4, "Measures for Fire Safety in High Buildings", to limit the danger to occupants and firefighters from exposure to smoke in a *building* fire.

(2) A *building* referred to in Sentence (1), shall be designed so that, during a period of 2 h after the start of a fire, each *exit* stair serving *storeys* below the lowest *exit level* will not contain more than 1% by volume of contaminated air from the fire floor, assuming an outdoor temperature equal to the January design temperature on a 2.5% basis determined in conformance with MMAH Supplementary Standard SB-1, "Climatic and Seismic Data".

(3) Each stairway that serves *storeys* above the lowest *exit level* shall have a vent to the outdoors, at or near the bottom of the stair shaft, that,

(a) has an openable area of 0.05 m^2 for every door between the stair shaft and a *floor area*, but not less than 1.8 m^2,
(b) opens directly to the outdoors or into a vestibule that has a similar opening to the outdoors, and
(c) has a door or *closure* that,
  (i) is openable manually, and
  (ii) can remain in the open position during a fire emergency.

(4) Measures shall be taken to limit movement of smoke from a fire in a *floor area* below the lowest *exit storey* into upper *storeys*.

(5) Except for exhaust fans in kitchens, washrooms and bathrooms in *dwelling units*, and except for fans used for smoke venting as required by Article 3.2.6.6., air moving fans in a system that serves more than 2 *storeys* shall be designed and installed so that in the event of a fire these fans can be stopped by means of a manually operated switch at the central alarm and control facility.

r11.1 **(5.1)** Except as provided in Article 3.2.4.13. or as otherwise provided in this Part, air handling systems used to provide make-up air to *public corridors* serving *suites* in a Group C *major occupancy* shall not shut down automatically upon actuation of the fire alarm so as to maintain corridor pressurization.

(6) A *building* that is not *sprinklered* shall be designed in accordance with MMAH Supplementary Standard SB-4, "Measures for Fire Safety in High Buildings", to limit the danger to occupants and firefighters from exposure to smoke in a *building* fire.

3.2.6.3. Connected Buildings

(1) If a *building* described in Article 3.2.6.1. is connected to any other *building*, measures shall be taken to limit movement of contaminated air from one *building* into another during a fire.

3.2.6.4. Emergency Operation of Elevators

(1) Manual emergency recall shall be provided for all elevators serving *storeys* above the *first storey*.

(2) Key-operated switches for emergency recall described by Sentence (1) shall be provided in a conspicuous location at,

(a) each elevator lobby on the recall level, and
(b) the central alarm and control facility required in Article 3.2.6.7.

(3) In-car emergency service switches shall be provided in all elevator cars.

(4) Keys to operate the switches required by Sentences (2) and (3) shall be,

(a) provided in a suitably identified box conspicuously located on the outside of an elevator hoistway near the central alarm and control facility required by Article 3.2.6.7., and
(b) kept at the central alarm and control facility.

(5) In a *building* that is not *sprinklered*, automatic emergency recall operation shall be provided for all elevators serving *storeys* above the *first storey*.

(6) The automatic emergency recall feature in Sentence (5) shall be actuated by,
(a) *smoke detectors* installed in each elevator lobby on each *storey*, or (See Appendix A.)
(b) the *building* fire alarm system.

(7) *Smoke detectors* in Sentence (6) shall be designed as part of the *building* fire alarm system.

3.2.6.5. Elevator for Use by Firefighters

(1) At least one elevator shall be provided for use by firefighters in conformance with Sentences (2) to (6).

(2) The elevator referred to in Sentence (1) shall have a useable platform area not less than 2.2 m^2 and shall be capable of carrying a load of 900 kg to the top floor that it serves from a landing on the *storey* containing the entrance for firefighter access referred to in Articles 3.2.5.4. and 3.2.5.5. within 1 min.

(3) Except where Measure K of MMAH Supplementary Standard SB-4, "Measures for Fire Safety in High Buildings", is used, each elevator for use by firefighters shall,
r5 (a) be provided with a *closure* at each shaft opening so that the interlock mechanism remains mechanically engaged and electrical continuity is maintained in the interlock circuits and associated wiring for a period of not less than 1 h when the assembly is subjected to the standard fire exposure described in CAN/ULC-S104, "Fire Tests of Door Assemblies",
(b) be protected with a vestibule containing no *occupancy* and separated from the remainder of the *floor area* by a *fire separation* having a *fire-resistance rating* not less than 45 min, or
(c) be protected with a corridor containing no *occupancy* and separated from the remainder of the *building* by a *fire separation* having a *fire-resistance rating* not less than 1 h.

(4) Except as permitted in Sentence (5), an elevator referred to in Sentence (1) shall be capable of providing transportation from the *storey* containing the entrance for firefighter access referred to in Articles 3.2.5.4. and 3.2.5.5. to every floor that is above *grade* in the *building* and that is normally served by the elevator system.

(5) If it is necessary to change elevators to reach any floor referred to in Sentence (4), the system shall be designed so that not more than one change of elevator is required when travelling to any floor in the *building* from the *storey* containing the entrance for firefighter access referred to in Articles 3.2.5.4. and 3.2.5.5.

(6) Electrical conductors for the operation of the elevator referred to in Sentence (1) shall be,
(a) installed in *service spaces* conforming to Section 3.6. that do not contain other *combustible* material, or
(b) protected against exposure to fire from the service entrance of the emergency power supply, or the normal service entrance of the normal power supply, to the equipment served, to ensure operation for a period of 1 h when subjected to the standard fire exposure described in CAN/ULC-S101, "Fire Endurance Tests of Building Construction and Materials".

3.2.6.6. Venting to Aid Firefighting

(1) Means of venting each *floor area* to the outdoors shall be provided by windows, wall panels, smoke shafts or, except as provided by Sentence (5), the *building* exhaust system.

(2) Fixed glass windows shall not be used for the venting required by Sentence (1) if the breaking of the windows could endanger pedestrians below.

(3) Openable windows used for the venting required by Sentence (1) shall be permanently marked so that they are easily identifiable.

(4) Elevator hoistways shall not be designed for the venting required by Sentence (1).

(5) In a *building* that is not *sprinklered,* venting of *floor areas* required in Sentence (1) shall not be provided by the *building* exhaust system.

3.2.6.7. Central Alarm and Control Facility

(1) A central alarm and control facility shall be provided on the *storey* containing the entrance for firefighter access referred to in Articles 3.2.5.4. and 3.2.5.5. in a location that,

(a) is readily accessible to firefighters entering the *building*, and

(b) takes into account the effect of background noise likely to occur under fire emergency conditions, so that the facility can properly perform its required function under such conditions.

(2) The central alarm and control facility required in Sentence (1) shall include,

(a) means to control the voice communication system required by Article 3.2.6.8., so that messages can be sent to,
  (i) all loudspeakers simultaneously,
  (ii) individual *floor areas*, and
  (iii) *exit* stairwells,

(b) means to indicate audibly and visually *alert signals* and *alarm signals* and a switch to,
  (i) silence the audible portion of these signals, and
  (ii) indicate visually that the audible portion has been silenced,

(c) means to indicate visually that elevators are on emergency recall,

(d) an annunciator conforming to Article 3.2.4.9.,

(e) means to transmit *alert signals* and *alarm signals* to the fire department in conformance with Article 3.2.4.8.,

(f) means to release hold-open devices on doors to vestibules,

(g) means to manually actuate *alarm signals* in the *building* selectively to any zone or zones,

r11.1 (h) means to silence the *alarm signals* referred to in Clause (g) in conformance with Sentences 3.2.4.23.(2) and (3),

(i) means, as appropriate to the measure for fire safety provided in the *building*, to,

r11.1
  (i) actuate auxiliary equipment identified in Articles 3.2.6.2., 3.2.6.3. and 3.2.6.6., or
  (ii) communicate with a continually staffed auxiliary equipment control centre,

(j) means for two-way communications with every elevator car,

(k) means to indicate visually, individual sprinkler system waterflow signals,

(l) means to indicate audibly and visually, sprinkler and standpipe system supervisory signals and trouble signals,

(m) a switch to silence the audible portion of a supervisory signal or a trouble signal, and

(n) visual indication that the audible portion of a supervisory signal or a trouble signal has been silenced.

3.2.6.8. Voice Communication System

r1 **(1)** A voice communication system conforming to Article 3.2.4.23. shall be provided in a *building* if,

(a) the floor of the top *storey* is more than 36 m above *grade*,

(b) a *floor area* or part of a *floor area* located above the third *storey* is designed or intended for use as a Group B, Division 2 or 3 *occupancy*, or

(c) a *floor area* or part of a *floor area* located more than 18 m above *grade* is designed or intended for use as a retirement home regulated under the *Retirement Homes Act, 2010* that is a Group C *occupancy*.

3.2.6.9. Testing

(1) The systems for control of smoke movement and mechanical venting required by Articles 3.2.6.2. and 3.2.6.6. shall be tested to ensure satisfactory operation in accordance with the procedures described in MMAH Supplementary Standard SB-4, “Measures for Fire Safety in High Buildings”.

3.2.7. Lighting and Emergency Power Systems

3.2.7.1. Minimum Lighting Requirements

(1) An *exit*, a *public corridor*, a corridor providing *access to exit* for the public, a corridor serving patients or residents in a Group B, Division 2 or 3 *occupancy*, a corridor serving classrooms, an electrical equipment room, a transformer vault and a hoistway pit shall be equipped to provide illumination to an average level not less than 50 lx at floor or tread level and at all points such as angles and intersections at changes of level where there are stairs or ramps.

(2) The minimum value of the illumination required by Sentence (1) shall not be less than 10 1x.

(3) Rooms and spaces used by the public shall be illuminated as described in Article 9.34.2.7.

(4) Lighting outlets in a *building* of *residential occupancy* shall be provided in conformance with Subsection 9.34.2.

(5) Elevator machine rooms shall be equipped to provide illumination to an average level of not less than 100 lx at floor level.

(6) Every place of assembly intended for the viewing of motion pictures or the performing arts, shall be equipped to provide an average level of illumination at floor level in the aisles of not less than 2 lx during the viewing.

(7) Every area where food is intended to be processed, prepared or manufactured and where equipment or utensils are intended to be cleaned shall be equipped to provide illumination to a level of not less than 500 lx measured at the floor level.

(8) Every storage room, dressing room, sanitary facility, service area and corridor serving the areas in Sentence (7) shall be equipped to provide illumination to a level of not less than 300 lx measured at the floor level.

3.2.7.2. Recessed Lighting Fixtures

(1) A recessed lighting fixture shall not be located in an insulated ceiling unless the fixture is designed for this type of installation.

3.2.7.3. Emergency Lighting

(1) Emergency lighting shall be provided to an average level of illumination not less than 10 lx at floor or tread level in,

(a) *exits*,
(b) principal routes providing *access to exit* in an open *floor area* and in *service rooms*,
(c) corridors used by the public,
(d) corridors serving patients' or residents' sleeping rooms in a Group B, Division 2 or 3 *occupancy*,
(e) corridors serving classrooms,
(f) underground *walkways*,
(g) *public corridors*,
(h) *floor areas* or parts of them where the public may congregate in,
  (i) Group A, Division 1 *occupancies*, or
  (ii) Group A, Divisions 2 and 3 *occupancies* having an *occupant load* of 60 or more,
(i) *floor areas* or parts of them in day care centres where persons are cared for,
(j) food preparation areas in commercial kitchens,
(k) principal routes providing *access to exit* in a *floor area* that is not subdivided into rooms or *suites* of rooms served by corridors in a *business and personal services occupancy*, a *mercantile occupancy* or an *industrial occupancy*,
(l) internal corridors or aisles serving as principal routes to *exits* in a *business and personal services occupancy*, a *mercantile occupancy* or an *industrial occupancy* that is subdivided into rooms or *suites* of rooms, and is not served by a *public corridor*, and
r11.1 (m) washrooms with *fixtures* for *public use*.

(2) Emergency lighting to provide an average level of illumination of not less than 10 lx at floor or catwalk level shall be included,

(a) in a *service space* referred to in Sentence 3.2.1.1.(9), and

(b) on a *shelf and rack storage system*, in locations described in Sentence 3.16.1.5.(2).

(3) The minimum value of the illumination required by Sentences (1) and (2) shall not be less than 1 lx.

(4) In addition to the requirements of Sentences (1) to (3), the installation of battery-operated emergency lighting in health care facilities shall conform to the appropriate requirements of CSA Z32, "Electrical Safety and Essential Electrical Systems in Health Care Facilities".

3.2.7.4. Emergency Power for Lighting

(1) An emergency power supply shall be,

(a) provided to maintain the emergency lighting required by this Subsection from a power source such as batteries or generators that will continue to supply power in the event that the regular power supply to the *building* is interrupted, and

r5 (b) so designed and installed that upon failure of the regular power it will assume the electrical load automatically for a period of,

(i) 2 h for a *building* within the scope of Subsection 3.2.6.,

(ii) 1 h for a *building* of Group B *major occupancy* classification that is not within the scope of Subsection 3.2.6.,

r6 (ii.1) 1 h for a *building* that contains a Group C *major occupancy retirement home* and that is not within the scope of Subsection 3.2.6.,

(iii) 1 h for a *building* within the scope of Article 3.2.2.43A. or 3.2.2.50A., and

(iv) 30 min for any other *building*.

(See Appendix A.)

(2) If self-contained emergency lighting units are used, they shall conform to CSA C22.2 No. 141, "Emergency Lighting Equipment".

3.2.7.5. Emergency Power Supply Installation

r5 **(1)** Except as required by Articles 3.2.7.6. and 3.2.7.7., an emergency electrical power system shall be installed in conformance with CSA C282, "Emergency Electrical Power Supply for Buildings".

(2) Every emergency power supply shall be equipped with an emergency audible and visual trouble indication.

3.2.7.6. Emergency Power for Hospitals

(1) Except as required by Article 3.2.7.7., an emergency electrical power system for emergency equipment required by this Part for health care facilities shall be installed in conformance with CSA Z32, "Electrical Safety and Essential Electrical Systems in Health Care Facilities". (See Appendix A.)

3.2.7.7. Fuel Supply Shut-Off Valves and Exhaust Pipes

(1) If a liquid or gas fuel-fired engine or turbine for an emergency electric power supply is dependent on a fuel supply from outside the *building*, the fuel supply shall be provided with a suitably-identified separate shut-off valve outside the *building*.

(2) Where pipes for exhaust gases from emergency power systems penetrate required *fire separations*, they shall be enclosed in a separate *service space* having a *fire-resistance rating* equal to that of the penetrated floor assembly, but not less than 45 min.

3.2.7.8. Emergency Power for Fire Alarm Systems

(1) Fire alarm systems, including those incorporating a voice communication system, shall be provided with an emergency power supply conforming to Sentences (2) to (4).

(2) The emergency power supply required by Sentence (1) shall be supplied from,
(a) a generator,
(b) batteries, or
(c) a combination of the items described in Clauses (a) and (b).

(3) The emergency power supply required by Sentence (1) shall be capable of providing,
(a) supervisory power for not less than 24 h, and
r5 (b) immediately following, emergency power under full load for not less than,
(i) 2 h for a *building* within the scope of Subsection 3.2.6.,
(ii) 1 h for a *building* classified as Group B *major occupancy* that is not within the scope of Subsection 3.2.6.,
r6 (ii.1) 1 h for a *building* that contains a Group C *major occupancy retirement home* and that is not within the scope of Subsection 3.2.6.,
(iii) 1 h for a *building* within the scope of Article 3.2.2.43A. or 3.2.2.50A.,
(iv) 5 min for a *building* not required to be equipped with an annunciator, and
(v) 30 min for any other *building*.
(See Appendix A.)

(4) The emergency power supply required by Sentence (1) shall be designed so that, in the event of a failure of the normal power source, there is an immediate automatic transfer to emergency power with no loss of information.

3.2.7.9. Emergency Power for Building Services

(1) An emergency power supply capable of operating under a full load for not less than 2 h shall be provided by an emergency generator for,
(a) every elevator serving *storeys* above the *first storey* in a *building* that is more than 36 m high measured between *grade* and the floor level of the top *storey* and every elevator for firefighters in conformance with Sentence (2),
(b) water supply for firefighting in conformance with Article 3.2.5.7., if the supply is dependent on electrical power supplied to the *building*, and the *building* is within the scope of Subsection 3.2.6.,
r11.1 (c) fans and other electrical equipment that are installed to maintain the air quality specified in Articles 3.2.6.2. and 3.3.3.6., other than air handling systems described in Sentence 3.2.6.2.(6), and
(d) fans required for venting by Article 3.2.6.6.
(See Appendix A.)

(2) Except as permitted by Sentence (3), the emergency power supply for elevators required by Clause (1)(a) shall be capable of operating all elevators for firefighters plus one additional elevator simultaneously.

(3) Sentence (2) does not apply if the time to recall all elevators under emergency power supply is not more than 5 min, each from its most remote *storey* to,
(a) the *storey* containing the entrance for firefighter access referred to in Articles 3.2.5.4 and 3.2.5.5., or
(b) to a transfer lobby.

(4) Except as provided by Sentence (5), an emergency power supply capable of operating under a full load for not less than 30 min shall be provided by emergency generator for water supply for firefighting in conformance with Article 3.2.5.7., if the supply is dependent on electrical power supplied to the *building*, and the *building* is not within the scope of Subsection 3.2.6.

(5) Sentence (4) does not apply to the water supply for a standpipe system.

3.2.7.10. Protection of Electrical Conductors

r11.1 **(1)** Electrical conductors shall conform to Sentences (2) to (9) and (11) if they,
(a) are within *buildings* identified in Article 3.2.6.1. and serve,
(i) fire alarm systems, or
(ii) emergency equipment within the scope of Articles 3.2.6.2. to 3.2.6.8.,
(b) serve fire pumps required to be installed under Article 3.2.5.19.,
(c) serve mechanical systems related to,
(i) compartments referred to in Clause 3.3.3.6.(1)(b),
(ii) *contained use areas* referred to in Clauses 3.3.3.7.(4)(a) and (b), or
(iii) provisions of Articles 3.2.8.4. to 3.2.8.6. and 3.2.8.9., or
(d) serve emergency lighting described in Article 3.2.7.3.

(2) Except as required by Sentence (3) and except as permitted in this Article, electrical conductors referred to in Sentence (1) shall,
r11.1 (a) conform to CAN/ULC-S139, "Fire Test for Evaluation of Integrity of Electrical Power, Data and Optical Fibre Cables", including the hose stream application, to provide a circuit integrity rating of not less than 1 h, or (See Appendix A.)
(b) be located in a *service space* that is separated from the remainder of the *building* by a *fire separation* that has a *fire-resistance rating* of not less than 1 h.

(3) Electrical conductors that are used in conjunction with systems referred to in Clause (1)(c) shall,
r11.1 (a) conform to CAN/ULC-S139, "Fire Test for Evaluation of Integrity of Electrical Power, Data and Optical Fibre Cables", including the hose stream application, to provide a circuit integrity rating of not less than 2 h, or (See A-3.2.7.10.(2)(a) in Appendix A)
(b) be located in a *service space* that is separated from the remainder of the *building* by a *fire separation* that has a *fire-resistance rating* of not less than 2 h.

(4) The *service spaces* referred to in Clause (2)(b) or (3)(b) shall not contain any *combustible* materials other than the electrical conductors being protected.

(5) Except as permitted by Sentences (7) and (9), the electrical conductors referred to in Sentence (1) are those that extend from the source of emergency power to,
(a) the equipment served, or
(b) the distribution equipment supplying power to the equipment served, if both are in the same room. (See Appendix A.)

(6) If a fire alarm transponder or annunciator located in one *fire compartment* is connected to a central processing unit or another transponder or annunciator located in a different *fire compartment*, the electrical conductors connecting them shall be protected in accordance with Sentence (2).

(7) Fire alarm system branch circuits within a *storey* that connect transponders and individual devices need not conform to Sentence (2). (See Appendix A.)

(8) Except as permitted by Sentence (9), if a distribution panel supplies power to emergency lighting, the power supply conductors leading up to the distribution panel shall be protected in accordance with Sentence (2).

(9) Conductors leading from a distribution panel referred to in Sentence (8) to emergency lighting units in the same *storey* need not conform to Sentence (2).

r11.1 **(10)** Distribution panels serving emergency lighting units located on other *storeys* shall be installed in a *service room* separated from the *floor area* by a *fire separation* having a *fire-resistance rating* of at least 1 h.

r11.1 **(11)** Conductors leading from a distribution panel referred to in Sentence (10) to emergency lighting units located on other *storeys* shall be protected in accordance with Sentence (2) between the distribution panel and the *floor area* where the emergency lighting units are located.

3.2.8. Mezzanines and Openings Through Floor Assemblies

3.2.8.1. Application

(1) Except as permitted by Article 3.2.8.2. and Sentence 3.3.4.2.(3), the portions of a *floor area* or a *mezzanine* that do not terminate at an exterior wall, a *firewall* or a vertical shaft shall,
(a) terminate at a vertical *fire separation* having a *fire-resistance rating* not less than that required for the floor assembly and extending from the floor assembly to the underside of the floor or roof assembly above, or
(b) be protected in conformance with the requirements of Articles 3.2.8.3. to 3.2.8.11.

(2) The penetration of a floor assembly by an *exit* or a *vertical service space* shall conform to the requirements of Sections 3.4. to 3.6.

(3) A *floor area* containing sleeping rooms in a *building* of Group B, Division 2 or 3 *major occupancy* shall not be constructed as part of an *interconnected floor space*.

(4) Except as permitted in Sentence (5), an elementary or secondary school shall not,
(a) contain an *interconnected floor space*, or
(b) be located in an *interconnected floor space*.

(5) An *interconnected floor space* is permitted in an elementary or secondary school provided,
(a) the *interconnected floor space* consists of the *first storey*, and the *storey* next above or below it, but not both,
(b) the *interconnected floor space* is *sprinklered*,
(c) the portions of the upper *floor area* that do not terminate at an exterior wall, a *firewall* or a vertical shaft shall terminate at a vertical *fire separation* extending from the floor assembly to the underside of the floor or roof assembly above,

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(8) A hose station located on one side of a *horizontal exit* shall be considered to serve only the *floor area* on that side of the *horizontal exit*.

(9) A hose cabinet shall be located so that its door, when fully opened, will not obstruct the required width of a *means of egress*.

(10) A hose station in a Group B, Division 1 *major occupancy* is permitted to be located in a secure area, or in a lockable cabinet provided that,
(a) identical keys for all cabinets are located at all guard stations, or
(b) electrical remote release devices are provided and are connected to an emergency power supply.

3.2.9.5. Supervisory Signal Annunciation for Valves

(1) If a fire alarm system in a *building* is required by Sentence 3.2.4.9.(1) to have an annunciator, valves controlling water supplies in a standpipe system, other than hose valves, shall be electrically supervised in accordance with Sentence 3.2.4.10.(2).

3.2.9.6. Water Supply for 38 mm Hose Connections

(1) If a standpipe and hose system is required, the water supply shall be sufficient to provide a flow, measured at each of the two hydraulically most remote 38 mm diam hose connections,
(a) of not less than 380 L/min,
(b) for not less than 30 min,
(c) at a pressure of not less than 450 kPa, and
(d) of not less than 190 L/min from each of the two outlets simultaneously.

3.2.9.7. Water Supply for 65 mm Hose Connections

(1) If 65 mm diam hose connections are required, the water supply shall be sufficient to provide a flow, measured at each of the two hydraulically most remote 65 mm diam hose connections,
(a) of not less than 1 890 L/min,
(b) for not less than 30 min,
(c) at a pressure of not less than 450 kPa, and
(d) of not less than 945 L/min from each of the two outlets simultaneously.

(2) If the *building* is less than 84 m high, measured between *grade* and the ceiling level of the top *storey*, the water supply required in Sentence (1) is permitted to be supplied through the fire department connection.

(3) If the *building* is 84 m or more high, measured between *grade* and the ceiling level of the top *storey*, the water supply required in Sentence (1) shall be provided by sufficient pumping capacity.

(4) If the *building* is 84 m or more high, measured between *grade* and the ceiling level of the top *storey*, the *building* shall be served by no fewer than two sources of water supply from a public water system.

r11.1 3.2.10. Testing of Integrated Fire Protection and Life Safety Systems

3.2.10.1. Testing

(1) Where fire protection and life safety systems, and systems with fire protection and life safety functions, are integrated with each other, the systems shall be tested as a whole in accordance with CAN/ULC-S1001, "Integrated Systems Testing of Fire Protection and Life Safety Systems", to verify that the systems have been properly integrated. (See Appendix A.)

Section 3.3. Safety Within Floor Areas (See Appendix A.)

3.3.1. All Floor Areas

3.3.1.1. Separation of Suites

(1) Except as permitted by Sentences (2) and (3), each *suite* in other than *business and personal services occupancies* shall be separated from adjoining *suites* by a *fire separation* having a *fire-resistance rating* not less than 1 h.

(2) The *fire-resistance rating* of the *fire separation* required by Sentence (1) is permitted to be less than 1 h but not less than 45 min provided the *fire-resistance rating* required by Subsection 3.2.2. is permitted to be less than 1 h for,
(a) the floor assembly above the *floor area*, or
(b) the floor assembly below the *floor area*, if there is no floor assembly above.

(3) *Occupancies* that are served by *public corridors* conforming to Clause 3.3.1.4.(4)(b) in a *building* that is *sprinklered*, are not required to be separated from one another by *fire separations* provided the *occupancies* are,
(a) *suites* of *business and personal services occupancy*,
(b) fast food vending operations that do not provide seating for customers,
(c) *suites* of *mercantile occupancy*, or
(d) any combination of these *occupancies*.

3.3.1.2. Hazardous Substances, Equipment and Processes

(1) Except as provided in Subsection 3.3.6., the storage, handling and use of the hazardous substances shall be in conformance with,
(a) the Fire Code made under the *Fire Protection and Prevention Act, 1997*, or
r11.1 (b) the CCBFC NRCC 56912, "National Fire Code of Canada", in the absence of regulations referred to in Clause (a). (See Appendix A.)

r11.1 **(2)** Systems for the ventilation of cooking equipment that is not within a *dwelling unit* and is used in processes producing grease-laden vapours shall be designed and installed in conformance with Articles 3.6.3.5 and 6.2.2.6. (See Appendix A.)

(3) A fuel-fired *appliance* shall not be installed in a corridor serving as an *access to exit*.

3.3.1.3. Means of Egress

(1) *Access to exit* within *floor areas* shall conform to Subsections 3.3.2. to 3.3.6., in addition to the requirements of this Subsection.

(2) If a podium, terrace, platform or contained open space is provided, egress requirements shall conform to the appropriate requirements of Sentence 3.3.1.5.(1) for rooms and *suites*.

r3 **(3)** *Means of egress* shall be provided from every roof that is intended for occupancy, and from every podium, terrace, platform or contained open space.

(4) At least two separate *means of egress* shall be provided from a roof, used or intended for an *occupant load* more than 60, to stairs designed in conformance with the *exit* stair requirements of Section 3.4.

(5) A rooftop enclosure shall be provided with an *access to exit* that leads to an *exit,*
(a) at the roof level, or
(b) on the *storey* immediately below the roof.

(6) A rooftop enclosure that is more than 200 m^2 in area shall be provided with at least two *means of egress*.

(7) Two points of egress shall be provided for a *service space* referred to in Sentence 3.2.1.1.(9) if,
(a) the area is more than 200 m^2, or
(b) the travel distance measured from any point in the *service space* to a point of egress is more than 25 m.

(8) Except as required by Sentence 3.3.4.4.(8) and permitted by Sentences 3.3.4.4.(5) and (6), each *suite* in a *floor area* that contains more than one *suite* shall have,
(a) an exterior *exit* doorway, or
(b) a doorway,
  (i) into a *public corridor*, or
  (ii) to an exterior passageway.

(9) Except as permitted by this Section and by Sentence 3.4.2.1.(2), at the point where a doorway referred to in Sentence (8) opens onto a *public corridor* or exterior passageway, it shall be possible to go in opposite directions to each of two separate *exits*.

(10) *Means of egress* from a roof for personnel servicing roof top equipment or for a below ground *service room* that is not normally occupied, is permitted to be provided by stairways or fixed ladders.

3.3.1.4. Public Corridor Separations

(1) Except as otherwise required by this Part or as permitted by Sentence (4), a *public corridor* shall be separated from the remainder of the *storey* by a *fire separation*. (See Appendix A.)

(2) Except as permitted by Sentence (3) and Clauses (4)(a) and (b), the *fire separation* between a *public corridor* and the remainder of the *storey* shall have a *fire-resistance rating* not less than 45 min.

r1 e2 **(3)** If a *storey* is *sprinklered*, no *fire-resistance rating* is required for a *fire separation* between a *public corridor* and the remainder of the *storey* provided the corridor does not serve a *care, care and treatment, detention* or *residential occupancy*.

(4) No *fire separation* is required in a *sprinklered floor area* between a *public corridor* and,
(a) except as required by Sentences 3.3.3.5.(9) and 3.3.4.2.(1) and notwithstanding Sentences 3.4.2.4.(2), the remainder of a *storey* provided the travel distance from any part of the *floor area* to an *exit* is not more than 45 m.,
(b) a room or *suite* provided the *public corridor* complies with Sentence 3.3.1.9.(6) and Clause 3.4.2.5.(1)(d), or
(c) a space containing *plumbing fixtures* required by Subsection 3.7.4. provided the space and the *public corridor* are separated from the remainder of the *storey* by a *fire separation* that has a *fire-resistance rating* not less than that required between the *public corridor* and the remainder of the *storey*.

(5) The sprinkler system in Sentences (3) and (4) shall be electrically supervised in conformance with Sentence 3.2.4.10.(3) and, upon operation, shall cause a signal to be transmitted to the fire department in conformance with Sentence 3.2.4.8.(4) when the corridor serves a Group E or Group F, Division 1 or 2 *occupancy*.

3.3.1.5. Egress Doorways

(1) Except for *dwelling units*, a minimum of two egress doorways located so that one doorway could provide egress from the room or *suite* as required by Article 3.3.1.3. if the other doorway becomes inaccessible to the occupants due to a fire that originates in the room or *suite*, shall be provided for every room and every *suite,*
(a) whose area is more than 15 m^2 and is used for,
  (i) a *high hazard industrial occupancy*, or
  (ii) a *hazardous room*,
(b) intended for an *occupant load* more than 60,

(c) in a *floor area* that is not *sprinklered* if,
  (i) the area of a room or *suite* is more than the value in Table 3.3.1.5.A., or
  (ii) the travel distance within the room or *suite* to the nearest egress doorway, is more than the value in Table 3.3.1.5.A.,
(d) in a *floor area* that is *sprinklered* and does not contain a *high hazard industrial occupancy* if,
  (i) the travel distance to an egress doorway is more than 25 m, or
  (ii) the area of the room or *suite* is more than the value in Table 3.3.1.5.B., or
(e) where the area of the room is more than 100 m^2 and it is a *hazardous classroom* in elementary or secondary school.

(2) Where two egress doorways are required by Sentence (1), they shall be placed at a distance from one another equal to or greater than one-third of the maximum overall diagonal dimension of the room or *suite* to be served, measured as the shortest distance that smoke would have to travel between the nearest required egress doors.

(3) Except for a *mezzanine* within a *dwelling unit*, every *mezzanine* that is not required to terminate at a vertical *fire separation* in Article 3.2.8.2. shall have two egress facilities placed in such a manner that one facility could provide egress from the *mezzanine* if the other facility becomes inaccessible to the occupants of the *mezzanine* due to a fire that might originate in the room or *suite* in which the *mezzanine* is located,
(a) where the *occupancy* of the *mezzanine*, room or *suite* is classified as Group F, Division 1,
(b) where the *mezzanine* is intended for an *occupant load* of more than 60 persons,
(c) in a *floor area* that is not *sprinklered* if,
  (i) the area of a *mezzanine* is more than the value in Table 3.3.1.5.A., or
  (ii) the travel distance to an egress doorway or an egress facility is more than the value in Table 3.3.1.5.A., or
(d) in a *floor area* that is *sprinklered* if,
  (i) the travel distance to an egress doorway or an egress facility is more than 25 m, or
  (ii) the area of the *mezzanine* is more than the value in Table 3.3.1.5.B.

(4) For the purpose of Clauses (3)(c) and (d),
(a) if the room or *suite* in which the *mezzanine* is located is permitted to have one egress doorway, the travel distance is measured from any point on the *mezzanine* to that doorway, or
(b) if the room or *suite* in which the *mezzanine* is located is required to have more than one egress doorway, the travel distance is measured from any point on the *mezzanine* to the nearest egress facility leading from the *mezzanine*.

(5) Except for a *mezzanine* which is not considered as a *storey* in calculating *building height* in Sentence 3.2.1.1.(4), where the space below a *mezzanine* is enclosed, an egress facility from the *mezzanine* shall not lead into the enclosed space.

Table 3.3.1.5.A.
Egress in Floor Area, not Sprinklered
Forming Part of Sentences 3.3.1.5.(1) and (3)

Occupancy of Room or *Suite*	Maximum Area of Room or *Suite*, m^2	Maximum Distance to Egress Doorway, m
Group A	150	15
Group C	150(1)	25(1)
Group D	200	25
Group E	200	25
Group F, Division 2	200	25
Group F, Division 3	200	25
Column 1	2	3

Notes to Table 3.3.1.5.A.:
(1) See Article 3.3.4.4. for *dwelling units*.

Table 3.3.1.5.B.
Egress in Sprinklered Floor Area
Forming Part of Sentences 3.3.1.5.(1) and (3)

Occupancy of Room or *Suite*	Maximum Area of Room or *Suite*, m^2
Group A	200
Group B, Division 1	100
Group B, Division 2 or 3 sleeping rooms other than sleeping rooms	 100 200
Group C	150(1)
Group D	300
Group E	200
Group F, Division 2	200
Group F, Division 3	300
Column 1	2

Notes to Table 3.3.1.5.B.:
(1) See Article 3.3.4.4. for *dwelling units*.

3.3.1.6. Travel Distance

(1) If more than one egress doorway is required from a room or *suite* referred to in Article 3.3.1.5., the travel distance within the room or *suite* to the nearest egress doorway shall not exceed the maximum travel distances specified in Clauses 3.4.2.5.(1)(a), (b), (c) and (f) for *exits*.

3.3.1.7. Protection on Floor Areas with a Barrier-Free Path of Travel

(1) Except as provided in Sentences (2) and (3), every *floor area* above or below the *first storey* that has a *barrier-free* path of travel shall,

(a) be served by an elevator,
  (i) conforming to Sentences 3.2.6.5.(4) to (6),
  (ii) protected against fire in conformance with Clause 3.2.6.5.(3)(b) or (c), and
  (iii) in a *building* over 3 *storeys* in *building height*, protected against smoke movement so that the hoistway will not contain more than 1% by volume of contaminated air from a fire floor during a period of 2 h after the start of a fire, assuming an outdoor temperature equal to the January design temperature on a 2.5% basis determined in conformance with MMAH Supplementary Standard SB-1, "Climatic and Seismic Data", or

r11.1 (b) be divided into at least two zones by *fire separations* conforming to Sentences (4) and (5) and 3.1.8.5.(6) so that, (See Appendix A.)
  (i) persons with physical disabilities can be accommodated in each zone,
  (ii) the travel distance from any point in one zone to a doorway leading to another zone shall be not more than the value for travel distance permitted by Sentence 3.4.2.5.(1) for the *occupancy* classification of the zone, and
  (iii) a b*arrier-free* path of travel is provided to an *exit*.

(See Appendix A.)

(2) In *residential occupancies*, the requirements of Sentence (1) are waived if a balcony conforming to Sentence (7) is provided for each *suite*, except for *suites* on the *storey* containing the *barrier-free* entrance described in Article 3.8.1.2.

(3) The requirements of Sentences (1) and (2) are waived when the *building* is *sprinklered*.

(4) Except as permitted by Sentence (5), the *fire separations* referred to in Clause (1)(b) shall have a *fire-resistance rating* not less than 1 h.

(5) The *fire-resistance rating* of the *fire separations* referred to in Clause (1)(b) is permitted to be less than 1 h but not less than 45 min provided the *fire-resistance rating* required by Subsection 3.2.2. is permitted to be less than 1 h for,
(a) the floor assembly above the *floor area*, or
(b) the floor assembly below the *floor area*, if there is no floor assembly above.

r11.1 **(6)** Reserved

(7) A balcony required by Sentence (2) shall,
(a) be provided with a door way having a clear width of not less that 800 mm when the door is in the open position,
(b) have no projection above the walking surface more than 13 mm,
(c) be not less than 1.5 m deep from the outside face of the exterior wall to the inside edge of the balcony, and
(d) provide not less than 0.5 m^2 for each occupant of the *suite*.

3.3.1.8. Headroom Clearance

(1) Except within the *floor area* of a *storage garage*, the minimum headroom clearance in every *access to exit* shall conform to the requirements of Article 3.4.3.5. for *exits*.

3.3.1.9. Corridors

(1) The minimum width of a *public corridor* shall be 1 100 mm.

(2) Except as required by Sentences 3.3.3.3.(2) and (3), the minimum unobstructed width shall be 1 100 mm for every,
(a) corridor used by the public,
(b) corridor serving classrooms, and
(c) corridor in a Group B, Division 2 or 3 *occupancy* where the corridor
  (i) serves a *service room*,
  (ii) serves an administrative area,
  (iii) will not be used by non-ambulatory outpatients, or
  (iv) will not be used by non-ambulatory residents.

(3) Except as permitted by Sentence (4), obstructions located within 1 980 mm of the floor shall not project more than 100 mm horizontally in a manner that would create a hazard for a person with a visual disability traveling adjacent to the walls in,
(a) an *exit* passageway,
(b) a *public corridor*,
(c) a corridor used by the public,
(d) a corridor serving classrooms, or
(e) a corridor serving patients' or residents' sleeping rooms in a Group B, Division 2 or Division 3 *occupancy*.

(4) The horizontal projection of an obstruction referred to in Sentence (3) is permitted to be more than 100 mm provided the clearance between the obstruction and the floor is less than 680 mm. (See Appendix A.)

(5) If a corridor contains an *occupancy*, the *occupancy* shall not reduce the unobstructed width of the corridor to less than its required width.

(6) If a *public corridor* conforming to Clause 3.4.2.5.(1)(d) contains an *occupancy*,
(a) the *occupancy* shall be located so that for pedestrian travel there is an unobstructed width not less than 3 m at all times adjacent and parallel to all rooms and *suites* that front onto the *public corridor*, and
(b) the combined area of all *occupancies* in the *public corridor* shall be not more than 15% of the area of the *public corridor*.

(7) Except as provided in Sentence 3.3.3.3.(1), a dead end corridor shall conform to Sentences (8) to (14).

(8) A dead end corridor is permitted in an *assembly occupancy* where there is a second and separate egress doorway from each room or *suite* not leading into a dead end corridor.

r6 **(9)** Except as provided in Sentence 3.3.4.11.(10) and except for corridors served by a single *exit* as described in Sentence 3.3.4.4.(6), a dead end *public corridor* is permitted in a *residential occupancy* provided it is not more than 6 m long.

(10) Dead end corridors in Sentence (9) shall contain no door openings to *service rooms* containing fuel-fired *appliances* or rooms that may be considered a hazard.

(11) A dead end *public corridor* is permitted in a *business and personal services occupancy* where,
(a) the dead end corridor,
  (i) serves an *occupant load* of not more than 30 persons,
  (ii) is not more than 9 m long, and
  (iii) is provided with doors having self-closing devices, or
(b) there is a second and separate egress doorway from each room or *suite* not leading into a dead end corridor.

(12) A dead end corridor is permitted in a *mercantile occupancy* where,
(a) the dead end corridor,
  (i) serves an *occupant load* of not more than 30 persons,
  (ii) is not more than 9 m long, and
  (iii) is provided with doors having self-closing devices, or
(b) there is a second and separate egress doorway from each room or *suite* not leading into a dead end corridor.

(13) A dead end corridor is permitted in a *low* or *medium hazard industrial occupancy* where,
(a) the dead end corridor,
  (i) serves an *occupant load* of not more than 30 persons,
  (ii) is not more than 9 m long, and
  (iii) is provided with doors having self-closing devices, or
(b) there is a second and separate egress doorway from each room or *suite* not leading into a dead end corridor.

(14) A dead end corridor is permitted in a *high hazard industrial occupancy* where there is a second and separate egress doorway from each room or *suite* not leading into a dead end corridor.

(15) Except as otherwise required by this Section, aisles shall be provided in conformance with the Fire Code made under the *Fire Protection and Prevention Act, 1997*.

3.3.1.10. Door Swing

r11.1 **(1)** Except as permitted by Sentence (5) and Article 3.3.1.11., a door that opens into a corridor or other facility providing *access to exit* from a *suite*, or a room not located within a *suite*, shall swing on a vertical axis.

(2) Except as permitted by Article 3.3.1.11., a door that opens into a corridor or other facility providing *access to exit* from a room or *suite* shall swing in the direction of travel to the *exit* if the room or *suite* is used or intended for,
(a) an *occupant load* more than 60,
(b) a *high hazard industrial occupancy*, or
(c) a *hazardous classroom* in an elementary or secondary school.

(3) Every door that divides a corridor that is not wholly contained within a *suite* shall swing on a vertical axis in the direction of travel to the *exit* where the corridor provides *access to exit* for,
(a) an *occupant load* more than 60,
(b) a *high hazard industrial occupancy*,
(c) a *hazardous classroom* in an elementary or secondary school,

(d) a Group B, Division 2 or 3 *occupancy*, or

r6 (e) a *retirement home*.

(4) If a pair of doors is installed in a corridor that provides *access to exit* in both directions, the doors shall swing in opposite directions, with the door on the right hand side swinging in the direction of travel to the *exit*.

r11.1 **(5)** Doors that serve individual storage spaces not more than 28 m^2 in area in *self-service storage buildings* need not conform to Sentence (1).

3.3.1.11. Sliding Doors

r11.1 **(1)** Except as permitted by Sentences (2) and 3.3.1.10.(5), a sliding door provided in the locations described in Article 3.3.1.10. shall,

(a) be designed and installed to swing on the vertical axis in the direction of travel to the *exit* when pressure is applied, and

(b) be identified as a swinging door by means of a label or decal affixed to it.

(2) In a Group B, Division 1 *occupancy*, or in an *impeded egress zone* in other *occupancies*, sliding doors used in an *access to exit* need not conform to Sentence (1) and Article 3.3.1.10.

(3) Movable *partitions* used to separate a *public corridor* from an adjacent *business and personal services occupancy* or a *mercantile occupancy* need not conform to Sentence (1) and Sentences 3.3.1.10.(1) and (2) provided the *partitions* are not located in the only *means of egress*. (See Appendix A.)

3.3.1.12. Doors and Door Hardware

r11.1 **(1)** Except as required by Article 3.3.3.4. and Sentences 3.3.4.11.(11), 3.8.3.3.(1) and (2), a door that opens into or is located within a *public corridor* or other facility that provides *access to exit* from a *suite*,

(a) shall provide a clear opening of not less than 800 mm, if there is only one door leaf,

(b) shall, in a doorway with multiple leaves, have the active leaf providing a clear opening of not less than 800 mm,

(c) shall not open onto a step, and

(d) shall not have a threshold more than 13 mm higher than the floor surface except where,

(i) the threshold is used to contain spillage, or

(ii) the doorway provides access to an exterior balcony, other than a balcony required by Sentence 3.3.1.7.(2).

(2) A door in an *access to exit* shall be readily openable in travelling to an *exit* without requiring keys, special devices or specialized knowledge of the door opening mechanism, except that this requirement does not apply to a door serving a *contained use area,* or an *impeded egress zone*, provided the locking devices conform to Sentence (6).

(3) Except as permitted by Sentence (4), door release hardware shall be operable by one hand and the door shall be openable with not more than one releasing operation.

r6 **(4)** Except in a *retirement home*, an egress door from an individual *dwelling unit* or from a *suite* of *residential occupancy* is permitted to be provided with additional devices that require a releasing operation additional to the main door release hardware, provided the devices are readily operable from the inside without the use of keys, special devices or specialized knowledge. (See Appendix A.)

(5) Door release hardware shall be installed not more than 1 200 mm above the finished floor.

(6) A door in a *means of egress* serving a *contained use area* or an *impeded egress zone* is permitted to be equipped with locking devices that can be released either locally or remotely in conformance with Sentence (7) or (8). (See Appendix A.)

(7) Local locking devices permitted by Sentence (6) shall be operable by a key from both sides of the door.

(8) Controls for the remote release of door locking devices permitted by Sentence (6) shall be located in an area readily available to security personnel.

(9) Locking devices permitted by Sentence (6) that are electrically operated shall be,
(a) designed to operate on emergency power, and
(b) capable of manual release by security personnel.

(10) A door in an *access to exit* is permitted to be equipped with an electromagnetic locking device conforming to Sentence 3.4.6.16.(4), except that this permission does not apply to a door,
(a) in an elementary or secondary school,
(b) a door leading from a Group F, Division 1 *occupancy*, or
(c) except as provided in Sentence (11), requiring a latch release device by Article 3.3.2.6.

(11) A door in an *access to exit* in a *gaming premise* is permitted to be equipped with an electromagnetic locking device conforming to Sentences 3.4.6.16.(4) and (7).

3.3.1.13. Ramps and Stairways

(1) Except as permitted by Sentence (2), Article 3.3.4.7. and Subsection 3.3.2., ramps and stairways that do not serve as *exits* shall conform to the dimensional, *guard*, handrail and slip-resistance requirements for *exit* ramps and stairways of Sentence 3.4.3.2.(7) and Articles 3.4.3.5. and 3.4.6.1. to 3.4.6.9.

(2) Ramps and stairways that do not conform to the requirements of Sentence (1) and are intended only for occasional use for servicing equipment and machinery are permitted,
(a) to serve *service rooms* and *service spaces,* and
(b) in *industrial occupancies*.

3.3.1.14. Exterior Passageways

(1) An exterior passageway leading to a required *exit* shall conform to the requirements of Section 3.4. for exterior *exit* passageways.

3.3.1.15. Curved or Spiral Stairs

(1) A curved or spiral stair is permitted in a stairway not required as an *exit* provided the stair has,
(a) treads with,
  (i) a minimum run not less than 150 mm, and
  (ii) an average run not less than 200 mm, and
(b) risers in conformance with Sentence 3.4.6.8.(2).

3.3.1.16. Capacity of Access to Exits

(1) The capacity of an *access to exit* shall be based on the *occupant load* of the portion of the *floor area* served.

(2) In an *access to exit* the required width of ramps with a slope not more than 1 in 8, doorways, and corridors shall be based on not less than 6.1 mm per person.

(3) In an *access to exit* the required width of a ramp with a slope more than 1 in 8 shall be based on not less than 9.2 mm per person.

(4) In an *access to exit* from a *floor area* used or intended to be used for patients or residents in a Group B, Division 2 or Division 3 *occupancy*, the required width of corridors, doorways, and ramps shall be based on not less than 18.4 mm per person.

(5) The capacity of stairs in an *access to exit* shall conform to the requirements for stairs in Sentences 3.4.3.2.(1) to (3).

r11.1 **(6)** In a *building* that is not *sprinklered* in accordance with Sentence 3.2.5.13.(1), an *access to exit* that is part of the principal entrance serving a dance hall or a licensed beverage establishment with an *occupant load* more than 250 shall be at least one-half of the required *exit* width.

3.3.1.17. Guards

(1) Except as provided in Sentence (6) and Articles 3.3.2.8. and 3.3.4.7., a *guard* not less than 1 070 mm high shall be provided,
(a) around each roof to which access is provided for other than maintenance,
(b) at openings into smoke shafts referred to in Subsection 3.2.6. that are less than 1 070 mm above the floor, and
(c) at each raised floor, *mezzanine*, balcony, gallery, interior or exterior vehicular ramp, and at other locations where the difference in level is more than 600 mm.

(2) Except as provided in Sentence (3) and Sentence 3.3.2.8.(4), openings through any *guard* that is required by Sentence (1) shall be of a size that will prevent the passage of a sphere having a diameter more than 100 mm unless it can be shown that the location and size of openings that exceed this limit do not represent a hazard.

(3) Openings through any *guard* that is required by Sentence (1) and that is installed in a *building* of *industrial occupancy* shall be of a size which will prevent the passage of a sphere having a diameter more than 200 mm unless it can be shown that the location and size of openings that exceed this limit do not represent a hazard.

(4) Openings through any *guard* that is not required by Sentence (1) and that serves a *building* of other than *industrial occupancy*, shall be of a size that,
(a) will prevent the passage of a sphere having a diameter more than 100 mm, or
(b) will permit the passage of a sphere having a diameter more than 200 mm unless it can be shown that the location and size of openings that exceed these limits do not represent a hazard.

(5) Unless it can be shown that the location and size of openings do not present a hazard, a *guard* shall be designed so that no member, attachment or opening located between 140 mm and 900 mm above the level protected by the *guard* will facilitate climbing.

(6) Sentence (1) does not apply at the front edges of *stages*, floor pits in *repair garages* and loading docks.

3.3.1.18. Transparent Doors and Panels

r11.1 **(1)** Except for *dwelling units* and as permitted by Sentence (4), a glass or transparent door shall be designed and constructed so that the existence and position of the door is readily apparent, by attaching visually contrasting hardware, bars or other permanent fixtures to it.

r11.1 **(1.1)** Fully glazed transparent doors, and fully glazed transparent sidelights and panels with widths greater than 300 mm, shall be marked in conformance with Sentence 3.8.3.3.(15).

(2) A glass door shall be constructed of,
(a) laminated or tempered safety glass conforming to CAN/CGSB-12.1-M, "Tempered or Laminated Safety Glass", or
(b) wired glass conforming to CAN/CGSB-12.11-M, "Wired Safety Glass".

(3) Except as permitted by Sentence (4), transparent panels used in an *access to exit* that, because of their physical configuration or design, could be mistaken as a *means of egress* shall be made inaccessible by barriers or railings.

r11.1 **(4)** Sliding glass *partitions* that separate a *public corridor* from an adjacent *occupancy* and that are intended to be open during normal working hours need not conform to Sentences (1) and (3), provided the *partitions* are marked in conformance with Sentence 3.8.3.3.(15).

r11.1 **(4.1)** Glass in a vision panel in a door or in a transparent sidelight shall conform to Sentence 3.8.3.3.(14).

(5) Glass in doors and glass sidelights that could be mistaken for doors, within or at the entrances to *dwelling units* and in public areas, shall conform to the requirements of Article 9.6.1.4.

(6) A window in a public area that extends to less than 1 070 mm above the floor and is located above the second *storey* in a *building* of *residential occupancy*, shall be protected by a barrier or railing from the floor to not less than 1 070 mm above the floor, or the window shall be non-openable and designed to withstand the lateral design loads for balcony *guards* required by Article 4.1.5.14.

r11.1 3.3.1.19. Exhaust Ventilation and Explosion Venting

(1) Except as provided in Sentence (2), an exhaust ventilation system designed in conformance with the appropriate requirements of Part 6 shall be provided in a *building* or part of a *building* in which dust, fumes, gases, vapour or other impurities or contaminants have the potential to create a fire or explosion hazard.

(2) Where a *fire separation* required to have a *fire-resistance rating* is penetrated by a ventilation system required by Sentence (1) for power-ventilated enclosures in laboratories, the ducts shall be continuously enclosed from the first penetrated *fire separation* to any subsequent *fire separations* or concealed spaces and to the outdoors so that the highest *fire-resistance rating* of all the penetrated *fire separations* is maintained.

(3) Ducts described in Sentence (2) need not be equipped with a *fire damper,* a smoke damper or a combination smoke and *fire damper*.

(4) Explosion relief devices, vents or other protective measures conforming to Subsection 6.2.2. shall be provided for a space in which substances or conditions that have the potential to create an explosion hazard are present as a result of the principal use of a *building*.

3.3.1.20. Janitors' Rooms

(1) Except as permitted by Sentences (2) and (3), a room or space within a *floor area* for the storage of janitorial supplies shall be separated from the remainder of the *building* by a *fire separation* having a *fire-resistance rating* not less than 1 h.

(2) The *fire-resistance rating* of the *fire separation* required by Sentence (1) is permitted to be not less than 45 min provided the *fire-resistance rating* required by Subsection 3.2.2. is permitted to be less than 1 h for,
(a) the floor assembly above the *floor area*, or
(b) the floor assembly below the *floor area*, if there is no floor assembly above.

(3) The *fire separation* required by Sentence (1) is not required to have a *fire-resistance rating* if the *floor area* in which the room or space is located is *sprinklered*.

3.3.1.21. Common Laundry Rooms

(1) Except as permitted by Sentences (2) and (3), in a *building* of *residential occupancy*, a laundry room in a *floor area* that is not within a *dwelling unit* shall be separated from the remainder of the *building* by a *fire separation* having a *fire-resistance rating* not less than 1 h.

(2) The *fire-resistance rating* of the *fire separation* required by Sentence (1) is permitted to be not less than 45 min provided the *fire-resistance rating* required by Subsection 3.2.2. is permitted to be less than 1 h for,
(a) the floor assembly above the *floor area*, or
(b) the floor assembly below the *floor area*, if there is no floor assembly above.

(3) The *fire separation* required by Sentence (1) is not required to have a *fire-resistance rating* if the *floor area* in which the laundry room is located is *sprinklered*.

3.3.1.22. Obstructions

(1) No obstruction shall be permitted in any *occupancy* that would restrict the width of a normal *means of egress* from any part of a *floor area* to less than 750 mm unless an unobstructed alternative *means of egress* is provided adjacent to, accessible from, and plainly visible from the obstructed *means of egress*. (See Appendix A.)

3.3.1.23. Signs in Service Spaces

(1) Illuminated signs conforming to Sentence 3.4.5.1.(2) or (7) shall be provided to indicate the direction to egress points in a *service space* referred to in Sentence 3.2.1.1.(9).

3.3.1.24. Welding and Cutting

(1) Except as provided in Sentence (2), welding and cutting operations shall be located in a room,
(a) separated from the remainder of the *building* by a *fire separation* having a *fire-resistance rating* not less than 1 h, or
(b) protected by an automatic fire extinguishing system.

(2) Sentence (1) does not apply to an *industrial occupancy* where the welding and cutting operations do not present a fire or explosion hazard to adjacent areas.

3.3.2. Assembly Occupancy

3.3.2.1. Scope

(1) This Subsection applies to *assembly occupancies* and to outdoor places of assembly.

3.3.2.2. Fire Separations

(1) Except as permitted by Sentence (2), the seating area of a Group A, Division 1 *occupancy* shall be separated from adjacent *occupancies* in the *floor area* by a *fire separation* having a *fire-resistance rating* not less than 1 h if the *occupant load* in the seating area exceeds 200.

(2) The *fire-resistance rating* of the *fire separation* required by Sentence (1) is permitted to be less than 1 h but not less than 45 min provided the *fire-resistance rating* required by Subsection 3.2.2. is permitted to be less than 1 h for,
(a) the floor assembly above the *floor area*, or
(b) the floor assembly below the *floor area*, if there is no floor assembly above.

(3) If usable space exists under tiers of seats in arena type *buildings*, a *fire separation* with a *fire-resistance rating* not less than 45 min shall be provided between the space and the seats or the space shall be *sprinklered*.

(4) Except as required in Sentences (5) to (7), in an elementary or secondary school, a *hazardous classroom* shall be separated from the remainder of the *building* by a *fire-separation* having a *fire-resistance rating* not less than,
(a) 1 h where the *building* is not *sprinklered*, or
(b) 30 min where the *building* is *sprinklered*.

(5) Except as provided in Sentence (6), in an elementary or secondary school, a *hazardous classroom* containing an auto repair shop shall be separated from the remainder of the *building* by a *fire-separation* having a *fire-resistance rating* not less than,
(a) 2 h where the *building* is not *sprinklered*, or
(b) 1 h where the *building* is *sprinklered*.

(6) In an elementary or secondary school, if there is a group of *hazardous classrooms* or a group of *hazardous classrooms* and ancillary rooms of a complementary use, the *fire separation* required by Sentence (4) or (5) need not be provided within the group but the *fire separation* is required between the group and the remainder of the *building*.

(7) In an elementary or secondary school, a *hazardous classroom* containing a spray painting operation shall be separated from the remainder of the *building* by a *fire separation* having a *fire-resistance rating* not less than,
(a) 2 h, or
(b) 1 h where the spray painting operation is separated from the classroom by a *fire-separation* having a *fire-resistance rating* not less than 1 h.

(8) Except as required in Sentence (9), in an elementary or secondary school, where the *occupant load* of a room exceeds 200 persons, the room and any ancillary rooms of a complementary use shall be separated from the remainder of the *building* by a *fire separation* having a *fire-resistance rating* not less than,
(a) 1 h where the *building* is not *sprinklered*, or
(b) 30 min where the *building* is *sprinklered*.

(9) A kitchen shall not be located within the *fire compartment* required in Sentence (8).

3.3.2.3. Fixed Seats

(1) Except for the requirements of Article 3.3.2.7. for bench-type seats and except as required or permitted by Sentence (2) and Articles 3.3.2.9. and 3.3.2.10., fixed seats in places of assembly shall be,

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r1 # 3.3.3. Care, Care and Treatment or Detention Occupancy

3.3.3.1. Scope

r1 **(1)** This Subsection applies to *care occupancies*, *care and treatment occupancies* and *detention occupancies*. (See Appendix A.)

3.3.3.2. Fire Separations

r1 **(1)** The *fire separation* required by Sentence 3.3.5.5.(1) between a *care*, *care and treatment* or *detention occupancy* and a *repair garage* shall have no openings.

(2) Except as permitted by Sentence (4), in a Group B, Division 3 *occupancy*, walls between sleeping rooms and adjacent rooms shall be constructed as *fire separations* having a *fire-resistance rating* not less than 1 h, except that the *fire-resistance rating* need not be more than 45 min where the floor assembly is not required to be more than 45 min.

(3) Except as permitted by Sentence (4), in a Group B, Division 3 *occupancy*, walls separating corridors serving sleeping rooms from adjacent rooms shall be constructed as *fire separations* having a *fire-resistance rating* not less than 1 h, except that the *fire-resistance rating* need not be more than 45 min where the floor assembly is not required to be more than 45 min.

(4) The walls separating sleeping rooms from adjacent rooms and corridors in those parts of a *floor area* classified as a Group B, Division 3 *occupancy* shall be constructed as *fire separations* but are not required to have a *fire-resistance rating* if,
(a) those parts of the *floor area* contain sleeping accommodation for not more than 10 persons, and
(b) not more than six occupants require assistance in evacuation in case of an emergency.

(5) The door in the *fire-separation* required in Sentence (4) is permitted to be equipped with a roller latch and need not be provided with a self-closing device.

3.3.3.3. Corridors

(1) A corridor used by the public or serving patients or residents shall have no dead-end portion unless the area served by the dead-end portion has a second and separate *means of egress*.

(2) A corridor serving patients in a hospital shall be not less than 2 400 mm wide.

(3) Except as permitted in Sentence (5), a corridor serving residents who are not ambulatory in a Group B, Division 2 or 3 *occupancy* shall be not less than 1 650 mm wide.

(4) Paired doors in a corridor serving patients or residents shall,
(a) swing in opposite directions, the right hand door swinging in the direction of travel, and
(b) be not less than 1 100 mm wide.

(5) A corridor in a Group B, Division 3 *occupancy* that contains sleeping accommodation for not more than 10 persons and not more than six occupants require assistance in evacuation in case of an emergency need not comply with Sentence (3).

3.3.3.4. Doorway Width

r6 **(1)** In a Group B, Division 2 or 3 *occupancy*, the minimum clear width of doorways through which it is necessary to move a patient or resident in a bed shall be 1 050 mm. (See Appendix A.)

3.3.3.5. Hospitals and Long-Term Care Homes

(1) *Floor areas* containing patients' or residents' sleeping rooms in a hospital or long-term care home shall conform to Sentences (2) to (12). (See Appendix A.)

(2) Except as permitted by Sentence (3), a *floor area* containing patients' or residents' sleeping rooms in a hospital or long-term care home shall be divided into no fewer than two *fire compartments*, each not more than 1 000 m^2 in area.

(3) The *floor area* on either side of a *horizontal exit* conforming to Article 3.4.6.10. is permitted to be considered as a *fire compartment* in applying the requirements of this Article.

(4) Except as permitted by Sentence (5), *fire separations* separating *fire compartments* required by Sentence (2) shall have a *fire-resistance rating* not less than 1 h.

(5) The *fire-resistance rating* of a *fire separation* referred to in Sentence (4) is permitted to be less than 1 h but not less than 45 min provided the *fire-resistance rating* required by Subsection 3.2.2. is permitted to be less than 1 h for,
(a) the floor assembly above the *floor area*, or
(b) the floor assembly below the *floor area*, if there is no floor assembly above.

r11.1 **(6)** Reserved

(7) The travel distance from any point within each *fire compartment* referred to in Sentence (2) to a door to an adjoining *fire compartment* shall be not more than 45 m.

(8) Each *fire compartment* referred to in Sentence (2) shall be capable of accommodating, in addition to its own occupants, the occupants of the largest adjacent *fire compartment* based on a clear floor space of 2.5 m^2 per patient or resident in the adjacent *fire compartment*.

(9) Except as permitted by Sentences (10) and (11), walls between patients' or residents' sleeping rooms and the remainder of the *floor area* shall be constructed as *fire separations* but are not required to have a *fire-resistance rating* unless a *fire-resistance rating* is required by other provisions in this Part.

(10) The *fire separation* requirements of Sentence (9) do not apply to walls within a group of intercommunicating patients' or residents' rooms, provided the group of rooms does not
(a) contain more than five patients or residents, or
(b) include storage, bathing or toilet facilities serving persons not occupying the group of rooms.
(See Appendix A.)

(11) A door in a *fire separation* required by Sentence (9) is permitted to be equipped with a roller latch.

(12) A *fire separation* required by Sentence (9) shall not contain any grilles, louvres or other openings.

3.3.3.6. Protection for Special Care and Treatment Facilities

(1) Compartments containing rooms such as operating rooms, recovery rooms, delivery rooms, intensive care units and critical care units, from which it is impracticable to move patients in an emergency, shall be,
(a) separated from adjacent spaces by *fire separations* having a *fire-resistance rating* not less than 1 h, and
(b) provided with a mechanical air supply so that during a period of 2 h after the start of a fire in another space, the compartments will not contain more than 1% by volume of contaminated air from the fire area.

(3) A single *exit* is permitted from a *dwelling unit* provided the *exit* is an exterior doorway not more than 1.5 m above adjacent ground level and,
(a) it is not necessary to travel up or down more than 1 *storey* to reach the *exit* door, or
(b) the uppermost floor level opens to a balcony not more than 6 m above adjacent ground level.

(4) An egress door from either the uppermost *storey* or the lowest *storey* in a *dwelling unit*, as required in Sentence (2), need not be provided,
(a) except as required by Sentence (8), if that *storey* is served by a stairway that,
  (i) leads to a public *access to exit*,
  (ii) has no direct access to any other *storey* in the *dwelling unit*, and
  (iii) is separated from the other *storeys* in the *dwelling unit* by a *fire separation* having a *fire-resistance rating* of not less than 45 min,
(b) on the uppermost *storey* in the *dwelling unit* if the *dwelling unit* has not more than 2 *storeys* above the *first storey* of the *building*,
(c) if it is not necessary to travel either more than 18 m or more than 1 *storey* up or down within the *dwelling unit* to reach the egress door, or
(d) if that *storey* is,
  (i) provided with a balcony conforming to Sentence (7),
  (ii) not more than 2 *storeys* above or below the *dwelling unit* egress door, and
  (iii) in a *building* that is not more than 6 *storeys* in *building height*.

(5) In a *building* of *residential occupancy* not more than 3 *storeys* in *building height*, a doorway from a *dwelling unit* is permitted to open directly into an *exit* stairway provided the *dwelling unit* has a second and separate *means of egress*.

(6) If a *dwelling unit* has a second and separate *means of egress*, one *means of egress* from a *dwelling unit* is permitted to pass through,
(a) an interior corridor served by a single *exit*,
(b) an exterior balcony served by a single *exit* stairway, or
(c) an exterior passageway served by a single *exit* stairway.

(7) Where a balcony is provided to meet the requirements of Sentence (3) or (4), the balcony shall have,
(a) a solid floor having a *fire-resistance rating* not less than that required for a floor assembly between *suites*, and
(b) an area providing not less than 1.5 m^2 per *suite* occupant, based on *occupant load*, and a minimum dimension of 1 200 mm.

(8) Each *dwelling unit* in a *building* conforming to Subclause 3.2.2.44.(1)(a)(ii) shall be served by,
(a) a direct *exit* that is an exterior doorway located not more than 1.5 m above adjacent ground level, or
(b) a stairway that,
  (i) leads to an exterior doorway not more than 1.5 m above adjacent ground level,
  (ii) has no access to another *dwelling unit*, and
  (iii) is separated from the remainder of the *building* with a *fire separation* having a *fire-resistance rating* not less than 1 h.

3.3.4.5. Automatic Locking Prohibition

(1) Except for *hotels*, a door opening onto a *public corridor* that provides *access to exit* from a *suite* shall be designed not to lock automatically. (See Appendix A.)

3.3.4.6. Sound Transmission

r11.1 **(1)** *Buildings* containing *dwelling units* shall be constructed so that airborne noise is controlled in conformance with Section 5.8.

3.3.4.7. Stairs, Ramps, Landings, Handrails and Guards for Dwelling Units

(1) Except as required by Article 3.3.4.8., stairs, ramps, landings, handrails and interior *guards* within a *dwelling unit* shall conform to the applicable requirements in Section 9.8.

(2) Except as provided in Sentence (3), exterior stairs, ramps, landings, handrails and *guards* serving a single *dwelling unit* shall conform to the applicable requirements in Section 9.8. and Sentence 3.1.20.1.(1).

r3 **(3)** Loads on exterior *guards* serving a *single dwelling unit* shall comply with Part 4.

3.3.4.8. Protection of Openable Windows

(1) Except as provided by Sentence (2), openable windows in *suites* of *residential occupancy* shall be protected by,
(a) a *guard* with a minimum height of 1 070 mm constructed in accordance with Article 3.3.1.17., or
r5 (b) a mechanism capable of controlling the free swinging or sliding of the openable part of the window so as to limit any clear unobstructed opening to a size that will prevent the passage of a sphere having a diameter more than 100 mm.

(2) Windows need not be protected in accordance with Sentence (1) where,
(a) the only opening having greater dimensions than those allowed by Clause (1)(b) is located higher than 1 070 mm above the finished floor, or
(b) the bottom edge of the openable portion of the window is located less than 1 800 mm above the floor or ground on the other side of the window.

3.3.4.9. Stud Wall Reinforcement

(1) If wood wall studs or sheet steel wall studs enclose the main bathroom in a *dwelling unit*, reinforcement shall be installed to permit the future installation of the following:
(a) for a water closet, a grab bar described in Clauses 3.8.3.8.(3)(a) and a grab bar described in Clause 3.8.3.8.(3)(c),
r11.1 (b) for a shower, grab bars described in Clause 3.8.3.13.(2)(g), and
r11.1 (c) for a bathtub, grab bars described in Clause 3.8.3.13.(4)(e).
(See Appendix A.)

3.3.4.10. Resistance to Forced Entry

(1) Resistance to forced entry into *dwelling units* shall conform to the applicable requirements in Articles 9.7.5.2. and 9.7.5.3.

r6 3.3.4.11. Retirement Homes

(1) *Floor areas* containing residents' sleeping rooms in a *retirement home* shall conform to Sentences (2) to (12).

(2) Except as permitted by Sentence (3), a *floor area* containing residents' sleeping rooms in a *retirement home* where sleeping accommodation is provided for more than 10 residents shall be divided into no fewer than two *fire compartments*, each not more than 1 000 m^2 in area.

(3) The *floor area* on either side of a *horizontal exit* conforming to Article 3.4.6.10. is permitted to be considered as a *fire compartment* in applying the requirements of this Article.

(4) Except as permitted by Sentence (5), *fire separations* separating *fire compartments* required by Sentence (2) shall have a *fire-resistance rating* not less than 1 h.

(5) The *fire-resistance rating* of a *fire separation* referred to in Sentence (4) is permitted to be less than 1 h but not less than 45 min provided the *fire-resistance rating* required by Subsection 3.2.2. is permitted to be less than 1 h for,
(a) the floor assembly above the *floor area*, or
(b) the floor assembly below the *floor area*, if there is no floor assembly above.

(6) A *closure* in a *fire separation* between *fire compartments* referred to in Sentence (2) shall be weatherstripped or otherwise designed and installed to retard the passage of smoke.

(7) The travel distance from any point within each *fire compartment* referred to in Sentence (2) to a door to an adjoining *fire compartment* shall be not more than 45 m.

(8) Each *fire compartment* referred to in Sentence (2) shall be capable of accommodating, in addition to its own occupants, the occupants of the largest adjacent *fire compartment* based on a clear floor space of 1.5 m^2 per resident in the adjacent *fire compartment*.

(9) The *fire separation* required by Sentence 3.3.5.5.(1) between a *retirement home* and a *repair garage* shall have no openings.

(10) In a *retirement home*, a dead end *public corridor* is permitted provided it is not more than 3 m long.

(11) The minimum clear width of doorways serving residents in a *retirement home* shall be 860 mm.

(12) A voice communication system conforming to Article 3.2.4.23. shall be provided in a *retirement home*.

3.3.5. Industrial Occupancy

3.3.5.1. Scope

(1) This Subsection applies to *industrial occupancies*.

3.3.5.2. Fire Extinguishing Systems

(1) In addition to other requirements in this Division for the installation of automatic fire extinguishing systems, an appropriate fire extinguishing system shall be installed in every *industrial occupancy floor area* to provide protection if required by,
(a) the Fire Code made under the *Fire Protection and Prevention Act, 1997*, or
r11.1 (b) the CCBFC NRCC 56192, "National Fire Code of Canada", in the absence of provisions referred to in Clause (a).

3.3.5.3. Basements

(1) A *basement* shall not be used for the storage, manufacture or handling of volatile solids, liquids or gases that generate explosive air-vapour mixtures or for processes that involve explosive dusts.

(2) Entrances and *exits* to a *basement* and to rooms containing *building* services shall be separate from the remainder of the *building* in a *building* in which,
(a) the storage, manufacture or handling of volatile materials can generate explosive air-vapour mixtures, or
(b) processes occur that produce explosive dusts.

(3) *Basements* and rooms referred to in Sentence (2) shall be separated from the remainder of the *building* with a vapour-tight separation.

3.3.5.4. Repair and Storage Garages (See Appendix A.)

(1) If access is provided from a *storage garage* to a stair tower or elevator serving *occupancies* above the level of the *storage garage*, the access shall be through a vestibule conforming to Sentence 3.3.5.7.(3).

(2) Treads and landings in interior stairs that extend to the roof of a *storage garage* shall be designed to be free of accumulations of ice and snow.

(3) A mechanical *storage garage* not more than 4 *storeys* in *building height*, in which no persons other than parking attendants are permitted above the *street* floor level, need not have a *fire separation* between the *exits* and the remainder of the *building*.

(4) A garage shall be provided with natural or mechanical ventilation in conformance with the requirements of Subsection 6.2.2. to prevent excessive accumulation of carbon monoxide, exhaust fumes or flammable and toxic vapours.

(5) Except as required by Sentence 3.8.2.2.(2), the clear height in a *storage garage* shall be not less than 2 m.

(6) A continuous curb not less than 150 mm high and a *guard* not less than 1 070 mm high shall be provided at every garage floor opening and around the perimeter of every floor where the exterior walls are omitted.

(7) Except for *open-air storeys*, every *storey* of a *storage garage* or *repair garage* located below *grade* shall be *sprinklered*.

3.3.5.5. Repair Garage Separation

(1) A *repair garage* and any ancillary spaces serving it, including waiting rooms, reception rooms, tool and parts storage areas and supervisory office space, shall be separated from other *occupancies* by a *fire separation* having a *fire-resistance rating* not less than 2 h.

3.3.5.6. Storage Garage Separation

(1) Except as permitted by Sentences 3.3.4.2.(4) and (5), a *storage garage* shall be separated from other *occupancies* by a *fire separation* with a *fire-resistance rating* not less than 1.5 h.

3.3.5.7. Vestibules

r6 **(1)** If access is provided through a *fire separation* between a *storage garage* and a Group A, Division 1 or Group B *occupancy* or a *retirement home*, the access shall be through a vestibule conforming to Sentence (3).

(2) In a *building* more than 3 *storeys* in *building height*, access through a *fire separation* between a *storage garage* and a Group A, Division 2, 3 or 4, or a Group C *occupancy*, shall be through a vestibule conforming to Sentence (3).

(3) If access is provided through a vestibule, as required by Sentences (1), (2) and 3.3.5.4.(1), the vestibule shall,

(a) be not less than 1.8 m long,

(b) be ventilated,

  (i) naturally to outside air by a vent that has an unobstructed area of not less than 0.1 m^2 for each door that opens into the vestibule but not less than 0.4 m^2, or

  (ii) mechanically at a rate of 14 m^3/h for each square metre of vestibule floor surface area, and

(c) have openings between the vestibule and an adjoining *occupancy* provided with self-closing doors with no hold-open devices.

3.3.5.8. Toe-Boards Required

(1) Where tools or other objects could fall from the floor of an upper level to a lower level in a room or space intended for use as a Group F *occupancy*, the edge of the floor at the upper level shall be provided with a toe-board extending from the floor surface to a height at least 125 mm above the floor surface.

3.3.6. Design of Hazardous Areas

3.3.6.1. Application

(1) This Subsection applies to design and fire protection requirements for *buildings* or parts of *buildings* intended for the storage, handling, use and processing of,
(a) *dangerous goods*,
(b) materials that involve a risk of explosion or high flammability, and
(c) materials that are highly reactive.
(See Appendix A.)

r11.1 3.3.6.2. Storage of Dangerous Goods

(1) A room intended for the storage of solid and liquid *dangerous goods* classified as oxidizers or organic peroxides shall be separated from the remainder of the *building* by a *fire separation* having a *fire-resistance rating* of not less than 2 h.

(2) A room intended for the storage of reactive materials shall be separated from the remainder of the *building* by a *fire separation* having a *fire-resistance rating* of not less than 2 h. (See Appendix A.)

(3) The design and *construction* of a *building* or part of a *building* intended for the storage of *dangerous goods* classified as explosives shall conform to the *Explosives Act* (Canada) and the regulations made under that Act.

3.3.6.3. Indoor Storage of Compressed Gases

(1) Except as provided by Sentence (3), where required by the Fire Code made under the *Fire Protection and Prevention Act, 1997*, a room intended for the indoor storage of cylinders containing flammable *compressed gases* shall meet the following requirements,
(a) it is separated from the remainder of the *building* by a gas-tight *fire separation* having a *fire-resistance rating* of not less than 2 h,
(b) it is located on an exterior wall of the *building*,
(c) it can be entered from the exterior,
(d) it is ventilated in conformance with Sentence (4),
(e) it is constructed so that an exterior wall provides explosion venting,
  (i) in the ratio of 0.2 m^2 for each cubic metre of room volume, or
  (ii) in the ratio computed in accordance with NFPA 68, "Explosion Protection by Deflagration Venting", but in no case less than 0.065 m^2 of vent area for each cubic metre of room volume,
(f) it is not intended to contain fuel-fired equipment or high temperature heating elements, and
(g) it is not intended to be used for a purpose other than the storage of *compressed gas*.

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Table 3.4.2.1.A.
Criteria for One Exit, Floor Area not Sprinklered
Forming Part of Sentence 3.4.2.1.(2)

Occupancy of *Floor Area*	Maximum *Floor Area*, m^2	Maximum Travel Distance, m
Group A	150	15
Group C	100	15
Group D	200	25
Group E	150	15
Group F, Division 2	150	10
Group F, Division 3	200	15
Column 1	2	3

Table 3.4.2.1.B.
Criteria for One Exit, Floor Area Sprinklered
Forming Part of Sentence 3.4.2.1.(2)

Occupancy of *Floor Area*	Maximum *Floor Area*, m^2
Group A	200
Group B	100
Group C	150
Group D	300
Group E	200
Group F, Division 2	200
Group F, Division 3	300
Column 1	2

(6) Every room containing an *assembly occupancy* serving a *hotel*, and located in the *building* containing the *hotel*, shall be provided with no fewer than,
(a) three separate egress doorways from the room where the *occupant load* is more than 600 persons, and
(b) four separate egress doorways from the room where the *occupant load* is more than 1 000 persons.

(7) Each egress doorway in Sentence (6) shall be considered as contributing not more than,
(a) one-third of the required width where three egress doorways are required, and
(b) one-fourth of the required width where four egress doorways are required.

3.4.2.2. Mezzanine Exiting

(1) Except as permitted by Sentences (2) to (4), a *mezzanine* shall be provided with *exits* on the same basis as required for *floor areas* by this Section.

(2) A *mezzanine* need not conform to Sentence (1) provided Article 3.2.8.2. does not require it to terminate at a vertical *fire separation*.

(3) In a *floor area* that is not *sprinklered*, a *mezzanine* need not conform to Sentence (1) where Article 3.2.8.1. does require it to terminate at a vertical *fire separation* provided the total *occupant load* of the *mezzanine* is not more than 60 and,

(a) the area of the *mezzanine* does not exceed the area limits for rooms and *suites* in Table 3.3.1.5.A., and

(b) the distance limits in Table 3.3.1.5.A. are not exceeded from any point on the *mezzanine* to,

(i) the egress doorway from the room in which the *mezzanine* is located if that room has a single egress doorway, or

(ii) an egress facility leading from the *mezzanine* if the room in which the *mezzanine* is located has two egress doorways provided in conformance with Subsection 3.3.1.

(4) In a *floor area* that is *sprinklered*, a *mezzanine* need not conform to Sentence (1) where Article 3.2.8.1. does require it to terminate at a vertical *fire separation* provided the total *occupant load* of the *mezzanine* is not more than 60 and,

(a) the area of the *mezzanine* does not exceed the area limits for rooms and *suites* in Table 3.3.1.5.B., and

(b) the distance of travel is not more than 25 m when measured from any point on the *mezzanine* to,

(i) the egress doorway from the room in which the *mezzanine* is located if that room has a single egress doorway, or

(ii) an egress facility leading from the *mezzanine* if the room in which the *mezzanine* is located has two egress doorways provided in conformance with Subsection 3.3.1.

3.4.2.3. Distance Between Exits

(1) Except as provided in Sentence (2), the least distance between two required *exits* from a *floor area* shall be,

(a) one-half the maximum diagonal dimension of the *floor area*, but need not be more than 9 m for a *floor area* having a *public corridor*, or

(b) one-half the maximum diagonal dimension of the *floor area*, but not less than 9 m for all other *floor areas*.

(See Appendix A.)

(2) *Exits* need not comply with Sentence (1) where,

(a) the *floor area* is divided so that not less than one-third of the *floor area* is on each side of the *fire separation*, and

(b) it is necessary to pass through the *fire separation* to travel from one *exit* to another *exit*.

(3) The minimum distance between *exits* referred to in Sentence (1) shall be the shortest distance that smoke would have to travel between the *exits*, assuming that the smoke will not penetrate an intervening *fire separation*.

r11.1 **(4)** The distance between exterior doors leading from two or more *exit* stairs serving the same *floor area* shall be,

(a) not less than 9 m, or

(b) not less than 6 m, where,

(i) the building is sprinklered, and

(ii) the exterior doors are located within 15 m of a *street*.

3.4.2.4. Travel Distance

(1) Except as permitted by Sentence (2), for the purposes of this Subsection, travel distance means the distance from any point in the *floor area* to an *exit* measured along the path of travel to the *exit*.

(2) The travel distance from a *suite* or a room not within a *suite* is permitted to be measured from an egress door of the *suite* or room to the nearest *exit* provided,

(a) the *suite* or room is separated from the remainder of the *floor area* by a *fire separation*,

(i) having a *fire-resistance rating* not less than 45 min in a *floor area* that is not *sprinklered*, or

(ii) that is not required to have a *fire-resistance rating*, in a *floor area* that is *sprinklered*, and

(b) the egress door opens onto,

(i) an exterior passageway,

(ii) a corridor used by the public that is separated from the remainder of the *floor area* in conformance with the requirements in Article 3.3.1.4. for the separation of *public corridors*, or

(iii) a *public corridor* that is separated from the remainder of the *floor area* in conformance with Article 3.3.1.4.

(3) Travel distance to an *exit* shall be not more than 50 m from any point in a *service space* referred to in Sentence 3.2.1.1.(9).

(4) If there is a *firewall* in an elementary or secondary school, the travel distance shall not be measured to a door in the *firewall*, but shall be measured to an exterior *exit* door or an *exit* door to a stairway.

3.4.2.5. Location of Exits

(1) Except as permitted by Sentences (2), 3.2.8.4.(4) and 3.3.2.4.(13) to (16), if more than one *exit* is required from a *floor area*, the *exits* shall be located so that the travel distance to at least one *exit* shall be not more than,

(a) 25 m in a *high hazard industrial occupancy*,
(b) 40 m in a *business and personal services occupancy*,
(c) 45 m in a *floor area* that contains an *occupancy* other than a *high hazard industrial occupancy*, provided it is *sprinklered*,
(d) 105 m in any *floor area*, served by a *public corridor*, in which rooms and *suites* are not separated from the remainder of the *floor area* by a *fire separation*, provided,
  (i) the *public corridor* is not less than 9 m wide,
  (ii) the ceiling height in the *public corridor* is not less than 4 m above all floor surfaces,
  (iii) the *building* is *sprinklered*, and
  (iv) not more than one-half of the required egress doorways from a room or *suite* open into the *public corridor* if the room or *suite* is required to have more than one egress doorway,
(e) 60 m in any *storage garage* that conforms to the requirements of Article 3.2.2.83., and
(f) 30 m in any *floor area* other than those referred to in Clauses (a) to (e).

(2) Except for a *high hazard industrial occupancy*, Sentence (1) need not apply if *exits* are placed along the perimeter of the *floor area* and are not more than 60 m apart, measured along the perimeter, provided each main aisle in the *floor area* leads directly to an *exit*.

(3) *Exits* shall be located and arranged so that they are clearly visible or their locations are clearly indicated and they are accessible at all times.

3.4.2.6. Principal Entrance

(1) For the purposes of this Section, at least one door at every principal entrance from ground level shall be designed in accordance with the requirements for *exits*.

r11.1 **(2)** In a *building* that is not *sprinklered* in accordance with Sentence 3.2.5.13.(1), the principal entrance serving a dance hall or a licensed beverage establishment with an *occupant load* more than 250 shall provide at least one-half of the required *exit* width.

3.4.3. Width and Height of Exits

3.4.3.1. Exit Width Based on Occupant Load

(1) For the purpose of determining the aggregate width of *exits*, the *occupant load* of every room or *floor area* shall be determined in conformance with Subsection 3.1.17.

(2) Except as permitted by Sentence 3.4.3.2.(4), the required *exit* width shall be cumulative if two or more *exits* converge.

3.4.3.2. Exit Width

(1) Except as permitted by Sentence (3), the minimum aggregate required width of *exits* serving *floor areas* intended for *assembly occupancies*, *residential occupancies*, *business and personal services occupancies*, *mercantile occupancies*, and *industrial occupancies* shall be determined by multiplying the *occupant load* of the area served by,

(a) 6.1 mm per person for ramps with a slope of not more than 1 in 8, doorways, corridors and passageways,

(b) 8 mm per person for a stair consisting of steps whose rise is not more than 180 mm and whose run is not less than 280 mm, or

(c) 9.2 mm per person for,

  (i) ramps with a slope of more than 1 in 8, or

  (ii) stairs, other than stairs conforming to Clause (b).

r1 **(2)** The minimum aggregate width of *exits* serving *floor areas* intended for a *care*, *care and treatment* or *detention occupancy* shall be determined by multiplying the *occupant load* of the area served by 18.4 mm per person.

(3) The minimum aggregate width of *means of egress* serving a Group A, Division 4 *occupancy* shall be determined by multiplying the *occupant load* of the area served by,

(a) 1.8 mm per person for,

  (i) aisles,

  (ii) stairs other than *exit* stairs, and

  (iii) ramps and passageways in vomitories and *exits*, and

(b) 2.4 mm per person for *exit* stairs.

(4) Except as required by Sentence (5), the required *exit* width need not be cumulative in an *exit* serving two or more *floor areas* located one above the other.

(5) The required *exit* width for an *exit* stair in an assembly hall or *theatre* serving more than one balcony level shall conform to the appropriate requirements for stairs serving *interconnected floor spaces* in Article 3.2.8.4.

(6) If more than one *exit* is required, every *exit* shall be considered as contributing not more than one-half of the required *exit* width.

(7) The width of an *exit* shall be not less than,

(a) 1 100 mm for corridors and passageways,

(b) 1 100 mm for ramps not serving patients' or residents' sleeping rooms,

(c) 1 100 mm for stairs, not serving patients' or residents' sleeping rooms, that serve more than two *storeys* above the lowest *exit level* or more than one *storey* below the lowest *exit level*,

(d) 900 mm for stairs, not serving patients' or residents' sleeping rooms, that serve not more than two *storeys* above the lowest *exit level* or not more than one *storey* below the lowest *exit level*,

(e) 1 650 mm for stairs and ramps serving patients' or residents' sleeping rooms,

(f) 1 050 mm for doorways serving patients' or residents' sleeping rooms, and

(g) 790 mm for doorways not serving patients' or residents' sleeping rooms.

(See Appendix A.)

3.4.3.3. Exits from Interconnected Floor Space

(1) *Exit* stairs that serve *interconnected floor spaces* as provided in Articles 3.2.8.3. to 3.2.8.11. shall conform to the requirements in Article 3.2.8.4. and in this Section.

3.4.3.4. Exit Width Reduction (See Appendix A.)

(1) Except as permitted by Sentences (2) to (4), no fixture, turnstile or construction shall project into or be fixed within the required width of an *exit*.

(2) *Exit* doors shall be hung so that, when open, they shall neither diminish nor obstruct the required width of the *exit* by more than 50 mm for each door leaf.

(3) Swinging doors in their swing shall not reduce the required width of *exit* stairs or landings to less than 750 mm or reduce the width of an *exit* passageway to less than the minimum required width.

(4) Handrails and construction below handrails are permitted to project into the required width of *means of egress* but the projections shall be not more than 100 mm on each side of the required width.

(5) In an elementary or secondary school, where a stair lift is installed in an *exit* stair, an intermediate handrail shall be installed between the path of travel of the stair lift and the remainder of the stair to ensure that the stair lift will not reduce the required width of the *exit* stair.

3.4.3.5. Headroom Clearance (See Appendix A.)

(1) Except as provided by Sentences (2), (4) and (5), every *exit* shall have a clear height over the clear width of the *exit* of not less than 2 100 mm.

(2) The clear height of stairways shall be measured vertically, over the clear width of the stairway, from a straight line tangent to the tread and landing nosings to the lowest point above, and shall not be less than 2 050 mm.

(3) The clear height of landings shall be measured vertically, over the clear width of the landing, to the lowest point above.

(4) Except as permitted by Sentence (5), the clear height of doorways shall not be less than 2 030 mm.

(5) No door closer or other device shall be installed so as to reduce the clear height of a doorway to less than 1 980 mm.

3.4.4. Fire Separation of Exits

3.4.4.1. Fire-Resistance Rating of Exit Separations

r5 **(1)** Except as provided by Sentences (2), (3) and (5) and Sentences 3.3.5.4.(3), 3.4.4.2.(2), 3.4.4.3.(1) and 3.13.3.1.(3), every *exit* shall be separated from the remainder of the *building* by a *fire separation* having a *fire-resistance rating* not less than that required by Subsection 3.2.2., but not less than 45 min, for,
(a) the floor assembly above the *storey*, or
(b) the floor assembly below the *storey*, if there is no floor assembly above.

(2) The *fire-resistance rating* of the *fire separation* referred to in Sentence (1) need not be more than 2 h.

r5 **(3)** In a *building* within the scope of Article 3.2.2.43A. or 3.2.2.50A., the *fire-resistance rating* of the *fire separation* referred to in Sentence (1) shall not be less than 1.5 h.

r5 **(4)** If an *exit* stair in an assembly hall or *theatre* serves more than one balcony level, the *exit* stair shall be separated from the remainder of the *building* in conformance with Sentence (1).

r5 **(5)** The path of *exit* travel may lead from an *exit* door or *exit* enclosure through *open air* parking that is located below a roof or floor assembly that is part of the *building* served by the *exit* door or *exit* enclosure where,
(a) the portion of the path of *exit* travel that leads through the *open air* parking is not more than 9 m in length measured from the *exit* door to a point at ground level at the perimeter of the *building*,
(b) measures are taken to prevent vehicles intended to park in spaces adjacent to the path of *exit* travel from encroaching on the path of *exit* travel, and
(c) an alternate *means of egress* not leading through the *open air* parking is available from the interior side of the door opening onto the path of *exit* travel through the *open air* parking area.

3.4.4.2. Exits Through Lobbies

(1) Except as permitted by Sentence (2), no *exit* from a *floor area* above or below the *first storey* shall lead through a lobby.

(2) Not more than one *exit* from a *floor area* is permitted to lead through a lobby provided,
(a) the lobby floor is not more than 4.5 m above *grade*,
(b) the path of travel through the lobby to the outdoors is not more than 15 m,
(c) the adjacent rooms or premises having direct access to the lobby do not contain a *residential occupancy* or an *industrial occupancy*, except that *dwelling units* may open directly onto the lobby where,
  (i) from the interior of the *exit* stair that opens onto the lobby there is alternate *means of egress* not leading through the lobby and such *means of egress* is entirely within the same *storey* as the lobby, or
  (ii) the *floor area* is *sprinklered*,
(d) except as required by Clause (g), the lobby is not located within an *interconnected floor space* other than as described in Sentence 3.2.8.2.(6),
(e) the lobby conforms to the requirements for *exits*, except that,
  (i) rooms other than *service rooms* and storage rooms are permitted to open onto the lobby,
  (ii) the *fire separation* between the lobby and a room used for the sole purpose of control and supervision of the *building* need not have a *fire-resistance rating*,
  (iii) the *fire separation* between the lobby and adjacent *occupancies* that are permitted to open onto the lobby need not have a *fire-resistance rating* provided the lobby and adjacent *occupancies* are *sprinklered,* and
  (iv) passenger elevator entrances are permitted to open onto the lobby provided the elevator entrance doors are designed to remain closed except while loading and unloading,
  (See Appendix A.)
(f) a *fire separation*, constructed in accordance with Sentence 3.4.4.1.(1), is maintained between the lobby and any *exit* permitted by this Sentence to lead through the lobby, and
(g) that if the *exit* serves a *hotel*, the lobby is not located within an *interconnected floor space*.

3.4.4.3. Exterior Passageway Exceptions

(1) The requirements of Sentences 3.4.4.1.(1) and 3.2.3.13.(1) and (3) do not apply to an exterior *exit* passageway provided,
(a) not less than 50% of the exterior side is open to the outdoors, and
(b) an *exit* stair is provided at each end of the passageway.

3.4.4.4. Integrity of Exits

(1) A *fire separation* that separates an *exit* from the remainder of the *building* shall have no openings except for,
(a) standpipe and sprinkler piping,
(b) electrical wires and cables, totally enclosed *noncombustible* raceways and *noncombustible* piping that serve only the *exit*,
(c) openings required by the provisions of Subsection 3.2.6.,
(d) *exit* doorways,
(e) wired glass and glass block permitted by Article 3.1.8.14., and
(f) a sprinkler protected glazed wall assembly conforming to Article 3.1.8.18.

(2) *Exits* within scissors stairs and other contiguous *exit* stairways shall be separated from each other by a smoke-tight *fire separation* having a *fire-resistance rating* not less than that required for the floor assembly through which they pass.

(3) *Fire separations* separating contiguous stairs described in Sentence (2) shall not be pierced by doorways, ductwork, piping or any other openings that affect the continuity of the separation.

(4) A fuel-fired *appliance* shall not be installed in an *exit*.

(5) An *exit* shall not be used as a *plenum* for a heating, ventilating or *air-conditioning* system.

(6) An *exit* shall be designed for no purpose other than for exiting, except that an *exit* is permitted also to be designed to serve as an access to a *floor area*.

(7) A *service room* shall not open directly into an *exit*.

(8) Storage rooms, washrooms, toilet rooms, laundry rooms and similar ancillary rooms shall not open directly into an *exit*.

(9) *Service spaces* referred to in Sentence 3.2.1.1.(9) shall not open directly into an *exit*.

(10) In elementary and secondary schools, an *exit* shall be designed so that it does not serve as an access from one portion of a *floor area* to another portion of the same *floor area*.

3.4.5. Exit Signs

3.4.5.1. Exit Signage

(1) Except as provided by Sentences (9) and (10), every *exit* door shall have an *exit* sign placed over or adjacent to it if the *exit* serves,
(a) a *building* more than 2 *storeys* in *building height*,
(b) a *building* having an *occupant load* of more than 150, or
(c) a room or *floor area* that has a fire escape as part of a required *means of egress*.

(2) Except as provided by Sentence (7), every *exit* sign shall,
(a) be visible on approach to the *exit*,
r5 (b) consist of a green pictogram and white graphic symbol meeting the visibility specifications referred to in ISO 3864-1, "Graphical Symbols – Safety Colours and Safety Signs – Part 1: Design Principles for Safety Signs and Safety Markings", and
r11.1 (c) conform to ISO 7010, "Graphical Symbols - Safety Colours and Safety Signs - Registered Safety Signs" for the following symbols:
(i) E001 emergency exit left,
(ii) E002 emergency exit right,
(iii) E005 90-degree directional arrow, and
(iv) E006 45-degree directional arrow.
(See Appendix A.)

(3) Internally illuminated *exit* signs shall,
(a) be continuously illuminated, and
r11.1 (b) where illumination of the sign is powered by an electrical circuit, be constructed in conformance with CSA C22.2 No. 141, "Emergency Lighting Equipment".

(4) Externally illuminated *exit* signs shall be continuously illuminated by a light fixture supplied by an electrical circuit.

(5) Photoluminescent and self-luminous *exit* signs shall,
(a) conform to CAN/ULC-S572, "Photoluminescent and Self-Luminous Signs and Path Marking Systems",
r5 (b) be labelled in accordance with the time duration for which they have been tested and *listed*,
r5 (c) be so installed that upon failure of the regular power they will continue to be illuminated for the applicable time duration specified in Clause 3.2.7.4.(1)(b), and
r5 (d) be continuously illuminated if reliant on an external energy source to energize the reflective coating of the sign.
(See Appendix A.)

(6) If illumination of an *exit* sign is provided from an electrical circuit, that circuit shall,
(a) serve no equipment other than emergency lighting in the area where *exit* signs are installed, and
(b) be connected to an emergency power supply as described in Sentence 3.2.7.4.(1).

(7) Where no *exit* is visible from a *public corridor*, from a corridor used by the public in a Group A or B *major occupancy* or from principal routes serving an open *floor area* having an *occupant load* of more than 150, an *exit* sign conforming to Clauses (2)(b) and (c) with an arrow or other indicator pointing at the direction of egress shall be provided.

(8) Except for egress doorways described in Sentence 3.3.2.3.(4), an *exit* sign conforming to Sentences (2) to (6) shall be placed over or adjacent to every egress doorway from rooms with an *occupant load* more than 60 in Group A, Division 1 *occupancies*, dance halls, licensed beverage establishments and other similar *occupancies* that, when occupied, have lighting levels below the level that would provide easy identification of the egress doorway.

(9) Except for *suite* doors opening directly to the exterior, every *exit* serving a *hotel* shall have an *exit* sign placed over or adjacent to it.

(10) An *exit* sign is not required within a *suite* containing a Group B, Division 3 *occupancy* if the following requirements are met:
(a) the *suite* contains sleeping accommodation for not more than 10 persons, and
(b) not more than 6 occupants require assistance in evacuation in case of an emergency.

3.4.5.2. Signs Within Exit Facilities

(1) In a *building* more than 2 *storeys* in *building height*, any part of an *exit* ramp or stair that continues up or down past the lowest *exit level* shall be clearly marked by a sign indicating that it does not lead to an *exit*.

(2) An *exit* stair serving a *building* more than 6 *storeys* in *building height* shall be clearly marked by signs indicating that it does not lead to an *exit* at the roof level. (See Appendix A.)

3.4.6. Types of Exit Facilities (See Appendix A.)

r4 3.4.6.1. Surface Finish of Ramps and Stairs

(1) The surfaces of ramps, landings and treads shall,
(a) have a finish that is slip-resistant, and
(b) if accessible to the public, have a colour contrast or a distinctive visual pattern to demarcate,
  (i) the leading edge of the tread,
  (ii) the leading edge of the landing, and
  (iii) the beginning and end of a ramp.

(2) A tactile attention indicator conforming to Article 3.8.3.18. shall be installed,
(a) at the top of the stairs, starting one tread depth back from the edge of the top stair, and
r5 (b) at the leading edge of landings where a doorway opens onto stairs, starting one tread depth back from the edge of the landing.
(See Appendix A.)

(3) Treads and landings of exterior *exit* stairs shall be designed to be free of ice and snow accumulations if the stairs,
(a) are more than 10 m high, or
(b) serve a *hotel*.

3.4.6.2. Minimum Number of Risers

(1) Except as permitted by Sentence 3.3.2.13.(1), every flight of interior stairs shall have no fewer than 3 risers.

3.4.6.3. Maximum Vertical Rise of Stair Flights and Required Landings

(1) No flight of stairs shall have a vertical rise of more than 3.7 m between floors or landings, except that a flight of stairs serving as an *exit* in a Group B, Division 2 or 3 *occupancy* shall have a vertical rise not more than 2.4 m between floors or landings.

(2) Except as provided by Sentence (3), a landing shall be provided,
(a) at the top and bottom of each flight of interior and exterior stairs,
(b) at the top and bottom of every section of ramp,
(c) where a doorway opens onto a stair or ramp,
(d) where a ramp opens onto a stair, and
(e) where a stair opens onto a ramp.

(3) A landing may be omitted at the bottom of an exterior stair or ramp, provided there is no gate, door or fixed obstruction within the lesser of,
(a) the width of the stair or ramp, or
(b) 1 100 mm.

3.4.6.4. Dimensions of Landings

(1) Except as provided by Sentence (4), the length and width of a landing shall be at least the width of the stairway or ramp in which it occurs, except that in a straight run the length of the landing need not be more than 1 100 mm.

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3.4.6.8. Treads and Risers

(1) Except as permitted for *dwelling units* and by Sentence 3.4.7.5.(1) for fire escapes, steps for stairs shall have a run of not less than 255 mm and not more than 355 mm between successive steps.

(2) Steps for stairs referred to in Sentence (1) shall have a rise between successive treads not less than 125 mm and not more than 200 mm.

(3) Except in fire escape stairs and where an exterior stair adjoins a *walkway* as permitted by Sentence 3.4.6.3.(3), risers, measured as the vertical nosing-to-nosing distance, shall be of uniform height in any one flight, with a maximum tolerance of,
(a) 5 mm between adjacent treads or landings, and
(b) 10 mm between the tallest and shortest risers in a flight.

(4) Except in fire escape stairs, treads, measured as the horizontal nosing-to-nosing distance, shall have a uniform run with a maximum tolerance of,
(a) 5 mm between adjacent treads, and
(b) 10 mm between the deepest and shallowest treads in a flight.

(5) Treads and risers shall not differ significantly in run and rise in successive flights in any stair system.
(See Appendix A.)

(6) Where angled treads are incorporated into a stair, the treads in all sets of angled treads within a flight shall turn in the same direction.

(7) The slope on treads or landings shall not exceed 1 in 50.

(8) Except as permitted by Sentence (10), the top of the nosing of a stair tread shall have a rounded or bevelled edge extending not less than 6 mm and not more than 13 mm measured horizontally from the front of the nosing.

(9) The front edge of stair treads in *exits* and public *access to exits* shall be at right angles to the direction of *exit* travel.

(10) If resilient material is used to cover the nosing of a stair tread, the minimum radius or bevel required by Sentence (8) is permitted to be reduced to 3 mm.

3.4.6.9. Curved Stairs

(1) Except as permitted by Sentence (2), tapered treads shall not be used in an *exit*.

(2) A curved stair used as an *exit* shall have,
(a) a handrail on each side,
(b) treads with a minimum run of 240 mm exclusive of nosings,
(c) treads that conform to Article 3.4.6.8. where they are measured 230 mm away from the handrail at the narrow end of the tread, and
(d) an inside radius that is not less than twice the stair width.

3.4.6.10. Horizontal Exits

(1) Except in an elementary or secondary school that is subdivided by a *firewall*, the *floor area* on each side of a *horizontal exit* shall be sufficient to accommodate the occupants of both *floor areas*, allowing not less than 0.5 m^2 of clear floor space per person, except that 1.5 m^2 shall be provided for each person in a wheelchair and 2.5 m^2 for each patient in bed.

(2) If vestibules, enclosed balconies or bridges are used as parts of a *horizontal exit*, their clear width shall be not less than that of the *exit* doorways opening into them, except that handrails are not permitted to project into this clear width more than 100 mm.

(3) In a *horizontal exit* where there is a difference in level between the connected *floor areas*, slopes not more than those specified for ramps in Article 3.4.6.7. are permitted to be used.

(4) No stairs or steps shall be used at a *horizontal exit*.

(5) If two doors are provided in a *horizontal exit* that comprises a part of the required number of *exits* from the *floor areas* on both sides of the *exit,*

(a) the doors shall be mounted adjacent to each other with the door on the right side in the direction of travel through the *horizontal exit* swinging in the direction of travel through the *horizontal exit*, and

(b) signs shall be provided on each side of the *horizontal exit* to indicate the door that swings in the direction of travel from that side.

(See Appendix A.)

(6) If a *horizontal exit* utilizes bridges between *buildings* or outside balconies, the bridges or balconies shall conform to Article 3.2.3.19.

(7) Any change in floor level from one side of a *horizontal exit* to the other side shall not exceed 2 000 mm.

3.4.6.11. Doors

(1) The distance between a stair riser and the leading edge of a door during its swing shall be not less than 300 mm.

r11.1 **(1.1)** Except as provided in Sentence (2) and where a threshold is used to contain spillage, a threshold for a doorway in an *exit* shall be not more than 13 mm higher than the surrounding finished floor surface.

(2) No *exit* door shall open directly onto a step except that, if there is danger of blockage from ice or snow, an *exit* door is permitted to open onto not more than one step which shall be not more than 150 mm high.

(3) *Exit* doors shall be clearly identifiable. (See Appendix A.)

(4) No door leaf in an *exit* doorway with more than one leaf shall be less than 600 mm wide.

r11.1 **(5)** Where an *exit* door leading directly to the outside is subject to being obstructed by a parked vehicle or storage because of its location, a visible sign prohibiting such obstructions shall be permanently mounted on the exterior side of the door.

3.4.6.12. Direction of Door Swing

r11.1 **(1)** Except as permitted by Sentences (2) to (4) and Article 3.4.6.14., every *exit* door shall,

(a) open in the direction of *exit* travel, and

(b) swing on its vertical axis.

(2) A door serving a single *dwelling unit* shall swing on its vertical axis.

(3) Except in a *high hazard industrial occupancy*, an *exit* door need not swing in the direction of *exit* travel where it serves,

(a) a room, *suite* or *floor area* having an *occupant load* of not more than 60 persons, or

(b) as part of a *means of egress* from more than one *floor area* and the *floor areas* so served have a total *occupant load* of not more than 60 persons.

r11.1 **(4)** *Exit* doors need not conform to Sentence (1) where they serve,
(a) *storage garages* serving not more than one *dwelling unit*,
(b) accessory *buildings* serving not more than one *dwelling unit*, or
(c) storage *suites* not more than 28 m^2 in area that are on the *first storey* of a warehouse and open directly outdoors at ground level.

3.4.6.13. Self-Closing Devices

(1) An *exit* door that is normally required to be kept closed,
(a) shall be provided with a self-closing mechanism, and
(b) shall not be secured in an open position except as permitted by Sentence 3.1.8.12.(1).

3.4.6.14. Sliding Doors

r11.1 **(1)** Except as permitted by Sentences (2) and 3.4.6.12.(4), an exit *door* leading directly to outdoors at ground level is permitted to be a sliding door provided it is released in conformance with Sentence 3.3.1.11.(1).

(2) An *exit* door serving a Group B, Division 1 *occupancy*, or an *impeded egress zone* in other *occupancies*, is permitted to be a sliding door that does not conform to Sentence 3.3.1.11.(1) provided it is designed to be released in conformance with Article 3.3.1.12.

3.4.6.15. Revolving Doors

(1) Except as permitted by Sentence (3), a revolving door, if used, shall,
(a) be collapsible,
(b) have hinged doors providing equivalent exiting capacity located adjacent to it,
(c) be used as an *exit* from the ground floor level only,
(d) be not less than 3 m from the foot of any stairway, and
(e) have all glass in door leaves and enclosure panels conforming to,
  (i) CAN/CGSB-12.1-M, "Tempered or Laminated Safety Glass", or
  (ii) CAN/CGSB-12.11-M, "Wired Safety Glass".

(2) Except as permitted by Sentence (3), a revolving door shall not be considered to have an exiting capacity for more than 45 persons.

(3) An electrically powered revolving door is not required to conform to Sentences (1) and (2) provided,
(a) the door leaves will collapse and stop automatic rotation of the door system and not obstruct the doorway if a force not more than that specified in Sentence 3.4.6.16.(2) is applied at the centre of a door leaf,
(b) the door leaves are capable of being opened from inside the *building* without requiring keys, special devices, or specialized knowledge of the door opening mechanism,
(c) the allowable exiting capacity is based on the clear width of passage through the door enclosure when the doors are fully collapsed,
(d) a permanent sign, whose centreline is between 1 000 mm and 1 500 mm above the floor, is placed on each face of each door leaf indicating the method for collapsing the door leaf in an emergency, and
(e) glass used for door leaves and enclosure panels is safety glass conforming to,
  (i) CAN/CGSB-12.1-M, "Tempered or Laminated Safety Glass", or
  (ii) CAN/CGSB-12.11-M, "Wired Safety Glass".

3.4.6.16. Door Release Hardware

(1) Except for *dwelling units*, except for devices on doors serving a *contained use area* or an *impeded egress zone* designed to be released in conformance with Article 3.3.1.12., and except as permitted by Sentence (4), locking, latching and other fastening devices on every *exit* door shall permit the door to be readily opened from the inside with not more than one releasing operation and without requiring keys, special devices or specialized knowledge of the door opening mechanism. (See Appendix A.)

(2) If a door is equipped with a latching mechanism, a device that will release the latch and allow the door to swing wide open when a force of not more than 90 N is applied to the device in the direction of travel to the *exit* shall be installed on,

(a) every *exit* door from a *floor area* containing an *assembly occupancy* having an *occupant load* more than 100,
(b) every door leading to an *exit* lobby from an *exit* stair shaft, and every exterior door leading from an *exit* stair shaft in a *building* having an *occupant load* more than 100, and
(c) every *exit* door from a *floor area* containing a *high hazard industrial occupancy*.

(3) Except as required by Sentence 3.8.3.3.(7), every *exit* door shall be designed and installed so that, when the latch is released, the door will open under a force of not more than 90 N, applied at the knob or other latch releasing device.

(4) Except as permitted by Sentence 3.3.1.12.(6), electromagnetic locks that do not incorporate latches, pins or other similar devices to keep the door in the closed position are permitted to be installed on *exit* doors other than doors described in Sentence (5) provided,

(a) the *building* is equipped with a fire alarm system conforming to Subsection 3.2.4.,
(b) the locking device, and all similar devices in the *access to exit* leading to the *exit* door, are installed as ancillary devices to the fire alarm system and release immediately upon activation of,
  (i) the *alarm signal* where a single stage fire alarm system is installed,
  (ii) except as provided in Subclause (iii), the *alert signal* where a two stage fire alarm system is installed, or
r6 (iii) the *alarm signal* of a two stage fire alarm system installed in a *care*, *care and treatment* or *detention occupancy* or in a *retirement home*,
(c) the locking device releases immediately upon loss of power to the fire alarm control panel or loss of power controlling the electromagnetic locking mechanism and its associated auxiliary controls,
(d) the locking device releases immediately upon actuation of a manually operated switch readily accessible only to authorized personnel and located near the main entrance of the *building* or in the central alarm and control facility of Sentence 3.2.6.7.(1),
(e) the locking device releases immediately upon a fault being detected in the electrical circuit between the fire alarm control panel and the controller of the locking device,
(f) the locking device releases immediately upon the operation of a manual pull station for the fire alarm system located on the wall not more than 600 mm from the door,
(g) a legible sign having the words **EMERGENCY EXIT UNLOCKED BY FIRE ALARM** is permanently mounted on the door,
(h) the lettering on the sign required in Clause (g) is at least 25 mm high with a 5 mm stroke,
(i) upon release, the locking device must be reset manually by the actuation of the switch referred to in Clause (d),
(j) the operation of any by-pass switch, where provided for testing of the fire alarm system, causes an audible signal and a visual signal to be indicated at the fire alarm annunciator panel and at the monitoring station referred to in Clause 3.2.4.8.(4) (a), and
(k) emergency lighting is provided at the doors.

(See Appendix A.)

(5) Except as permitted by Sentences (6) and (7), electromagnetic locks are not permitted to be installed on *exit* doors,

(a) described in Clause (2)(a), (b) or (c),
(b) serving an elementary or secondary school, or
(c) leading directly from a *high hazard industrial occupancy*.

r6 **(6)** Electromagnetic locks are permitted to be installed on an exterior door leading from an *exit* stairway in a *building* containing only a Group B, Division 2 *major occupancy*, a Group B, Division 3 *major occupancy* or a *retirement home*.

(7) Electromagnetic locks are permitted to be installed on an *exit* door that serves only a *gaming premises* if,
(a) the *gaming premises* is located within a *sprinklered floor area*,
(b) *smoke detectors* are installed in each room and each corridor accessible to the public,
(c) a force of not more than 90 N applied to the door opening hardware initiates an irreversible process that will release the locking device within 15 s and not relock until the door has been opened, and
(d) a legible sign conforming with Clause (4)(h) is permanently mounted on the *exit* door to indicate that the locking device will release within 15 s of applying pressure to the door release hardware.

(8) Door hardware for the operation of the doors referred to in this Section shall be installed at a height not more than 1 200 mm above the finished floor.

3.4.6.17. Reserved

r11.1 3.4.6.18. Emergency Crossover Access to Floor Areas

(1) Except as permitted in Sentence (2), doors providing access to *floor areas* from *exit* stairs shall not have locking devices to prevent entry into any *floor area* from which the travel distance up or down to an unlocked door is more than 2 *storeys*.

(2) Doors referred to in Sentence (1) are permitted to be equipped with electromagnetic locks provided they comply with Sentences 3.4.6.16.(4) and (5).

(3) Doors referred to in Sentence (1) shall be identified by a permanently mounted sign on the stair side to indicate that they are openable from that side.

(4) Locked doors intended to prevent entry into a *floor area* from an *exit* stair shall,
(a) be identified by a permanently mounted sign on the stair side to indicate the location of the nearest unlocked door in each direction of travel, and
(b) be openable with a master key that fits all locking devices and is kept in a designated location accessible to firefighters or be provided with a wired glass panel not less than 0.0645 m^2 in area and located not more than 300 mm from the door opening hardware.

(5) Where access to a *floor area* is required by Sentence (1), access through unlocked doors to the *floor area* from at least one other *exit* shall also be provided.

(6) In a *building* not more than 6 *storeys* in *building height*, doors providing access from *exit* stairs to a *floor area* containing a *hotel* are permitted to have locking devices to prevent entry into the *floor area* provided the requirements in Clause (4)(b) are complied with.

3.4.6.19. Floor Numbering

(1) Arabic numerals indicating the assigned floor number shall,
(a) be mounted permanently on each side of doors to *exit* stair shafts,
(b) be not less than 60 mm high, raised approximately 0.7 mm above the surface,
(c) be located 1 500 mm from the finished floor, and
(d) be contrasting in colour with the surface to which they are applied. (See Appendix A.)

(2) Upper case letters indicating the designation assigned to each *exit* stair shaft shall be mounted permanently on each side of doors to the *exit* stair shaft and shall,
(a) be not less than 60 mm high, raised approximately 0.7 mm above the surface,
(b) be located 1 500 mm from the finished floor, and
(c) be contrasting in colour with the surface on which they are applied.

3.4.7. Fire Escapes

3.4.7.1. Scope

(1) Except as permitted by Sentence (2), fire escapes shall not be erected on a *building*.

(2) If it is impracticable to provide one or more of the *exit* facilities listed in Article 3.4.1.4., fire escapes conforming to Articles 3.4.7.2. to 3.4.7.7. are permitted to serve *floor areas* in an existing *building* provided the *floor areas* served are,

r6 (a) not in an elementary or secondary school or a *retirement home*,

r1 (b) not more than 2 *storeys* above ground level in *care*, *care and treatment* or *detention occupancies*, and

(c) not more than 5 *storeys* above ground level in other *occupancies*.

3.4.7.2. Fire Escape Construction

(1) Fire escapes shall be of metal or concrete, of the stair type extending to ground level, constructed throughout in a strong substantial manner and securely fixed to the *building*, except that wooden fire escapes are permitted to be used on *buildings* of *combustible construction* if all posts and brackets are not less than 89 mm in their least dimension and all other woodwork is not less than 38 mm in its least dimension.

3.4.7.3. Access to Fire Escapes

(1) Access to fire escapes shall be from corridors through doors at floor level, except that access from a *dwelling unit* is permitted to be through a casement window having an unobstructed opening not less than 1 100 mm high by 550 mm wide with a sill height of not more than 900 mm above the inside floor.

(2) The clear area of a fire escape balcony onto which a door opens, shall be not less than 1 m^2.

3.4.7.4. Protection of Fire Escapes

(1) If a fire escape serves any *storey* above the second, openings located in a zone described in Sentence (2), including access doorways in the exterior walls of the *building* to which the fire escape is attached, shall be protected by *closures* conforming to Subsection 3.1.8.

(2) The zone referred to in Sentence (1) extends from any balcony, platform or stairway of a fire escape to a distance,

(a) 3 m horizontally,

(b) 10 m below, and

(c) 1 800 mm above.

3.4.7.5. Stairs

(1) Stairs shall be inclined at an angle of not more than 45° with the horizontal, and their steps shall have risers not more than 210 mm high and treads not less than 220 mm wide exclusive of nosing.

(2) Stairway headroom shall be not less than 1 950 mm plus the height of one riser measured vertically above the nosing of any tread or platform.

(3) The width of a fire escape shall conform to Articles 3.4.3.1., 3.4.3.2. and 3.4.3.4., except that the width is permitted to be reduced to 550 mm provided the fire escape serves,

(a) not more than 3 *storeys*, and

(b) not more than 15 persons.

(4) If a flight of stairs leading to the ground at the foot of a fire escape is not fixed in position, it shall,
(a) be held in the raised position without a latch or locking device,
(b) be fitted with a counterbalancing device,
(c) be easily and quickly brought into position for use, and
(d) reach the ground in the lowered position.

3.4.7.6. Guards and Railings

(1) The open sides of every platform, balcony and stairway forming part of a fire escape shall be protected by *guards* not less than 920 mm high measured vertically above the nosing of any tread or platform.

(2) The top rail of a *guard* is permitted to serve as a handrail if it is free from obstructions that could break a handhold.

(3) A wall handrail shall be installed if the fire escape is more than 550 mm wide.

(4) Openings through any *guard* that is required by Sentence (1) shall be of a size that will prevent the passage of a sphere having a diameter more than 100 mm unless it can be shown that the location and size of openings that exceed this limit do not represent a hazard.

(5) Unless it can be shown that the location and size of openings do not present a hazard, a *guard* for a fire escape shall be designed so that no member, attachment or opening located between 140 mm and 900 mm above a platform or the nosing of any tread will facilitate climbing.

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3.6.2.7. Electrical Equipment Vaults

r11.1 **(1)** Where an electrical equipment vault is required by the Electrical Safety Code adopted under Ontario Regulation 164/99 (Electrical Safety Code) made under the *Electricity Act, 1998*, the electrical equipment vault shall be totally enclosed by a *fire separation* of *solid masonry* or concrete construction having a *fire-resistance rating* of not less than 3 h if the vault is not provided with an automatic fire extinguishing system and not less than 2 h if the vault is so protected.

(2) Where a *building* is required to be *sprinklered*, the electrical equipment vault described in Sentence (1) need not be *sprinklered* provided,
(a) the vault is designed for no purpose other than to contain the electrical equipment, and
(b) a *smoke detector* is provided in the vault that will actuate the *building* fire alarm system in the event of a fire in the vault.

(3) A vault, that is part of a *building* and houses electrical equipment indoors, shall have,
(a) roofs or ceilings consisting of reinforced concrete of adequate strength for the conditions and not less than 150 mm thick, and
(b) floors consisting of reinforced concrete of adequate strength for the conditions and not less than 150 mm thick, except that floors that are at excavation level are permitted to be of reinforced concrete not less than 100 mm thick.

(4) Walls, roofs or ceilings, and floors shall be adequately anchored together in a manner designed to resist dislodgement by explosion.

(5) Only pipes or ducts necessary for fire protection or the proper operation of the electrical installation shall penetrate the *fire separations* surrounding the electrical equipment vault.

(6) A ventilation duct or opening, that penetrates the *fire separation* to the outdoors, need not be protected by a *closure* at the penetration.

(7) Each door to an electrical equipment vault shall be provided with a substantial lock or padlock.

r11.1 **(8)** Explosion-relief devices and vents or other protective measures shall be provided for every electrical equipment vault containing dielectric liquid filled electrical equipment in conformance with Sentence 3.3.1.19.(4).

(9) Every electrical equipment vault shall be provided with a ventilation system designed in conformance with Part 6 to prevent the ambient temperature in the vault from exceeding 40°C.

(10) Where the vault ventilation system in Sentence (9) is directly from an outdoor area by natural ventilation without the use of ducts, and where the electrical equipment is the principal source of heat, the combined net area of inlet and outlet openings shall be not less than 0.002 m^2/kVa of electrical equipment capacity with a minimum of 0.093 m^2, except that,
(a) where equipment in the power class as described in CAN/CSA-C88-M, "Power Transformers and Reactors" is installed, ventilation requirements are permitted to be based on the actual full-load losses, or
(b) where the equipment is installed for emergency purposes only and is not normally energized, it need not be considered in determining the ventilation requirements.

(11) In the vault ventilation system in Sentence (10), the inlet for fresh air shall lead from an outdoor area and shall terminate at a point not more than 1 000 mm above the floor level of the vault.

(12) Where the vault ventilation system in Sentence (9) is a mechanical system, it shall be separate from the system for the remainder of the *building* and shall be designed so that,
(a) the vault temperature is thermostatically controlled,
(b) the fan is located so that it may be serviced without danger to personnel,
(c) a high temperature alarm is provided in the vault,
(d) the system is automatically shut off in the event of a fire in the vault, and
(e) a filter is provided in the air inlet if there is a possibility of dirt being drawn in.

(13) All ventilation openings shall be protected in conformance with Sentences 6.2.3.12.(3) and (4) and the protection shall be installed in such a manner that it cannot be removed from the outside by the use of common tools and it is tamperproof.

(14) Except as permitted in Sentence (15), the floor of the electrical equipment vault described in Sentences (1) and (2) shall be liquid tight and surrounded by liquid tight walls and sills of sufficient height to confine within the vault all of the liquid from the largest item of electrical equipment, but to a height of not less than 100 mm.

(15) The floor of the electrical equipment vault described in Sentences (1) and (2) may be provided with a floor drain connected to a covered sump capable of holding all of the liquid from the largest item of electrical equipment, and the connection shall have a *noncombustible* trap to prevent the spread of fire from the vault to the sump.

(16) Where the electrical equipment vault is located in a hazardous location classified as Class II, Division 1 in accordance with the Electrical Safety Code adopted under Ontario Regulation 164/99 (Electrical Safety Code) made under the *Electricity Act, 1998*, it shall have,
(a) no vent opening except to the exterior of the *building*, and
(b) suitable pressure-relief openings communicating only with the air outside the *building*.

(17) Where doors are provided between the vault described in Sentence (16) and the rest of the *building*, they shall have suitable seals such as weatherstripping to minimize the entrance of dust into the vault.

(18) Every electrical equipment vault shall be provided with,
(a) adequate lighting, controlled by one or more switches located near the entrance,
(b) luminaires located so that they may be relamped without danger to personnel, and
(c) a grounded receptacle located in a convenient location inside the vault, near the entrance.

3.6.2.8. Emergency Power Installations

(1) Where a generator intended to supply emergency power for lighting, fire safety and life safety systems is located in a *building*, it shall be located in a room that,
(a) is separated from the remainder of the *building* by a *fire separation* with a *fire-resistance rating* not less than,
  (i) 2 h for *buildings* within the scope of Subsection 3.2.6., and
  (ii) 1 h for other *buildings*, and
(b) contains only the generating set and equipment that is related to the emergency power supply system.

3.6.2.9. Storage of Oxygen Containers

r6 **(1)** In a Group B, Division 2 or 3 *occupancy* or in a *retirement home*, a room for the storage of oxygen containers shall be,
(a) separated from the remainder of the *building* by a *fire separation* having a *fire-resistance rating* not less than 1 h,
(b) designed for the storage of oxygen containers only,
(c) vapour tight,
(d) lined with *noncombustible* finish,
(e) separately exhausted to the exterior, and
(f) equipped with racks to store the containers.

3.6.3. Vertical Service Spaces and Service Facilities

3.6.3.1. Fire Separations for Vertical Service Spaces

r11.1 **(1)** Except as provided in Section 3.5. and Articles 3.6.3.3. and 3.6.3.5., a *vertical service space* shall be separated from all other portions of each adjacent *storey* by a *fire separation* having a *fire-resistance rating* conforming to Table 3.6.3.1. for the *fire-resistance rating* required by Subsection 3.2.2. for,

(a) the floor assembly above the *storey*, or
(b) the floor assembly below the *storey*, if there is no floor assembly above.
(See Appendix A.)

(2) A *vertical service space* that does not extend through the roof of a *building* shall be enclosed at the top with construction having a *fire-resistance rating* not less than that required for the *vertical service space* walls.

(3) A *vertical service space* that does not extend to the bottom of a *building* shall be enclosed at the lowest level with construction having a *fire-resistance rating* not less than that required for the *vertical service space* walls.

(4) A vent from a *vertical service space* not extending to the roof shall be enclosed within the *building* with construction having a *fire-resistance rating* not less than that required for the *vertical service space* walls.

(5) Only openings that are necessary for the use of the *vertical service space* shall be permitted through a *vertical service space* enclosure.

Table 3.6.3.1.
Fire Separations for Vertical Service Space
Forming Part of Clause 3.2.9.2.(9)(b) and Sentence 3.6.3.1.(1)

Fire-Resistance Rating of *Fire Separation* Required for Floor Assembly	Minimum *Fire-Resistance Rating* of *Vertical Service Space*
less than 45 min	---
45 min	45 min
1 h	45 min
1.5 h	1 h
2 h or more	1 h
Column 1	2

3.6.3.2. Foamed Plastic Protection

r11.1 **(1)** Foamed plastic insulation in a *vertical service space* shall be protected in conformance with Article 3.1.5.12A.

3.6.3.3. Linen and Refuse Chutes

(1) A linen chute or refuse chute shall,
(a) be impervious to moisture,
(b) have a smooth internal surface,
(c) be corrosion-resistant,
(d) be constructed of *noncombustible* material, and
(e) be located in a shaft in which there are no services other than *noncombustible* drain, waste and vent piping or *noncombustible* water piping.

(2) A shaft containing a linen chute or refuse chute shall have a *fire-resistance rating* conforming to Sentence 3.6.3.1.(1), but not less than,
(a) 1 h if the chute outlet for the discharge room is protected by an automatic, self-latching *closure* held open by a fusible link, or
(b) 2 h if no *closure* is provided at the chute outlet into the discharge room.

(3) An interior linen chute or refuse chute shall extend not less than 1 m above the roof and shall be vented above the roof with a vent that,
(a) has an unobstructed area not less than the cross-sectional area of the chute, and
(b) is equipped with a cover that will open automatically, or that can be opened manually, in the event of a fire in the chute.

(4) Intake openings for a linen chute or a refuse chute shall,
(a) have an area not more than 60% of the cross-sectional area of the chute, and
(b) be fitted with *closures* designed to close automatically and latch after use.

(5) Intake openings for a linen chute or a refuse chute shall be located in rooms or compartments that,
(a) have no dimension less than 750 mm,
(b) are separated from the remainder of the *building* by a *fire separation* with a *fire-resistance rating* not less than 45 min,
(c) are designed for no other purpose, and
(d) do not open directly into an *exit*.

(6) Sprinklers shall be installed at the top of each linen chute or refuse chute, at alternate floor levels and in the room or bin into which the chute discharges.

(7) The room into which a linen chute discharges shall be separated from the remainder of the *building* by a *fire separation* with a *fire-resistance rating* not less than 1 h.

(8) A refuse chute shall be equipped at the top with spray equipment for washing-down purposes.

(9) A refuse chute shall discharge only into a room or bin separated from the remainder of the *building* by a *fire separation* with a *fire-resistance rating* not less than 2 h.

(10) The room or bin into which a refuse chute discharges shall be of sufficient size to contain the refuse between normal intervals of emptying, be impervious to moisture and be equipped with a water connection and floor drain for washing-down purposes.

(11) A room into which a refuse chute discharges shall contain no service equipment that is not related to refuse handling and disposal.

3.6.3.4. Exhaust Duct Negative Pressure

(1) If a *vertical service space* contains an *exhaust duct* that serves more than one *fire compartment*, the duct shall have a fan located at or near the exhaust outlet to ensure that the duct is under negative pressure.

r11.1 3.6.3.5. Grease Duct Enclosures (See Appendix A.)

(1) Except as provided in Sentence (2), *fire separations* enclosing grease ducts for commercial cooking operations shall conform to NFPA 96, "Ventilation Control and Fire Protection of Commercial Cooking Operations".

(2) The *fire-resistance rating* of field-applied and factory-built grease duct enclosure assemblies shall be determined in conformance with CAN/ULC-S144, "Fire Resistance Test - Grease Duct Assemblies".

3.6.4. Horizontal Service Spaces and Service Facilities

3.6.4.1. Scope

(1) This Subsection applies to *horizontal service spaces* and service facilities, including ceiling spaces, duct spaces, crawl spaces and *attic or roof spaces*.

3.6.4.2. Fire Separations for Horizontal Service Spaces

r11.1 **(1)** Except as provided in Article 3.6.3.5., a *horizontal service space* that penetrates a required vertical *fire separation* shall be separated from the remainder of the *building* it serves in conformance with Sentence (2).

(2) If a *horizontal service space* or other concealed space is located above a required vertical *fire separation* other than a vertical shaft, this space need not be divided at the *fire separation* as required by Article 3.1.8.3. provided the construction between this space and the space below is a *fire separation* with a *fire-resistance rating* equivalent to that required for the vertical *fire separation*, except that the *fire-resistance rating* is permitted to be not less than 30 min if the vertical *fire separation* is not required to have a *fire-resistance rating* more than 45 min. (See Appendix A.)

3.6.4.3. Plenum Requirements

(1) A concealed space used as a *plenum* within a floor assembly or within a roof assembly need not conform to Sentence 3.1.5.15.(1) and Article 6.2.3.2. provided,

(a) all materials within the concealed space have a *flame-spread rating* not more than 25 and a smoke developed classification not more than 50, except for,
  (i) tubing for pneumatic controls,
  (ii) optical fibre cables and electrical wires and cables that exhibit a flame spread not more than 1.5 m, a smoke density not more than 0.5 at peak optical density and a smoke density not more than 0.15 at average optical density when tested in conformance with the Flame and Smoke Test in the Appendix to CSA C22.2 No. 0.3, "Test Methods for Electrical Wires and Cables", (FT6 Rating),
  (iii) optical fibre cables and electrical wires and cables that are located in totally enclosed *noncombustible* raceways,
r11.1 (iv) totally enclosed nonmetallic raceways that exhibit a horizontal flame distance of not more than 1.5 m, an average optical smoke density of not more than 0.15 and a peak optical smoke density of not more than 0.5 when tested in conformance with CAN/ULC-S102.4, "Fire and Smoke Characteristics of Electrical Wiring, Cables and Non-Metallic Raceways", (FT6 Rating), and
  (v) single conductor electrical wires and cables that exhibit a vertical char of not more than 1.5 m when tested in conformance with the Vertical Flame Test —Cables in Cabletrough in Clause 4.11.4. of CSA C22.2 No. 0.3, "Test Methods for Electrical Wires and Cables", (FT4 Rating), and
(b) the supports for the ceiling membrane are of *noncombustible* material having a melting point not below 760°C.

(2) If a concealed space referred to in Sentence (1) is used as a return-air *plenum* and incorporates a ceiling membrane that forms part of the required *fire-resistance rating* of the assembly, every opening through the membrane shall be protected by a *fire stop flap* that shall,

(a) stop the flow of air into the concealed space in the event of a fire,
(b) be supported in a manner that will maintain the integrity of the ceiling membrane for the duration of time required to provide the required *fire-resistance rating*,
(c) conform to CAN/ULC-S112.2, "Fire Test of Ceiling Firestop Flap Assemblies", and
r11.1 (d) activate at a temperature approximately 30°C above the normal maximum temperature that occurs in the return-air *plenum*, whether the air duct system is operating or shut down.

r11.1 **(3)** Reserved.

3.6.4.4. Attic or Roof Space Access

(1) An *attic or roof space* more than 600 mm high shall be provided with access from the floor immediately below by a hatchway not less than 550 mm by 900 mm or by a stairway.

3.6.4.5. Horizontal Service Space Access

(1) A *horizontal service space*, consisting of ceiling and duct spaces, that is more than 1 200 mm high and 600 mm wide shall have inspection doors not less than 300 mm in both horizontal and vertical dimensions placed so that the entire interior of the duct or space can be viewed.

3.6.4.6. Crawl Space Access

(1) A crawl space shall have at least one access opening not less than 550 mm by 900 mm.

Section 3.7. Health Requirements

3.7.1. Height and Area of Rooms

3.7.1.1. Room and Space Height

(1) The height of every room and space shall be sufficient so that the ceiling or ceiling fixtures do not obstruct movement or activities below.

(2) The unobstructed height in *dwelling units* and sleeping rooms in Group C *occupancies* shall conform to Subsection 9.5.3.

3.7.1.2. Residential Room Dimensions

(1) The areas of rooms in *dwelling units*, dormitories, boarding houses and rooming houses shall conform to Part 9.

3.7.1.3. Sleeping Areas in Group B and Child Care Facilities

(1) Except as provided in Sentence (2), a sleeping area in a Group B *occupancy* shall provide not less than 4.7 m^2 per person in a room having,
(a) an area not less than 7 m^2,
(b) a horizontal dimension not less than 2 000 mm, and
(c) a ceiling height not less than 2 300 mm.

(2) Sleeping rooms for residents in long-term care homes shall have, exclusive of space provided for washrooms and for built-in or portable clothes closets, a floor space not less than,
(a) 10.22 m^2 in a single-bed unit,
(b) 16.72 m^2 in a two-bed unit,
(c) 25.08 m^2 in a three-bed unit, and
(d) 29.73 m^2 in a four-bed unit.

(3) A child care facility shall provide sleeping accommodation having not less than 0.93 m^2 of floor surface area for each child with not less than 2 300 mm ceiling height over the entire room area.

3.7.1.4. Sleeping Areas in Camps

(1) *Recreational camps* shall have an area in the sleeping quarters of not less than 3.72 m^2 per camper or, if double or triple tier bunk units are used, 2.79 m^2 per camper.

(2) A *camp for housing of workers* shall have an area of not less than 3.72 m^2 per employee in every room used for sleeping purposes.

3.7.2. Windows

3.7.2.1. Window Areas

(1) Except as provided in Sentences (2) and (3) or otherwise permitted, every room used for sleeping in any *building*, and every principal room such as living room, dining room or combination of them in *dwelling units* shall be provided with windows having areas conforming to Part 9, except that Article 9.9.10.1. does not apply. (See Appendix A.)

(2) Long-term care homes shall have,
(a) in an activity room, a sitting room or a lounge, one or more windows with a total unobstructed glass area, exclusive of skylights, of not less than 10% of the area of the room, and
(b) in a residents' sleeping room, one or more windows that,
  (i) have a total unobstructed glass area, exclusive of skylights, of not less than 10% of the area of the room,
  (ii) open to the outdoors and have a total unobstructed glass area, exclusive of skylights, of not less than 5% of the area of the room, and
  (iii) are installed with the bottom edge of the glass of every window not more than 660 mm above the floor.

(3) Play activity rooms in a child care facility and work areas in *live/work units* shall have one or more windows that conform to Clause (2)(a).

3.7.3. Reserved

3.7.4. Plumbing Facilities

3.7.4.1. Plumbing and Drainage Systems

(1) Except as permitted in Sentence (3), each *building* situated on property that abuts on a *street* in which a public or municipal water main is located shall be provided with or have accessible to its occupants a *plumbing system* including a *potable* water supply, a *sanitary drainage system* and *plumbing fixtures*.

(2) When the installation of a *sanitary drainage system* is not possible because of the absence of a water supply, sanitary privies, chemical closets or other means for the disposal of human waste shall be provided.

(3) *Plumbing fixtures* need not be provided in a *building* that is not normally occupied by persons where such installations are impractical and other *fixtures* are available in nearby *buildings* when the subject *building* is in use.

3.7.4.2. Plumbing Fixtures, General

(1) For the purposes of this Subsection, the *occupant load* shall be determined in accordance with the provisions in Subsection 3.1.17. except that in a Group D *occupancy*, the area per person shall be 14 m^2. (See Appendix A.)

(2) Except as provided in this Subsection, water closets shall be provided for each sex assuming that the *occupant load* is equally divided between males and females, unless the proportion of each sex expected in the *building* can be determined with reasonable accuracy.

(3) Except as provided in Sentence (4), urinals are permitted to be substituted for water closets required by this Subsection for males and may be counted as water closets provided the number of urinals is not more than,
(a) one-fifth of the required number of water closets in hospitals and long-term care homes, and
(b) two-thirds of the required number of water closets in any other *occupancy*.

(4) If only two water closets are required for males, one urinal is permitted to be substituted for one of the water closets.

(5) Except as required in this Subsection, at least one lavatory shall be provided in a room containing one or two water closets or urinals, and at least one additional lavatory shall be provided for each additional two water closets or urinals.

(6) Wash fountains in circular or straight trough form are permitted to be provided in lieu of required lavatories provided each 500 mm of circumference or trough length is considered to be the equivalent of one lavatory.

r4 **(7)** The water closet and lavatory provided in the universal washroom described in Sentence 3.8.3.12.(1) may be counted as part of the *plumbing fixtures* required for males and females in this Subsection if,
(a) more than one water closet is required for males, and
(b) more than one water closet is required for females.

r4 **(8)** Where one water closet is required for males and one water closet is required for females, the following may be provided in lieu of the water closets otherwise required by this Subsection:
(a) one universal washroom conforming to Sentence 3.8.3.12.(1), and
(b) one washroom containing one water closet that is permitted to be used by both sexes provided the door to the room can be locked from the inside.
(See Appendix A.)

r4 **(9)** Both sexes are permitted to be served by a single water closet if the *occupant load* is not more than 10 persons in an *assembly occupancy* referred to in Article 3.7.4.3. except for,
(a) elementary and secondary schools,
(b) child care facilities,
(c) places of worship, and
(d) undertaking premises.

r4 **(10)** Any shelf or projection above a lavatory shall be located so that it will not be a hazard.

r4 **(11)** Except for *dwelling units*, lavatories required by Sentence (5) shall be equipped with faucets that,
(a) operate automatically, or
r11.1 (b) have a manual control that,
(i) has a lever type handle or is otherwise operable with a closed fist,
(ii) does not require the application of continuous force to maintain water flow, and
(iii) where metered, provides at least 10 s of water flow.

3.7.4.3. Plumbing Fixtures for Assembly Occupancies

r4 **(1)** Except as provided by Sentences (2) to (16) and Sentence 3.7.4.2.(9), the number of water closets required for *assembly occupancies* shall conform to Table 3.7.4.3.A.

Table 3.7.4.3.A.
Water Closets for Assembly Occupancies
Forming Part of Sentence 3.7.4.3.(1)

Number of Persons of Each Sex	Minimum Number of Water Closets for Males	Minimum Number of Water Closets for Females
1 - 25	1	1
26 - 50	1	2
51 - 75	2	3
76 - 100	2	4
101 - 125	3	5
126 - 150	3	6
151 - 175	4	7
176 - 200	4	8
201 - 250	5	9
251 - 300	5	10
301 - 350	6	11
351 - 400	6	12
Over 400	7 plus 1 for each additional increment of 200 males in excess of 400	13 plus 1 for each additional increment of 100 females in excess of 400
Column 1	2	3

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3.7.4.13. Floor Drains

(1) A floor drain shall be installed in a washroom for *public use* that contains a urinal or a water closet equipped with an automatic flushing device. (See Appendix A.)

3.7.4.14. Grab Bar Installation

(1) Grab bars that are installed shall resist a minimum load of 1.3 kN applied vertically or horizontally.

3.7.4.15. Clearances for Water Closets

e3 **(1)** Except in a *dwelling unit* and except as required by Section 3.8., a minimum clearance of 380 mm shall be provided in front of a water closet. (See Appendix A.)

3.7.4.16. Privacy

(1) If a room contains not more than 1 water closet, the doorway to the room shall be provided with a full height door that is capable of being locked from the inside.

(2) Except in a room for *private use*, water closets, urinals, lavatories, showers and bathtubs shall not be visible from the entrance to the room where it contains at least,
(a) two water closets,
(b) one water closet and one urinal,
(c) one shower stall, or
(d) one bathtub.

3.7.4.17. Water Temperature Control

(1) A *water distribution system* supplying hot water to *plumbing fixtures* shall conform to the requirements in Subsection 7.6.5.

3.7.4.18. Drinking Water

(1) On every floor where work will be performed and within 100 m of any area where work will be performed, *potable* water shall be provided from,
(a) a fountain with an upward jet,
(b) a tap from a piped water supply, or
(c) a tap from a covered vessel.

3.7.4.19. Pharmacies

(1) Every *pharmacy* shall be provided with a sink with hot and cold *potable* water for washing utensils used in the preparation, service or storage of drugs.

3.7.5. Health Care Facility Systems

3.7.5.1. Electrical Systems

(1) In anaesthetizing locations, electrical systems shall be designed, constructed, installed and tested in conformance with CSA Z32, "Electrical Safety and Essential Electrical Systems in Health Care Facilities".

3.7.5.2. Medical Gas Piping

r11.1 **(1)** All medical gas piping systems shall be designed, constructed, installed and tested in conformance with,
(a) CSA Z7396.1, "Medical Gas Piping Systems - Part 1: Pipelines for Medical Gases, Medical Vacuum, Medical Support Gases, and Anaesthetic Gas Scavenging Systems", and
(b) the provisions of the Fire Code made under the *Fire Protection and Prevention Act, 1997* or, in the absence of such provisions, Part 3 of Division B of the CCBFC NRCC 56192, "National Fire Code of Canada".

3.7.5.3. Shielding of X-Ray Equipment

(1) Every installation of an *x-ray machine* or of *x-ray equipment* in a *building* shall be shielded to protect any person who could be exposed to radiation inside and outside the *building*. (See Appendix A.)

3.7.6. Food Premises

3.7.6.1. Application

(1) The requirements of this Subsection apply to all *food premises*.

3.7.6.2. Room Finishes

(1) Except as provided in Sentence (2), floors and floor coverings shall be tight, smooth and non-absorbent in rooms where,
(a) food or drink for human consumption, or an ingredient of food or drink for human consumption, is manufactured, processed, prepared, stored, displayed, handled, served, distributed, sold or offered for sale,
(b) utensils are washed, or
(c) washing *fixtures* or toilet *fixtures* are located.

(2) Carpeting may be used in areas where food is served.

(3) Wall and ceiling finishes of rooms and passageways shall be easy to clean.

3.7.6.3. Location of Plumbing Fixtures

(1) A room containing a water closet shall be located where,
(a) it does not open directly into any room or area where food or drink for human consumption, or an ingredient of food or drink for human consumption, is intended to be stored, prepared, processed, distributed, served, sold or offered for sale, and
(b) it is not necessary for the public to go through the food preparation areas to gain access to the *plumbing fixtures*.

(2) Except as permitted in Sentence (3), a room containing *plumbing fixtures* for the public and employees in a restaurant shall be located in the restaurant.

(3) A room containing *plumbing fixtures* for the public in Sentence (2) need not be located in the restaurant if,
(a) the room is located in the *building* containing the restaurant, and
(b) the distance of travel between the restaurant and the room is not more than 45 m.

3.7.6.4. Lavatories, Appliances and Sinks

(1) A separate lavatory for the handwashing of employees shall be constructed in a location convenient for employees in each manufacturing, processing and preparation area.

(2) If equipment and facilities for the cleaning and sanitizing of utensils are provided, they shall consist of,
(a) mechanical equipment, or
(b) drainage racks of corrosion-resistant materials and,
  (i) a three-compartment sink or three sinks, or
  (ii) a two-compartment sink or two sinks, where the first compartment or sink can be used effectively for washing and rinsing and the second compartment or sink can be used effectively for sanitizing.

(3) A retail *food premises* is exempt from compliance with this Article if its eating and drinking area does not exceed 56 m^2 and any one or more of the following applies:
(a) it is designed to sell only cold drinks in or from the original container,
(b) it is designed to sell only frozen confections in the original package or wrapper,
(c) it is designed to prepare and sell only hot beverages,
(d) it is designed to prepare and sell only popped corn, roasted nuts or french-fried potatoes,
(e) it is designed to sell only food or drink for human consumption that,
  (i) is pre-packaged at a premises other than the *food premises* at which it is being offered for sale, and
  (ii) is not capable of supporting the growth of pathogenic organisms or the production of the toxins of such organisms.

3.7.6.5. Hot and Cold Water Supply

(1) A hot and cold water supply shall be provided to,
(a) every *plumbing appliance* and *fixture* required by Article 3.7.6.4.,
(b) every area where food or drink for human consumption, or an ingredient of food or drink for human consumption, is manufactured, processed or prepared, and
(c) every area where utensils are washed.

(2) This Article does not apply to a retail *food premises* described in Sentence 3.7.6.4.(3).

3.7.6.6. Employee Facilities

(1) In a *food premises*, where dressing rooms are provided for employees, there shall be separate dressing rooms for males and females that,
(a) are large enough for the employees to change and store their clothing, and
(b) are equipped with lockers or other facilities suitable for storing the clothing of the employees.

(2) Every room containing *sanitary units* for employees shall have a floor area not less than 2.3 m^2.

3.7.6.7. Sleeping Quarters

(1) A room or space intended to be used as sleeping quarters shall not open directly into any room where food or drink for human consumption, or an ingredient of food or drink for human consumption, is manufactured, processed, prepared, stored, displayed, handled, served, distributed, sold or offered for sale.

Section 3.8. Barrier-Free Design (See Appendix A.)

3.8.1. General

3.8.1.1. Application

r4 r6 **(1)** The requirements of this Section apply to all *buildings* except,
(a) *houses*, triplexes and boarding or rooming houses with fewer than 8 boarders or roomers,
(b) *buildings* of Group F, Division 1 *major occupancy*, (See Appendix A.)
(c) *buildings* that are not intended to be occupied on a daily or full time basis, including automatic telephone exchanges, pumphouses and substations, and
(d) *camps for housing of workers*. (See Appendix A.)

r4 3.8.1.2. Entrances (See Appendix A.)

(1) Except as provided in Sentence 3.13.8.1.(2), the number of *barrier-free* entrances into a *building* shall conform to Table 3.8.1.2.

Table 3.8.1.2.
Minimum Number of Pedestrian Entrances Required to be Barrier-Free
Forming Part of Sentence 3.8.1.2.(1)

Number of Pedestrian Entrances into B*uilding*	Minimum Number of Pedestrian Entrances Required to be B*arrier-Free*
1 to 3	1
4 to 5	2
More than 5	Not less than 50%
Column 1	2

(2) One of the *barrier-free* entrances required by Sentence (1) shall be the principal entrance to the *building*.

(3) In addition to the *barrier-free* entrances required by Sentence (1), a *suite* of *assembly occupancy, business and personal services occupancy* or *mercantile occupancy* that is located in the *first storey* of a *building* or in a *storey* to which a *barrier-free* path of travel is provided, and that is separated from the remainder of the *building* so that there is no access to the remainder of the *building*, shall have at least one *barrier-free* entrance.

(4) A *barrier-free* entrance shall,
(a) be designed in accordance with Article 3.8.3.3., and
(b) lead from,
  (i) the outdoors at sidewalk level, or
  (ii) a ramp that conforms to Article 3.8.3.4. and leads from a sidewalk.

(5) At a *barrier-free* entrance that includes more than one doorway, only one of the doorways is required to be designed in accordance with Article 3.8.3.3.

(6) If a *walkway* or pedestrian bridge connects two *barrier-free storeys* in different *buildings*, the path of travel from one *storey* to the other *storey* by means of the *walkway* or bridge shall be *barrier-free*.

3.8.1.3. Barrier-Free Path of Travel

(1) Except as required in Sentence (4) and except as permitted in Subsection 3.8.3., every *barrier-free* path of travel shall provide an unobstructed width of at least 1 100 mm for the passage of wheelchairs.

(2) Interior and exterior walking surfaces that are within a *barrier-free* path of travel shall,
(a) have no opening that will permit the passage of a sphere more than 13 mm in diam,
(b) have any elongated openings oriented approximately perpendicular to the direction of travel,
(c) be stable, firm and slip-resistant,
(d) be bevelled at a maximum slope of 1 in 2 at changes in level not more than 13 mm, and
(e) be provided with sloped floors or ramps at changes in level more than 13 mm.
(See Appendix A.)

(3) A *barrier-free* path of travel is permitted to include ramps, passenger elevators or other platform equipped passenger elevating devices to overcome a difference in level.

r4 **(4)** Every *barrier-free* path of travel less than 1 600 mm in width shall be provided with an unobstructed space not less than 1 800 mm in width and 1 800 mm in length located not more than 30 m apart. (See Appendix A.)

r4 **(5)** Where the headroom of an area in a *barrier-free* path of travel is reduced to less than 1 980 mm, a guardrail or other barrier with its leading edge at or below 680 mm from the finished floor shall be provided. (See Appendix A.)

r4 **(6)** A normally occupied *floor area* that is not required by Article 3.8.2.1. to have a *barrier-free* path of travel shall meet the following requirements:
(a) interior walking surfaces throughout the normally occupied *floor area* shall comply with Clauses (2)(a) to (e), and
(b) where the headroom of an area in a corridor or aisle in the normally occupied *floor area* is reduced to less than 1 980 mm, a guardrail or other barrier with its leading edge at or below 680 mm from the finished floor shall be provided. (See Appendix A.)

r4 3.8.1.4. Escalators and Moving Walks

(1) In a *building* in which an escalator or inclined moving walk provides access to any floor level above or below the entrance floor level, an interior *barrier-free* path of travel shall be provided to that floor level. (See Appendix A.)

(2) The route from the escalator or inclined moving walk to the *barrier-free* path of travel required by Sentence (1) shall be clearly indicated by appropriate signs.

(3) In a *building* in which a moving walk provides access between areas on the same floor level, a *barrier-free* path of travel shall be provided between the areas served by the moving walk.

3.8.1.5. Controls

r4 **(1)** Except as required by Sentences 3.5.2.2.(1) and 3.8.3.5.(1) for elevators and Sentence 3.8.3.3.(17) for power door operator controls, controls for the operation of *building* services or safety devices, including electrical switches, thermostats and intercom switches, intended to be operated by the occupant and located in a *barrier-free* path of travel shall,
r11.1 (a) be mounted,
(i) 1 200 mm above the finished floor, in the case of a thermostat or a manual pull station, and
(ii) not less than 900 mm and not more than 1 100 mm above the finished floor, in the case of all other controls, and
r11.1 (b) be located so as to be adjacent to and centred on either the length or the width of a clear floor space of 810 mm by 1 370 mm, and

r11.1 (c) be operable,
(i) using one hand, without requiring tight grasping, pinching with fingers or twisting of the wrist, and with a force of not more than 22.2 N, in the case of a manual pull station, and
(ii) using a closed fist and with a force of not more than 22.2 N, in the case of all other controls.
(See Appendix A.)

(2) A signal intended for the public to indicate the operation of a *building* security system that controls access to a *building* shall consist of an audible and visual signal.

3.8.1.6. Illumination

(1) All portions of a *barrier-free* path of travel shall be equipped to provide a level of illumination in accordance with Sentence 3.2.7.1.(1).

3.8.2. Occupancy Requirements

r4 ### 3.8.2.1. Areas Requiring Barrier-Free Path of Travel

(1) Except as permitted by Sentence (3), a *barrier-free* path of travel from the entrances required by Sentences 3.8.1.2.(1) and (3) to be *barrier-free* shall be provided,
(a) throughout the entrance *storey*,
(b) except as permitted by Sentence (2), to and throughout all normally occupied *floor areas* and rooftop amenity spaces, and (See Appendix A.)
(c) throughout all normally occupied *floor areas* and rooftop amenity spaces that, (See Appendix A.)
(i) are exempt from the application of Clause (b), and
(ii) are served by a passenger elevator, escalator, inclined moving walk, or other platform equipped passenger elevating device.
(See Appendix A.)

(2) A *barrier-free* path of travel described in Clause (1)(b) is not required to extend,
(a) to *floor areas* or portions of *floor areas* containing a Group B, Division 2 or 3 *occupancy* that are not required by Article 3.5.2.1. to be connected by a ramp or served by an elevator,
(b) to Group C or Group D *occupancies* that are in *floor areas* in a *building* that,
(i) is three or fewer *storeys* in *building height*, and
(ii) has a *building area* not exceeding 600 m^2,
(See Appendix A.)
(c) to Group F, Division 2 or 3 *occupancies* that are not required by Sentence 3.8.2.2.(1) to be served by an elevator,
(d) to portions of restaurants and licensed beverage establishments where the same amenities and uses are provided on other *floor areas* that have a *barrier-free* path of travel, or
(e) to portions of child care facilities that have all entrance doors at floor levels that do not have a *barrier-free* path of travel.
(See Appendix A.)

(3) A *barrier-free* path of travel described in Sentence (1) is not required to extend,
(a) into *service rooms*,
(b) into elevator machine rooms,
(c) into janitors' rooms,
(d) into *service spaces*,
(e) into crawl spaces,
(f) into *attic or roof spaces*,
(g) into *high hazard industrial occupancies*,

(h) to portions of a *floor area* with fixed seats in an *assembly occupancy* where these portions are not part of the *barrier-free* path of travel to,
  (i) spaces designated for wheelchair use,
  (ii) seats designated for *adaptable seating*, or
  (iii) spaces for the storage of wheelchairs and *mobility assistive devices*,
(i) to *suites* of *residential occupancy* that are in *storeys* other than the entrance *storey* and that have all entrance doors at floor levels that are not required to have a *barrier-free* path of travel,
(j) except as required by Sentence (5), on the inside of a *suite* of *residential occupancy*, or
(k) to portions of a *floor area* that are not at the same level as the entry level, provided amenities and uses provided on any raised or sunken level are accessible on the entry level by means of a *barrier-free* path of travel.
(See Appendix A.)

(4) In an *assembly occupancy* with fixed seats, the minimum number of spaces designated for wheelchair use and the minimum number of fixed seats designated for *adaptable seating* shall conform to Table 3.8.2.1. (See Appendix A.)

Table 3.8.2.1.
Designated Wheelchair Spaces and Adaptable Seating
Forming Part of Sentence 3.8.2.1.(4)

Number of Fixed Seats in Seating Area	Minimum Number of Spaces Designated for Wheelchairs	Minimum Number of Fixed Seats Designated for *Adaptable Seating*
Up to 20	2	1
21 to 40	2	2
41 to 60	2	3
61 to 80	2	4
81 to 100	3	5
Over 100	3% of the seating capacity	The greater of 5 seats or 5% of the aisle seating capacity
Column 1	2	3

(5) In a Group C *major occupancy* apartment *building*, not less than 15% of all *suites* of *residential occupancy* shall be provided with a *barrier-free* path of travel from the *suite* entrance door into the following rooms and spaces that shall be located at the same level as the *barrier-free* path of travel:
(a) at least one bedroom, (See Appendix A.)
(b) at least one bathroom conforming to Sentence (6), (See Appendix A.)
(c) a kitchen or kitchen space, and
(d) a living room or space.
(See Appendix A.)

(6) Bathrooms required by Clause (5)(b) shall,
(a) contain a lavatory,
(b) contain a water closet,
(c) contain a bathtub or a shower,
(d) have wall reinforcement installed in conformance with Sentence 3.3.4.9.(1), and
(e) be designed to permit a wheelchair to turn in an open space not less than 1 500 mm in diameter.
(See Appendix A.)

(7) The number of *suites* described in Sentence (5) having 1, 2 or 3 or more bedrooms shall be in proportion to the number of *suites* of *residential occupancy* having 1, 2 or 3 or more bedrooms in the remainder of the *building*. (See Appendix A.)

(8) The *suites* described in Sentence (5) shall be distributed among *storeys* that are required by Article 3.8.2.1. to have a *barrier-free* path of travel, having regard to the height of the *suite* above *grade*.

3.8.2.2. Access to Parking Areas

(1) A *barrier-free* path of travel shall be provided from the entrance described in Article 3.8.1.2. to,
(a) an exterior parking area, where exterior parking is provided, and (See Appendix A.)
(b) at least one parking level, where a passenger elevator serves an indoor parking level.

(2) The vehicular entrance to and egress from at least one parking level described in Sentence (1) and all areas intended to be used by wheelchair accessible vehicles to gain access to a parking space on that level shall have a vertical clearance of not less than 2 100 mm.

(3) If an exterior passenger loading zone is provided, it shall have,
r4 (a) an access aisle not less than 2 440 mm wide and 7 400 mm long adjacent and parallel to the vehicle pull-up space,
(b) a curb ramp, where there are curbs between the access aisle and the vehicle pull-up space, and
r4 (c) a clearance height of not less than 3 600 mm at the vehicle pull-up space and along the vehicle access and egress routes.

r4 3.8.2.3. Washrooms Required to be Barrier-Free (See Appendix A.)

(1) A *barrier-free* path of travel shall be provided to *barrier-free* washrooms designed to accommodate persons with disabilities in conformance with the requirements in Articles 3.8.3.8. to 3.8.3.12.

(2) The number of universal washrooms conforming to Article 3.8.3.12. provided in a *building* in which a washroom is required by Subsection 3.7.4. shall conform to Table 3.8.2.3.A. (See Appendix A.)

Table 3.8.2.3.A.
Minimum Number of Universal Washrooms per Building
Forming Part of Sentence 3.8.2.3.(2)

Number of *Storeys* in *Building*	Minimum Number of Universal Washrooms per *Building*
1 to 3	1
4 to 6	2
Over 6	3, plus 1 for each additional increment of 3 *storeys* in excess of 6 *storeys*
Column 1	2

(3) Where a washroom required by Subsection 3.7.4. is provided in a *storey* that is required by Article 3.8.2.1. to have a *barrier-free* path of travel,
(a) the washroom shall conform to Articles 3.8.3.8. to 3.8.3.11., and
r11.1 (b) the number of *barrier-free* water closet stalls or enclosures provided in the washroom shall conform to Table 3.8.2.3.B.
(See Appendix A.)

(4) Except as permitted in Sentence (5), where washrooms in excess of those required by Subsection 3.7.4. are provided in a *storey* that is required by Article 3.8.2.1. to have a *barrier-free* path of travel, the additional washrooms shall be designed to accommodate persons with disabilities in conformance with the requirements of,
(a) Articles 3.8.3.8. to 3.8.3.11., or
(b) Article 3.8.3.12.

r11.1 **Table 3.8.2.3.B.**
Minimum Number of Water Closet Stalls or Enclosures Required to be Barrier-Free
Forming Part of Sentence 3.8.2.3.(3)

Number of Water Closets per Washroom	Minimum Number of *Barrier-Free* Water Closet Stalls or Enclosures per Washroom
1 to 3	0, where a universal washroom is provided on the same floor level within 45 m of the washroom, or 1, where a universal washroom is not provided on the same floor level within 45 m of the washroom
4 to 9	1
10 to 16	2
17 to 20	3
21 to 30	4
Over 30	5, plus 1 for each additional increment of 10 water closets per washroom in excess of 30 water closets per washroom
Column 1	2

(5) Washrooms need not conform to Sentence (4) provided,
(a) they are located within *suites* of *residential occupancy*,
(b) other *barrier-free* washrooms are provided on the same floor level within 45 m, or (See Appendix A.)
(c) they are located in an individual *suite* that is,
(i) used for a *business and personal services occupancy*, a *mercantile occupancy* or an *industrial occupancy*,
(ii) less than 300 m^2 in area, and
(iii) completely separated from, and without access to, the remainder of the *building*.

(6) Where a washroom required by Subsection 3.7.4. is provided in a *storey* that is not required by Article 3.8.2.1. to have a *barrier-free* path of travel, the washroom shall,
r11.1 (a) conform to Article 3.8.3.9. and Sentences 3.8.3.10.(4) and 3.8.3.11.(5), and
r11.1 (b) be provided with at least one ambulatory water closet stall or enclosure conforming to Sentence 3.8.3.8.(10).
(See Appendix A.)

r4 3.8.2.4. Hotels

(1) Except as permitted in Sentence (2), at least 10% of the *suites* of a *hotel* shall,
(a) have a *barrier-free* path of travel extending to,
(i) the inside of each room, and
(ii) a balcony where required by Sentence 3.3.1.7.(2), and
(b) be distributed among *storeys* that are required by Article 3.8.2.1. to have a *barrier-free* path of travel, having regard to the height of the *suite* above *grade*.
(See Appendix A.)

(2) Not more than 20 *suites* need comply with Sentence (1).

(3) A *suite* having a *barrier-free* path of travel required by Sentence (1) shall have a bathroom that,
(a) conforms to Clauses 3.8.3.12.(1)(a) to (h) and (j),
(b) has an unobstructed area at least 1 200 mm in diameter extending the full height of the room, except that a door is permitted to open on the inside if it does not reduce the unobstructed area, and
(c) has a bathtub or shower that conforms to Article 3.8.3.13.

(4) Except as required by Sentence 3.8.3.3.(17) for power door operator controls, controls for the operation of *building* services or safety devices, including electrical switches, thermostats and intercom switches, intended to be operated by the occupant and located within a *suite* having a *barrier-free* path of travel required by Sentence (1) shall conform to Sentence 3.8.1.5.(1).

(5) An entrance door to a *suite* having a *barrier-free* path of travel required by Sentence (1) shall have,
(a) a power door operator conforming to Article 3.8.3.3., and
(b) a door viewer located at a height no higher than 1 100 mm above the finished floor.

(6) Where a door is provided between a *suite* having a *barrier-free* path of travel required by Sentence (1) and an adjoining *suite*, the door shall conform to Sentences 3.8.3.3.(1) and (3).

(7) Where an emergency power supply is supplied by a generator, it shall supply at least one emergency power receptacle in at least one of the *suites* having a *barrier-free* path of travel required by Sentence (1). (See Appendix A.)

(8) The emergency power receptacle described in Sentence (7) shall be identified with a legible sign having the words **EMERGENCY POWER OUTLET** permanently mounted on the wall beside the receptacle.

3.8.3. Design Standards

r4 3.8.3.1. Accessibility Signs (See Appendix A.)

(1) Where a *building* is required to have a *barrier-free* entrance, signs incorporating the International Symbol of Access shall be installed to indicate the location of,
(a) that entrance,
(b) ramps located in a required *barrier-free* path of travel serving that entrance, and
(c) an exterior passenger loading zone conforming to Sentence 3.8.2.2.(3), if one is provided.

(2) Where a washroom, elevator, telephone or parking area is required to accommodate persons with disabilities, it shall be identified by a sign consisting of the International Symbol of Access and such other graphic, tactile or written directions as are needed to indicate clearly the type of facility available.

(3) Where a washroom is not designed to accommodate persons with disabilities in a *storey* that is required by Article 3.8.2.1. to have a *barrier-free* path of travel, signs shall be provided to indicate the location of a washroom required to be *barrier-free*.

(4) Signs incorporating the International Symbol of Access shall be installed where necessary to indicate the location of a *barrier-free means of egress*.

(5) Where a wall mounted tactile sign is provided in a *building*, characters, symbols or pictographs on the sign shall be located not less than 1 200 mm and not more than 1 500 mm above the finished floor. (See Appendix A.)

(6) Where a wall mounted tactile sign is provided in a *storey* that is not required by Article 3.8.2.1. to have a *barrier-free* path of travel, characters, symbols or pictographs on the sign shall conform to Sentence (5).

3.8.3.2. Exterior Walks

r4 **(1)** Except as provided in Sentence (2), exterior walks that form part of a *barrier-free* path of travel shall,
(a) be provided by means of a continuous plane not interrupted by steps or abrupt changes in level,
(b) have a permanent, firm and slip-resistant surface,
(c) except as required in Sentence 3.8.1.3.(4), have an uninterrupted width of not less than 1 100 mm and a gradient not exceeding 1 in 20,
(d) be designed as a ramp where the gradient is greater than 1 in 20,
(e) have not less than 1 100 mm wide surface of a different texture to that surrounding it, where the line of travel is level and even with adjacent walking surfaces,
(f) be free from obstructions for the full width of the walk to a minimum height of 1 980 mm, except that handrails are permitted to project not more than 100 mm from either side into the clear area,
(g) have a level area adjacent to the entrance doorway conforming to Clause 3.8.3.4.(1)(c), and
(h) have a tactile attention indicator conforming to Article 3.8.3.18. that is located to identify an entry into a vehicular route or area where no curbs or any other element separate the vehicular route or area from a pedestrian route. (See Appendix A.)

(2) Where a difference in elevation between levels in a walkway is not more than 200 mm, a curb ramp conforming to Sentences (3) and (4) may be provided.

(3) The curb ramp permitted by Sentence (2) shall,
(a) have a running slope conforming to Table 3.8.3.2.,
r4 (b) have a width of not less than 1 500 mm exclusive of flared sides,
(c) have a surface including flared sides that shall,
(i) be slip-resistant,
(ii) have a detectable warning surface that is colour- and texture-contrasted with the adjacent surfaces, and
(iii) have a smooth transition from the ramp and adjacent surfaces, and
(d) have flared sides with a slope of not more than 1:10 where pedestrians are likely to walk across them.

(4) Curb ramps described in Sentence (3) do not require handrails or *guards*.

Table 3.8.3.2.
Ramp Rise and Slope
Forming Part of Sentence 3.8.3.2.(3)

Vertical Rise Between Surfaces, mm	Slope
75 to 200	1:10 to 1:12
less than 75	1:8 to 1:10
Column 1	2

3.8.3.3. Doorways and Doors

r4 **(1)** Every doorway that is located in a *barrier-free* path of travel shall have a clear width of not less than 860 mm when the door is in the open position. (See Appendix A.)

r6 **(2)** Except as provided in Sentence 3.3.4.11.(11) and except where no bathroom within the *suite* is at the level of the *suite* entrance door to which a *barrier-free* path of travel is provided in accordance with Sentence 3.8.2.1.(1), the doorway to at least one bathroom and to each bedroom at the same level as such bathroom within a *suite* of *residential occupancy* shall have, when the door is in the open position, a clear width of not less than,
(a) 760 mm where the door is served by a corridor or space not less than 1 060 mm wide, and
(b) 810 mm where the door is served by a corridor or space less than 1 060 mm wide.
(See Appendix A.)

r4 **(3)** Door opening devices that are the only means of operation shall,
(a) be designed to be operable using a closed fist, and
(b) be mounted not less than 900 mm and not more than 1 100 mm above the finished floor.
(See Appendix A.)

r4 **(4)** Except as permitted by Sentence (12), every door that provides a *barrier-free* path of travel through a *barrier-free* entrance required by Article 3.8.1.2. shall be equipped with a power door operator if the entrance serves a *building* containing a Group A, Group B, Division 2 or 3, Group C, Group D or Group E *occupancy*. (See Appendix A.)

r4 **(5)** Except as permitted by Sentence (12), where a *barrier-free* entrance required by Article 3.8.1.2. incorporates a vestibule, a door leading from the vestibule into the *floor area* shall be equipped with a power door operator in a *building* containing a Group A, Group B, Division 2 or 3, Group C, Group D of Group E *occupancy*.

r4 **(6)** A door shall be equipped with a power door operator where the door serves,
(a) a washroom for *public use* required to be *barrier-free*, or
(b) a Group A *occupancy* within a Group C *major occupancy* apartment *building*.

(7) Except as permitted in Sentence (8), and except for doors with power operators, closers for doors in a *barrier-free* path of travel shall be designed to permit doors to open when a force of not more than 38 N is applied to the handles, push plates or latch-releasing devices in the case of exterior doors and 22 N in the case of interior doors.

(8) Sentence (7) does not apply to doors at the entrances to *dwelling units*, or where greater forces are required in order to close and latch the doors against prevailing differences in air pressures on opposite sides of the doors. (See Appendix A.)

(9) Except for doors at the entrances to *dwelling units*, closers for interior doors in a *barrier-free* path of travel shall have a closing period of not less than 3 seconds measured from when the door is in an open position of 70° to the doorway, to when the door reaches a point 75 mm from the closed position, measured from the leading edge of the latch side of the door. (See Appendix A.)

r4 **(10)** Unless equipped with a power door operator, a door in a *barrier-free* path of travel shall have a clear space on the latch side extending the height of the doorway and not less than,
(a) 600 mm beyond the edge of the door opening if the door swings toward the approach side,
(b) 300 mm beyond the edge of the door opening if the door swings away from the approach side, and
(c) 300 mm beyond both sides of a sliding door.
(See Appendix A.)

r4 **(11)** Vestibules located in a *barrier-free* path of travel,
(a) shall be arranged to allow the movement of wheelchairs between doors, and
(b) shall provide,
  (i) where the doors into the vestibule are in series, a distance between the doors of at least 1 500 mm plus the width of any door that swings into the space in the path of travel from one door to another, and
  (ii) where the doors into the vestibule are not aligned, a turning diameter of 1 500 mm within the vestibule clear of any door swing.
(See Appendix A.)

(12) Only the active leaf in a multiple leaf door in a *barrier-free* path of travel need conform to the requirements of this Article.

(13) Except as provided in Clause 3.8.3.4.(1)(c), the floor surface on each side of a door in a *barrier-free* path of travel shall be level within a rectangular area,
(a) as wide as the door plus the clearance required on the latch side by Sentence (10), and
(b) whose dimension perpendicular to the closed door is not less than the width of the *barrier-free* path of travel but need not exceed 1 500 mm.

(14) Where a vision panel is provided in a door in a *barrier-free* path of travel, such panel shall be at least 75 mm in width and be located so that,
(a) the bottom of the panel is not more than 900 mm above the finished floor, and
(b) the edge of the panel closest to the latch is not more than 250 mm from the latch side of the door.

(15) A door in a *barrier-free* path of travel consisting of a sheet of glass shall be marked with a continuous opaque strip that,
(a) shall be colour and brightness contrasted to the background of the door,
(b) shall be at least 50 mm wide,
(c) shall be located across the width of the door at a height of 1 350 mm to 1 500 mm above the finished floor, and
(d) may incorporate a logo or symbol provided such logo or symbol does not diminish,
(i) the opacity of the strip,
(ii) the width of the strip,
(iii) the colour and brightness contrast of the strip to the background of the door, and
(iv) the continuity of the strip across the width of the door.

r11.1 **(16)** Reserved.

(17) Except where a proximity scanning device is installed in conformance with Sentence (18), the control for a power door operator required by Sentence (4), (5) or (6) shall,
(a) have a face dimension of not less than,
(i) 150 mm in diameter where the control is circular, or
(ii) 50 mm by 100 mm where the control is rectangular,
(b) be operable using a closed fist,
(c) be located so that,
(i) its centre is located not less than 900 mm and not more than 1 100 mm from the finished floor or ground, or
(ii) it extends from not more than 200 mm to not less than 900 mm above the finished floor or ground,
(See Appendix A.)
(d) be located not less than 600 mm and not more than 1 500 mm beyond the door swing where the door opens towards the control,
r11.1 (e) be located to allow persons to activate the opening of the door from either direction of travel,
r11.1 (f) be located so that the path of travel is not obstructed,
r11.1 (g) be located in a clearly visible position, and
r11.1 (h) contain a sign incorporating the International Symbol of Access.

r4 **(18)** A proximity scanning device that activates a power door shall be capable of detecting a person in a wheelchair. (See Appendix A.)

r4 **(19)** A normally occupied *floor area* that is not required by Article 3.8.2.1. to have a *barrier-free* path of travel shall comply with the following requirements:
(a) all doorways in *public corridors* in the normally occupied *floor area* shall comply with Sentence (1),
(b) door opening devices that are the only means of operation on doors in the normally occupied *floor area* shall comply with Sentence (3), (See Appendix A.)
(c) where a vision panel is provided in a door in the normally occupied *floor area*, the panel shall comply with Sentence (14),
(d) doors consisting of a sheet of glass in the normally occupied *floor area* shall comply with Sentence (15), and
r11.1 (e) where a power door operator is installed for doors in the normally occupied *floor area*, the control for the power door operator shall comply with Sentence (17).

3.8.3.4. Ramps

(1) Ramps located in a *barrier-free* path of travel shall,
(a) have a minimum width of 900 mm between handrails,
(b) have a maximum gradient of 1 in 12, (See Appendix A.)

(c) have a level area of at least 1 670 mm by 1 670 mm at the top and bottom of a ramp and where a door is located in a ramp, so that the level area extends at least 600 mm beyond the latch side of the door opening, except that where the door opens away from the ramp, the area extending beyond the latch side of the door opening may be reduced to 300 mm, (See Appendix A.)

(d) have a level area at least 1 670 mm long and at least the same width as the ramp,

(i) at intervals of not more than 9 m along its length, and

r4 (ii) where there is a change of 90° or more in the direction of the ramp,

(e) except as provided in Sentence (2), be equipped with handrails on both sides that shall,

(i) be continuously graspable along their entire length and have circular cross-section with an outside diameter not less than 30 mm and not more than 40 mm, or any non-circular shape with a graspable portion that has a perimeter not less than 100 mm and not more than 155 mm and whose largest cross-sectional dimension is not more than 57 mm,

(ii) be not less than 865 mm and not more than 965 mm high, measured vertically from the surface of the ramp, except that handrails not meeting these requirements are permitted provided they are installed in addition to the required handrail,

(iii) be terminated in a manner that will not obstruct pedestrian travel or create a hazard,

(iv) extend horizontally not less than 300 mm beyond the top and bottom of the ramp,

r4 (v) be provided with a clearance of not less than 50 mm between the handrail and any wall or *guard* to which it is attached, and

(vi) be designed and constructed such that handrails and their supports will withstand the loading values obtained from the nonconcurrent application of a concentrated load not less than 0.9 kN applied at any point and in any direction for all handrails and a uniform load not less than 0.7 kN/m applied in any direction to the handrail,

(f) except as provided in Sentence (2), have a wall or a *guard* on both sides and where a *guard* is provided the *guard* shall,

(i) be not less than 1 070 mm measured vertically to the top of the *guard* from the ramp surface, and

r4 (ii) be designed so that no member, attachment or opening located between 140 mm and 900 mm above the ramp surface being protected by the *guard* will facilitate climbing,

(g) be provided,

(i) with a curb at least 50 mm high on any side of the ramp where no solid enclosure or solid *guard* is provided, and

r4 (ii) with railings or other barriers that extend to within 50 mm of the finished ramp surface or have a curb not less than 50 mm high, and

r4 (h) except as provided in Sentence (2), where the ramp is wider than 2 200 mm, have an intermediate handrail with a clear width of 900 mm between the intermediate handrail and one of the handrails described in Clause (e).

r4 **(2)** Where a ramp serves as an aisleway for fixed seating, the requirements for handrails in Clauses (1)(e) and (h) and for walls or *guards* in Clause (1)(f) need not apply. (See Appendix A.)

(3) Floors or walks in a *barrier-free* path of travel having a slope steeper than 1 in 20 shall be designed as ramps. (See Appendix A.)

3.8.3.5. Passenger Elevating Devices

r5 **(1)** A passenger elevating device referred to in Article 3.8.2.1. shall conform to CSA B355, "Lifts for Persons with Physical Disabilities".

r4 3.8.3.6. Wheelchair Spaces and Adaptable Seating

(1) Spaces designated for wheelchair use required by Sentence 3.8.2.1.(4) shall be,

(a) clear and level or level with removable seats,

(b) not less than 900 mm wide and not less than,

(i) 1 525 mm long where designed to permit a wheelchair to enter from a side approach, and

(ii) 1 220 mm long where designed to permit a wheelchair to enter from the front or rear of the space,

(c) arranged so that,
  (i) at least two of the designated spaces are side by side, and
  (ii) at least one fixed seat for a companion is located beside,
    (A) each group of designated spaces, if two or more designated spaces are arranged side by side in a group, and
    (B) each designated space that is not part of a group described in Sub-subclause (A),
  (See Appendix A.)
(d) located adjoining a *barrier-free* path of travel without infringing on egress from any row of seating or any aisle requirements, and
(e) situated, as part of the designated seating plan, to provide a choice of viewing location and a clear view of the event taking place.

(2) Fixed seats designated for *adaptable seating* required by Sentence 3.8.2.1.(4) shall be,
(a) located adjoining a *barrier-free* path of travel without infringing on egress from any row of seating or any aisle requirements,
(b) equipped with a movable or removable armrest on the side of the seat adjoining the *barrier-free* path of travel, and
(c) situated, as part of the designated seating plan, to provide a choice of viewing location and a clear view of the event taking place.

(3) In an *assembly occupancy* with fixed seats, space shall be provided for the storage of wheelchairs and *mobility assistive devices* in accordance with the following requirements:
(a) at least one storage space not less than 810 mm by 1 370 mm shall be provided where the *assembly occupancy* has not more than 200 fixed seats and at least two such storage spaces shall be provided where the *assembly occupancy* has more than 200 fixed seats, and
(b) the storage space or spaces shall be located on the same level and in proximity to the spaces designated for wheelchair use and seats designated for *adaptable seating*.

3.8.3.7. Assistive Listening Devices

(1) In *buildings* of *assembly occupancy*, all classrooms, auditoria, meeting rooms and *theatres* with an area of more than 100 m^2 and an *occupant load* of more than 75 shall be equipped with assistive listening systems encompassing the entire seating area. (See Appendix A.)

r4 3.8.3.8. Water Closet Stalls and Enclosures

r11.1 **(1)** Every *barrier-free* water closet stall or enclosure in a washroom described in Sentence 3.8.2.3.(3) or (4) shall,
(a) have a clear turning space within the stall or enclosure of at least 1 500 mm in diameter, (See Appendix A.)
(b) have a clear floor space in front of the stall or enclosure of at least 1 500 mm in diameter,
(c) be equipped with a door that,
  (i) is capable of being latched from the inside with a mechanism conforming to Subclause 3.8.1.5.(1)(b)(ii),
  (ii) in an open position, has a clear opening of at least 860 mm wide,
  (iii) swings outward, unless 820 mm by 1 440 mm clear floor area is provided within the stall to permit the door to be closed without interfering with the wheelchair, (See Appendix A.)
  (iv) is self-closing so that, when at rest, the door remains open not more than 50 mm beyond the jamb,
  (v) is provided with a horizontal, D-shaped, visually contrasting door pull on both sides of the door, mounted on the vertical centre line of the door, located at a height not less than 800 mm and not more than 1 000 mm above the finished floor, (See Appendix A.)
  (vi) is aligned with a clear transfer space required by Subclause (2)(a)(ii) or Clause (2)(b), and
  (vii) is capable of having the latch required by Subclause (i) released from the outside in case of an emergency,
(d) be equipped with a water closet conforming to Article 3.8.3.9. that is located in accordance with Clause (2)(a) or (b),
(e) be equipped with a coat hook mounted not more than 1 200 mm above the finished floor on a side wall and projecting not more than 50 mm from the wall,
(f) have a clearance of at least 1 700 mm between the outside of the stall face and the face of an in-swinging washroom door and 1 400 mm between the outside of the stall face and any wall-mounted fixture or other obstruction, and (See Appendix A.)

(g) be equipped with a toilet paper dispenser mounted on the side wall closest to the water closet so that,
  (i) the dispenser is located below the grab bar,
  (ii) the closest edge of the dispenser is 300 mm from the front of the water closet seat, and
  (iii) the bottom of the dispenser is 600 mm to 800 mm above the finished floor.

r11.1 **(2)** A water closet described in Clause (1)(d) shall be,
(a) located so that,
  (i) the centre line of the water closet is not less than 460 mm and not more than 480 mm from one side wall, and
  (ii) a clear transfer space at least 900 mm wide and 1 500 mm deep is provided on the other side of the water closet, or
(b) located so that a clear transfer space at least 900 mm wide and 1 500 mm deep is provided on each side of the water closet. (See Appendix A.)

(3) Where a water closet is located in accordance with Clause (2)(a),
(a) a grab bar conforming to Sentences (5) and (7) shall be provided on the side wall referred to in Subclause (2)(a)(i),
(b) a fold-down grab bar may be provided and, if one is provided, it shall conform to Sentence (8) and be provided on the side of the water closet opposite the grab bar described in Clause (a), and
(c) a grab bar conforming to Sentences (6) and (7) shall be provided on the wall behind the water closet.
(See Appendix A.)

(4) Where a water closet is located in accordance with Clause (2)(b),
(a) a fold-down grab bar conforming to Sentence (8) shall be provided on each side of the water closet, and
(b) a grab bar conforming to Sentences (6) and (7) shall be provided on the wall behind the water closet.
(See A-3.8.3.8.(3) in Appendix A.)

(5) A grab bar described in Clause (3)(a) shall,
r5 (a) be continuous L-shaped with 750 mm long horizontal and vertical components, and
(b) be wall mounted with the horizontal component 750 mm above the finished floor and the vertical component 150 mm in front of the water closet.
(See A-3.8.3.8.(3) and A-3.8.3.8.(5) in Appendix A.)

(6) A grab bar described in Clause (3)(c) or (4)(b) shall,
(a) be at least 600 mm in length, and
(b) be wall mounted horizontally from 840 mm to 920 mm above the finished floor and, where the water closet has a water tank, be wall mounted 150 mm above the tank.
(See A-3.8.3.8.(3) in Appendix A.)

(7) A grab bar described in Clause (3)(a) or (c) or (4)(b) shall,
(a) be installed to resist a load of at least 1.3 kN applied vertically or horizontally,
r11.1 (b) be not less than 30 mm and not more than 40 mm in diameter,
r5 (c) have a clearance of not less than 38 mm and not more than 50 mm from the wall to the inside surface of the grab bar, and
(d) have a slip-resistant surface.
(See A-3.8.3.8.(3) in Appendix A.)

(8) A fold-down grab bar described in Clause (3)(b) or (4)(a) shall,
(a) be mounted on the wall behind the water closet,
  (i) with the horizontal component 750 mm above the finished floor, and
  (ii) not less than 390 mm and not more than 410 mm from the centre line of the water closet,
(b) not require a force of more than 22.2 N to pull it down,
r5 (c) be at least 750 mm in length,
(d) be installed to resist a load of at least 1.3 kN applied vertically or horizontally,
r11.1 (e) be not less than 30 mm and not more than 40 mm in diameter, and
(f) have a slip-resistant surface.
(See A-3.8.3.8.(3) and A-3.8.3.8.(8) in Appendix A.)

(9) A fold-down grab bar installed in accordance with Sentence (8) is permitted to encroach into,
(a) the clear turning space described in Clause (1)(a), or
(b) a clear transfer space described in Subclause (2)(a)(ii) or Clause (2)(b).
(See A-3.8.3.8.(3) in Appendix A.)

r11.1 **(10)** Where an ambulatory water closet stall or enclosure is required by Sentence 3.8.2.3.(6), it shall,
(a) be at least 1 500 mm in depth and be not less than 890 mm and not more than 940 mm in width,
(b) be equipped with a door that shall,
(i) be capable of being latched from the inside with a mechanism that is operable using a closed fist,
(ii) when the door is in an open position, have a clear opening of at least 810 mm,
(iii) swing outward, unless the minimum dimensions in Clause (a) are not located within the door swing,
(iv) be provided with spring-type or gravity hinges so that the door closes automatically,
r5 (v) be provided with a door pull on both sides of the door, near the latch side of the door, located at a height not less than 900 mm and not more than 1 100 mm above the finished floor, and
(vi) be capable of having the latch required by Subclause (i) released from the outside in the case of an emergency,
(c) be equipped with a water closet conforming to Article 3.8.3.9. and located so that its centre line is centred between the partition walls,
(d) be equipped on each side of the water closet with grab bars conforming to Clause (3)(a), and
(e) be equipped with a coat hook conforming to Clause (1)(e).
(See Appendix A.)

r11.1 3.8.3.9. Water Closets (See Appendix A.)

(1) A water closet described in Clause 3.8.3.8.(1)(d) or (10)(c) or 3.8.3.12.(1)(d) shall,
(a) be equipped with a seat located at not less than 430 mm and not more than 485 mm above the finished floor,
(b) flush automatically or be equipped with a flushing control that,
(i) is located between 500 mm and 900 mm above the finished floor,
(ii) is operable from the transfer side, and
(iii) is operable using a closed fist and with a force of not more than 22.2 N, and
(c) be equipped with a back support where there is no seat lid or tank. (See Appendix A.)
(See Appendix A.)

r11.1 3.8.3.10. Urinals (See Appendix A.)

(1) Where more than one urinal is provided in a washroom described in Sentence 3.8.2.3.(3) or (4), at least one urinal shall,
(a) be mounted with the rim located not more than 430 mm above the finished floor,
(b) have a clear floor space at least 800 mm wide that is perpendicular to, and centred on, the urinal and is unobstructed by privacy screens, and
(c) have no step in front of it.

(2) A urinal described in Sentence (1) shall,
(a) flush automatically or be equipped with a flushing control that is,
(i) located between 900 mm and 1 100 mm above the finished floor, and
(ii) operable using a closed fist and with a force of not more than 22.2 N, and
(b) have installed on each side, a vertically mounted grab bar that,
(i) complies with Article 3.8.3.8.(7),
(ii) is not less than 600 mm long, with its centre line 1 000 mm above the finished floor, and
(iii) is located not more than 380 mm from the centre line of the urinal.

(3) Where privacy screens are installed for a urinal described in Sentence (1), they shall,
(a) be mounted a minimum of 460 mm from the centre line of the urinal, and
(b) have a clearance of at least 50 mm from the grab bars required by Clause (2)(b).

(4) Where more than one urinal is provided in a washroom described in Sentence 3.8.2.3.(6), at least one urinal conforming to Sentences (1) to (3) shall be provided in the washroom.

e8 ## 3.8.3.11. Lavatories, Mirrors and Washroom Accessories (See Appendix A.)

r11.1 **(1)** A washroom described in Sentence 3.8.2.3.(2), (3) or (4) shall be provided with a lavatory that shall,
(a) be located so that the distance between the centre line of the lavatory and the side wall is not less than 460 mm,
(b) have a rim height not more than 865 mm above the finished floor,
(c) have a clearance beneath the lavatory not less than,
(i) 920 mm wide,
(ii) 735 mm high at the front edge,
(iii) 685 mm high at a point 200 mm back from the front edge, and
(iv) 350 mm high over the distance from a point 280 mm to a point 430 mm back from the front edge,
(See Appendix A.)
(d) have insulated pipes where they would otherwise present a burn hazard or have water supply temperature limited to a maximum of 43°C, (See Appendix A.)
(e) be equipped with faucets that,
(i) operate automatically or comply with 3.7.4.2.(11)(b)(i) and (ii), and
(ii) are located so that the distance from the centre line of the faucet to the edge of the basin or, where the basin is mounted in a vanity, to the front edge of the vanity, is not more than 485 mm,
(f) have a minimum 1 370 mm deep floor space to allow for a forward approach, of which a maximum of 500 mm can be located under the lavatory, (See Appendix A.)
(g) have a soap dispenser that,
(i) operates automatically or is operable using a closed fist and with a force of not more than 22.2 N, and
(ii) is located not more than 1 100 mm above the finished floor, within 500 mm from the front of the lavatory, and,
(h) have a towel dispenser or other hand drying equipment that is,
(i) located to be accessible to persons in wheelchairs,
(ii) located so that the dispensing height is not more than 1 200 mm above the finished floor,
(iii) operable with one hand, and
(iv) located not more than 610 mm, measured horizontally, from the edge of the lavatory.

(2) If mirrors are installed in a washroom described in Sentence 3.8.2.3.(2), (3) or (4), at least one mirror shall be,
(a) installed above a lavatory required by Sentence (1), and
(b) mounted with its bottom edge not more than 1 000 mm above the finished floor or inclined to the vertical to be usable by a person in a wheelchair.

r11.1 **(3)** If dispensing or hand-operated washroom accessories, other than those located in water closet stalls or enclosures and those described in Clause (1)(g), are provided, they shall be mounted so that,
(a) the dispensing height is not less than 900 mm and not more than 1 200 mm above the finished floor,
(b) the controls or operating mechanisms are mounted not less than 900 mm and not more than 1 200 mm above the finished floor, and
(c) a minimum 1 370 mm deep floor space is provided in front of the controls or operating mechanisms to allow for a front approach.

(4) Where a shelf is installed above a lavatory required by Sentence (1), it shall,
(a) be located not more than 200 mm above the top of the lavatory and not more than 1 100 mm above the finished floor, and
(b) project not more than 100 mm from the wall.

(5) A washroom described in Sentence 3.8.2.3.(6) shall be provided with a lavatory conforming to Clauses (1)(e), (g) and (h).

r4 3.8.3.12. Universal Washrooms

(1) A universal washroom room shall,
(a) be served by a *barrier-free* path of travel,
r11.1 (b) have a door that,
(i) complies with Article 3.8.3.3.,
(ii) has a graspable latch-operating mechanism that is,
(A) operable using a closed fist and with a force of not more than 22.2 N, and
(B) located between 900 mm and 1 000 mm above the finished floor, and
(iii) is capable of being locked from the inside and released from the outside in case of emergency,
(c) have one lavatory conforming to Sentences 3.8.3.11.(1), (3) and (4),
(d) have one water closet conforming to Article 3.8.3.9. that is located in accordance with Clause 3.8.3.8.(2)(a) or (b), (See Appendix A.)
(e) have grab bars conforming to,
(i) Sentence 3.8.3.8.(3), if the water closet is located in accordance with Clause 3.8.3.8.(2)(a), or
(ii) Sentence 3.8.3.8.(4), if the water closet is located in accordance with Clause 3.8.3.8.(2)(b),
(f) have no internal dimension between walls that is less than 1 700 mm,
r5 (g) have a coat hook that conforms to Clause 3.8.3.8.(1)(e) and a shelf that is located not more than 1 100 mm above the finished floor and projects not more than 100 mm from the wall,
(h) be designed to permit a wheelchair to turn in an open space not less than 1 700 mm in diameter,
r11.1 (i) be provided with a door equipped with a power door operator,
(j) be provided with a mirror,
(i) installed above a lavatory described in Clause (1)(c), and
(ii) mounted with its bottom edge not more than 1 000 mm above the finished floor or inclined to the vertical to be usable by a person in a wheelchair, and
(k) have lighting controlled by a motion sensor conforming to Sentence 12.2.4.1.(2).
(See Appendix A.)

(2) A universal washroom shall have,
(a) an emergency call system that consists of audible and visual signal devices inside and outside of the washroom that are activated by a control device inside the washroom, and
(b) an emergency sign that contains the words **IN THE EVENT OF AN EMERGENCY PUSH EMERGENCY BUTTON AND AUDIBLE AND VISUAL SIGNAL WILL ACTIVATE** in letters at least 25 mm high with a 5 mm stroke and that is posted above the emergency button.
(See Appendix A.)

(3) A clear space not less than 810 mm wide and 1 830 mm long shall be provided in each universal washroom for an adult-size change table. (See A-3.8.3.12.(1) in Appendix A.)

(4) Where the clear space provided for an adult-size change table is adjacent to a wall, reinforcement shall be installed in the wall to permit the future installation of the change table.

(5) Where an adult-size change table is installed, it shall,
(a) when fully loaded, have a surface height above the finished floor that can be adjusted from between 450 mm and 500 mm at the low range to between 850 mm and 900 mm at the high range,
(b) be designed to carry a minimum load of 1.33 kN,
(c) have a clear floor space parallel to the long side of the table not less than 760 mm wide and 1 500 mm long, and
(d) in the case of a fold-down table,
(i) be installed so that it does not encroach into a clear transfer space described in Clause 3.8.3.8.(2)(a) or (b), and
(ii) have no operating mechanisms higher than 1 200 mm.

(6) A universal washroom need not conform to Sentences (3) and (4) if,

(a) it is located in an individual *suite* that,

(i) is used for an *assembly occupancy*, a *business and personal services occupancy*, a *mercantile occupancy* or an *industrial occupancy*, and

r5 (ii) meets one of the following requirements,

(A) it is located in a *building* that is less than 300 m^2 in *building area*, or

(B) it is less than 300 m^2 in area, if located in a *building* that is at least 300 m^2 in *building area*, or

(b) another universal washroom conforming to this Article is provided on the same floor level within 45 m.

(See Appendix A.)

r4 3.8.3.13. Showers and Bathtubs

(1) Except within a *suite* of *residential occupancy*, if showers are provided in a *building*, the number of *barrier-free* showers shall conform to Table 3.8.3.13. (See Appendix A.)

Table 3.8.3.13.
Minimum Number of Barrier-Free Showers
Forming Part of Sentence 3.8.3.13.(1)

Number of Showers Provided in a Group	Minimum Number of Showers Required to be *Barrier-Free*
1	0
2 to 7	1
Over 7	1, plus 1 for each additional increment of 7 showers in a group
Column 1	2

r11.1 **(2)** A *barrier-free* shower required by Sentence (1) shall,

(a) be not less than 1 500 mm wide and 900 mm deep,

(b) have a clear floor space at the entrance to the shower not less than 900 mm deep and the same width as the shower, except that fixtures are permitted to project into that space provided they do not restrict access to the shower, (See Appendix A.)

(c) have no doors that obstruct the shower controls or the clear floor space described in Clause (b),

(d) have a slip-resistant floor surface,

(e) have a threshold that is level with the adjacent finished floor or a bevelled threshold not more than 13 mm higher than the adjacent finished floor,

(f) have a hinged seat, other than a spring-loaded hinged seat, or a fixed seat that shall,

(i) be not less than 450 mm wide and 400 mm deep,

(ii) be mounted on the same side wall as the vertical grab bar between 460 mm and 480 mm above the finished floor,

(iii) be designed to carry a minimum load of 1.3 kN,

(iv) be located so that the edge of the seat is within 500 mm of the shower controls, and

(v) have a smooth and slip-resistant surface and no rough edges,

(See Appendix A.)

(g) have two grab bars,

(i) that conform to Sentence 3.8.3.8.(7) and do not obstruct the use of the shower controls,

(ii) one of which is 1 000 mm long vertically located on the side wall between 50 mm and 80 mm from the adjacent clear floor area, and with the lower end between 600 mm and 650 mm above the finished floor, and

(iii) one of which is L-shaped, located on the wall opposite the entrance to the shower, with a 1 000 mm long horizontal component mounted between 750 mm and 870 mm above the finished floor and a 750 mm long vertical component mounted between 400 mm and 500 mm from the side wall on which the vertical grab bar described in Subclause (ii) is mounted,

(See Appendix A.)

(h) have a pressure-equalizing or thermostatic mixing valve that,
  (i) is operable using a closed fist and with a force of not more than 22.2 N,
  (ii) is mounted on the wall opposite the entrance to the shower no more than 1 200 mm above the finished floor, and
  (iii) is located within reach of the seat,
(i) have a hand-held shower head with not less than 1 800 mm of flexible hose located so that it,
  (i) can be reached from a seated position,
  (ii) can be used in a fixed position at a height of 1 200 mm and 2 030 mm from the finished floor, and
  (iii) does not obstruct the use of the grab bars, and
(j) have fully recessed soap holders that can be reached from the seated position.

r11.1 **(2.1)** All other controls installed in a shower described in Sentence (2) shall comply with Subclauses (2)(h)(i) to (iii).

(3) Individual showers that are provided for use by patients or residents in *buildings* of Group B, Division 2 or 3 *occupancy* shall conform to Sentence (2).

r11.1 **(4)** Individual bathtubs that are provided for the use of patients or residents in *buildings* of Group B, Division 2 or 3 *occupancy* shall,
(a) be located in a room with a clear floor space not less than 1 500 mm in diameter,
(b) be not less than 1 500 mm long,
(c) be capable of being accessed along the full length of the bathtub with no tracks mounted on the bathtub rim,
(d) have faucets that,
  (i) are operable using a closed fist and with a force of not more than 22.2 N, and
  (ii) are located on the centre line of the bathtub or between the centre line of the bathtub and the exterior edge of the bathtub rim, at a maximum height of 450 mm above the rim,
(e) unless the bathtub is free-standing, have three grab bars,
  (i) conforming to Sentence 3.8.3.8.(7),
  (ii) that are not less than 1 200 mm long,
  (iii) two of which are located vertically at each end of the bathtub, mounted between 80 mm and 280 mm above the bathtub rim, and
  (iv) one of which is located horizontally along the full length of the bathtub, mounted between 80 mm and 280 mm above the bathtub rim,
(f) have a slip-resistant bottom surface, and
(g) be equipped with a hand-held shower head with not less than 1 800 mm of flexible hose that can be used in a fixed position at a height of 1 200 mm and 2 030 mm and does not obstruct the use of the grab bars.

(See Appendix A.)

r11.1 **(5)** Where a *barrier-free* bathtub is provided, a clear floor space at least 900 mm wide and 1 500 mm long shall be provided along the full length of the bathtub.

3.8.3.14. Reserved

r4 3.8.3.15. Shelves or Counters for Telephones (See Appendix A.)

(1) Where more than one telephone is provided for public use, a built-in shelf or counter shall be provided for at least one telephone.

(2) A shelf or counter described in Sentence (1) shall,
(a) be level,
(b) be not less than 500 mm wide and 350 mm deep, and
(c) have, for each telephone provided, a clear space that,
  (i) is not less than 810 mm wide and 1 370 mm deep, centred on the telephone, and
  (ii) has no obstruction within 250 mm above the surface.

(3) The top surface of a section of the shelf or counter described in Sentence (1) shall,
(a) be located not less than 775 mm and not more than 875 mm from the finished floor, and
(b) have a knee space not less than 740 mm high.

(4) Where a wall-hung telephone is provided above the shelf or counter section described in Sentence (3), it shall be located so that the receiver and coin or card slot are not more than 1 200 mm from the finished floor.

(5) Where more than one telephone is provided for public use in a normally occupied *floor area* that is not required by Article 3.8.2.1. to have a *barrier-free* path of travel, a built-in shelf or counter that conforms to Sentences (2), (3) and (4) shall be provided for at least one telephone.

r4 ## 3.8.3.16. Drinking Fountains (See Appendix A.)

(1) Where more than one drinking fountain is provided, at least one shall be a *barrier-free* fountain that conforms to Sentences (2) and (3).

(2) A *barrier-free* drinking fountain shall,
(a) have a spout located near the front of the unit not more than 915 mm above the finished floor,
(b) be equipped with controls that are easily operated from a wheelchair using one hand with a force of not more than 22 N or operates automatically,
(c) project the water at least 100 mm high,
(d) provide the water stream at a vertical angle of up to,
  (i) 30°, where the spout is located less than 75 mm from the front of the fountain, or
  (ii) 15°, where the spout is located not less than 75 mm and not more than 125 mm from the front of the fountain,
(e) be detectable by a cane at a level at or below 680 mm from the finished floor, and
(f) where the drinking fountain is cantilevered, meet the following requirements:
  (i) be mounted not more than 915 mm above the finished floor,
  (ii) provide a clearance height under the fountain of not less than 735 mm above the finished floor,
r5 (iii) have a clear depth under the fountain of not less than 450 mm,
  (iv) have a clear width under the fountain of not less than 760 mm,
  (v) have a toe clearance height under the fountain of at least 350 mm above the finished floor from a point 300 mm back from the front edge to the wall, and
  (vi) have a depth at the base of the fountain of at least 700 mm.

(3) A *barrier-free* drinking fountain required by Sentence (1) shall have a clear floor space in front of, or adjacent to, the fountain that is a minimum of 810 mm deep and 1 370 mm wide.

(4) Where more than one drinking fountain is provided in a normally occupied *floor area* that is not required by Article 3.8.2.1. to have a *barrier-free* path of travel, at least one shall be a *barrier-free* fountain that conforms to Sentences (2) and (3).

r4 ## 3.8.3.17. Platforms

(1) A tactile attention indicator conforming to Article 3.8.3.18. shall be installed along any edge of a platform that is,
(a) not protected by a *guard*, and
(b) higher than 250 mm above the finished floor or ground or sloped steeper than 1 in 3.

(2) Sentence (1) does not apply to the front edges of *stages*.

r4 ## 3.8.3.18. Tactile Attention Indicators

r5 **(1)** Where a tactile attention indicator is required, it shall conform to Sentence (2) and Clauses 4.1.1. and 4.1.2. of ISO 23599, "Assistive Products for Blind and Vision-Impaired Persons – Tactile Walking Surface Indicators".

r5 **(2)** The depth of the tactile attention indicator shall be not less than 300 mm and not more than 610 mm.

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Part 4

Structural Design

Section 4.1. Structural Loads and Procedures

4.1.1. General

4.1.1.1. Scope

(1) The scope of this Part shall be as described in Subsection 1.1.2. of Division A.

4.1.1.2. Reserved

4.1.1.3. Design Requirements

(1) *Buildings* and their structural members and connections including formwork and falsework shall be designed to have sufficient structural capacity and structural integrity to safely and effectively resist all loads, effects of loads and influences that may reasonably be expected, having regard to the expected service life of *buildings*, and shall in any case satisfy the requirements of this Section. (See Appendix A.)

(2) *Buildings* and their structural members shall be designed for serviceability, in accordance with Articles 4.1.3.4. to 4.1.3.6. (See Appendix A.)

(3) All permanent and temporary structural members, including formwork and falsework of a *building*, shall be protected against loads exceeding the specified loads during the *construction* period except when, as verified by analysis or test, temporary overloading of a structural member would result in no impairment of that member or any other member.

(4) Precautions shall be taken during all stages of *construction* to ensure that the *building* is not damaged or distorted due to loads applied during *construction*.

4.1.1.4. Design Basis

r3 **(1)** Except as provided in Sentence (2), *buildings* and their structural members shall be designed in conformance with the procedures and practices provided in this Part.

(2) Provided the design is carried out by a person especially qualified in the specific methods applied and provided the design demonstrates a level of safety and performance in accordance with the requirements of this Part, *buildings* and their structural components falling within the scope of this Part that are not amenable to analysis using a generally established theory may be designed by,

(a) evaluation of a full-scale structure or a prototype by a loading test, or

(b) studies of model analogues.

(See Appendix A.)

4.1.2. Specified Loads and Effects

4.1.2.1. Loads and Effects (See Appendix A.)

(1) Except as provided in Article 4.1.2.2., the categories of loads, specified loads and effects set out in Table 4.1.2.1.A. shall be taken into consideration in the design of a *building* and its structural members and connections. (See Appendix A.)

Table 4.1.2.1.A.
Categories of Loads, Specified Loads and Effects
Forming Part of Sentence 4.1.2.1.(1)

r3

Symbol	Loads, Specified Loads and Effects(1)
D	*dead load* – a permanent load(2) due to the weight of *building* components as specified in Subsection 4.1.4.
E	earthquake load and effects – a rare load(4) due to an earthquake, as specified in Subsection 4.1.8.
H	a permanent load(2) due to lateral earth pressure, including *groundwater*
L	*live load* – a variable load(3) due to intended use and *occupancy* (including loads due to cranes and the pressure of liquids in containers), as specified in Subsection 4.1.5.
L_{xc}	*live load* exclusive of crane loads
C	*live load* due to cranes including self weight
C_d	self weight of all cranes positioned for maximum effects
C_7	crane bumper impact load
P	permanent effects caused by prestress
S	variable load(3) due to snow including ice and associated rain, as specified in Article 4.1.6.2., or due to rain, as specified in Article 4.1.6.4.
T	effects due to contraction, expansion, or deflection caused by temperature changes, shrinkage, moisture changes, creep, ground settlement, or a combination of them (See Appendix A.)
W	wind load – a variable load(3) due to wind, as specified in Subsection 4.1.7.
Column 1	2

Notes to Table 4.1.2.1.A.:

(1) Load means the imposed deformations (i.e., deflections, displacements or motions that induce deformations and forces in the structure), forces and pressures applied to the *building* structure.

(2) Permanent load is a load that changes very little once it has been applied to the structure, except during repair.

(3) Variable load is a load that frequently changes in magnitude, direction or location.

(4) Rare load is a load that occurs infrequently and for a short time only.

(2) Minimum specified values of the loads described in Sentence (1), as set forth in Subsections 4.1.4. to 4.1.8., shall be increased to account for dynamic effects where applicable.

(3) For the purpose of determining specified loads **S**, **W** or **E** in Subsections 4.1.6. to 4.1.8., *buildings* shall be assigned an Importance Category based on intended use and *occupancy*, in accordance with Table 4.1.2.1.B. (See Appendix A.)

Table 4.1.2.1.B.
Importance Categories for Buildings
Forming Part of Sentence 4.1.2.1.(3)

Use and *Occupancy*	Importance Category
Buildings that represent a low direct or indirect hazard to human life in the event of failure, including: • low human-*occupancy buildings*, where it can be shown that collapse is not likely to cause injury or other serious consequences • minor storage *buildings*	Low(1)
All *buildings* except those listed in Importance Categories Low, High and Post-disaster	Normal
Buildings that are likely to be used as post-disaster shelters, including *buildings* whose primary use is: • as an elementary, middle or secondary school • as a community centre Manufacturing and storage facilities containing toxic, explosive or other hazardous substances in sufficient quantities to be dangerous to the public if released(1)	High
Post-disaster buildings	Post-disaster
Column 1	2

Notes to Table 4.1.2.1.B.:
(1) See Appendix A.

4.1.2.2. Loads Not Listed

(1) Where a *building* or structural member can be expected to be subjected to loads, forces or other effects not listed in Article 4.1.2.1., such effects shall be taken into account in the design based on the most appropriate information available.

4.1.3. Limit States Design (See Appendix A.)

4.1.3.1. Definitions

(1) In this Part, the term,
(a) "limit states" means those conditions of a *building* structure that result in the *building* ceasing to fulfill the function for which it was designed. (Those limit states concerning safety are called ultimate limit states (ULS) and include exceeding the load-carrying capacity, overturning, sliding and fracture; those limit states that restrict the intended use and *occupancy* of the *building* are called serviceability limit states (SLS) and include deflection, vibration, permanent deformation and local structural damage such as cracking; and those limit states that represent failure under repeated loading are called fatigue limit states),
(b) "specified loads (**C, D, E, H, L, P, S, T** and **W**)" mean those loads set out in Table 4.1.2.1.A.,
(c) "principal load" means the specified variable load or rare load that dominates in a given load combination,
(d) "companion load" means a specified variable load that accompanies the principal load in a given load combination,
(e) "service load" means a specified load used for the evaluation of a serviceability limit state,
(f) "principal-load factor" means a factor applied to the principal load in a load combination to account for the variability of the load and load pattern and the analysis of its effects,
(g) "companion-load factor" means a factor that, when applied to a companion load in the load combination, gives the probable magnitude of a companion load acting simultaneously with the factored principal load,
(h) "importance factor, I," means a factor applied in Subsections 4.1.6. to 4.1.8. to obtain the specified load and take into account the consequences of failure as related to the limit state and the use and *occupancy* of the *building*,
(i) "factored load" means the product of a specified load and its principal-load factor or companion-load factor,
(j) "effects" refers to forces, moments, deformations or vibrations that occur in the structure,
(k) "nominal resistance, R," of a member, connection or structure, is based on the geometry and on the specified properties of the structural materials,

(l) "resistance factor, Φ," means a factor applied to a specified material property or to the resistance of a member, connection or structure, and that, for the limit state under consideration, takes into account the variability of dimensions and material properties, workmanship, type of failure and uncertainty in the prediction of resistance, and

(m) "factored resistance, ΦR," means the product of nominal resistance and the applicable resistance factor.

4.1.3.2. Strength and Stability

(1) A *building* and its structural components shall be designed to have sufficient strength and stability so that the factored resistance, ΦR, is greater than or equal to the effect of factored loads, which shall be determined in accordance with Sentence (2).

(2) Except as provided in Sentence (3), the effect of factored loads for a *building* or structural component shall be determined in accordance with the requirements of this Article and the following load combination cases, the applicable combination being that which results in the most critical effect:

(a) for load cases without crane loads, the load combinations listed in Table 4.1.3.2.A., and

(b) for load cases with crane loads, the load combinations listed in Table 4.1.3.2.B.

(See Appendix A.)

(3) Other load combinations that must also be considered are the principal loads acting with the companion loads taken as zero.

e1 **(4)** Where the effects due to lateral earth pressure, **H**, restraint effects from pre-stress, **P**, and imposed deformation, **T**, affect the structural safety, they shall be taken into account in the calculations, with load factors of 1.5, 1.0 and 1.25 assigned to **H**, **P** and **T** respectively. (See Appendix A.)

(5) Except as provided in Sentence 4.1.8.16.(1), the counteracting factored *dead load*, 0.9**D** in load combination cases 2, 3 and 4 and 1.0**D** in load combination case 5 of Table 4.1.3.2.A. and 0.9**D** in load combination cases 1 to 5 and 1.0**D** in load combination case 6 of Table 4.1.3.2.B., shall be used when the *dead load* acts to resist overturning, uplift, sliding, failure due to stress reversal, and to determine anchorage requirements and the factored resistance of members. (See Appendix A.)

(6) The principal-load factor 1.5 for *live loads*, **L** in Table 4.1.3.2.A. and $\mathbf{L_{XC}}$ in Table 4.1.3.2.B. may be reduced to 1.25 for liquids in tanks.

r11.1 **(7)** The companion-load factor for *live loads*, **L** in Table 4.1.3.2.A. and $\mathbf{L_{XC}}$ in Table 4.1.3.2.B. shall be increased by 0.5 for storage areas and for equipment areas and *service rooms* referred to in Table 4.1.5.3.

(8) Except as provided in Sentence (9), the load factor 1.25 for *dead load*, **D**, for *soil*, superimposed earth, plants and trees given in Tables 4.1.3.2.A. and 4.1.3.2.B. shall be increased to 1.5, except that when the *soil* depth exceeds 1.2 m, the factor may be reduced to $1 + 0.6/h_s$ but not less than 1.25, where h_s is the depth of *soil* in metres supported by the structure.

(9) A principal-load factor of 1.5 shall be applied to the weight of saturated *soil* used in load combination case 1 of Table 4.1.3.2.A.

(10) Earthquake load, **E**, in load combination case 5 of Table 4.1.3.2.A. and case 6 of Table 4.1.3.2.B. includes horizontal earth pressure due to earthquake determined in accordance with Sentence 4.1.8.16.(4).

(11) Provision shall be made to ensure adequate stability of the structure as a whole and adequate lateral, torsional and local stability of all structural parts.

(12) Sway effects produced by vertical loads acting on the structure in its displaced configuration shall be taken into account in the design of *buildings* and their structural members.

r11.1

Table 4.1.3.2.A.
Load Combinations Without Crane Loads for Ultimate Limit States
Forming Part of Sentences 4.1.3.2.(2) and (5) to (10)

Case	Load Combination(1)	
	Principal Loads	Companion Loads
1	1.4**D**(2)	—
2	(1.25**D**(3) or 0.9**D**(4)) + 1.5**L**(5)	1.0**S**(6) or 0.4**W**
3	(1.25**D**(3) or 0.9**D**(4)) + 1.5**S**	1.0.**L**(6)(7) or 0.4**W**
4	(1.25**D**(3) or 0.9**D**(4)) + 1.4**W**	0.5**L**(7) or 0.5**S**
5	1.0**D**(4) + 1.0**E**(8)	0.5**L**(6)(7) + 0.25**S**(6)
Column 1	2	3

Notes to Table 4.1.3.2.A.:
(1) See Sentences 4.1.3.2.(2), (3) and (4).
(2) See Sentence 4.1.3.2.(9).
(3) See Sentence 4.1.3.2.(8).
(4) See Sentence 4.1.3.2.(5).
(5) See Sentence 4.1.3.2.(6).
(6) See Article 4.1.5.5.
(7) See Sentence 4.1.3.2.(7).
(8) See Sentence 4.1.3.2.(10).

r11.1

Table 4.1.3.2.B.
Load Combinations With Crane Loads for Ultimate Limit States
Forming Part of Sentences 4.1.3.2.(2), (5) to (8) and (10)

Case	Load Combination(1)	
	Principal Loads	Companion Loads
1	(1.25**D**(2) or 0.9**D**(3)) + (1.5**C** + 1.0**L**xc)	1.0**S**(4) or 0.4**W**
2	(1.25**D**(2) or 0.9**D**(3)) + (1.0**C** + 1.5**L**xc(5))	1.0**S**(4) or 0.4**W**
3	(1.25**D**(2) or 0.9**D**(3)) + 1.5**S**	1.0**C** + 1.0**L**xc(4)(6)
4	(1.25**D**(2) or 0.9**D**(3)) + 1.4**W**	1.0**C**(7) + 0.5**L**xc(4)(6)
5	(1.25**D**(2) or 0.9**D**(3)) + $\mathbf{C}_7$	—
6	1.0**D**(3) + 1.0**E**(8)	1.0$\mathbf{C}_d$ + 0.5**L**xc(4)(6) + 0.25**S**(4)
Column 1	2	3

Notes to Table 4.1.3.2.B.:
(1) See Sentences 4.1.3.2.(2) to (4).
(2) See Sentence 4.1.3.2.(8).
(3) See Sentence 4.1.3.2.(5).
(4) See Article 4.1.5.5.
(5) See Sentence 4.1.3.2.(6).
(6) See Sentence 4.1.3.2.(7).
(7) Side thrust due to cranes need not be combined with full wind load.
(8) See Sentence 4.1.3.2.(10).

4.1.3.3. Fatigue

(1) A *building* and its structural components, including connections, shall be checked for fatigue failure under the effect of the cyclical loads, as required in the standards listed in Section 4.3. (See Appendix A.)

(2) Where vibration effects, such as resonance and fatigue resulting from machinery and equipment, are likely to be significant, a dynamic analysis shall be carried out. (See Appendix A.)

4.1.3.4. Serviceability

(1) A *building* and its structural components shall be checked for serviceability limit states as defined in Clause 4.1.3.1.(1)(a) under the effect of service loads for serviceability criteria specified or recommended in Articles 4.1.3.5. and 4.1.3.6. and in the standards listed in Section 4.3. (See Appendix A.)

4.1.3.5. Deflection

(1) In proportioning structural members to limit serviceability problems resulting from deflections, consideration shall be given to,

(a) the intended use of the *building* or member,
(b) limiting damage to non-structural members made of materials whose physical properties are known at the time of design,
(c) limiting damage to the structure itself, and
(d) creep, shrinkage, temperature changes and prestress.

(See Appendix A.)

(2) The lateral deflection of *buildings* due to service wind and gravity loads shall be checked to ensure that structural elements and non-structural elements, whose nature is known at the time the structural design is carried out, will not be damaged.

(3) Except as provided in Sentence (4), the total drift per *storey* under service wind and gravity loads shall not exceed 1/500 of the *storey* height unless other drift limits are specified in the design standards referenced in Section 4.3. (See Appendix A.)

(4) The deflection limits required in Sentence (3) do not apply to industrial *buildings* or sheds if experience has proven that greater movement will have no significant adverse effects on the strength and function of the *building*.

(5) The *building* structure shall be designed for lateral deflection due to **E**, in accordance with Article 4.1.8.13.

4.1.3.6. Vibration

(1) Floor systems susceptible to vibration shall be designed so that vibrations will have no significant adverse effects on the intended *occupancy* of the *building*. (See Appendix A.)

(2) Where the fundamental vibration frequency of a structural system supporting an *assembly occupancy* used for rhythmic activities, such as dancing, concerts, jumping exercises or gymnastics, is less than 6 Hz, the effects of resonance shall be investigated by means of a dynamic analysis. (See Appendix A.)

(3) A *building* susceptible to lateral vibration under wind load shall be designed in accordance with Article 4.1.7.2. so that the vibrations will have no significant adverse effects on the intended use and *occupancy* of the *building*. (See Appendix A.)

4.1.4. Dead Loads

4.1.4.1. Dead Loads

(1) The specified *dead load* for a structural member consists of,
(a) the weight of the member itself,
(b) the weight of all materials of construction incorporated into the *building* to be supported permanently by the member,
(c) the weight of *partitions*,
(d) the weight of permanent equipment, and
(e) the vertical load due to earth, plants and trees.

(2) Except as provided in Sentence (5), in areas of a *building* where *partitions* other than permanent *partitions* are shown on the drawings, or where *partitions* might be added in the future, allowance shall be made for the weight of such *partitions*.

(3) The *partition* weight allowance in Sentence (2) shall be determined from the actual or anticipated weight of the *partitions* placed in any probable position, but shall be not less than 1 kPa over the area of floor being considered.

(4) *Partition* loads used in design shall be shown on the drawings.

(5) In cases where the *dead load* of the *partition* is counteractive, the load allowances referred to in Sentences (2) and (3) shall not be included in the design calculations.

(6) Except for structures where the *dead load* of *soil* is part of the load-resisting system, where the *dead load* due to *soil*, superimposed earth, plants and trees is counteractive, it shall not be included in the design calculations. (See Appendix A.)

4.1.5. Live Loads Due to Use and Occupancy

4.1.5.1. Loads Due to Use of Floors and Roofs

(1) Except as provided in Sentence (2), the specified *live load* on an area of floor or roof depends on the intended use and *occupancy*, and shall not be less than whichever of the following loads produces the most critical effect:
(a) the uniformly distributed load patterns listed in Article 4.1.5.3.,
(b) the loads due to the intended use and *occupancy*, or
(c) the concentrated loads listed in Article 4.1.5.9.

(See Appendix A.)

(2) For *buildings* in the Low Importance Category as described in Table 4.1.2.1.B., a factor of 0.8 may be applied to the *live load*.

4.1.5.2. Uses Not Stipulated

(1) Except as provided in Sentence (2), where the use of an area of floor or roof is not provided for in Article 4.1.5.3., the specified *live loads* due to the use and *occupancy* of the area shall be determined from an analysis of the loads resulting from the weight of,
(a) the probable assembly of persons,
(b) the probable accumulation of equipment and furnishings, and
(c) the probable storage of materials.

(2) For *buildings* in the Low Importance Category as described in Table 4.1.2.1.B., a factor of 0.8 may be applied to the *live load*.

4.1.5.3. Full and Partial Loading

(1) The uniformly distributed *live load* shall be not less than the value listed in Table 4.1.5.3., which may be reduced as provided in Article 4.1.5.8., applied uniformly over the entire area, or on any portions of the area, whichever produces the most critical effects in the members concerned.

Table 4.1.5.3.
Specified Uniformly Distributed Live Loads on an Area of Floor or Roof
Forming Part of Sentence 4.1.5.3.(1)

Use of Area of Floor or Roof	Minimum Specified Load, kPa
Assembly Areas	
(a) Except for those areas listed under (b), (c), (d) and (e), assembly areas with or without fixed seats including:	
Arenas[5] (areas without fixed seats that have backs)	
Auditoria	
Churches and similar places of worship (areas without fixed seats that have backs)	
Dance floors	
Dining areas[1]	
Foyers and entrance halls	
Grandstands[5] (areas without fixed seats that have backs), reviewing stands and bleachers	4.8
Gymnasia	
Lecture halls[5] (areas without fixed seats that have backs)	
Museums	
Promenades	
Rinks	
Stadia[5] (areas without fixed seats that have backs)	
Stages	
Theatres (areas without fixed seats that have backs)	
Other areas with similar uses	
(b) Classrooms and courtrooms with or without fixed seats[5]	2.4
(c) Portions of assembly areas with fixed seats that have backs for the following uses:	
Arenas	2.9[5]
Grandstands	
Stadia	
(d) Portions of assembly areas with fixed seats that have backs for the following uses:	
Churches and similar places of worship	2.4
Lecture halls[5]	
Theatres	
(e) Vomitories, *exits*, lobbies and corridors[5]	4.8
Attics[5]	
Accessible by a stairway in *residential occupancies* only	1.4
Having limited accessibility so that there is no storage of equipment or material	0.5
Balconies	
Exterior	4.8
Interior and *mezzanines* that could be used by an assembly of people as a viewing area[5]	4.8
Interior and *mezzanines* other than above	[2]
Column 1	2

Table 4.1.5.3. (Cont'd)
Specified Uniformly Distributed Live Loads on an Area of Floor or Roof
Forming Part of Sentence 4.1.5.3.(1)

Use of Area of Floor or Roof	Minimum Specified Load, kPa
Corridors, lobbies and aisles[5]	
Other than those listed below	4.8
Not more than 1 200 mm in width and all upper floor corridors of residential areas only of apartments, *hotels* and motels (that cannot be used by an assembly of people as a viewing area)[5]	[2][5]
In a Group B, Division 3 *occupancy* that contains sleeping accommodation for not more than 10 persons and not more than 6 occupants require assistance in evacuation in case of an emergency	2.4
Equipment areas and *service rooms* including:	3.6[3]
Generator rooms	
Mechanical equipment exclusive of elevators	
Machine rooms	
Pump rooms	
Transformer vaults	
Ventilating or *air-conditioning* equipment	
Exits and fire escapes	4.8
Factories	6.0[3]
Footbridges	4.8
Garages for	
Vehicles not exceeding 4 000 kg gross weight	2.4
Vehicles exceeding 4 000 kg but not exceeding 9 000 kg gross weight	6.0
Vehicles exceeding 9 000 kg gross weight	12.0[5]
Kitchens (other than residential)	4.8
Libraries	
Stack rooms	7.2
Reading and study rooms	2.9
Office areas (not including record storage and computer rooms) located in	
Basement and the *first storey*	4.8
Floors above the *first storey*	2.4
Operating rooms and laboratories	3.6
Patients' bedrooms	1.9
Recreation areas that cannot be used for assembly purposes including:	3.6
Billiard rooms	
Bowling alleys	
Pool rooms	
Residential areas (within the scope of Article 1.1.2.2. of Division A)	
Sleeping and living quarters in apartments, *hotels*, motels, boarding schools and colleges	1.9
Work areas within *live/work units*	2.4
Residential areas (within the scope of Article 1.1.2.4. of Division A)	
Bedrooms and other areas	1.9
Stairs within dwelling units	1.9
Retail and wholesale areas	4.8
Roofs	1.0[4][5]
Column 1	2

Table 4.1.5.3. (Cont'd)
Specified Uniformly Distributed Live Loads on an Area of Floor or Roof
Forming Part of Sentence 4.1.5.3.(1)

Use of Area of Floor or Roof	Minimum Specified Load, kPa
Sidewalks and driveways over areaways and *basements*	12.0(4)(5)
Storage areas, including locker rooms in apartment *buildings*	4.8(3)
Toilet areas	2.4
Underground slabs with earth cover	(4)
Warehouses	4.8(3)
Column 1	2

Notes to Table 4.1.5.3.:
(1) See Article 4.1.5.6.
(2) See Article 4.1.5.4.
(3) See Sentence 4.1.5.1.(1).
(4) See Article 4.1.5.5.
(5) See Appendix A.

4.1.5.4. Loads for Occupancy Served

(1) The following shall be designed to carry not less than the specified load required for the *occupancy* they serve, provided they cannot be used by an assembly of people as a viewing area:
(a) corridors, lobbies and aisles not more than 1 200 mm wide,
(b) all corridors above the *first storey* of residential areas of apartments, *hotels* and motels, and
(c) interior balconies and *mezzanines*.

4.1.5.5. Loads on Exterior Areas (See Appendix A.)

(1) Exterior areas accessible to vehicular traffic shall be designed for their intended use, including the weight of firefighting equipment, but not for less than the snow and rain loads prescribed in Subsection 4.1.6.

(2) Except as provided in Sentences (3) and (4), roofs shall be designed for the uniform *live loads* specified in Table 4.1.5.3., the concentrated *live loads* listed in Table 4.1.5.9., or the snow and rain loads prescribed in Subsection 4.1.6., whichever produces the most critical effects in the members concerned.

(3) Exterior areas accessible to pedestrian traffic, but not vehicular traffic, shall be designed for their intended use, but not for less than the greater of,
(a) the *live load* prescribed for assembly areas in Table 4.1.5.3., or
(b) the snow and rain loads prescribed in Subsection 4.1.6.

(4) Roof parking decks shall be designed for the uniformly distributed *live loads* specified in Table 4.1.5.3., the concentrated *live loads* listed in Table 4.1.5.9., or the roof snow load, whichever produces the most critical effect in the members concerned.

4.1.5.6. Loads for Dining Areas

(1) The minimum specified *live load* listed in Table 4.1.5.3. for dining areas may be reduced to 2.4 kPa for areas in *buildings* that are being converted to dining areas, provided that the *floor area* does not exceed 100 m² and the dining area will not be used for other assembly purposes, including dancing.

4.1.5.7. More Than One Occupancy

(1) Where an area of floor or roof is intended for 2 or more *occupancies* at different times, the value to be used from Table 4.1.5.3. shall be the greatest value for any of the *occupancies* concerned.

4.1.5.8. Variation With Tributary Area (See Appendix A.)

(1) An area used for *assembly occupancies* designed for a *live load* of less than 4.8 kPa and roofs designed for the minimum loading specified in Table 4.1.5.3. shall have no reduction for tributary area.

(2) Where a structural member supports a tributary area of a floor or a roof, or a combination of them, that is greater than 80 m² and either used for *assembly occupancies* designed for a *live load* of 4.8 kPa or more, or used for storage, manufacturing, retail stores, garages or as a footbridge, the specified *live load* due to use and *occupancy* is the load specified in Article 4.1.5.3. multiplied by,

$$0.5 + \sqrt{20 / A}$$

where,

"A" is the tributary area in square metres for this type of use and *occupancy*.

(3) Where a structural member supports a tributary area of a floor or a roof or a combination of them, that is greater than 20 m² and used for any use or *occupancy* other than *assembly occupancies* and those indicated in Sentences (1) and (2), the specified *live load* due to use and *occupancy*, is the load specified in Article 4.1.5.3. multiplied by,

$$0.3 + \sqrt{9.8 / B}$$

where,

"B" is the tributary area in square metres for this type of use and *occupancy*.

(4) Where the specified *live load* for a floor is reduced in accordance with Sentence (2) or (3), the structural drawings shall indicate that a *live load* reduction factor for tributary area has been applied.

4.1.5.9. Concentrated Loads

(1) The specified *live load* due to possible concentrations of load resulting from the use of an area of floor or roof shall not be less than that listed in Table 4.1.5.9. applied over the loaded area noted in Table 4.1.5.9. and located so as to cause maximum effects, except that for *occupancies* not listed in Table 4.1.5.9., the concentrations of load shall be determined in accordance with Article 4.1.5.2.

Table 4.1.5.9.
Specified Concentrated Live Loads on an Area of Floor or Roof
Forming Part of Sentence 4.1.5.9.(1)

Area of Floor or Roof	Minimum Specified Concentrated Load, kN	Loaded Area, mm x mm
Roof surfaces	1.3	200 x 200
Floors of classrooms	4.5	750 x 750
Floors of offices, manufacturing *buildings*, hospital wards and *stages*	9.0	750 x 750
Floors and areas used by vehicles not exceeding 4000 kg gross weight	18	120 x 120
Floors and areas used by vehicles exceeding 4000 kg but not exceeding 9000 kg gross weight	36	120 x 120
Floors and areas used by vehicles exceeding 9000 kg gross weight	54(1)	250 x 600(1)
Driveways and sidewalks over areaways and *basements*	54(1)	250 x 600(1)
Column 1	2	3

Notes to Table 4.1.5.9.:
(1) See Appendix A.

4.1.5.10. Sway Forces in Assembly Occupancies

(1) The floor assembly and other structural elements that support fixed seats in any *building* used for *assembly occupancies* accommodating large numbers of people at one time, such as grandstands, stadia and *theatre* balconies, shall be designed to resist a horizontal force equal to not less than 0.3 kN for each metre length of seats acting parallel to each row of seats, and not less then 0.15 kN for each metre length of seats acting at right angles to each row of seats, based on the assumption that these forces are acting independently of each other.

4.1.5.11. Crane-Supporting Structures and Impact of Machinery and Equipment
(See Appendix A.)

(1) The minimum specified load due to equipment, machinery or other objects that may produce impact shall be the sum of the weight of the equipment or machinery and its maximum lifting capacity, multiplied by an appropriate factor listed in Table 4.1.5.11.

(2) Crane-supporting structures shall be designed for the appropriate load combinations listed in Article 4.1.3.2.

Table 4.1.5.11.
Factors for the Calculation of Impact Loads
Forming Part of Sentence 4.1.5.11.(1)

Cause of Impact	Factor
Operation of cab or radio-operated cranes	1.25
Operation of pendant or hand-operated cranes	1.10
Operation of elevators	(1)
Supports for light machinery, shaft or motor-driven	1.20
Supports for reciprocating machinery (e.g. compressors)	1.50
Supports for power-driven units (e.g. piston engines)	1.50
Column 1	2

Notes to Table 4.1.5.11.:
(1) See ASME A17.1 / CSA B44, “Safety Code for Elevators and Escalators.”

(3) Crane runway structures shall be designed to resist a horizontal force applied normal to the top of the rails equal to not less than 20% of the sum of the weights of the lifted load and the crane trolley, excluding other parts of the crane.

(4) The force described in Sentence (3) shall be equally distributed on each side of the runway and shall be assumed to act in either direction.

(5) Crane runway structures shall be designed to resist a horizontal force applied parallel to the top of the rails equal to not less than 10% of the maximum wheel loads of the crane.

4.1.5.12. Bleachers

(1) Bleacher seats shall be designed for a uniformly distributed *live load* of 1.75 kN for each linear metre or for a concentrated load of 2.2 kN distributed over a length of 750 mm, whichever produces the most critical effect on the supporting members.

(2) Bleachers shall be checked by the erector after erection to ensure that all structural members, including bracing specified in the design, have been installed.

(3) Telescopic bleachers shall be provided with locking devices to ensure stability while in use.

4.1.5.13. Helicopter Landing Areas

(1) Helicopter landing areas on roofs shall be constructed in conformance with the requirements for heliports contained in Part III of the *Canadian Aviation Regulations* made under the *Aeronautics Act* (Canada).

4.1.5.14. Loads on Guards (See Appendix A.)

(1) The minimum specified horizontal load applied outward at the minimum required height of every required *guard* shall be,

(a) 3.0 kN/m for open viewing stands without fixed seats and for *means of egress* in grandstands, stadia, bleachers and arenas,

(b) a concentrated load of 1.0 kN applied at any point for access ways to equipment platforms, contiguous stairs and similar areas where the gathering of many people is improbable, and

(c) 0.75 kN/m or a concentrated load of 1.0 kN applied at any point, whichever governs for locations other than those described in Clauses (a) and (b).

(2) Individual elements within the *guard*, including solid panels and pickets, shall be designed for a load of 0.5 kN applied over an area of 100 mm by 100 mm located at any point in the element or elements so as to produce the most critical effect.

(3) The loads required in Sentence (2) need not be considered to act simultaneously with the loads provided for in Sentences (1) and (4).

(4) The minimum specified load applied vertically at the top of every required *guard* shall be 1.5 kN/m and need not be considered to act simultaneously with the horizontal load provided for in Sentence (1).

(5) For loads on handrails, refer to Sentence 3.4.6.5.(12).

4.1.5.15. Loads on Vehicle Guardrails

(1) Vehicle guardrails shall be designed for a concentrated load of 22 kN applied horizontally outward at any point 500 mm above the floor surface. (See A-4.1.5.14. in Appendix A.)

4.1.5.16. Loads on Walls Acting As Guards

r11.1 **(1)** Where the floor elevation on one side of a wall, including a wall around a shaft, is more than 600 mm higher than the elevation of the floor or ground on the other side, the wall shall be designed to resist the appropriate outward lateral design loads prescribed elsewhere in this Subsection or 0.5 kPa acting outward, whichever produces the more critical effect.

4.1.5.17. Firewalls (See Appendix A.)

(1) *Firewalls* shall be designed to resist the maximum effect due to,
(a) the appropriate lateral design loads prescribed elsewhere in this Section, or
(b) a factored lateral load of 0.5 kPa under fire conditions, as described in Sentence (2).

(2) Under fire conditions, where the *fire-resistance rating* of the structure is less than that of the *firewall*,
(a) lateral support shall be assumed to be provided by the structure on one side only, or
(b) another structural support system capable of resisting the loads imposed by a fire on either side of the *firewall* shall be provided.

4.1.6. Loads Due to Snow and Rain

4.1.6.1. Specified Load Due to Rain or to Snow and Associated Rain

(1) The specified load on a roof or any other *building* surface subject to snow and associated rain shall be the snow load specified in Article 4.1.6.2., or the rain load specified in Article 4.1.6.4., whichever produces the more critical effect.

r11.1 ### 4.1.6.2. Specified Snow Load (See Appendix A.)

(1) The specified load, **S**, due to snow and associated rain accumulation on a roof or any other *building* surface subject to snow accumulation shall be calculated from the formula,

$$S = I_s [S_s (C_b C_w C_s C_a) + S_r]$$

where,

I_s = importance factor for snow load as provided in Table 4.1.6.2.A.,

S_s = 1-in-50-year ground snow load, in kPa, determined in accordance with Subsection 1.1.2.,

C_b = basic roof snow load factor in Sentence (2),

C_w = wind exposure factor in Sentences (3) and (4),

C_s = slope factor in Sentences (5), (6) and (7),

C_a = accumulation factor in Sentence (8), and

S_r = 1-in-50-year associated rain load, in kPa, determined in accordance with Subsection 1.1.2., but not greater than $S_s(C_b C_w C_s C_a)$.

Table 4.1.6.2.A.
Importance Factor for Snow Load, I_s
Forming Part of Sentence 4.1.6.2.(1)

Importance Category	Importance Factor, I_s	
	ULS	SLS
Low	0.8	0.9
Normal	1	0.9
High	1.15	0.9
Post-disaster	1.25	0.9
Column 1	2	3

(2) The basic roof snow load factor, C_b, shall be,
(a) for $l_c \leq (70/C_w^2)$, 0.8, and
(b) for $l_c > (70/C_w^2)$,
(i) calculated using the following formula:

$$\frac{1}{C_w}\left[1-(1-0.8C_w)\exp\left(-\frac{l_c C_w^2-70}{100}\right)\right]$$

where,

l_c = characteristic length of the upper or lower roof, defined as $2w\text{-}w^2/l$, in metres,

w = smaller plan dimension of the roof, in metres, and

l = larger plan dimension of the roof, in metres, or

(ii) determined in accordance with Table 4.1.6.2.B., using linear interpolation for intermediate values of $l_c C_w^2$.

(See Appendix A.)

(3) Except as provided for in Sentence (4), the wind exposure factor, C_w, shall be 1.0.

(4) For *buildings* in the Low and Normal Importance Categories as set out in Table 4.1.2.1.B., the wind exposure factor given in Sentence (3) may be reduced to 0.75 in rural areas, or to 0.5 in exposed areas north of the treeline, where,
(a) the *building* is exposed on all sides to wind over open terrain as defined in Clause 4.1.7.1.(5)(a), and is expected to remain so during its life,
(b) the area of roof under consideration is exposed to the wind on all sides with no significant obstructions on the roof, such as parapet walls, within a distance of at least 10 times the difference between the height of the obstruction and $C_bC_wS_s/\gamma$ metres, where γ is the unit weight of snow on roofs as specified in Article 4.1.6.13., and
(c) the loading does not involve the accumulation of snow due to drifting from adjacent surfaces.

(5) Except as provided for in Sentences (6) and (7), the slope factor, C_s, shall be,
(a) 1.0 where the roof slope, α, is equal to or less than 30°,
(b) (70° - α)/40° where α is greater than 30° but not greater than 70°, and
(c) 0 where α exceeds 70°.

(6) The slope factor, C_s, for unobstructed slippery roofs where snow and ice can slide completely off the roof shall be,
(a) 1.0 when the roof slope, α, is equal to or less than 15°,
(b) (60° - α)/45° when α is greater than 15°, but not greater than 60°, and
(c) 0 when α exceeds 60°.

(7) Except as otherwise provided in this Subsection, the slope factor, C_s, shall be 1.0 when used in conjunction with accumulation factors for increased snow loads.

Table 4.1.6.2.B
Basic Roof Snow Load Factor for $I_c > (70/C_w^2)$
Forming Part of Sentence 4.1.6.2.(2)

Value of $I_c C_w^2$	Value of C_b where C_w = 1.0	Value of C_b where C_w = 0.75	Value of C_b where C_w = 0.5
70	0.80	0.80	0.80
80	0.82	0.85	0.91
100	0.85	0.94	1.11
120	0.88	1.01	1.27
140	0.90	1.07	1.40
160	0.92	1.12	1.51
180	0.93	1.16	1.60
200	0.95	1.19	1.67
220	0.96	1.21	1.73
240	0.96	1.24	1.78
260	0.97	1.25	1.82
280	0.98	1.27	1.85
300	0.98	1.28	1.88
320	0.98	1.29	1.90
340	0.99	1.30	1.92
360	0.99	1.30	1.93
380	0.99	1.31	1.95
400	0.99	1.31	1.96
420	0.99	1.32	1.96
440	1.00	1.32	1.97
460	1.00	1.32	1.98
480	1.00	1.32	1.98
500	1.00	1.33	1.98
520	1.00	1.33	1.99
540	1.00	1.33	1.99
560	1.00	1.33	1.99
580	1.00	1.33	1.99
600	1.00	1.33	1.99
620	1.00	1.33	2.00
Column 1	2	3	4

(8) The accumulation factor, C_a, shall be 1.0, which corresponds to the uniform snow load case, except that where appropriate for the shape of the roof, it shall be assigned other values that account for,

(a) increased non-uniform snow loads due to snow drifting onto a roof that is at a level lower than other parts of the same *building* or at a level lower than another *building* within 5 m of it horizontally, as prescribed in Articles 4.1.6.5., 4.1.6.6. and 4.1.6.8.,

(b) increased non-uniform snow loads on areas adjacent to roof projections, such as penthouses, large *chimneys* and equipment, as prescribed in Articles 4.1.6.7. and 4.1.6.8.,

(c) non-uniform snow loads on,

(i) gable roofs, as prescribed in Article 4.1.6.9., and

(ii) arched roofs, curved roofs and domes, as prescribed in Article 4.1.6.10.,

(d) increased snow or ice loads due to snow sliding, as prescribed in Article 4.1.6.11.,

(e) increased snow loads in roof valleys, as prescribed in Article 4.1.6.12., and
(f) increased snow or ice loads due to meltwater draining from adjacent *building* elements and roof projections.

(9) For shapes not addressed in Sentence (8), C_a corresponding to the non-uniform snow load case shall be established based on applicable field observations, special analyses including local climatic effects, appropriate model tests or a combination of these methods.

4.1.6.3. Full and Partial Loading

(1) A roof or other *building* surface and its structural members subject to loads due to snow accumulation shall be designed for the specified load in Sentence 4.1.6.2.(1), distributed over the entire loaded area.

(2) In addition to the distribution in Sentence (1), flat roofs and shed roofs, gable roofs of 15° slope or less, and arched or curved roofs shall be designed for the specified uniform snow load indicated in Sentence 4.1.6.2.(1), which shall be calculated using $C_a = 1.0$, distributed on any one portion of the loaded area, and half of this load on the remainder of the loaded area, in such a way as to produce the most critical effects on the member concerned. (See Appendix A.)

4.1.6.4. Specified Rain Load

(1) Except as provided in Sentence (4), the specified load, **S**, due to the accumulation of rainwater on a surface whose position, shape and deflection under load make such an accumulation possible, is that resulting from the one-day rainfall determined in conformance with Subsection 1.1.2. and applied over the horizontal projection of the surface and all tributary surfaces. (See Appendix A.)

(2) The provisions of Sentence (1) apply whether or not the surface is provided with a means of drainage, such as rainwater *leaders*.

(3) Except as provided for in Sentence 4.1.6.2.(1), loads due to rain need not be considered to act simultaneously with loads due to snow. (See Appendix A.)

(4) Where scuppers are provided and where the position, shape and deflection of the loaded surface make an accumulation of rainwater possible, the loads due to rain shall be the lesser of either the one-day rainfall determined in conformance with Subsection 1.1.2. or a depth of rainwater equal to 30 mm above the level of the scuppers, applied over the horizontal projection of the surface and tributary areas.

r11.1 4.1.6.5. Multi-Level Roofs

(1) The drifting load of snow on a roof adjacent to a higher roof shall be taken as trapezoidal, as shown in Figure 4.1.6.5.A., where the accumulation factor, C_a, is,

$$C_a = C_{a0} - (C_{a0} - 1)(x/x_d), \text{ for } 0 \le x \le x_d$$

or

$$C_a = 1.0, \text{ for } x > x_d$$

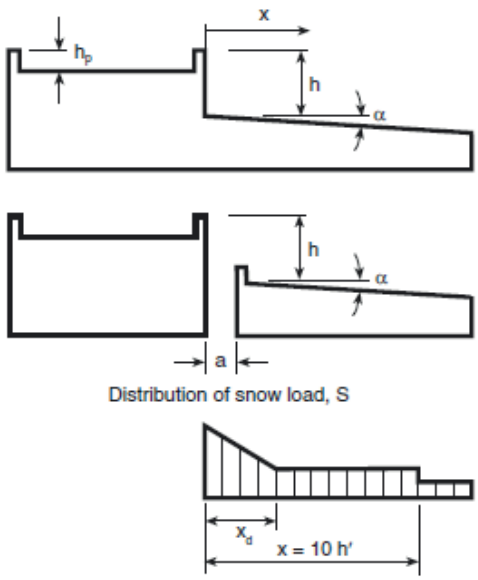
where,

C_{a0} = peak value of C_a at $x = 0$ as specified in Sentences (3) and (4) and as shown in Figure 4.1.6.5.A.,

x = distance from roof step as shown in Figure 4.1.6.5.A., and

x_d = length of drift as specified in Sentence (2) and as shown in Figure 4.1.6.5.A.

Figure 4.1.6.5.A.
Snow Load Factors for Lower Level Roofs
Forming Part of Sentences 4.1.6.5.(1) and (3) and 4.1.6.6.(1)



$$x_d = 5\frac{C_b S_s}{\gamma}(C_{a0} - 1)$$

C_{a0} = the lesser of

$$\beta\frac{\gamma h}{C_b S_s}$$

and

$$\frac{F}{C_b}$$

$$h' = h - \frac{C_b C_w S_s}{\gamma}$$

x	Factors[1]		
	C_w	C_s[2]	C_a
0	1.0	f(α)	C_{a0}
$0 < x \le x_d$	1.0	f(α)	$C_{a0} - (C_{a0} - 1)\frac{x}{x_d}$
$x_d < x \le 10\ h'$	1.0	f(α)	1.0
$x > 10\ h'$	1.0 for non-exposed roof areas 0.75 for exposed roof areas 0.5 for exposed roof areas north of tree line	f(α)	1.0

Notes to Figure 4.1.6.5.A.:

(1) If $a > 5$ m or $h \le 0.8S_s/\gamma$, drifting from the higher roof need not be considered.

(2) For lower roofs with parapets, $C_s = 1.0$, otherwise it varies as a function of slope α as defined in Sentences 4.1.6.2.(5) and (6).

(2) The length of the drift, x_d, shall be calculated as follows:

$$x_d = 5\frac{C_b S_s}{\gamma}(C_{a0} - 1)$$

where,

γ = specific weight of snow as specified in Article 4.1.6.13.

(3) The value of C_{a0} for each of Cases I, II and III shall be the lesser of,

$$C_{a0} = \beta\frac{\gamma h}{C_b S_s} \text{ and}$$

$$C_{a0} = \frac{F}{C_b}$$

where,

β = 1.0 for Case I and 0.67 for Cases II and III,

h = difference in elevation between the lower roof surface and the top of the parapet on the upper roof as shown in Figure 4.1.6.5.A., and

$$F = 0.35\beta\sqrt{\frac{\gamma(l_{cs} - 5h'_p)}{S_s}} + C_b, \text{but } F \leq 5 \text{ for } C_{ws} = 1.0$$

where,

C_{ws} = value for C_w applicable to the source of drifting,

l_{cs} = the characteristic length of the source area for drifting, defined as, $l_{cs} = 2w_s - \frac{w_s^2}{l_s}$, where w_s and l_s are respectively the shorter and longer dimensions of the relevant source areas for snow drifting shown in Figure 4.1.6.5.B. for Cases I, II and III, and

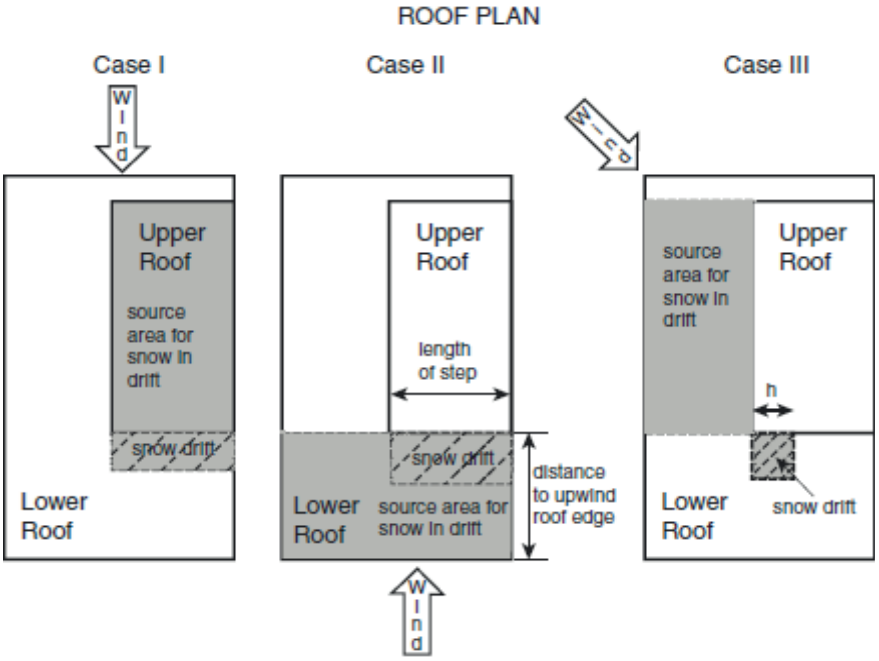
$$h'_p = h_p - \left(\frac{0.8S_s}{\gamma}\right), \text{but } 0 \leq h'_p \leq \left(\frac{l_{cs}}{5}\right)$$

where,

h_p = height of the roof perimeter parapet of the source area, to be taken as zero unless all the roof edges of the source area have parapets.

(4) The value of C_{a0} shall be the highest of Cases I, II and III, considering the different roof source areas for drifting snow, as specified in Sentence (3) and Figure 4.1.6.5.B.

Figure 4.1.6.5.B.
Snow Load Cases I, II and III for Lower Level Roofs
Forming Part of Sentences 4.1.6.5.(3) and (4)



Parameter	Case I	Case II	Case III
β	1.0	0.67	0.67
h_p	parapet height of upper-roof source area	parapet height of lower-roof source area	parapet height of lower-roof source area
$l_{cs} = 2w_s - \frac{w_s^2}{l_s}$	with w_s and l_s being the shorter and longer dimensions of the upper roof	with w_s and l_s being the shorter and longer dimensions of source area on lower roof for upwind facing step	with w_s and l_s being the shorter and longer dimensions of the source area on the lower roof for downwind facing step

r11.1 4.1.6.6. Horizontal Gap Between a Roof and a Higher Roof

(1) Where the roof of one *building* is separated by a distance, a, from an adjacent *building* with a higher roof as shown in Figure 4.1.6.5.A., the influence of the adjacent *building* on the value of the accumulation factor, C_a, for the lower roof shall be determined as follows:

(a) if $a > 5$ m, the influence of the adjacent *building* on C_a need not be considered, and

(b) if $a \leq 5$ m, C_a for the lower roof shall be calculated in accordance with Article 4.1.6.5. for values of $x \geq a$.

r11.1 4.1.6.7. Areas Adjacent to Roof Projections

(1) Except as provided in Sentences (2) and (3), the accumulation factor, C_a, for areas adjacent to roof-mounted vertical projections shall be calculated in accordance with Sentence 4.1.6.5.(1) using the following values for the peak accumulation factor, C_{a0}, and the drift length, x_d:

(a) C_{a0} shall be taken as the lesser of,

$$0.67\frac{\gamma h}{C_b S_s} \text{ and } \frac{\gamma l_0}{7.5 C_b S_s} + 1, \text{ and}$$

(b) x_d shall be taken as the lesser of,

(i) 3.35h, and

(ii) $(2/3)l_0$,

where,

h = height of the projection, and

l_0 = longest horizontal dimension of the projection.

(See Appendix A.)

(2) C_a is permitted to be calculated in accordance with Article 4.1.6.5. for larger projections. (See Appendix A.)

(3) Where the longest horizontal dimension of the roof projection, l_0, is less than 3 m, the drift surcharge adjacent to the projection need not be considered.

r11.1 4.1.6.8. Snow Drift at Corners

(1) The drift loads on the lower level roof against the two faces of an outside corner of an upper level roof or roof obstruction shall be extended radially around the corner as shown in Figure 4.1.6.8.A. and may be taken as the least severe of the drift loads lying against the two faces of the corner.

(2) The drift loads on the lower level roof against the two faces of an inside corner of an upper level roof or a parapet shall be calculated for each face and applied as far as the bisector of the corner angle as shown in Figure 4.1.6.8.B.

Figure 4.1.6.8.A.
Snow Load at Outside Corner
Forming Part of Sentence 4.1.6.8.(1)

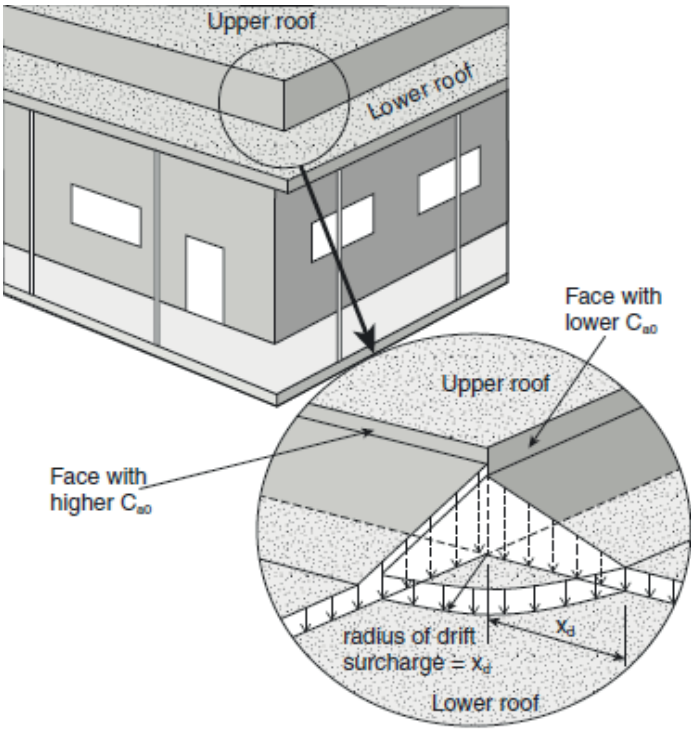
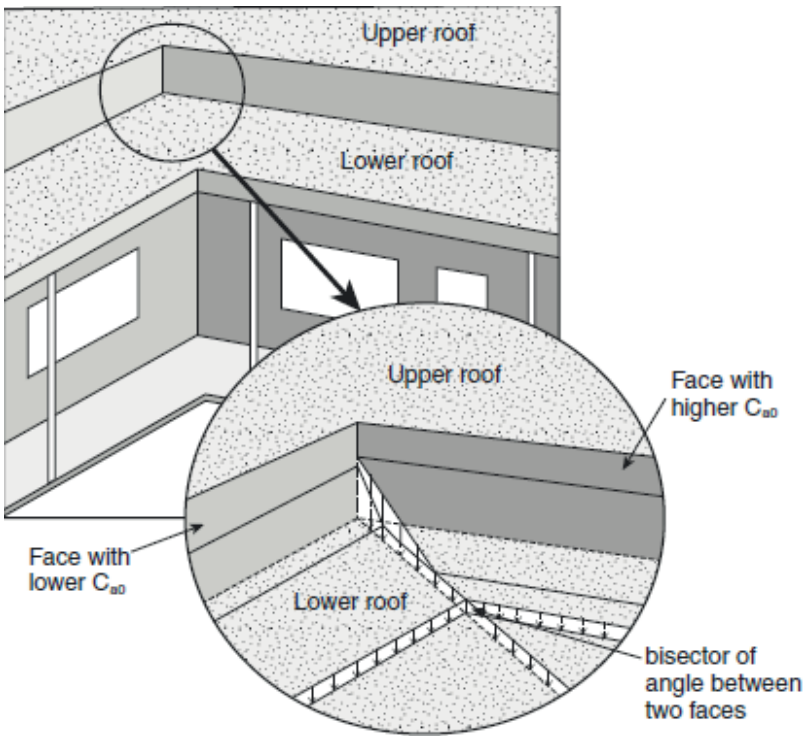


Figure 4.1.6.8.B.
Snow Load at Inside Corner
Forming Part of Sentence 4.1.6.8.(2)



r11.1 4.1.6.9. Gable Roofs (See Appendix A.)

(1) For all gable roofs, the full and partial load cases defined in Article 4.1.6.3. shall be considered.

(2) For gable roofs with a slope of $\alpha > 15°$, the unbalanced load case shall also be considered by setting the values of the accumulation factor, C_a, as follows:
(a) on the upwind side of the roof peak, C_a shall be taken as 0, and
(b) on the downwind side of the roof peak, C_a shall be taken as,
  (i) $0.25 + \alpha/20$, where $15° \le \alpha \le 20°$, and
  (ii) 1.25, where $20° < \alpha \le 90°$.

(3) For all gable roofs, the slope factor, C_s, shall be as prescribed in Sentences 4.1.6.2.(5) and (6).

(4) For all gable roofs, the wind exposure factor, C_w, shall be,
(a) as prescribed in Sentences 4.1.6.2.(3) and (4) for the full and partial load cases, and
(b) 1.0 for the unbalanced load case referred to in Sentence (2).

r11.1 4.1.6.10. Arch Roofs, Curved Roofs and Domes

(1) For all arch roofs, curved roofs and domes, the full and partial load cases defined in Article 4.1.6.3. shall be considered.

(2) For arch roofs, curved roofs and domes with rise-to-span ratio $h/b > 0.05$ as shown in Figure 4.1.6.10.A., the load cases provided in Sentences (3) to (7) shall also be considered.

(3) For arch roofs with a slope at the edge $\alpha_e \le 30°$ as shown in Figure 4.1.6.10.A. and as described in Table 4.1.6.10., C_a shall be,
(a) taken as 0 on the upwind side of the peak, and
(b) on the downwind side of the peak, taken as,

$$C_a = \frac{xh}{0.03C_b b^2} \text{ for } 0.05 < \frac{h}{b} \le 0.12 \text{ and}$$

$$C_a = \frac{4x}{C_b b} \text{ for } \frac{h}{b} > 0.12$$

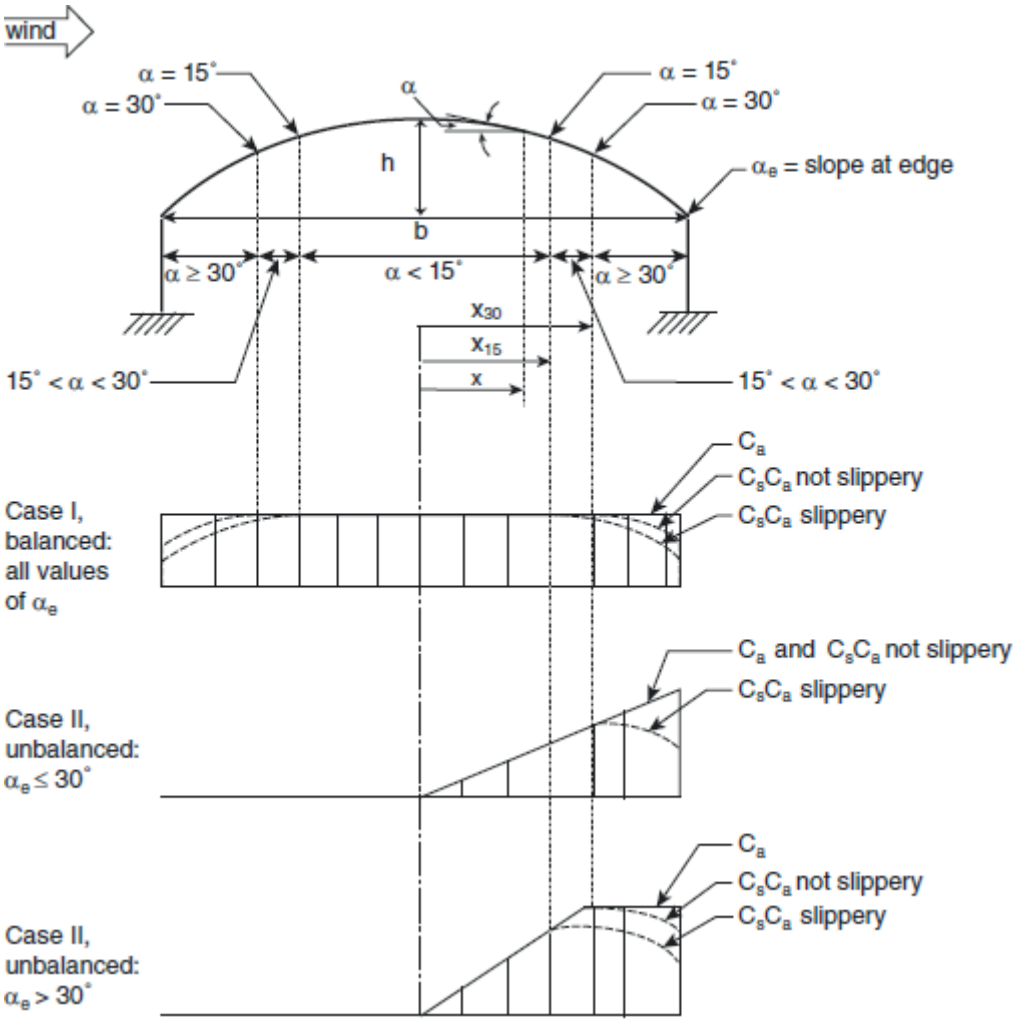
where,

x = horizontal distance from the roof peak,

h = height of arch, and

b = width of arch.

Figure 4.1.6.10.A.
Accumulation Factors for Arch Roofs and Curved Roofs(1)
Forming Part of Sentences 4.1.6.10.(2) to (4)



Notes to Figure 4.1.6.10.A.:

(1) Refer to Table 4.1.6.10. for applicable values of C_w and Sentences 4.1.6.2.(5) and (6) for applicable values of C_s.

Table 4.1.6.10.
Load Cases for Arch Roofs, Curved Roofs and Domes
Forming Part of Sentences 4.1.6.10.(3), (4) and (9)

Load Case	Range of Application	Arch Roofs, Curved Roofs and Domes	Arch and Curved Roofs		Domes
		C_w	C_a Upwind Side	C_a Downwind Side	C_a Downwind Side
Case I	All values of h/b	As prescribed in Sentences 4.1.6.2.(3) and (4)	1.0	1.0	1.0
Case II	Slope at edge ≤ 30° h/b > 0.05 all values of x	1.0	0.0	$C_a = (xh/0.03C_bb^2)$ for h/b ≤ 0.12 $C_a = (4x/C_bb)$ for h/b > 0.12	$C_a (x,y) = Ca(x,0)(1 – y/r)$
	Slope at edge > 30° h/b > 0.05 $0 < x < x_{30}$	1.0	0.0	$C_a = (xh/0.06C_bx_{30}b)$ for h/b ≤ 0.12 $C_a = (2x/C_bx_{30})$ for h/b > 0.12	$C_a (x,y) = Ca(x,0)(1 – y/r)$
	Slope at edge > 30° h/b > 0.05 $x_{30} \leq x$	1.0	0.0	$C_a = (h/0.06C_bb)$ for h/b ≤ 0.12 $C_a = (2/C_b)$ for h/b > 0.12	$C_a (x,y) = Ca(x,0)(1 – y/r)$
Column 1	2	3	4	5	6

(4) For arch roofs with slope at the edge $\alpha_e > 30°$ as shown in Figure 4.1.6.10.A. and as described in Table 4.1.6.10., C_a, shall be,

(a) taken as 0 on the upwind side of the peak, and

(b) on the downwind side of the peak,

(i) for the part of the roof between the peak and point where the slope $\alpha = 30°$, taken as,

$$C_a = \frac{xh}{0.06C_bx_{30}b} \text{ for } 0.05 < \frac{h}{b} \leq 0.12 \text{ and}$$

$$C_a = \frac{2x}{C_bx_{30}} \text{ for } \frac{h}{b} > 0.12$$

where,

x, h, b = as specified in Sentence (2), and

x_{30} = value of x where the slope $\alpha = 30°$, and

(ii) for the part of the roof where the slope $\alpha > 30°$, taken as,

$$C_a = \frac{h}{0.06C_bb} \text{ for } 0.05 < \frac{h}{b} \leq 0.12 \text{ and}$$

$$C_a = \frac{2}{C_b} \text{ for } \frac{h}{b} > 0.12$$

(5) Except as provided in Sentence (6), C_a for curved roofs shall be determined in accordance with the requirements for arch roofs stated in Sentences (3) and (4).

(6) Where the slope, α, of a curved roof at its peak is greater than 10°, C_a shall be determined in accordance with the requirements for gable roofs described in Article 4.1.6.9. using a slope equal to the mean slope of the curved roof.

(7) For domes of circular plan form as shown in Figure 4.1.6.10.B., C_a shall,

(a) along the central axis parallel to the wind, vary in the same way as for an arch roof with the same rise-to-span ratio, h/b, and

(b) off this axis, vary according to,

$$C_a(x,y) = C_a(x,0)\left(1 - \frac{y}{r}\right)$$

where,

$C_a(x,y)$ = value of C_a at location (x,y),

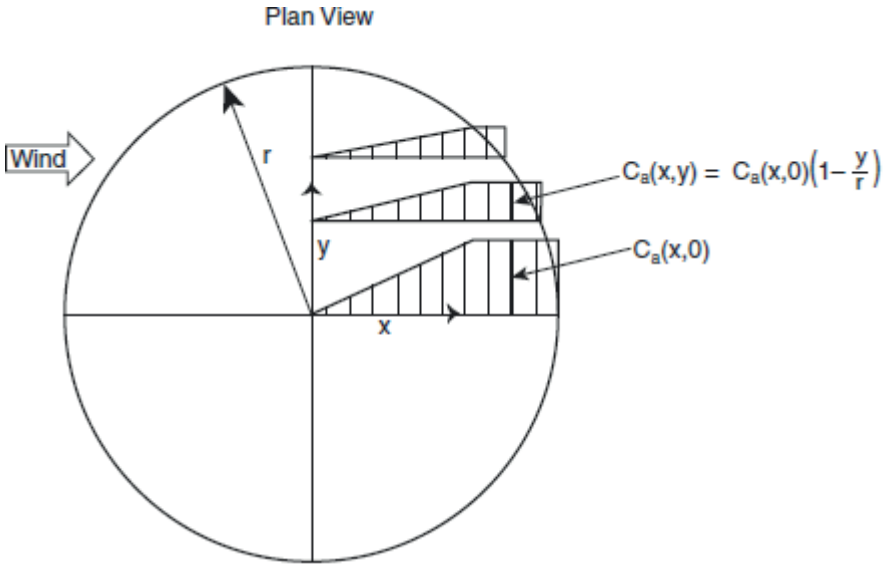
$C_a(x,0)$ = value of C_a on the central axis parallel to the wind,

x = distance along the central axis parallel to the wind,

y = horizontal coordinate normal to the x direction, and

r = radius of dome.

Figure 4.1.6.10.B.
Unbalanced Snow Accumulation Factor on a Circular Dome(1)(2)
Forming Part of Sentence 4.1.6.10.(7)



Notes to Figure 4.1.6.10.B.:

(1) Refer to Table 4.1.6.10. for applicable values of C_w and Sentences 4.1.6.2.(5) and (6) for applicable values of C_s.

(2) Refer to Sentences 4.1.6.10.(3) and (4) for the calculation of $C_a(x,0)$.

(8) For all arch roofs, curved roofs and domes, the slope factor, C_s, shall be as prescribed in Sentences 4.1.6.2.(5) and (6).

(9) For all arch roofs, curved roofs and domes, the wind exposure factor, C_w, shall be as prescribed in Table 4.1.6.10.

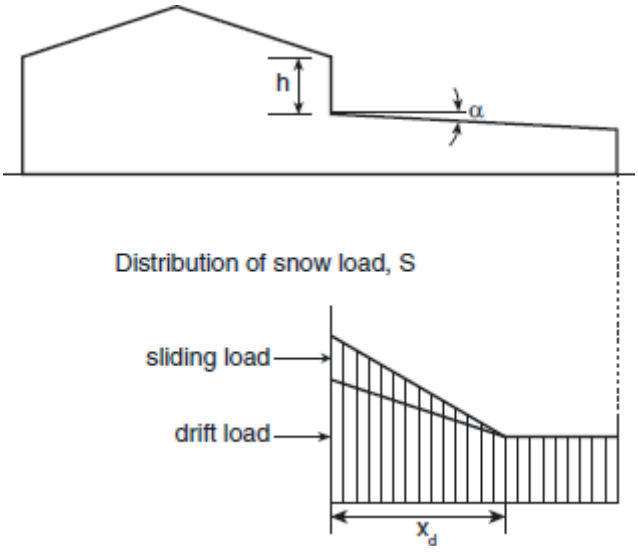
r11.1 4.1.6.11. Snow Loads Due to Sliding

(1) Except as provided in Sentence (2), where an upper roof, or part thereof, slopes downwards with a slope $\alpha > 0$ towards a lower roof, the snow load, S, on the lower roof, determined in accordance with Articles 4.1.6.2. and 4.1.6.5., shall be augmented in accordance with Sentence (3) to account for the additional load resulting from sliding snow.

(2) Sentence (1) need not apply where,
(a) snow from the upper roof is prevented from sliding by a parapet or other effective means, or
(b) the upper roof is not considered slippery and has a slope less than 20°.

(3) The total weight of additional snow resulting from sliding shall be taken as half the total weight of snow resulting from the uniform load case prescribed in Article 4.1.6.2. with,
(a) the accumulation factor $C_a = 1.0$ for the relevant part of the upper roof,
(b) the slope factor, C_s, based on the slope of the lower roof, as prescribed in Sentences 4.1.6.2.(5) and (6), and
(c) the sliding snow distributed on the lower roof such that it is a maximum for $x = 0$ and decreases linearly to 0 at $x = x_d$, as shown in Figure 4.1.6.11., where x and x_d are as defined in Article 4.1.6.5.

Figure 4.1.6.11.
Snow Distribution on Lower Roof with Sloped Upper Roof
Forming Part of Sentence 4.1.6.11.(3)



r11.1 4.1.6.12. Valleys in Curved or Sloped Roofs

(1) For valleys in curved or sloped roofs with a slope $\alpha > 10°$, in addition to the full and partial load cases defined in Article 4.1.6.3., the non-uniform load Cases II and III described in Sentences (2) and (3) shall be considered to account for sliding, creeping and movement of meltwater.

(2) For Case II as shown in Figure 4.1.6.12., the accumulation factor, C_a, shall be calculated as follows:

$$C_a = \frac{1}{C_b} \text{ for } 0 < x \leq \frac{b}{4} \text{ and}$$

$$C_a = \frac{0.5}{C_b} \text{ for } \frac{b}{4} < x \leq \frac{b}{2}$$

where,

x = horizontal distance from the bottom of the valley, and

b = twice the horizontal distance between the bottom of the valley and the peak of the roof surface under consideration.

(3) For Case III as shown in Figure 4.1.6.12., C_a shall be calculated as follows:

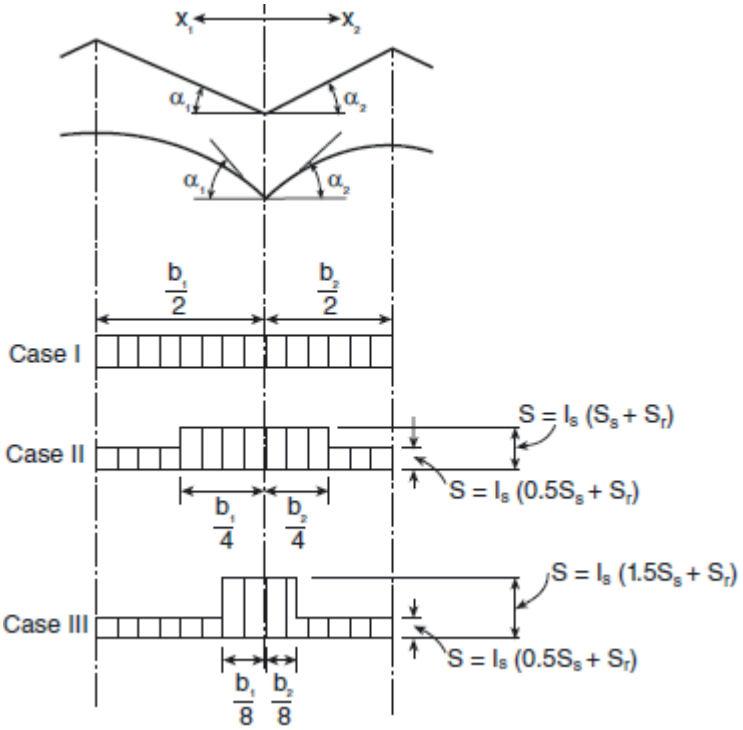
$$C_a = \frac{1.5}{C_b} \text{ for } 0 < x \leq \frac{b}{8} \text{ and}$$

$$C_a = \frac{0.5}{C_b} \text{ for } \frac{b}{8} < x \leq \frac{b}{2}$$

where,

x, b = as specified in Sentence (2).

Figure 4.1.6.12.
Snow Loads in Valleys of Sloped or Curved Roofs(1)(2)
Forming Part of Sentences 4.1.6.12.(2) and (3)



Notes to Figure 4.1.6.12.:

(1) C_w = 1.0, as specified in Sentence 4.1.6.2.(3).

(2) C_s = 1.0, as specified in Sentence 4.1.6.2.(7).

r11.1 4.1.6.13. Specific Weight of Snow

(1) For the purposes of calculating snow loads in drifts, the specific weight of snow, γ, shall be taken as the lesser of 4.0 kN/m^3 and $0.43S_S + 2.2$ kN/m^3.

r11.1 4.1.6.14. Snow Removal

(1) Snow removal by mechanical, thermal, manual or other means shall not be used as a rationale to reduce design snow loads.

r11.1 4.1.6.15. Ice Loading of Structures

(1) For lattice structures connected to the *building*, and other *building* components or appurtenances involving small width elements subject to significant ice accretion, the weight of ice accretion and the effective area presented to wind shall be as prescribed in CSA S37, "Antennas, Towers, and Antenna-Supporting Structures".

r11.1 4.1.7. Wind Load

4.1.7.1. Specified Wind Load

(1) The specified wind loads for a *building* and its components shall be determined using the Static, Dynamic or Wind Tunnel Procedure as provided in Sentences (2) to (5).

(2) For the design of *buildings* that are not classified as dynamically sensitive in accordance with Sentence 4.1.7.2.(1), one of the following procedures shall be used to determine the specified wind loads:
(a) the Static Procedure described in Article 4.1.7.3.,
(b) the Dynamic Procedure described in Article 4.1.7.8., or
(c) the Wind Tunnel Procedure described in Article 4.1.7.12.

(3) For the design of *buildings* that are classified as dynamically sensitive in accordance with Sentence 4.1.7.2.(2), one of the following procedures shall be used to determine the specified wind loads:
(a) the Dynamic Procedure described in Article 4.1.7.8., or
(b) the Wind Tunnel Procedure described in Article 4.1.7.12.

(4) For the design of *buildings* that may be subject to wake buffeting or channelling effects from nearby *buildings*, or that are classified as very dynamically sensitive in accordance with Sentence 4.1.7.2.(3), the Wind Tunnel Procedure described in Article 4.1.7.12. shall be used to determine the specified wind loads.

(5) For the design of cladding and secondary structural members, one of the following procedures shall be used to determine the specified wind loads:
(a) the Static Procedure described in Article 4.1.7.3., or
(b) the Wind Tunnel Procedure described in Article 4.1.7.12.

(6) Computational fluid dynamics shall not be used to determine the specified wind loads for a *building* and its components. (See Appendix A.)

4.1.7.2. Classification of Buildings (See Appendix A.)

(1) Except as provided in Sentences (2) and (3), a *building* is permitted to be classified as not dynamically sensitive.

(2) A *building* shall be classified as dynamically sensitive if,
(a) its lowest natural frequency is less than 1 Hz and greater than 0.25 Hz,
(b) its height is greater than 60 m, or
(c) its height is greater than 4 times its minimum effective width considering all wind directions, where the effective width, w, of a *building* shall be taken as,

$$w = \frac{\sum h_i w_i}{\sum h_i}$$

where,

the summations are over the height of the building for a given wind direction,

h_i = the height above grade to level i, and

w_i = the width normal to the wind direction at height hi.

(3) A *building* shall be classified as very dynamically sensitive if,
(a) its lowest natural frequency is less than or equal to 0.25 Hz, or
(b) its height is more than 6 times its minimum effective width, where the minimum effective width is determined in accordance with Clause (2)(c).

4.1.7.3. Static Procedure

(1) The specified external pressure or suction due to wind on part or all of a surface of a *building* shall be calculated using the following formula:

$$p = I_w q C_e C_t C_g C_p$$

where,

p = specified external pressure acting statically and in a direction normal to the surface, considered positive when the pressure acts towards the surface and negative when it acts away from the surface,

I_w = importance factor for wind load, as provided in Table 4.1.7.3.,

q = reference velocity pressure, as provided in Sentence (4),

C_e = exposure factor, as provided in Sentences (5) and (7),

C_t = topographic factor, as provided in Article 4.1.7.4.,

C_g = gust effect factor, as provided in Sentence (8), and

C_p = external pressure coefficient, as provided in Articles 4.1.7.5. and 4.1.7.6.

(2) The net wind load for the *building* as a whole shall be the algebraic difference of the loads on the windward and the leeward surfaces, and in some cases may be calculated as the sum of the products of the external pressures or suctions and the areas of the surfaces over which they are averaged as provided in Sentence (1).

(3) The net specified pressure due to wind on part or all of a surface of a *building* shall be the algebraic difference, such as to produce the most critical effect, of the external pressure or suction calculated in accordance with Sentence (1) and the specified internal pressure or suction due to wind calculated as follows:

$$p_i = I_w q C_{ei} C_t C_{gi} C_{pi}$$

where,

p_i = specified internal pressure acting statically and in a direction normal to the surface, either as a pressure directed toward the surface or as a suction directed away from the surface,

I_w = importance factor for wind load, as defined in Sentence (1),

q = reference velocity pressure, as defined in Sentence (1),

C_{ei} = exposure factor for internal pressure, as provided in Sentence (7),

C_t = topographic factor, as defined in Sentence (1),

C_{gi} = internal gust effect factor, as provided in Sentence (10), and

C_{pi} = internal pressure coefficient, as provided in Article 4.1.7.7.

Table 4.1.7.3.
Importance Factor for Wind Load, I_W
Forming Part of Sentence 4.1.7.3.(1)

Importance Category	Importance Factor, I_W	
	ULS	SLS
Low	0.8	0.75
Normal	1.0	0.75
High	1.15	0.75
Post-disaster	1.25	0.75
Column 1	2	3

(4) The reference velocity pressure, q, shall be the appropriate value determined in conformance with Subsection 1.1.2. based on a probability of being exceeded in any one year of 1-in-50.

(5) The exposure factor C_e, shall be based on the reference height, h, determined in accordance with Sentence (6) for the surface or part of the surface under consideration and shall be,

(a) $(h/10)^{0.2}$ but not less than 0.9 for open terrain, where open terrain is level terrain with only scattered *buildings*, trees or other obstructions, open water or shorelines thereof,

(b) $0.7(h/12)^{0.3}$ but not less than 0.7 for rough terrain, where rough terrain is suburban, urban or wooded terrain extending upwind from the *building* uninterrupted for at least 1 km or 20 times the height of the *building*, whichever is greater, or

(c) an intermediate value between the two exposures defined in Clauses (a) and (b) in cases where the site is less than 1 km or 20 times the height of the *building* from a change in terrain conditions, whichever is greater, provided an appropriate interpolation method is used. (See Appendix A.)

(6) The reference height, h, shall be determined as follows:

(a) for *buildings* with height less than or equal to 20 m and less than the smaller plan dimension, h shall be the mid-height of the roof above *grade*, but shall not be less than 6 m,

(b) for other *buildings*, h shall be,
  (i) the actual height above *grade* of the point on the windward wall for which external pressures are being calculated,
  (ii) the mid-height of the roof for pressures on surfaces parallel to the wind direction, and
  (iii) the mid-height of the *building* for pressures on the leeward wall, and

(c) for any structural element exposed to wind, h shall be the mid-height of the element above the ground.

(7) The exposure factor for internal pressure, C_{ei}, shall be determined as follows:

(a) for *buildings* whose height is greater than 20 m and that have a dominant opening, C_{ei} shall be equal to the exposure factor for external pressures, C_e, calculated at the mid-height of the dominant opening, and

(b) for other *buildings*, C_{ei} shall be the same as the exposure factor for external pressures, C_e, calculated for a reference height, h, equal to the mid-height of the *building* or 6 m, whichever is greater.

(8) Except as provided in Sentences (9) and 4.1.7.6.(1), the gust effect factor, C_g, shall be one of the following values:

(a) 2.0 for the *building* as a whole and main structural members, or

(b) 2.5 for external pressures and suctions on secondary structural members including cladding.

(9) For cases where C_g and C_p are combined into a single product, C_pC_g, as provided in Article 4.1.7.6., the values C_p and C_g need not be independently specified. (See Appendix A.)

(10) The internal gust effect factor, C_{gi}, shall be 2.0, except it is permitted to be calculated using the following equation or large structures enclosing a single large unpartitioned volume that does not have numerous overhead doors or openings:

$$C_{gi} = 1 + \frac{1}{\sqrt{1 + \frac{V_0}{6950A}}}$$

where,

V_0 = internal volume in m^3, and

A = total area of all exterior openings of the volume in m^2.

(See Appendix A.)

4.1.7.4. Topographic Factor

(1) Except as provided in Sentence (2), the topographic factor, C_t, shall be taken as 1.0.

(2) For *buildings* on hills or escarpments with slope, $H_h/(2L_h)$, greater than 0.1 as shown in Figure 4.1.7.4., the topographic factor, C_t, shall be calculated as follows:

$$C_t = \left(1 + \frac{\Delta S}{C_g}\right)(1 + \Delta S)$$

where,

$$\Delta S = \Delta S_{max}\left(1 - \frac{|x|}{kL_h}\right)\exp\left(-\alpha z/L_h\right)$$

where,

ΔS_{max} = applicable values from Table 4.1.7.4.,

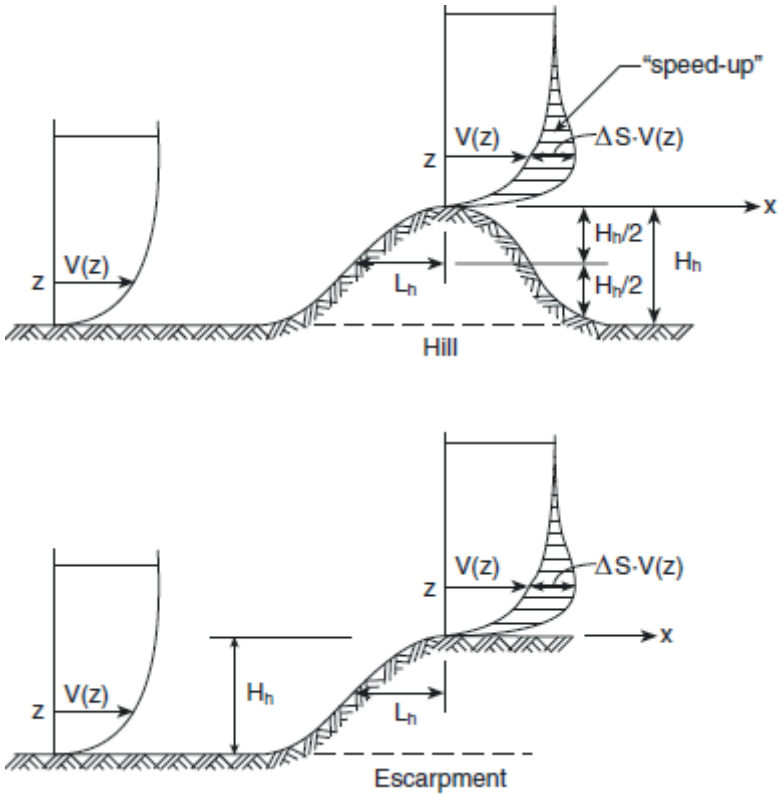
x = horizontal distance from the peak of the hill or escarpment,

L_h = horizontal distance upwind from the peak to the point where the ground surface lies at half the height of the hill or escarpment, or $2H_h$ where H_h is the height of the hill or escarpment, whichever is greater,

Z = height above ground, and

k and α = applicable constants from Table 4.1.7.4. based on shape of hill or escarpment.

Figure 4.1.7.4.
Speed-up of Mean Velocity on a Hill or Escarpment(1)
Forming Part of Sentence 4.1.7.4.(2)



Notes to Figure 4.1.7.4.:

(1) V(z) = wind speed.

Table 4.1.7.4.
Parameters for Maximum Speed-up Over Hills and Escarpments
Forming Part of Sentence 4.1.7.4.(2)

Shape of Hill or Escarpment	ΔS_{max}(1)	α	k, where x < 0	k, where x ≥ 0
2-dimensional hill	2.2 H_h/L_h	3	1.5	1.5
2-dimensional escarpment	1.3 H_h/L_h	2.5	1.5	4
3-dimensional axi-symmetrical hill	1.6 H_h/L_h	4	1.5	1.5
Column 1	2	3	4	5

Notes to Table 4.1.7.4.:

(1) For $H_h/L_h > 0.5$, assume $H_h/L_h = 0.5$ and substitute 2 H_h for L_h in the equation for ΔS.

4.1.7.5. External Pressure Coefficients

(1) Applicable values of external pressure coefficients, C_p, are provided in,
(a) Sentences (2) to (5), and
(b) Article 4.1.7.6. for certain shapes of low *buildings*.

(2) For the design of the main structural system, the value of C_p shall be established as follows, where H is the height of the *building* and D is the width of the *building* parallel to the wind direction:

(a) on the windward face,

C_p = 0.6 for H/D < 0.25
= 0.27(H/D + 2) for 0.25 ≤ H/D < 1.0
= 0.8 for H/D ≥ 1.0,

(b) on the leeward face,

C_p = –0.3 for H/D < 0.25
= –0.27(H/D + 0.88) for 0.25 ≤ H/D < 1.0
= –0.5 for H/D ≥ 1.0, and

(c) on the walls parallel to the wind, C_p = –0.7.

(See Appendix A.)

(3) For the design of roofs, the value of C_p shall be established as follows, where x is the distance from the upwind edge of the roof:

(a) for H/D ≥ 1.0, C_p = –1.0, and

(b) for H/D <1.0,

C_p = –1.0 for x ≤ H
= –0.5 for x > H

(See Appendix A.)

(4) For the design of the cladding and of secondary structural elements supporting the cladding, the value of C_p shall be established as follows, where W and D are the widths of the *building*:

(a) on walls, C_p shall be taken as ±0.9, except that within a distance equal to the larger of 0.1D and 0.1W from a *building* corner the negative value of C_p shall be taken as –1.2,

(b) on walls where vertical ribs deeper than 1 m are placed on the facade, C_p shall be taken as ±0.9, except that within a distance equal to the larger of 0.2D and 0.2W from a *building* corner the negative value of C_p shall be taken as –1.4, and

(c) on roofs, C_p shall be taken as –1.0, except that,

(i) within a distance equal to the larger of 0.1D and 0.1W from a roof edge, C_p shall be taken as –1.5,

(ii) in a zone that is within a distance equal to the larger of 0.2D and 0.2W from a roof corner, C_p shall be taken as –2.3 but is permitted to be taken as –2.0 for roofs with perimeter parapets that are higher than 1 m, and

(iii) on lower levels of flat stepped roofs, positive pressure coefficients established for the walls of the steps apply for a distance b as shown in Figure 4.1.7.6.D.

(See Appendix A.)

(5) For the design of balcony *guards*, the internal pressure coefficient, C_{pi}, shall be taken as zero and the value of C_p shall be taken as ±0.9, except that within a distance equal to the larger of 0.1D and 0.1W from a *building* corner, C_p shall be taken as ±1.2.

4.1.7.6. External Pressure Coefficients for Low Buildings

(1) For the design of *buildings* with a height, H, that is less than or equal to 20 m and less than the smaller plan dimension, the values of the product of the pressure coefficient and gust factor, C_pC_g, provided in Sentences (2) to (9) are permitted to be used.

(2) For the design of the main structural system of the *building*, which is affected by wind pressures on more than one surface, the values of C_pC_g are provided in Figure 4.1.7.6.A.

(3) For the design of individual walls and wall cladding, the values of C_pC_g are provided in Figure 4.1.7.6.B.

(4) For the design of roofs with a slope less than or equal to 7°, the values of C_pC_g are provided in Figure 4.1.7.6.C.

(5) For the design of flat roofs with steps in elevation, the values of C_pC_g are provided in Figure 4.1.7.6.D.

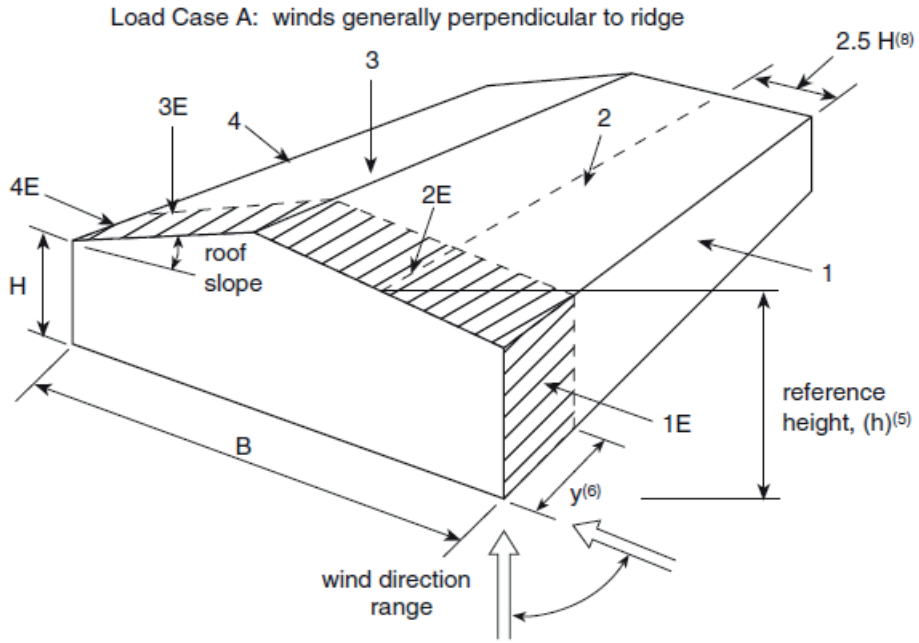
(6) For the design of gabled or hipped, single-ridge roofs with slope greater than 7°, the values of C_pC_g are provided in Figure 4.1.7.6.E.

(7) For the design of gabled, multi-ridge roofs, the values of C_pC_g are provided in,
(a) Figure 4.1.7.6.C. for roofs with slope less than or equal to 10°, and
(b) Figure 4.1.7.6.F. for roofs with slope greater than 10°.

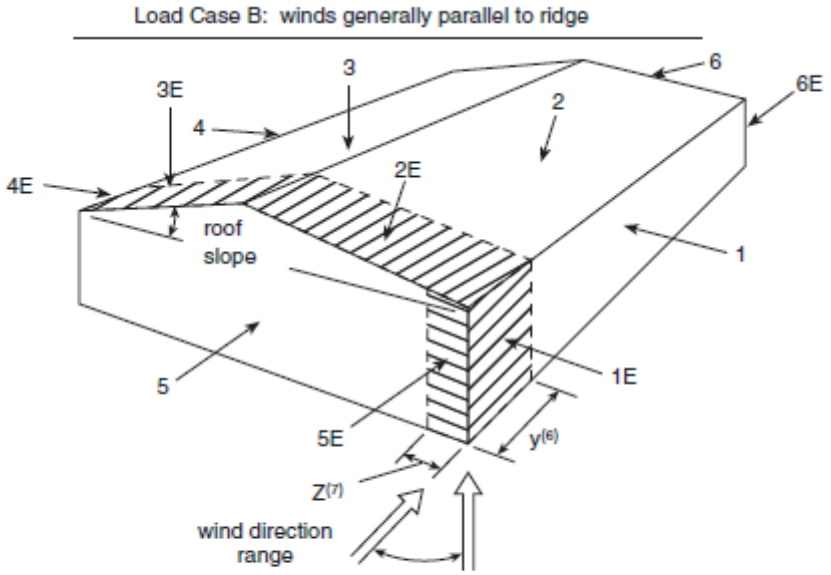
(8) For monosloped roofs, the values of C_pC_g are provided in,
(a) Figure 4.1.7.6.C. for roofs with a slope less than or equal to 3°, and
(b) Figure 4.1.7.6.G. for roofs with a slope greater than 3° and less than or equal to 30°.

(9) For sawtooth roofs, the values of C_pC_g are provided in,
(a) Figure 4.1.7.6.C. for roofs with a slope less than or equal to 10°, and
(b) Figure 4.1.7.6.H. for roofs with a slope greater than 10°.

Figure 4.1.7.6.A.
External Peak Values of C_pC_g for Primary Structural Actions Arising from Wind Load Acting Simultaneously on All Surfaces of Low Buildings, H ≤ 20 m(1)(2)(3)(4)
Forming Part of Sentence 4.1.7.6.(2)



Roof Slope	Building Surfaces							
	1	1E	2	2E	3	3E	4	4E
0° to 5°	0.75	1.15	-1.3	-2.0	-0.7	-1.0	-0.55	-0.8
20°	1.0	1.5	-1.3	-2.0	-0.9	-1.3	-0.8	-1.2
30° to 45°	1.05	1.3	0.4	0.5	-0.8	-1.0	-0.7	-0.9
90°	1.05	1.3	1.05	1.3	-0.7	-0.9	-0.7	-0.9



Roof Slope	Building Surfaces											
	1	1E	2	2E	3	3E	4	4E	5	5E	6	6E
0° to 90°	-0.85	-0.9	-1.3	-2.0	-0.7	-1.0	-0.85	-0.9	0.75	1.15	-0.55	-0.8

Notes to Figure 4.1.7.6.A.:

(1) The *building* shall be designed for all wind directions. Each corner shall be considered in turn as the windward corner shown in the Figure. For all roof slopes, Load Case A and Load Case B are required as two separate loading conditions to generate the wind actions, including torsion, to be resisted by the structural system.

(2) For values of roof slope not shown, the coefficient, C_pC_g, may be interpolated linearly.

(3) Positive coefficients denote forces toward the surface, whereas negative coefficients denote forces away from the surface.

(4) For the design of *foundations*, exclusive of anchorages to the frame, only 70% of the effective load is to be considered.

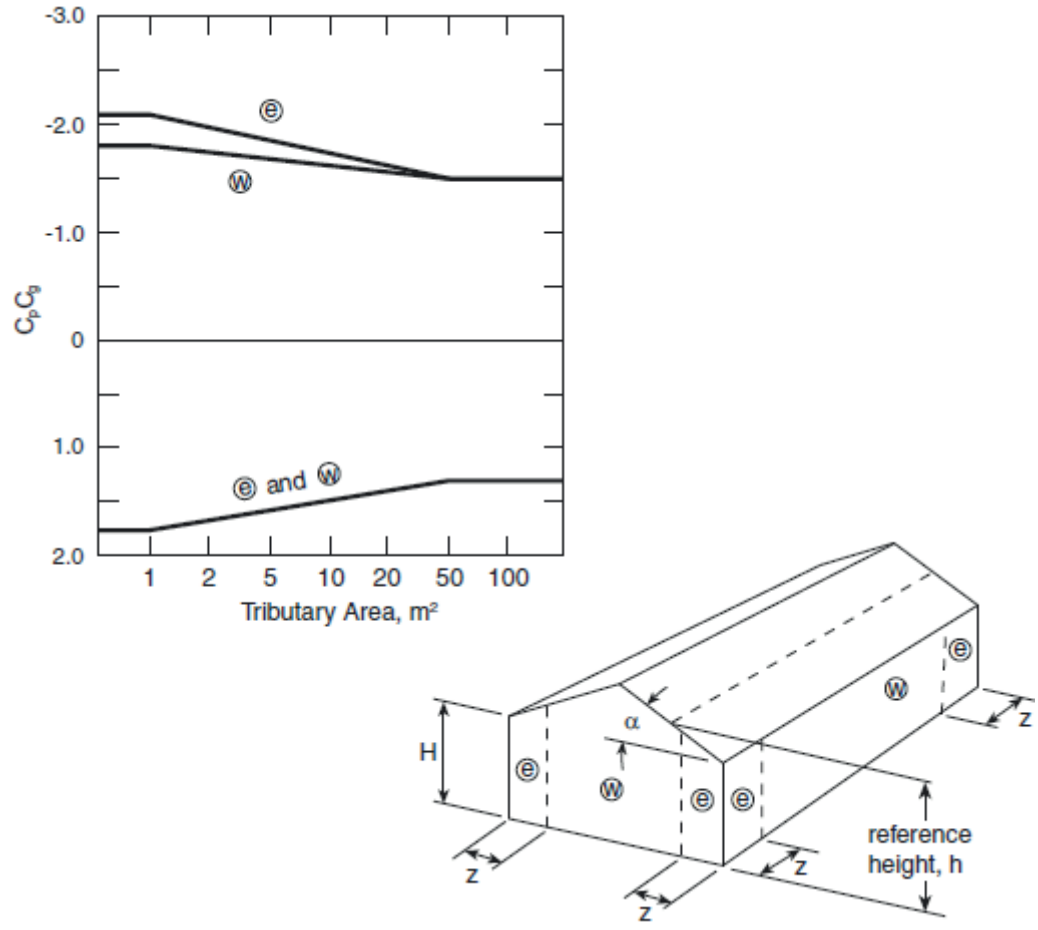
(5) The reference height, h, for pressures is the mid-height of the roof or 6 m, whichever is greater. The eave height, H, may be substituted for the mid-height of the roof if the roof slope is less than 7°.

(6) End-zone width, y, is the greater of 6 m or 2z, where z is the width of the gable-wall end zone defined for Load Case B. Alternatively, for *buildings* with frames, y may be the distance between the end and the first interior frame.

(7) End-zone width, z, is the lesser of 10% of the least horizontal dimension and 40% of height, H, but not less than 4% of the least horizontal dimension or 1 m.

(8) For B/H > 5 in Load Case A, the listed negative coefficients on surfaces 2 and 2E shall only be applied on an area whose width is 2.5H measured from the windward eave. The pressures on the remainder of the windward roof may be reduced to the pressures for the leeward roof.

Figure 4.1.7.6.B.
External Peak Values of C_pC_g on Individual Walls for the Design of Cladding and Secondary Structural Members(1)(2)(3)(4)(5)
Forming Part of Sentence 4.1.7.6.(3)



Notes to Figure 4.1.7.6.B.:

(1) These coefficients apply for any roof slope, α.

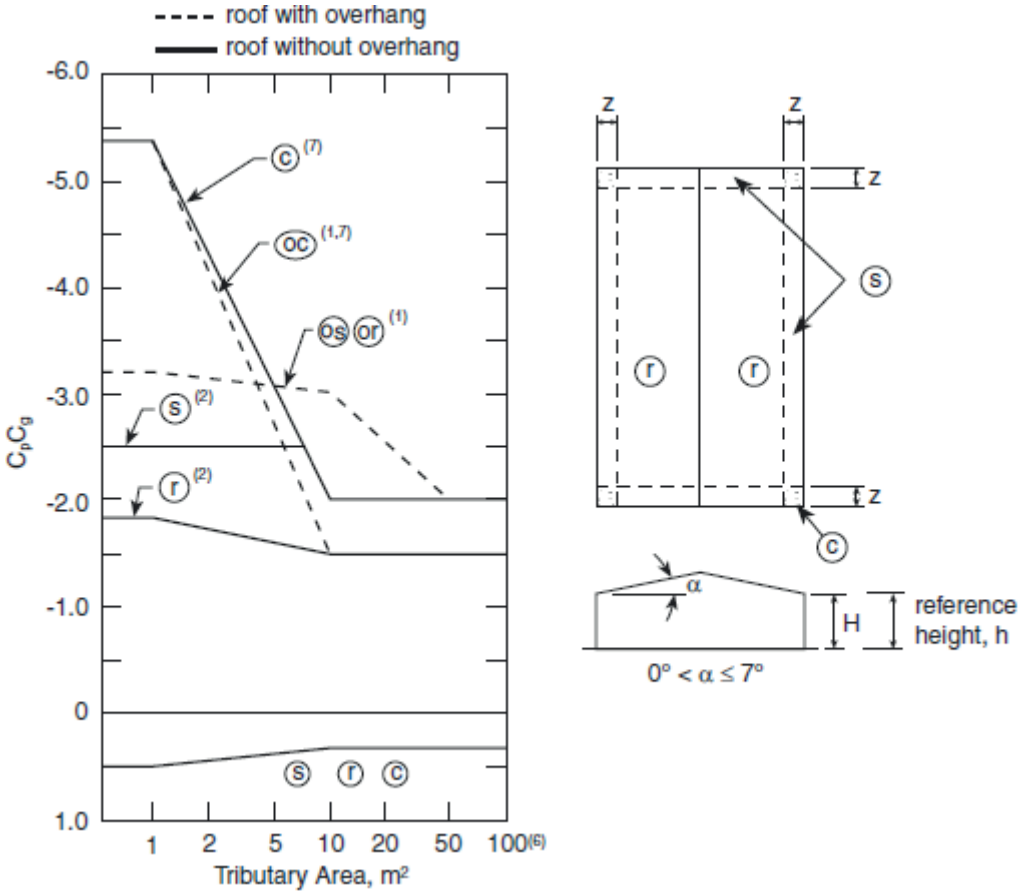
(2) End-zone width, z, is the lesser of 10% of the least horizontal dimension and 40% of height, H, but not less than 4% of the least horizontal dimension or 1 m.

(3) Combinations of exterior and interior pressures shall be evaluated to obtain the most severe loading.

(4) Positive coefficients denote forces toward the surface, whereas negative coefficients denote forces away from the surface. Each structural element shall be designed to withstand forces of both signs.

(5) Pressure coefficients generally apply for facades with architectural features; however, where vertical ribs deeper than 1 m are placed on a facade, a local C_pC_g of –2.8 applies to zone e.

Figure 4.1.7.6.C.
External Peak Values of C_pC_g on Roofs with a Slope of 7° or Less for the Design of Structural Components and Cladding[3][4][5]
Forming Part of Sentences 4.1.7.6.(4), (7), (8), and (9)



Notes to Figure 4.1.7.6.C.:

(1) Coefficients for overhung roofs have the prefix "o" and refer to the same roof areas as referred to by the corresponding symbol without a prefix. They include contributions from both upper and lower surfaces. In the case of overhangs, the walls are inboard of the roof outline.

(2) s and r apply to both roofs and upper surfaces of canopies.

(3) End-zone width, z, is the lesser of 10% of the least horizontal dimension and 40% of height, H, but not less than 4% of the least horizontal dimension or 1 m.

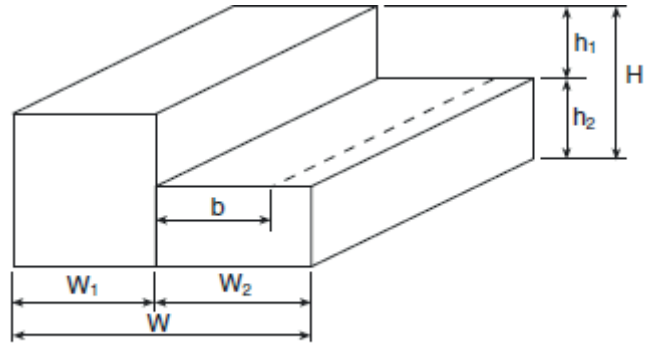
(4) Combinations of exterior and interior pressures shall be evaluated to obtain the most severe loading.

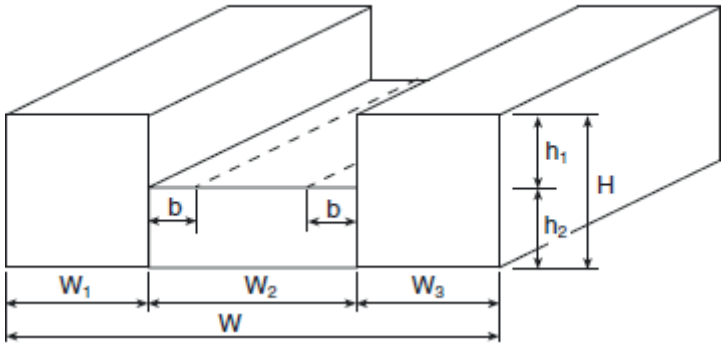
(5) Positive coefficients denote forces toward the surface, whereas negative coefficients denote forces away from the surface. Each structural element shall be designed to withstand forces of both signs.

(6) For calculating the uplift forces on tributary areas larger than 100 m² on unobstructed nearly-flat roofs with low parapets, and where the centre of the tributary area is at least twice the height of the *building* from the nearest edge, the value of C_pC_g may be reduced from –1.5 to –1.1 at x/H = 2 and further reduced linearly to –0.6 at x/H = 5, where x is the distance to the nearest edge and H is the height of the *building*.

(7) For roofs having a perimeter parapet with a height of 1 m or greater, the corner coefficients C_pC_g for tributary areas less than 1 m² can be reduced from –5.4 to –4.4.

Figure 4.1.7.6.D.
External Peak Values of C_pC_g for the Design of the Structural Components and Cladding of Buildings with Stepped Roofs(1)(2)
Forming Part of Sentences 4.1.7.5.(4) and 4.1.7.6.(5)



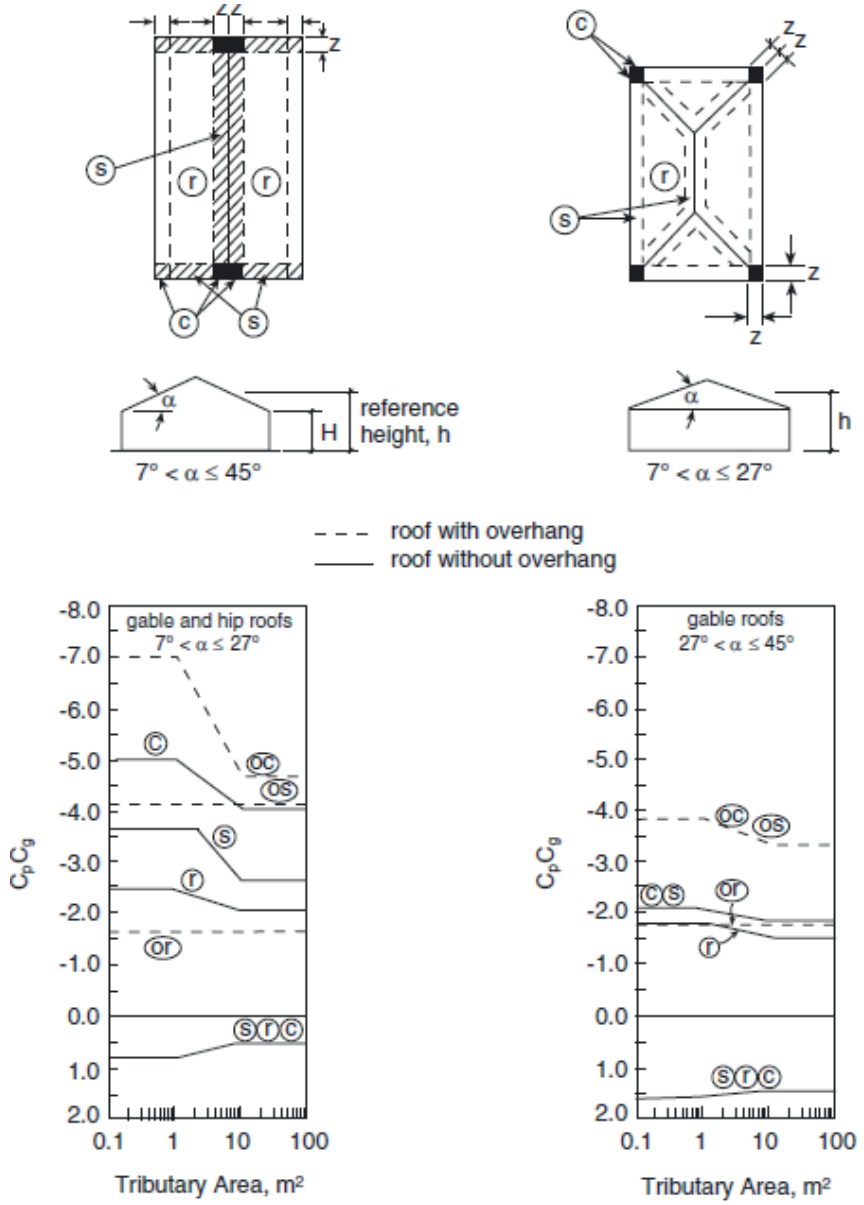


Notes to Figure 4.1.7.6.D.:

(1) The zone designations, pressure-gust coefficients and Notes to Figure 4.1.7.6.C. apply on both the upper and lower levels of flat stepped roofs, except that on the lower levels, positive pressure-gust coefficients equal to those in Figure 4.1.7.6.B. for walls apply for a distance, b, where b is equal to $1.5h_1$ but not greater than 30 m. For all walls in Figure 4.1.7.6.D., zone designations and pressure coefficients provided for walls in Figure 4.1.7.6.B. apply.

(2) Note (1) applies only when the following conditions are met: $h_1 \geq 0.3H$, $h_1 \geq 3$ m, and W1, W2, or W3 is greater than 0.25W but not greater than 0.75W.

Figure 4.1.7.6.E.
External Peak Values of C_pC_g on Single-Span Gabled and Hipped Roofs with a Slope Greater than 7° for the Design of Structural Components and Cladding(1)(2)(3)(4)(5)
Forming Part of Sentence 4.1.7.6.(6)



Notes to Figure 4.1.7.6.E.:

(1) Coefficients for overhung roofs have the prefix "o" and refer to the same roof areas as referred to by the corresponding symbol without a prefix. They include contributions from both upper and lower surfaces.

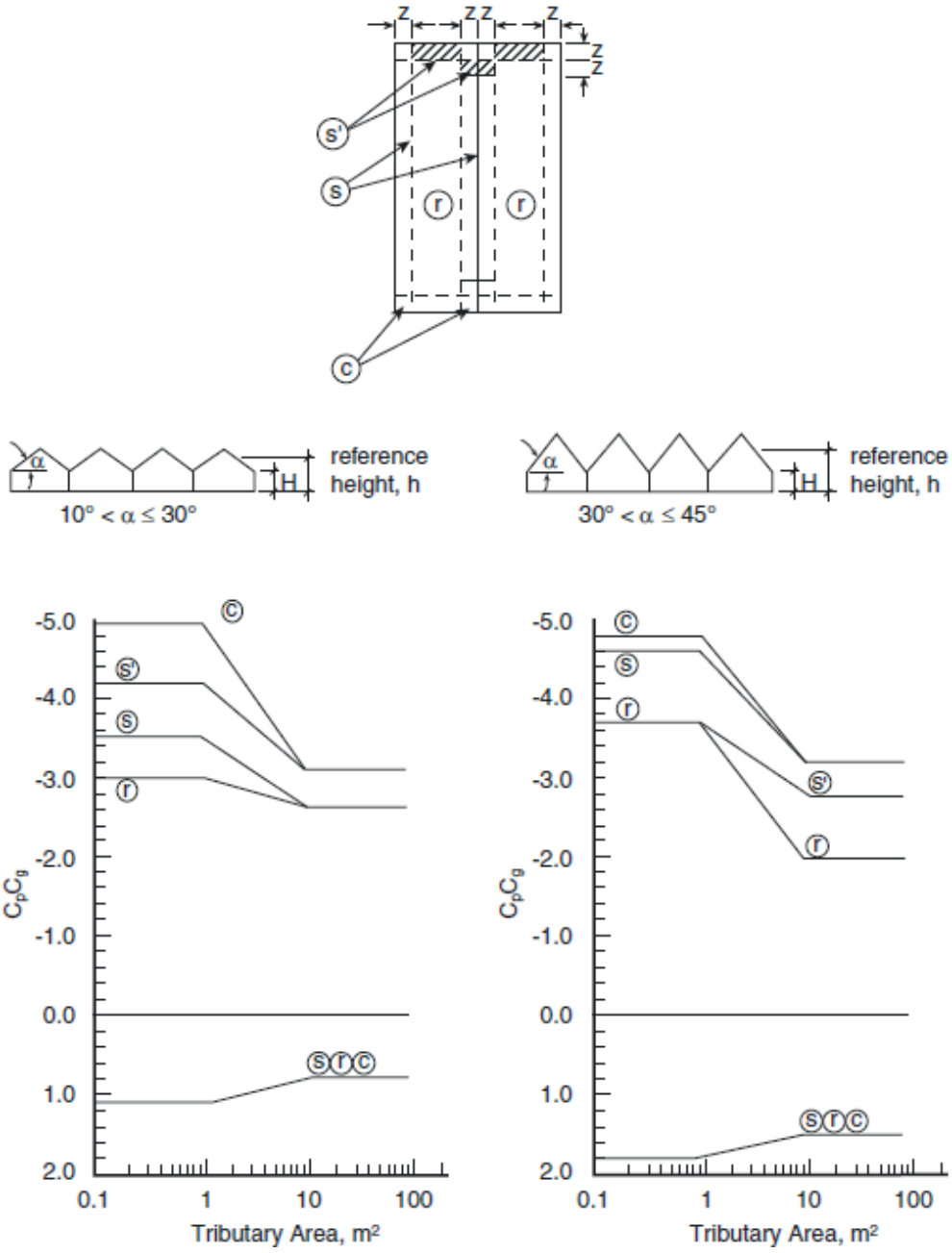
(2) End-zone width, z, is the lesser of 10% of the least horizontal dimension and 40% of height, H, but not less than 4% of the least horizontal dimension or 1 m.

(3) Combinations of external and internal pressures shall be evaluated to obtain the most severe loading.

(4) Positive coefficients denote forces toward the surface, whereas negative coefficients denote forces away from the surface. Each structural element shall be designed to withstand forces of both signs.

(5) For hipped roofs with 7° < α ≤ 27°, edge/ridge strips and pressure-gust coefficients for ridges of gabled roofs apply along each hip.

Figure 4.1.7.6.F.
External Peak Values of C_pC_g on Multi-Span Gabled (Folded) Roofs with a Slope Greater than 10° for the Design of Structural Components and Cladding[1][2][3][4]
Forming Part of Sentence 4.1.7.6.(7)



Notes to Figure 4.1.7.6.F.:

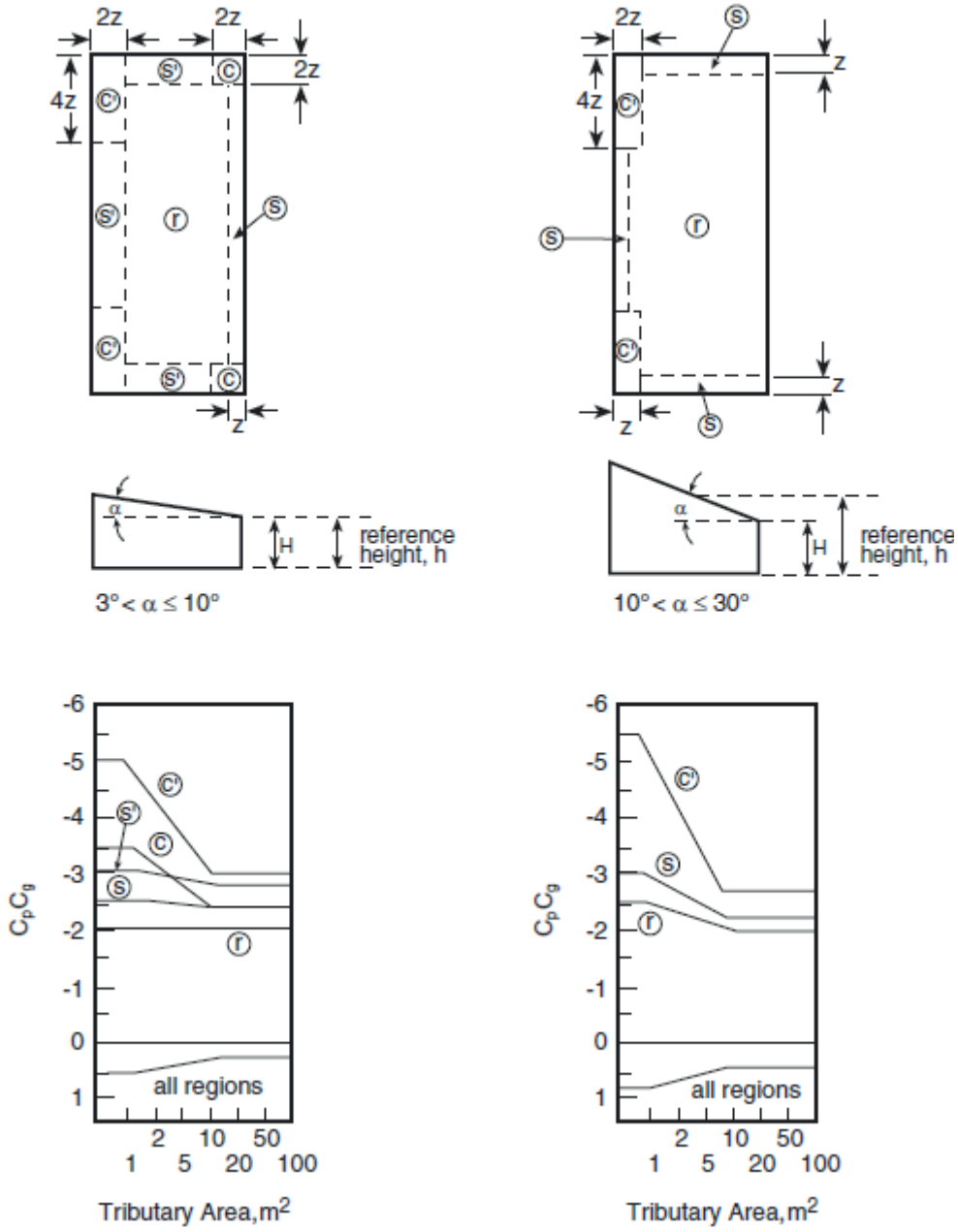
(1) End-zone width, z, is the lesser of 10% of the least horizontal dimension and 40% of height, H, but not less than 4% of the least horizontal dimension or 1 m.

(2) Combinations of external and internal pressures shall be evaluated to obtain the most severe loading.

(3) Positive coefficients denote forces toward the surface, whereas negative coefficients denote forces away from the surface. Each structural element shall be designed to withstand forces of both signs.

(4) Where α ≤ 10°, the coefficients given in Figure 4.1.7.6.C. apply. Where α > 7°, use α = 7°.

Figure 4.1.7.6.G.
External Peak Values of C_pC_g on Monoslope Roofs for the Design of Structural Components and Cladding[1][2][3][4]
Forming Part of Sentence 4.1.7.6.(8)



Notes to Figure 4.1.7.6.G.:

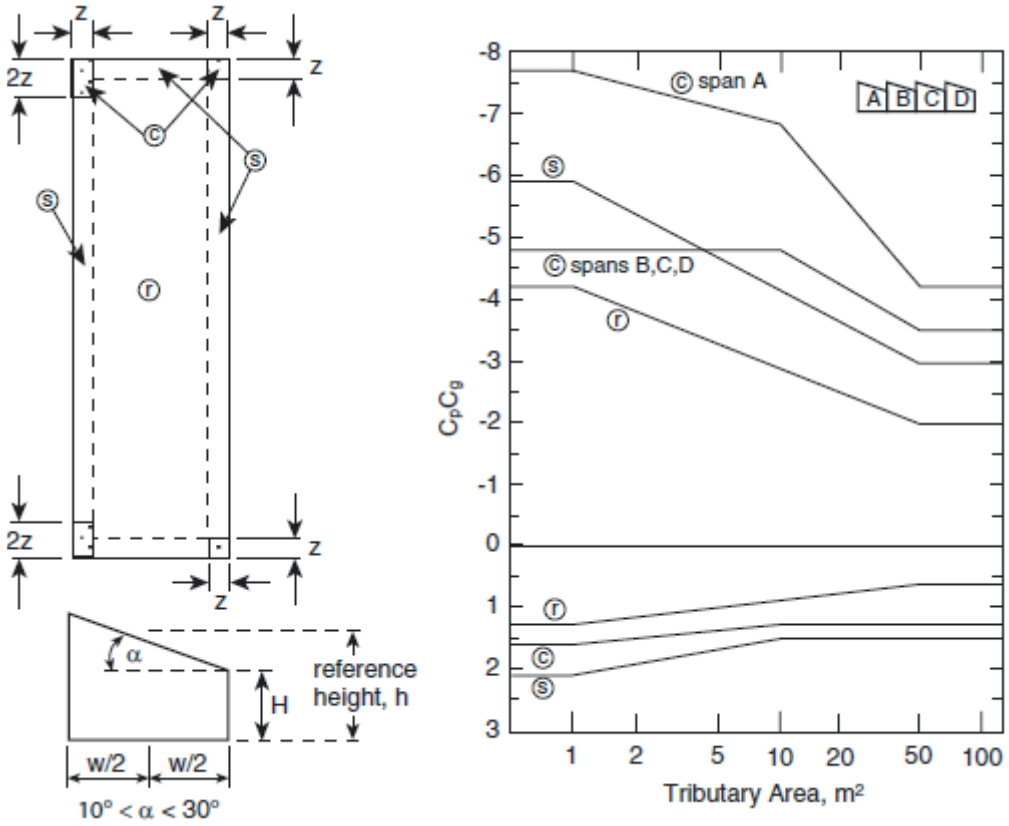
(1) End-zone width, z, is the lesser of 10% of the least horizontal dimension and 40% of height, H, but not less than 4% of the least horizontal dimension or 1 m.

(2) Combinations of external and internal pressures shall be evaluated to obtain the most severe loading.

(3) Positive coefficients denote forces toward the surface, whereas negative coefficients denote forces away from the surface. Each structural element shall be designed to withstand forces of both signs.

(4) Where α ≤ 3°, the coefficients given in Figure 4.1.7.6.C. apply.

Figure 4.1.7.6.H.
External Peak Values of C_pC_g on Sawtooth Roofs with a Slope Greater than 10° for the Design of Structural Components and Cladding(1)(2)(3)(4)(5)
Forming Part of Sentence 4.1.7.6.(9)



Notes to Figure 4.1.7.6.H.:

(1) End-zone width, z, is the lesser of 10% of the least horizontal dimension and 40% of height, H, but not less than 4% of the least horizontal dimension or 1 m.

(2) Combinations of external and internal pressures shall be evaluated to obtain the most severe loading.

(3) Positive coefficients denote forces toward the surface, whereas negative coefficients denote forces away from the surface. Each structural element shall be designed to withstand forces of both signs.

(4) Negative coefficients on corner zones of Span A differ from those on Spans B, C, and D.

(5) Where $\alpha \leq 10°$, the coefficients given in Figure 4.1.7.6.C. apply. Where $\alpha > 7°$, use $\alpha = 7°$.

4.1.7.7. Internal Pressure Coefficient

(1) The internal pressure coefficient, C_{pi}, shall be as prescribed in Table 4.1.7.7.

Table 4.1.7.7.
Internal Pressure Coefficients
Forming Part of Sentence 4.1.7.7.(1)

Building Openings	Values for C_{pi}
Uniformly distributed small openings amounting to less than 0.1% of the total surface area	–0.15 to 0.0
Non-uniformly distributed openings of which none is significant or significant openings that are wind-resistant and closed during storms	–0.45 to +0.30
Large openings likely to remain open during storms	–0.70 to +0.70
Column 1	2

4.1.7.8. Dynamic Procedure

(1) For the application of the Dynamic Procedure, the provisions of Article 4.1.7.3. shall be followed, except that the exposure factor, C_e, shall be as prescribed in Sentences (2) and (3), and the gust effect factor, C_g, shall be as prescribed in Sentence (4), when determining the wind loads on the main structural system.

(2) For *buildings* in open terrain as described in Clause 4.1.7.3.(5)(a), the value of C_e for the design of the main structural system shall be calculated as follows:

$$C_e = (h/10)^{0.28}, \text{ but } 1.0 \le C_e \le 2.5$$

(See Appendix A.)

(3) For *buildings* in rough terrain as described in Clause 4.1.7.3.(5)(b), the value of C_e for the design of the main structural system shall be calculated as follows:

$$C_e = 0.5(h/12.7)^{0.50}, \text{ but } 0.5 \le C_e \le 2.5$$

(See Appendix A.)

(4) For the design of the main structural system, C_g shall be calculated as follows:

$$C_g = 1 + g_p(\sigma/\mu)$$

where,

g_p = peak factor calculated as $\sqrt{2\ln(\upsilon T)} + \frac{0.577}{\sqrt{2\ln(\upsilon T)}}$, and

$\sigma/\mu = \sqrt{\frac{K}{C_{eH}}\left(B + \frac{sF}{\beta}\right)}$,

where,

υ = average fluctuation rate calculated as $f_{nD}\sqrt{\frac{sF}{sF + \beta B}}$,

T = 3 600 s,

K = 0.08 for open terrain and 0.10 for rough terrain,

C_{eH} = exposure factor evaluated at reference height h = H,

B = background turbulence factor, a function of w/H determined from Figure 4.1.7.8.,

s = size reduction factor calculated as $\frac{\pi}{3}\left|\frac{1}{1+\frac{8f_nH}{3V_H}}\right|\left|\frac{1}{1+\frac{10f_nW}{V_H}}\right|$,

F = gust energy ratio calculated as $\frac{x_0^2}{(1+x_0^2)^{4/3}}$, where $x_0 = (1\ 220\ f_n/V_H)$, and

β = damping ratio, which shall be determined by a rational method or may be taken to be 0.01 for steel structures, 0.02 for concrete structures and 0.015 for composite structures,

where,

f_{nD} = natural frequency of vibration of the *building* in the along-wind direction, in Hz,

f_n = lowest natural frequency of the *building,* in Hz, as described in Sentences 4.1.7.2.(2) and (3),

H = height of the *building*,

w = effective width of windward face of the *building* calculated as $\frac{\sum h_i w_i}{\sum h_i}$, where w_i = width normal to wind direction at height h_i, and

V_H = mean wind speed at the top of the structure, in m/s, calculated as $\overline{V}\sqrt{C_{eH}}$,

where,

$\overline{V}$ = reference wind speed at a height of 10 m, in m/s, calculated as $\sqrt{\frac{2 \cdot I_w \cdot q}{\varrho}}$,

where,

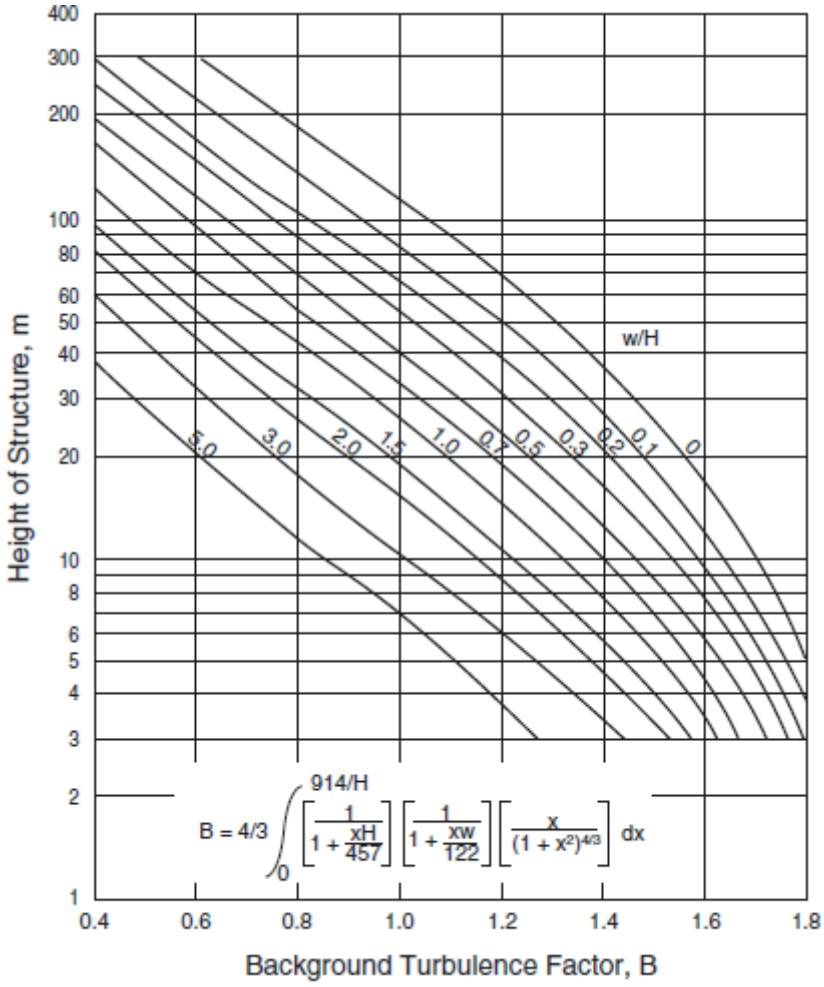
I_w = importance factor,

q = reference velocity pressure, in Pa, and

ϱ = air density = 1.2929 kg/m^3.

(See Appendix A.)

Figure 4.1.7.8.
Background Turbulence Factor, B
Forming Part of Sentence 4.1.7.8.(4)



4.1.7.9. Full and Partial Wind Loading

(1) Except where the wind loads are derived from the combined C_pC_g values determined in accordance with Article 4.1.7.6., *buildings* and structural members shall be capable of withstanding the effects of,

(a) the full wind loads acting along each of the two principal horizontal axes considered separately,
(b) the wind loads as described in Clause (a) but with 100% of the load removed from any one portion of the area,
(c) the wind loads as described in Clause (a) but with both axes considered simultaneously at 75% of their full value, and
(d) the wind loads as described in Clause (c) but with 50% of these loads removed from any portion of the area.

(See Appendix A.)

4.1.7.10. Interior Walls and Partitions

(1) In the design of interior walls and *partitions*, due consideration shall be given to differences in air pressure on opposite sides of the wall or *partition* that may result from,

(a) pressure differences between the windward and leeward sides of a *building*,
(b) stack effects due to a difference in air temperature between the exterior and interior of the *building*, and
(c) air pressurization by the mechanical services of the *building*.

4.1.7.11. Exterior Ornamentations, Equipment and Appendages (See Appendix A.)

(1) The effects of wind loads on exterior ornamentations, equipment and appendages, including the increase in exposed area as a result of ice buildup as described in CSA S37, "Antennas, Towers, and Antenna-Supporting Structures", shall be considered in the structural design of the connections and the *building*.

(2) Where there are a number of similar components, the net increase in force is permitted to be based on the total area for all similar components as opposed to the summation of forces of individual elements.

4.1.7.12. Wind Tunnel Procedure

(1) Except as provided in Sentences (2) and (3), wind tunnel tests on scale models to determine wind loads on *buildings* shall be conducted in accordance with ASCE/SEI 49, "Wind Tunnel Testing for Buildings and Other Structures".

(2) Where an adjacent *building* provides substantial sheltering effect, the wind loads for the main structural system shall be no lower than 80% of the loads determined from tests described in Sentence (1) with the effect of the sheltering *building* removed as applied to,

(a) the base shear force for *buildings* with ratio of height to minimum effective width, as described in Sentence 4.1.7.2.(2), less than or equal to 1.0, or

(b) the base moment for *buildings* with a ratio of height to minimum effective width greater than 1.0.

(3) For the design of cladding and secondary structural members, the exterior wind loads determined from the wind tunnel tests shall be no less onerous than those determined by analysis in accordance with Article 4.1.7.3. using the following assumptions:

(a) $C_p = \pm 0.72$ and $C_g = 2.5$, where the height of the *building* is greater than 20 m or greater than its minimum effective width, and

(b) $C_pC_g = 80\%$ of the values for zones w and r provided in Article 4.1.7.6., where the height of the *building* is less than or equal to 20 m and no greater than its minimum effective width.

r11.1 4.1.8. Earthquake Load and Effects

4.1.8.1. Analysis

(1) Except as permitted in Sentence (2), the deflections and specified loading due to earthquake motions shall be determined according to the requirements of Articles 4.1.8.2. to 4.1.8.22.

(2) Where $I_EF_sS_a(0.2)$ and $I_EF_sS_a(2.0)$ are less than 0.16 and 0.03 respectively, the deflections and specified loading due to earthquake motions are permitted to be determined in accordance with Sentences (3) to (15), where,

(a) I_E is the earthquake importance factor and has a value of 0.8, 1.0, 1.3 and 1.5 for *buildings* of Low, Normal, High and Post-Disaster importance respectively,

(b) F_s is the site coefficient based on the average $\overline{N}_{60}$ or s_u, as defined in Article 4.1.8.2., for the top 30 m of *soil* below the footings, pile caps or mat *foundations* and has a value of,

  (i) 1.0 for *rock* sites or when $\overline{N}_{60} > 50$ or $s_u > 100$ kPa,

  (ii) 1.6 when $15 \leq \overline{N}_{60} \leq 50$ or 50 kPa $\leq s_u \leq$ 100 kPa, and

  (iii) 2.8 for all other cases, and

(c) $S_a(T)$ is the 5% damped spectral response acceleration value for period T, determined in accordance with Subsection 1.1.2.

(3) The structure shall have a clearly defined,

(a) SFRS, as defined in Article 4.1.8.2., to resist the earthquake loads and their effects, and

(b) load path or paths that will transfer the inertial forces generated by the earthquake to the *foundations* and supporting ground.

(4) An unreinforced masonry SFRS shall not be permitted where,
(a) I_E is greater than 1.0, or
(b) the height above *grade* is greater than or equal to 30 m.

(5) The height above *grade* of SFRS designed in accordance with CSA S136, "North American Specification for the Design of Cold-Formed Steel Structural Members", shall be less than 15 m.

(6) Earthquake forces shall be assumed to act horizontally and independently about any two orthogonal axes.

(7) The minimum lateral earthquake design force, V_s, at the base of the structure in the direction under consideration shall be calculated as follows:

$$V_s = F_s\, S_a(T_s)\, I_E\, W_t / R_s$$

where,

$S_a(T_s)$ = value of S_a at T_s determined by linear interpolation between the value of S_a at 0.2 s, 0.5 s and 1.0 s, and
= $S_a(0.2)$ for $T_s \leq 0.2$ s,
W_t = sum of W_i over the height of the *building*, where W_i is defined in Article 4.1.8.2., and
R_s = 1.5 except R_s = 1.0 for structures where the *storey* strength is less than that in the *storey* above and for an unreinforced masonry SFRS,

where,

T_s = fundamental lateral period of vibration of the *building*, as defined in Article 4.1.8.2.,
= $0.085(h_n)^{3/4}$ for steel moment frames,
= $0.075(h_n)^{3/4}$ for concrete moment frames,
= 0.1 N for other moment frames,
= $0.025h_n$ for braced frames, and
= $0.05(h_n)^{3/4}$ for shear walls and other structures,

where,

h_n = height above the base, in m, as defined in Article 4.1.8.2.,

except that V_s shall not be less than $F_sS_a(1.0)I_EW_t/R_s$ and, in cases where R_s = 1.5, V_s need not be greater than $F_sS_a(0.5)I_EW_t/R_s$.

(8) The total lateral earthquake design force, V_s, shall be distributed over the height of the *building* in accordance with the following formula:

$$F_x = V_s W_x h_x \Big/ \left(\sum_{i=1}^{n} w_i h_i \right)$$

where,

F_x = force applied through the centre of mass at level x,
W_x,W_i = portion of W that is located at or is assigned to level x or level i respectively, and
h_x, h_i = height, in m, above the base of level x and level i as described in Article 4.1.8.2.

(9) Accidental torsional effects applied concurrently with F_x shall be considered by applying torsional moments about the vertical axis at each level for each of the following cases considered separately:
(a) $+0.1D_{nx}F_x$, and
(b) $-0.1D_{nx}F_x$.

(10) Deflections obtained from a linear analysis shall include the effects of torsion and be multiplied by R_s/I_E to get realistic values of expected deflections.

(11) The deflections described in Sentence (10) shall be used to calculate the largest interstorey deflection, which shall not exceed,
(a) $0.01h_s$ for post-disaster buildings,
(b) $0.02h_s$ for High Importance Category *buildings*, and
(c) $0.025h_s$ for all other *buildings*,

where h_s is the interstorey height as defined in Article 4.1.8.2.

(12) When earthquake forces are calculated using $R_s = 1.5$, the following elements in the SFRS shall have their design forces due to earthquake effects increased by 33%:
(a) diaphragms and their chords, connections, struts and collectors,
(b) tie downs in wood or drywall shear walls,
(c) connections and anchor bolts in steel- and wood-braced frames,
(d) connections in precast concrete, and
(e) connections in steel moment frames.

(13) Except as provided in Sentence (14), where cantilever parapet walls, other cantilever walls, exterior ornamentation and appendages, towers, chimneys or penthouses are connected to or form part of a *building*, they shall be designed, along with their connections, for a lateral force, V_{sp}, distributed according to the distribution of mass of the element and acting in the lateral direction that results in the most critical loading for design using the following equation:

$$V_{sp} = 0.1F_sI_EW_p$$

where W_p is the weight of a portion of a structure as defined in Article 4.1.8.2.

(14) The value of V_{sp} shall be doubled for unreinforced masonry elements.

(15) Structures designed in accordance with this Article need not comply with the seismic requirements stated in the applicable design standard referenced in Section 4.3.

4.1.8.2. Notation (See Appendix A.)

(1) In this Subsection,

A_r = response amplification factor to account for type of attachment of mechanical/electrical equipment, as defined in Sentence 4.1.8.18.(1),

A_x = amplification factor at level x to account for variation of response of mechanical/electrical equipment with elevation within the *building*, as defined in Sentence 4.1.8.18.(1),

B_x = ratio at level x used to determine torsional sensitivity, as defined in Sentence 4.1.8.11.(9),

B = maximum value of B_x, as defined in Sentence 4.1.8.11.(9),

C_p = seismic coefficient for mechanical/electrical equipment, as defined in Sentence 4.1.8.18.(1),

D_{nx} = plan dimension of the *building* at level x perpendicular to the direction of seismic loading being considered,

e_x = distance measured perpendicular to the direction of earthquake loading between centre of mass and centre of rigidity at the level being considered, (See Appendix A.)

F_a = site coefficient, as defined in Sentence 4.1.8.4.(7),

F(PGA) = site coefficient for PGA, as defined in Sentence 4.1.8.4.(5),

F(PGV) = site coefficient for PGV, as defined in Sentence 4.1.8.4.(5),

F_s = site coefficient, as defined in Sentence 4.1.8.1.(2),

$F(T)$ = site coefficient for spectral acceleration, as defined in Sentence 4.1.8.4.(5),

F_t = portion of V to be concentrated at the top of the structure, as defined in Sentence 4.1.8.11.(6),

F_v = site coefficient, as defined in Sentence 4.1.8.4.(7),

F_x = lateral force applied to level x, as defined in Sentence 4.1.8.11.(6),

h_i, h_n, h_x = the height above the base (i = 0) to level i, n, or x respectively, where the base of the structure is the level at which horizontal earthquake motions are considered to be imparted to the structure,

h_s = interstorey height (h_i - h_{i-1}),

I_E = earthquake importance factor of the structure, as described in Sentence 4.1.8.5.(1),

J = numerical reduction coefficient for base overturning moment, as defined in Sentence 4.1.8.11.(5),

J_X = numerical reduction coefficient for overturning moment at level x, as defined in Sentence 4.1.8.11.(7),

Level i = any level in the *building*, i =1 for first level above the base,

Level n = level that is uppermost in the main portion of the structure,

Level x = level that is under design consideration,

M_v = factor to account for higher mode effect on base shear, as defined in Sentence 4.1.8.11.(5),

M_x = overturning moment at level x, as defined in Sentence 4.1.8.11.(7),

N = total number of *storeys* above exterior *grade* to level n,

$\overline{N}_{60}$ = Average Standard Penetration Resistance for the top 30 m, corrected to a rod energy efficiency of 60% of the theoretical maximum,

PGA = Peak Ground Acceleration expressed as a ratio to gravitational acceleration, as defined in Sentence 4.1.8.4.(1),

PGA_{ref} = reference PGA for determining F(T), F(PGA) and F(PGV), as defined in Sentence 4.1.8.4.(4),

PGV = Peak Ground Velocity, in m/s, as defined in Sentence 4.1.8.4.(1),

PI = plasticity index for clays,

R_d = ductility-related force modification factor reflecting the capability of a structure to dissipate energy through reversed cyclic inelastic behaviour, as given in Article 4.1.8.9.,

R_o = overstrength-related force modification factor accounting for the dependable portion of reserve strength in a structure designed according to these provisions, as defined in Article 4.1.8.9.,

R_s = combined overstrength and ductility-related modification factor, as defined in Sentence 4.1.8.1.(7),

S_P = horizontal force factor for part or portion of a *building* and its anchorage, as given in Sentence 4.1.8.18.(1),

S(T) = design spectral response acceleration, expressed as a ratio to gravitational acceleration, for a period of T, as defined in Sentence 4.1.8.4.(7),

$S_a(T)$ = 5% damped spectral response acceleration, expressed as a ratio to gravitational acceleration, for a period of T, as defined in Sentence 4.1.8.4.(1),

SFRS = Seismic Force Resisting System(s) is that part of the structural system that has been considered in the design to provide the required resistance to the earthquake forces and effects defined in Subsection 4.1.8.,

S_u = average undrained shear strength in the top 30 m of *soil*,

T = period in seconds,

T_a = fundamental lateral period of vibration of the *building* or structure in seconds in the direction under consideration, as defined in Sentence 4.1.8.11.(3),

T_x = floor torque at level x, as defined in Sentence 4.1.8.11.(10),

TDD = Total Design Displacement of any point in a seismically isolated structure, within or above the isolation system, obtained by calculating the mean + (I_E × the standard deviation) of the peak horizontal displacements from all sets of ground motion histories analyzed, but not less than $\sqrt{I_E}$ × the mean, where the peak horizontal displacement is based on the vector sum of the two orthogonal horizontal displacements considered for each time step,

V = lateral earthquake design force at the base of the structure, as determined by Article 4.1.8.11.,

V_d = lateral earthquake design force at the base of the structure, as determined by Article 4.1.8.12.,

V_e = lateral earthquake elastic force at the base of the structure, as determined by Article 4.1.8.12.,

V_{ed} = lateral earthquake design elastic force at the base of the structure, as determined by Article 4.1.8.12.,

V_P = lateral force on a part of the structure, as determined by Article 4.1.8.18.,

V_s = lateral earthquake design force at the base of the structure, as determined by Sentence 4.1.8.1.(7),

$\overline{V}_{s30}$ = average shear wave velocity in the top 30 m of *soil* or *rock*,

W = *dead load*, as defined in Article 4.1.4.1., except that the minimum *partition* load as defined in Sentence 4.1.4.1.(3) need not exceed 0.5 kPa, plus 25% of the design snow load specified in Subsection 4.1.6., plus 60% of the storage load for areas used for storage, except that *storage garages* need not be considered storage areas, and the full contents of any tanks, (See Appendix A.)

W_i, W_x = portion of W that is located at or is assigned to level i or x respectively,

W_P = weight of a part or portion of a structure, e.g., cladding, *partitions* and appendages,

W_t = sum of W_i over the height of the *building*,

δ_{ave} = average displacement of the structure at level x, as defined in Sentence 4.1.8.11.(9), and

δ_{max} = maximum displacement of the structure at level x, as defined in Sentence 4.1.8.11.(9).

4.1.8.3. General Requirements

(1) The *building* shall be designed to meet the requirements of this Subsection and of the design standards referenced in Section 4.3.

(2) Structures shall be designed with a clearly defined load path, or paths, that will transfer the inertial forces generated in an earthquake to the supporting ground.

(3) The structure shall have a clearly defined Seismic Force Resisting System(s) (SFRS), as defined in Article 4.1.8.2.

(4) The SFRS shall be designed to resist 100% of the earthquake loads and their effects. (See Appendix A.)

(5) All structural framing elements not considered to be part of the SFRS must be investigated and shown to behave elastically or to have sufficient non-linear capacity to support their gravity loads while undergoing earthquake-induced deformations calculated from the deflections determined in Article 4.1.8.13.

(6) Stiff elements that are not considered part of the SFRS, such as concrete, masonry, brick or pre-cast walls or panels, shall be,

(a) separated from all structural elements of the *building* such that no interaction takes place as the *building* undergoes deflections due to earthquake effects as calculated in this Subsection, or

(b) made part of the SFRS and satisfy the requirements of this Subsection.

(See Appendix A.)

(7) Stiffness imparted to the structure from elements not part of the SFRS, other than those described in Sentence (6), shall not be used to resist earthquake deflections but shall be accounted for,

(a) in calculating the period of the structure for determining forces if the added stiffness decreases the fundamental lateral period by more than 15%,

(b) in determining the irregularity of the structure, except the additional stiffness shall not be used to make an irregular SFRS regular or to reduce the effects of torsion, and (See Appendix A.)

(c) in designing the SFRS if inclusion of the elements not part of the SFRS in the analysis has an adverse effect on the SFRS. (See Appendix A.)

(8) Structural modelling shall be representative of the magnitude and spatial distribution of the mass of the *building* and of the stiffness of all elements of the SFRS, including stiff elements that are not separated in accordance with Sentence 4.1.8.3.(6), and shall account for,

(a) the effect of cracked sections in reinforced concrete and reinforced masonry elements,

(b) the effect of the finite size of members and joints,

(c) sway effects arising from the interaction of gravity loads with the displaced configuration of the structure, and

(d) other effects that influence the lateral stiffness of the *building*.

(See Appendix A.)

4.1.8.4. Site Properties

(1) The peak ground acceleration (PGA), peak ground velocity (PGV) and the 5% damped spectral response acceleration values, $S_a(T)$, for the reference ground conditions (Site Class C in Table 4.1.8.4.A.) for periods T of 0.2 s, 0.5 s, 1.0 s, 2.0 s, 5.0 s and 10.0 s, shall be determined in accordance with Subsection 1.1.2. and are based on a 2% probability of exceedance in 50 years.

(2) Site classifications for ground shall conform to Table 4.1.8.4.A. and shall be determined using $\overline{V}_{s30}$, or where $\overline{V}_{s30}$ is not known, using Sentence (3).

(3) If average shear wave velocity, $\overline{V}_{s30}$, is not known, Site Class shall be determined from energy-corrected Average Standard Penetration Resistance, $\overline{N}_{60}$, or from *soil* average undrained shear strength, s_u, as noted in Table 4.1.8.4.A., $\overline{N}_{60}$ and s_u being calculated based on rational analysis. (See Appendix A.)

(4) For the purpose of determining the values of F(T) to be used in the calculation of design spectral acceleration, S(T), in Sentence (9), and the values of F(PGA) and F(PGV), the value of PGA_{ref} to be used with Tables 4.1.8.4.B. to 4.1.8.4.I. shall be taken as,

(a) 0.8 PGA, where the ratio $S_a(0.2)/PGA < 2.0$, and

(b) 1 PGA, in all other cases.

(5) The values of the site coefficient for design spectral acceleration at period T, F(T), and of similar coefficients F(PGA) and F(PGV) shall conform to Tables 4.1.8.4.B. to 4.1.8.4.I. using linear interpolation for intermediate values of PGA_{ref}.

(6) Site-specific evaluation is required to determine F(T), F(PGA) and F(PGV) for Site Class F. (See Appendix Note A-4.1.8.4.(3))

(7) For all applications in Subsection 4.1.8., $F_a = F(0.2)$ and $F_v = F(1.0)$.

(8) For structures with a fundamental period of vibration equal to or less than 0.5 s that are built on liquefiable *soils*, Site Class and the corresponding values of F(T) may be determined as described in Tables 4.1.8.4.A., 4.1.8.4.B., and 4.1.8.4.C. by assuming that the *soils* are not liquefiable. (See Appendix Note A-4.1.8.4.(3))

(9) The design spectral acceleration values of S(T) shall be determined as follows, using linear interpolation for intermediate values of T:

$S(T) = F(0.2)S_a(0.2)$ or $F(0.5)S_a(0.5)$, whichever is larger, for $T \leq 0.2$ s

$= F(0.5)S_a(0.5)$ for $T = 0.5$ s

$= F(1.0)S_a(1.0)$ for $T = 1.0$ s

$= F(2.0)S_a(2.0)$ for $T = 2.0$ s

$= F(5.0)S_a(5.0)$ for $T = 5.0$ s

$= F(10.0)S_a(10.0)$ for $T \geq 10.0$ s

Table 4.1.8.4.A.
Site Classification for Seismic Site Response
Forming Part of Sentences 4.1.8.4.(1) to (3)

Site Class	Ground Profile Name	Average Properties in Top 30 m[5]		
		Average Shear Wave Velocity, $\overline{V}_{s30}$, m/s	Average Standard Penetration Resistance, $\overline{N}_{60}$	*Soil* Undrained Shear Strength, s_u
A	Hard *rock*[1][2]	$\overline{V}_{s30} > 1500$	N/A	N/A
B	*Rock*[1]	$760 < \overline{V}_{s30} \leq 1500$	N/A	N/A
C	Very dense *soil* and soft *rock*	$360 < \overline{V}_{s30} < 760$	$\overline{N}_{60} > 50$	$s_u > 100$kPa
D	Stiff *soil*	$180 < \overline{V}_{s30} < 360$	$15 \leq \overline{N}_{60} \leq 50$	50 kPa $< s_u \leq$ 100 kPa
E	Soft *soil*[3]	$\overline{V}_{s30} < 180$	$\overline{N}_{60} < 15$	$s_u <$ 50 kPa
F	Other *soils*[4]	Site-specific evaluation required	Site-specific evaluation required	Site-specific evaluation required
Column 1	2	3	4	5

Notes to Table 4.1.8.4.A.:

(1) Site Classes A and B, hard *rock* and *rock*, are not to be used if there is more than 3 m of softer materials between the *rock* and the underside of footing or mat *foundations*. The appropriate Site Class for such cases is determined on the basis of the average properties of the total thickness of the softer materials.

(2) Where $\overline{V}_{s30}$ has been measured in-situ, the F(T) values for Site Class A derived from Tables 4.1.8.4.B. to 4.1.8.4.G. are permitted to be multiplied by the factor $0.04 + (1500/\overline{V}_{s30})^{1/2}$.

(3) Any profile with more than 3 m of *soil* with the following characteristics:
- (a) plasticity index: PI > 20
- (b) moisture content: w ≥ 40%, and
- (c) undrained shear strength: su < 25 kPa.

(4) Other *soils* include:
- (a) liquefiable *soils*, quick and highly sensitive clays, collapsible weakly cemented *soils*, and other *soils* susceptible to failure or collapse under seismic loading,
- (b) peat and/or highly organic clays greater than 3 m in thickness,
- (c) highly plastic clays (PI > 75) more than 8 m thick, and
- (d) soft to medium stiff clays more than 30 m thick.

(5) See Appendix A.

Table 4.1.8.4.B.
Values of F(0.2) as a Function of Site Class and PGA_{ref}
Forming Part of Sentences 4.1.8.4.(4) and (5)

Site Class	Values of F(0.2)				
	$PGA_{ref} \leq 0.1$	$PGA_{ref} = 0.2$	$PGA_{ref} = 0.3$	$PGA_{ref} = 0.4$	$PGA_{ref} \geq 0.5$
A	0.69	0.69	0.69	0.69	0.69
B	0.77	0.77	0.77	0.77	0.77
C	1.00	1.00	1.00	1.00	1.00
D	1.24	1.09	1.00	0.94	0.90
E	1.64	1.24	1.05	0.93	0.85
F	(1)	(1)	(1)	(1)	(1)
Column 1	2	3	4	5	6

Notes to Table 4.1.8.4.B.:
(1) See Sentence 4.1.8.4.(6)

Table 4.1.8.4.C.
Values of F(0.5) as a Function of Site Class and PGA_{ref}
Forming Part of Sentence 4.1.8.4.(4) and (5)

Site Class	Values of F(0.5)				
	$PGA_{ref} \leq 0.1$	$PGA_{ref} = 0.2$	$PGA_{ref} = 0.3$	$PGA_{ref} = 0.4$	$PGA_{ref} \geq 0.5$
A	0.57	0.57	0.57	0.57	0.57
B	0.65	0.65	0.65	0.65	0.65
C	1.00	1.00	1.00	1.00	1.00
D	1.47	1.30	1.20	1.14	1.10
E	2.47	1.80	1.48	1.30	1.17
F	(1)	(1)	(1)	(1)	(1)
Column 1	2	3	4	5	6

Notes to Table 4.1.8.4.C.:
(1) See Sentence 4.1.8.4.(6)

Table 4.1.8.4.D.
Values of F(1.0) as a Function of Site Class and PGA_{ref}
Forming Part of Sentences 4.1.8.4.(4) and (5)

Site Class	Values of F(1.0)				
	$PGA_{ref} \leq 0.1$	$PGA_{ref} = 0.2$	$PGA_{ref} = 0.3$	$PGA_{ref} = 0.4$	$PGA_{ref} \geq 0.5$
A	0.57	0.57	0.57	0.57	0.57
B	0.63	0.63	0.63	0.63	0.63
C	1.00	1.00	1.00	1.00	1.00
D	1.55	1.39	1.31	1.25	1.21
E	2.81	2.08	1.74	1.53	1.39
F	(1)	(1)	(1)	(1)	(1)
Column 1	2	3	4	5	6

Notes to Table 4.1.8.4.D.:
(1) See Sentence 4.1.8.4.(6)

Table 4.1.8.4.E.
Values of F(2.0) as a Function of Site Class and PGA_{ref}
Forming Part of Sentences 4.1.8.4.(4) and (5)

Site Class	Values of F(2.0)				
	$PGA_{ref} \leq 0.1$	$PGA_{ref} = 0.2$	$PGA_{ref} = 0.3$	$PGA_{ref} = 0.4$	$PGA_{ref} \geq 0.5$
A	0.58	0.58	0.58	0.58	0.58
B	0.63	0.63	0.63	0.63	0.63
C	1.00	1.00	1.00	1.00	1.00
D	1.57	1.44	1.36	1.31	1.27
E	2.90	2.24	1.92	1.72	1.58
F	(1)	(1)	(1)	(1)	(1)
Column 1	2	3	4	5	6

Notes to Table 4.1.8.4.E.:
(1) See Sentence 4.1.8.4.(6)

Table 4.1.8.4.F.
Values of F(5.0) as a Function of Site Class and PGA_{ref}
Forming Part of Sentences 4.1.8.4.(4) and (5)

Site Class	Values of F(5.0)				
	$PGA_{ref} \leq 0.1$	$PGA_{ref} = 0.2$	$PGA_{ref} = 0.3$	$PGA_{ref} = 0.4$	$PGA_{ref} \geq 0.5$
A	0.61	0.61	0.61	0.61	0.61
B	0.64	0.64	0.64	0.64	0.64
C	1.00	1.00	1.00	1.00	1.00
D	1.58	1.48	1.41	1.37	1.34
E	2.93	2.40	2.14	1.96	1.84
F	(1)	(1)	(1)	(1)	(1)
Column 1	2	3	4	5	6

Notes to Table 4.1.8.4.F.:
(1) See Sentence 4.1.8.4.(6)

Table 4.1.8.4.G.
Values of F(10.0) as a Function of Site Class and PGA_{ref}
Forming Part of Sentences 4.1.8.4.(4) and (5)

Site Class	Values of F(10.0)				
	$PGA_{ref} \leq 0.1$	$PGA_{ref} = 0.2$	$PGA_{ref} = 0.3$	$PGA_{ref} = 0.4$	$PGA_{ref} \geq 0.5$
A	0.67	0.67	0.67	0.67	0.67
B	0.69	0.69	0.69	0.69	0.69
C	1.00	1.00	1.00	1.00	1.00
D	1.49	1.41	1.37	1.34	1.31
E	2.52	2.18	2.00	1.88	1.79
F	(1)	(1)	(1)	(1)	(1)
Column 1	2	3	4	5	6

Notes to Table 4.1.8.4.G.:
(1) See Sentence 4.1.8.4.(6)

Table 4.1.8.4.H.
Values of F(PGA) as a Function of Site Class and PGA_{ref}
Forming Part of Sentences 4.1.8.4.(4) and (5)

Site Class	Values of F(PGA)				
	$PGA_{ref} \leq 0.1$	$PGA_{ref} = 0.2$	$PGA_{ref} = 0.3$	$PGA_{ref} = 0.4$	$PGA_{ref} \geq 0.5$
A	0.90	0.90	0.90	0.90	0.90
B	0.87	0.87	0.87	0.87	0.87
C	1.00	1.00	1.00	1.00	1.00
D	1.29	1.10	0.99	0.93	0.88
E	1.81	1.23	0.98	0.83	0.74
F	(1)	(1)	(1)	(1)	(1)
Column 1	2	3	4	5	6

Notes to Table 4.1.8.4.H.:
(1) See Sentence 4.1.8.4.(6)

Table 4.1.8.4.I.
Values of F(PGV) as a Function of Site Class and PGA_{ref}
Forming Part of Sentences 4.1.8.4.(4) and (5)

Site Class	Values of F(PGV)				
	$PGA_{ref} \leq 0.1$	$PGA_{ref} = 0.2$	$PGA_{ref} = 0.3$	$PGA_{ref} = 0.4$	$PGA_{ref} \geq 0.5$
A	0.62	0.62	0.62	0.62	0.62
B	0.67	0.67	0.67	0.67	0.67
C	1.00	1.00	1.00	1.00	1.00
D	1.47	1.30	1.20	1.14	1.10
E	2.47	1.80	1.48	1.30	1.17
F	(1)	(1)	(1)	(1)	(1)
Column 1	2	3	4	5	6

Notes to Table 4.1.8.4.I.:
(1) See Sentence 4.1.8.4.(6)

4.1.8.5. Importance Factor

(1) The earthquake importance factor, I_E, shall be determined according to Table 4.1.8.5.

Table 4.1.8.5.
Importance Factor for Earthquake Loads and Effects, I_E
Forming Part of Sentence 4.1.8.5.(1)

Importance Category	Importance Factor, I_E	
	ULS	SLS
Low	0.8	(1)(2)
Normal	1.0	(1)(2)
High	1.3	(1)(2)
Post-disaster	1.5	(1)(2)
Column 1	2	3

Notes to Table 4.1.8.5.:
(1) See Article 4.1.8.13.
(2) See Appendix A.

4.1.8.6. Structural Configuration

(1) Structures having any of the features listed in Table 4.1.8.6. shall be designated irregular.

(2) Structures not classified as irregular according to Sentence 4.1.8.6.(1) may be considered regular.

(3) Except as required by Article 4.1.8.10., in cases where $I_E F_a S_a(0.2)$ is equal to or greater than 0.35, structures designated as irregular must satisfy the provisions referenced in Table 4.1.8.6.

Table 4.1.8.6.
Structural Irregularities(1)(7)
Forming Part of Sentence 4.1.8.6.(1)

Type	Irregularity Type and Definition	Notes
1	**Vertical Stiffness Irregularity** Vertical stiffness irregularity shall be considered to exist when the lateral stiffness of the SFRS in a *storey* is less than 70% of the stiffness of any adjacent *storey*, or less than 80% of the average stiffness of the three *storeys* above or below.	(2)(3)
2	**Weight (mass) Irregularity** Weight irregularity shall be considered to exist where the weight, W_i, of any *storey* is more than 150% of the weight of an adjacent *storey*. A roof that is lighter than the floor below need not be considered.	(2)
3	**Vertical Geometric Irregularity** Vertical geometric irregularity shall be considered to exist where the horizontal dimension of the SFRS in any *storey* is more than 130% of that in an adjacent *storey*.	(2)(3)(4)
4	**In-Plane Discontinuity in Vertical Lateral-Force-Resisting Element** Except for braced frames and moment-resisting frames, an in-plane discontinuity shall be considered to exist where there is an offset of a lateral-force-resisting element of the SFRS or a reduction in lateral stiffness of the resisting element in the *storey* below.	(2)(3)(4)
5	**Out-of-Plane Offsets** Discontinuities in a lateral force path, such as out-of-plane offsets of the vertical elements of the SFRS.	(2)(3)(4)
6	**Discontinuity in Capacity – Weak Storey** A weak *storey* is one in which the *storey* shear strength is less than that in the *storey* above. The *storey* shear strength is the total strength of all seismic-resisting elements of the SFRS sharing the *storey* shear for the direction under consideration.	(2)(3)
7	**Torsional Sensitivity (to be considered when diaphragms are not flexible)** Torsional sensitivity shall be considered to exist when the ratio B calculated according to Sentence 4.1.8.11.(9) exceeds 1.7.	(2)(3)(5)
8	**Non-Orthogonal Systems** A non-orthogonal system irregularity shall be considered to exist when the SFRS is not oriented along a set of orthogonal axes.	(2)(6)
9	**Gravity-Induced Lateral Demand Irregularity** Gravity-induced lateral demand irregularity on the SFRS shall be considered to exist where the ratio α calculated in accordance with Sentence 4.1.8.10.(5) exceeds 0.1 for SFRS with self-centering characteristics and 0.03 for other systems.	(2)(3)(6)
Column 1	2	3

Notes to Table 4.1.8.6.:
(1) One-*storey* penthouses with a weight of less than 10% of the level below need not be considered in the application of this Table.
(2) See Article 4.1.8.7.
(3) See Article 4.1.8.10.
(4) See Article 4.1.8.15.
(5) See Sentences 4.1.8.11.(9) and (10) and 4.1.8.12.(4).
(6) See Article 4.1.8.8.
(7) See Appendix A.

4.1.8.7. Methods of Analysis

(1) Analysis for design earthquake actions shall be carried out in accordance with the Dynamic Analysis Procedure described in Article 4.1.8.12., except that the Equivalent Static Force Procedure described in Article 4.1.8.11. may be used for structures that meet any of the following criteria: (See Appendix A.)

(a) in cases where $I_E F_a S_a(0.2)$ is less than 0.35,

(b) regular structures that are less than 60 m in height and have a fundamental lateral period, T_a, less than 2 s in each of two orthogonal directions as defined in Article 4.1.8.8., or

(c) structures with structural irregularity, of Type 1, 2, 3, 4, 5, 6 or 8 as defined in Table 4.1.8.6., that are less than 20 m in height and have a fundamental lateral period, T_a, less than 0.5 s in each of two orthogonal directions as defined in Article 4.1.8.8.

4.1.8.8. Direction of Loading

(1) Earthquake forces shall be assumed to act in any horizontal direction, except that the following shall be considered to provide adequate design force levels in the structure:

(a) where components of the SFRS are oriented along a set of orthogonal axes, independent analyses about each of the principal axes of the structure shall be performed,

(b) where the components of the SFRS are not oriented along a set of orthogonal axes and $I_E F_a S_a(0.2)$ is less than 0.35, independent analyses about any two orthogonal axes is permitted, or

(c) where the components of the SFRS are not oriented along a set of orthogonal axes and $I_E F_a S_a(0.2)$ is equal to or greater than 0.35, analysis of the structure independently in any two orthogonal directions for 100% of the prescribed earthquake loads applied in one direction plus 30% of the prescribed earthquake loads in the perpendicular direction, with the combination requiring the greater element strength being used in the design.

4.1.8.9. SFRS Force Reduction Factors, System Overstrength Factors, and General Restrictions

(1) Except as provided in Sentence 4.1.8.20.(7), the values of R_d and R_o and the corresponding system restrictions shall conform to Table 4.1.8.9. and the requirements of this Subsection.

(2) When a particular va1ue of R_d is required by this Article, the corresponding R_o shall be used.

(3) For combinations of different types of SFRS acting in the same direction in the same *storey*, $R_d R_o$ shall be taken as the lowest value of $R_d R_o$ corresponding to these systems.

(4) For vertical variations of $R_d R_o$, excluding rooftop structures not exceeding two *storeys* in height whose weight is less than the greater of 10% of W and 30% of W_i of the level below, the value of $R_d R_o$ used in the design of any *storey* shall be less than or equal to the lowest value of $R_d R_o$ used in the given direction for the *storeys* above, and the requirements of Sentence 4.1.8.15.(5) must be satisfied. (See Appendix A.)

(5) If it can be demonstrated through testing, research and analysis that the seismic performance of a structural system is at least equivalent to one of the types of SFRS mentioned in Table 4.1.8.9., then such a structural system will qualify for values of R_d and R_o corresponding to the equivalent type in that Table. (See Appendix A.)

Table 4.1.8.9.
SFRS Ductility-Related Force Modification Factors, R_d,
Overstrength-Related Force Modification Factors, R_o, and General Restrictions(1)
Forming Part of Sentences 4.1.8 9.(1) and (5)

Type of SFRS	R_d	R_o	Restrictions(2)				
			Cases Where $I_E F_a S_a(0.2)$				Cases Where $I_E F_v S_a(1.0)$
			< 0.2	≥ 0.2 to < 0.35	≥ 0.35 to ≤ 0.75	> 0.75	> 0.3
Steel Structures Designed and Detailed According to CSA S16(3)(6)							
Ductile moment-resisting frames	5.0	1.5	NL	NL	NL	NL	NL
Moderately ductile moment-resisting frames	3.5	1.5	NL	NL	NL	NL	NL
Limited ductility moment-resisting frames	2.0	1.3	NL	NL	60	30	30
Moderately ductile concentrically braced frames							
Tension-compression braces	3.0	1.3	NL	NL	40	40	40
Tension only braces	3.0	1.3	NL	NL	20	20	20
Limited ductility concentrically braced frames							
Tension-compression braces	2.0	1.3	NL	NL	60	60	60
Tension only braces	2.0	1.3	NL	NL	40	40	40
Ductile buckling-restrained braced frames	4.0	1.2	NL	NL	40	40	40
Ductile eccentrically braced frames	4.0	1.5	NL	NL	NL	NL	NL
Ductile plate walls	5.0	1.6	NL	NL	NL	NL	NL
Limited ductility plate walls	2.0	1.5	NL	NL	60	60	60
Conventional construction of moment-resisting frames, braced frames or plate walls							
Assembly occupancies	1.5	1.3	NL	NL	15	15	15
Other *occupancies*	1.5	1.3	NL	NL	60	40	40
Other steel SFRS(s) not defined above	1.0	1.0	15	15	NP	NP	NP
Concrete Structures Designed and Detailed According to CAN/CSA-A23.3							
Ductile moment-resisting frames	4.0	1.7	NL	NL	NL	NL	NL
Moderately ductile moment-resisting frames	2.5	1.4	NL	NL	60	40	40
Ductile coupled walls	4.0	1.7	NL	NL	NL	NL	NL
Moderately ductile coupled walls	2.5	1.4	NL	NL	NL	60	60
Ductile partially coupled walls	3.5	1.7	NL	NL	NL	NL	NL
Moderately ductile partially coupled walls	2.0	1.4	NL	NL	NL	60	60
Ductile shear walls	3.5	1.6	NL	NL	NL	NL	NL
Moderately ductile shear walls	2.0	1.4	NL	NL	NL	60	60
Conventional construction							
Moment-resisting frames	1.5	1.3	NL	NL	20	15	10(4)
Shear walls	1.5	1.3	NL	NL	40	30	30
Two-way slabs without beams	1.3	1.3	20	15	NP	NP	NP
Tilt-up Construction							
Moderately ductile walls and frames	2.0	1.3	30	25	25	25	25
Limited ductility walls and frames	1.5	1.3	30	25	20	20	20(5)
Conventional walls and frames	1.3	1.3	25	20	NP	NP	NP
Other concrete SFRS(s) not listed above	1.0	1.0	15	15	NP	NP	NP
Column 1	2	3	4	5	6	7	8

Table 4.1.8.9. (Cont'd)
SFRS Ductility-Related Force Modification Factors, R_d,
Overstrength-Related Force Modification Factors, R_o, and General Restrictions(1)
Forming Part of Sentence 4.1.8 9.(1)

Type of SFRS	R_d	R_o	Restrictions(2)				
			Cases Where $I_E F_a S_a(0.2)$				Cases Where $I_E F_v S_a(1.0)$
			< 0.2	≥ 0.2 to < 0.35	≥ 0.35 to ≤ 0.75	> 0.75	> 0.3
Timber Structures Designed and Detailed According to CSA O86							
Shear walls							
Nailed shear walls: wood-based panel	3.0	1.7	NL	NL	30	20	20
Shear walls: wood-based and gypsum panels in combination	2.0	1.7	NL	NL	20	20	20
Braced or moment-resisting frames with ductile connections							
Moderately ductile	2.0	1.5	NL	NL	20	20	20
Limited ductility	1.5	1.5	NL	NL	15	15	15
Other wood- or gypsum-based SFRS(s) not listed above	1.0	1.0	15	15	NP	NP	NP
Masonry Structures Designed and Detailed According to CSA S304							
Moderately ductile shear walls	2.0	1.5	NL	NL	60	40	40
Ductile shear walls	3.0	1.5	NL	NL	60	40	40
Conventional construction							
Shear walls	1.5	1.5	NL	60	30	15	15
Moment-resisting frames	1.5	1.5	NL	30	NP	NP	NP
Unreinforced masonry	1.0	1.0	30	15	NP	NP	NP
Other masonry SFRS(s) not listed above	1.0	1.0	15	NP	NP	NP	NP
Cold-Formed Steel Structures Designed and Detailed According to CSA S136							
Shear walls							
Screw-connected shear walls - wood-based panel	2.5	1.7	20	20	20	20	20
Screw-connected shear walls - wood-based and gypsum panels in combination	1.5	1.7	20	20	20	20	20
Diagonal strap concentrically braced walls							
Limited ductility	1.9	1.3	20	20	20	20	20
Conventional construction	1.2	1.3	15	15	NP	NP	NP
Other cold-formed SFRS(s) not listed above	1.0	1.0	15	15	NP	NP	NP
Column 1	2	3	4	5	6	7	8

Notes to Table 4.1.8.9.:

(1) See Article 4.1.8.10.

(2) NP = system is not permitted.
NL = system is permitted and not limited in height as an SFRS; height may be limited in other Parts of the Code.
Numbers in Columns 4 to 8 are maximum height limits above grade in m.
The most stringent requirement governs.

(3) Higher design force levels are prescribed in CSA S16 for some heights of *buildings*.

(4) Frames limited to a maximum of 2 *storeys*.

(5) Frames limited to a maximum of 3 *storeys*.

(6) See Appendix A.

4.1.8.10. Additional System Restrictions

(1) Except as required by Clause (2)(b), structures with a Type 6 irregularity, Discontinuity in Capacity – Weak Storey, as described in Table 4.1.8.6., are not permitted unless $I_E F_a S_a(0.2)$ is less than 0.2 and the forces used for design of the SFRS are multiplied by $R_d R_o$.

(2) *Post-disaster buildings* shall,
(a) not have any irregularities conforming to Types 1, 3, 4, 5 and 7 as described in Table 4.1.8.6., in cases where $I_E F_a S_a(0.2)$ is equal to or greater than 0.35,
(b) not have a Type 6 irregularity as described in Table 4.1.8.6.,
(c) have an SFRS with an R_d of 2.0 or greater, and
(d) have no *storey* with a lateral stiffness that is less than that of the *storey* above it.

(3) For *buildings* having fundamental lateral periods, T_a, of 1.0 s or greater and where $I_E F_v S_a(1.0)$ is greater than 0.25, shear walls that are other than wood-based and form part of the SFRS shall be continuous from their top to the *foundation* and shall not have irregularities of Type 4 or 5 as described in Table 4.1.8.6.

(4) For *buildings* constructed with more than 4 *storeys* of continuous wood construction and where $I_E F_a S_a(0.2)$ is equal to or greater than 0.35, timber SFRS of shear walls with wood-based panels, braced frames or moment-resisting frames as defined in Table 4.1.8.9. within the continuous wood construction shall not have irregularities of Type 4 or 5 as described in Table 4.1.8.6. (See Appendix A.)

(5) The ratio, α, for Type 9 irregularity as described in Table 4.1.8.6. shall be determined independently for each orthogonal direction using the following equation:

$$\alpha = Q_G / Q_y$$

where,

Q_G = gravity-induced lateral demand on the SFRS at the critical level of the yielding system, and

Q_y = the resistance of the yielding mechanism required to resist the minimum earthquake loads, which need not be taken less than Ro multiplied by the minimum lateral earthquake force as determined in Article 4.1.8.11. or 4.1.8.12, as appropriate.

(See Appendix A.)

(6) For *buildings* with a Type 9 irregularity as described in Table 4.1.8.6. and where $I_E F_a S_a(0.2)$ is equal to or greater than 0.5, deflections determined in accordance with Article 4.1.8.13. shall be multiplied by 1.2.

(7) Structures where the value of α, as determined in accordance with Sentence (5), exceeds twice the limits in Table 4.1.8.6. for a Type 9 irregularity, and where $I_E F_a S_a(0.2)$ is equal to or greater than 0.5 are not permitted unless determined to be acceptable based on non-linear dynamic analysis studies. (See Appendix A.)

4.1.8.11. Equivalent Static Force Procedure for Structures Satisfying the Conditions of Article 4.1.8.7.

(1) The static loading due to earthquake motion shall be determined according to the procedures given in this Article.

(2) Except as provided in Sentence (12), the minimum lateral earthquake force, V, shall be calculated using the following formula:

$$V = S(T_a) M_v I_E W / (R_d R_o)$$

except,

(a) for walls, coupled walls and wall-frame systems, V shall not be less than,

$$S(4.0) M_v I_E W / (R_d R_o)$$

(b) for moment-resisting frames, braced frames and other systems, V shall not be less than,

$$S\ (2.0)\ M_v\ I_E W/\ (R_d R_o)$$

(c) for *buildings* located on a site other than Class F and having an SFRS with an R_d equal to or greater than 1.5, V need not be greater than the larger of,

$$^2/_3\ S\ (0.2)\ I_E W\ /\ (R_d R_o)$$

and

$$S\ (0.5)\ I_E W/\ (R_d R_o)$$

(3) Except as provided in Sentence (4), the fundamental lateral period, T_a, in the direction under consideration in Sentence (2) shall be determined as,

(a) for moment-resisting frames that resist 100% of the required lateral forces and where the frame is not enclosed by or adjoined by more rigid elements that would tend to prevent the frame from resisting lateral forces, and where h_n is in metres,
  (i) $0.085\ (h_n)^{3/4}$ for steel moment frames,
  (ii) $0.075\ (h_n)^{3/4}$ for concrete moment frames, or
  (iii) 0.1 N for other moment frames,

(b) $0.025\ h_n$ for braced frames where h_n is in metres,

(c) $0.05\ (h_n)^{3/4}$ for shear wall and other structures where h_n is in metres, or

(d) other established methods of mechanics using a structural model that complies with the requirements of Sentence 4.1.8.3.(8), except that,
  (i) for moment-resisting frames, T_a shall not be taken greater than 1.5 times that determined in Clause (a),
  (ii) for braced frames, T_a shall not be taken greater than 2.0 times that determined in Clause (b),
  (iii) for shear wall structures, T_a shall not be greater than 2.0 times that determined in Clause (c),
  (iv) for other structures, T_a shall not be taken greater than that determined in Clause (c), and
  (v) for the purpose of calculating the deflections, the period without the upper limit specified in Subclauses (d)(i) to (iv) may be used, except that, for walls, coupled walls and wall-frame systems, T_a shall not exceed 4.0 s, and for moment-resisting frames, braced frames, and other systems, T_a shall not exceed 2.0 s.

(See Appendix A.)

(4) For single-*storey buildings* with steel deck or wood roof diaphragms, the fundamental lateral period, T_a, in the direction under consideration is permitted to be taken as,

(a) $0.05\ (h_n)^{3/4} + 0.004\ L$ for shear walls,

(b) $0.035\ h_n + 0.004\ L$ for steel moment frames and steel braced frames, or

(c) the value obtained from methods of mechanics using a structural model that complies with the requirements of Sentence 4.1.8.3.(8), except that T_a shall not be greater than 1.5 times the value determined in Clause (a) or (b), as applicable,

where L is the shortest length of the diaphragm, in m, between adjacent vertical elements of the SFRS in the direction perpendicular to the direction under consideration.

(5) The weight, W, of the *building* shall be calculated using the formula,

$$W = \sum_{i=1}^{n} W_i$$

(6) The higher mode factor, M_v, and its associated base overturning moment reduction factor, J, shall conform to Tables 4.1.8.11.A. to 4.1.8.11.E.

Table 4.1.8.11.A.
Higher Mode Factor, M_v, and Base Overturning Reduction Factor, J[(1)(2)(3)(4)] for Moment-Resisting Frames
Forming Part of Sentence 4.1.8.11.(6)

$S_a(0.2)/S_a(5.0)$	M_V For $T_a \leq 0.5$	M_V For $T_a = 1.0$	M_V For $T_a = 2.0$	M_V For $T_a \geq 5.0$	J For $T_a \leq 0.5$	J For $T_a = 1.0$	J For $T_a = 2.0$	J For $T_a \geq 5.0$
5	1	1	1	(5)	1	0.97	0.92	(5)
20	1	1	1	(5)	1	0.93	0.85	(5)
40	1	1	1	(5)	1	0.87	0.78	(5)
65	1	1	1.03	(5)	1	0.80	0.70	(5)
Column 1	2	3	4	5	6	7	8	9

Notes to Table 4.1.8.11.A.:

(1) For intermediate values of the spectral ratio S(0.2)/S(0.5), M_v and J shall be obtained by linear interpolation.

(2) For intermediate values of the fundamental lateral period, T_a, $S(T_a)M_v$ shall be obtained by linear interpolation using the values of M_v obtained in accordance with Note (1).

(3) For intermediate values of the fundamental lateral period, T_a, J shall be obtained by linear interpolation using the values of J obtained in accordance with Note (1).

(4) For a combination of different seismic force resisting systems (SFRS) not given in Table 4.1.8.11.A. that are in the same direction under consideration, use the highest M_v factor of all the SFRS and the corresponding value of J.

(5) For fundamental lateral periods, T_a, greater than 2.0 s, use the 2.0 s values obtained in accordance with Note (1). See Clause 4.1.8.11.(2)(b).

Table 4.1.8.11.B.
Higher Mode Factor, M_v, and Base Overturning Reduction Factor, J[(1)(2)(3)(4)] for Coupled Walls[(5)]
Forming Part of Sentence 4.1.8.11.(6)

$S_a(0.2)/S_a(5.0)$	M_V For $T_a \leq 0.5$	M_V For $T_a = 1.0$	M_V For $T_a = 2.0$	M_V For $T_a \geq 5.0$	J For $T_a \leq 0.5$	J For $T_a = 1.0$	J For $T_a = 2.0$	J For $T_a \geq 5.0$
5	1	1	1	1	1	0.97	0.92	0.80[(7)]
20	1	1	1	1.08[(6)]	1	0.93	0.85	0.65[(7)]
40	1	1	1	1.30[(6)]	1	0.87	0.78	0.53[(7)]
65	1	1	1.03	1.49[(6)]	1	0.80	0.70	0.46[(7)]
Column 1	2	3	4	5	6	7	8	9

Notes to Table 4.1.8.11.B.:

(1) For intermediate values of the spectral ratio S(0.2)/S(0.5), M_v and J shall be obtained by linear interpolation.

(2) For intermediate values of the fundamental lateral period, T_a, $S(T_a)M_v$ shall be obtained by linear interpolation using the values of M_v obtained in accordance with Note (1).

(3) For intermediate values of the fundamental lateral period, T_a, J shall be obtained by linear interpolation using the values of J obtained in accordance with Note (1).

(4) For a combination of different seismic force resisting systems (SFRS) not given in Table 4.1.8.11.B. that are in the same direction under consideration, use the highest M_v factor of all the SFRS and the corresponding value of J.

(5) A "coupled" wall is a wall system with coupling beams, where at least 66% of the base overturning moment resisted by the wall system is carried by the axial tension and compression forces resulting from shear in the coupling beams.

(6) For fundamental lateral periods, T_a, greater than 4.0 s, use the 4.0 s values of $S(T_a)M_v$ obtained by interpolation between 2.0 s and 5.0 s using the value of M_v obtained in accordance with Note (1). See Clause 4.1.8.11.(2)(a).

(7) For fundamental lateral periods, T_a, greater than 4.0 s, use the 4.0 s values of J obtained by interpolation between 2.0 s and 5.0 s using the value of J obtained in accordance with Note (1). See Clause 4.1.8.11.(2)(a).

Table 4.1.8.11.C.
Higher Mode Factor, M_v, and Base Overturning Reduction Factor, J[(1)(2)(3)(4)] for Braced Frames
Forming Part of Sentence 4.1.8.11.(5)

$S_a(0.2)/S_a(5.0)$	M_V For $T_a \leq 0.5$	M_V For $T_a = 1.0$	M_V For $T_a = 2.0$	M_V For $T_a \geq 5.0$	J For $T_a \leq 0.5$	J For $T_a = 1.0$	J For $T_a = 2.0$	J For $T_a \geq 5.0$
5	1	1	1	(5)	1	0.95	0.89	(5)
20	1	1	1	(5)	1	0.85	0.78	(5)
40	1	1	1	(5)	1	0.79	0.70	(5)
65	1	1.04	1.07	(5)	1	0.71	0.66	(5)
Column 1	2	3	4	5	6	7	8	9

Notes to Table 4.1.8.11.C.:

(1) For intermediate values of the spectral ratio S(0.2)/S(0.5), Mv and J shall be obtained by linear interpolation.

(2) For intermediate values of the fundamental lateral period, Ta, S(Ta)Mv shall be obtained by linear interpolation using the values of Mv obtained in accordance with Note (1).

(3) For intermediate values of the fundamental lateral period, Ta, J shall be obtained by linear interpolation using the values of J obtained in accordance with Note (1).

(4) For a combination of different seismic force resisting systems (SFRS) not given in Table 4.1.8.11.C. that are in the same direction under consideration, use the highest Mv factor of all the SFRS and the corresponding value of J.

(5) For fundamental lateral periods, Ta, greater than 2.0 s, use the 2.0 s values obtained in accordance with Note (1). See Clause 4.1.8.11.(2)(b).

Table 4.1.8.11.D.
Higher Mode Factor, M_v, and Base Overturning Reduction Factor, J[(1)(2)(3)(4)] for Walls, Wall Frame Systems
Forming Part of Sentence 4.1.8.11.(5)

$S_a(0.2)/S_a(5.0)$	M_V For $T_a \leq 0.5$	M_V For $T_a = 1.0$	M_V For $T_a = 2.0$	M_V For $T_a \geq 5.0$	J For $T_a \leq 0.5$	J For $T_a = 1.0$	J For $T_a = 2.0$	J For $T_a \geq 5.0$
5	1	1	1	1.25(5)	1	0.97	0.85	0.55(6)
20	1	1	1.18	2.30(5)	1	0.80	0.60	0.35(6)
40	1	1.19	1.75	3.70(5)	1	0.63	0.46	0.28(6)
65	1	1.55	2.25	4.65(5)	1	0.51	0.39	0.23(6)
Column 1	2	3	4	5	6	7	8	9

Notes to Table 4.1.8.11.D.:

(1) For intermediate values of the spectral ratio S(0.2)/S(0.5), Mv and J shall be obtained by linear interpolation.

(2) For intermediate values of the fundamental lateral period, Ta, S(Ta)Mv shall be obtained by linear interpolation using the values of Mv obtained in accordance with Note (1).

(3) For intermediate values of the fundamental lateral period, Ta, J shall be obtained by linear interpolation using the values of J obtained in accordance with Note (1).

(4) For a combination of different seismic force resisting systems (SFRS) not given in Table 4.1.8.11.D. that are in the same direction under consideration, use the highest Mv factor of all the SFRS and the corresponding value of J.

(5) For fundamental lateral periods, Ta, greater than 4.0 s, use the 4.0 s values of S(Ta)Mv obtained by interpolation between 2.0 s and 5.0 s using the value of Mv obtained in accordance with Note (1). See Clause 4.1.8.11.(2)(a).

(6) For fundamental lateral periods, Ta, greater than 4.0 s, use the 4.0 s values of J obtained by interpolation between 2.0 s and 5.0 s using the value of J obtained in accordance with Note (1). See Clause 4.1.8.11.(2)(a).

Table 4.1.8.11.E.
Higher Mode Factor, M_v, and Base Overturning Reduction Factor, J[(1)(2)(3)(4)] for Other Systems
Forming Part of Sentence 4.1.8.11.(5)

$S_a(0.2)/S_a(5.0)$	M_V For $T_a \leq 0.5$	M_V For $T_a = 1.0$	M_V For $T_a = 2.0$	M_V For $T_a \geq 5.0$	J For $T_a \leq 0.5$	J For $T_a = 1.0$	J For $T_a = 2.0$	J For $T_a \geq 5.0$
5	1	1	1	(5)	1	0.97	0.85	(5)
20	1	1	1.18	(5)	1	0.80	0.60	(5)
40	1	1.19	1.75	(5)	1	0.63	0.46	(5)
65	1	1.55	2.25	(5)	1	0.51	0.39	(5)
Column 1	2	3	4	5	6	7	8	9

Notes to Table 4.1.8.11.E.:

(1) For intermediate values of the spectral ratio S(0.2)/S(0.5), Mv and J shall be obtained by linear interpolation.

(2) For intermediate values of the fundamental lateral period, Ta, S(Ta)Mv shall be obtained by linear interpolation using the values of Mv obtained in accordance with Note (1).

(3) For intermediate values of the fundamental lateral period, Ta, J shall be obtained by linear interpolation using the values of J obtained in accordance with Note (1).

(4) For a combination of different seismic force resisting systems (SFRS) not given in Table 4.1.8.11.E. that are in the same direction under consideration, use the highest Mv factor of all the SFRS and the corresponding value of J.

(5) For fundamental lateral periods, Ta, greater than 2.0 s, use the 2.0 s values obtained in accordance with Note (1). See Clause 4.1.8.11.(2)(b).

(7) The total lateral seismic force, V, shall be distributed such that a portion, F_t, shall be assumed to be concentrated at the top of the *building*, where F_t, is equal to $0.07\ T_aV$ but need not exceed 0.25 V and may be considered as zero, where the fundamental lateral period, T_a, does not exceed 0.7 s; the remainder, $V - F_t$, shall be distributed along the height of the *building*, including the top level, in accordance with the formula,

$$F_x = (V - F_t)\ W_x h_x \Big/ \left(\sum_{i=1}^{n} W_i h_i \right)$$

(8) The structure shall be designed to resist overturning effects caused by the earthquake forces determined in Sentence (7) and the overturning moment at level x, M_x, shall be determined using the formula,

$$M_x = J_x \sum_{i=x}^{n} F_i\ (h_i - h_x)$$

where,

J_x = 1.0 for $h_x \geq 0.6h_n$, and

$J_x = J + (1- J)(h_x / 0.6h_n)$ for $h_x, < 0.6h_n$

where,

J = base overturning moment reduction factor conforming to Table 4.1.8.11.

(9) Torsional effects that are concurrent with the effects of the forces mentioned in Sentence (7) and are caused by the simultaneous actions of the following torsional moments shall be considered in the design of the structure according to Sentence (11):

(a) torsional moments introduced by eccentricity between the centres of mass and resistance and their dynamic amplification, and

(b) torsional moments due to accidental eccentricities.

(10) Torsional sensitivity shall be determined by calculating the ratio B_x for each level x according to the following equation for each orthogonal direction determined independently:

$$B_x = \delta_{max} / \delta_{ave}$$

where,

B = maximum of all values of B_x in both orthogonal directions, except that the B_x for one-*storey* penthouses with a weight less than 10% of the level below need not be considered,

δ_{max} = maximum *storey* displacement at the extreme points of the structure, at level x in the direction of the earthquake induced by the equivalent static forces acting at distances $\pm 0.10\ D_{nx}$ from the centres of mass at each floor, and

δ_{ave} = average of the displacements at the extreme points of the structure at level x produced by the above-mentioned forces.

(11) Torsional effects shall be accounted for as follows:

(a) for a *building* with $B \leq 1.7$ or where $I_E F_a S_a(0.2)$ is less than 0.35, by applying torsional moments about a vertical axis at each level throughout the *building*, derived for each of the following load cases considered separately,

(i) $T_x = F_x(e_x + 0.10\ D_{nx})$, and

(ii) $T_x = F_x(e_x - 0.10\ D_{nx})$

where F_x is the lateral force at each level determined according to Sentence (6) and where each element of the *building* is designed for the most severe effect of the above load cases, or

(b) for a *building* with $B > 1.7$, in cases where $I_E F_a S_a(0.2)$ is equal to or greater than 0.35, by a Dynamic Analysis Procedure as specified in Article 4.1.8.12.

(12) Where the fundamental lateral period, T_a, is determined in accordance with Clause (3)(d) and the *building* is constructed with more than 4 *storeys* of continuous wood construction and has a timber SFRS consisting of shear walls with wood-based panels, braced frames or moment-resisting frames as defined in Table 4.1.8.9., the lateral earthquake force, V, as determined in accordance with Sentence (2) shall be multiplied by 1.2 but need not exceed the value determined by using Clause (2)(c). (See Appendix Note A-4.1.8.10.(4))

4.1.8.12. Dynamic Analysis Procedure

(1) Except as provided in Articles 4.1.8.19. and 4.1.8.21., the Dynamic Analysis Procedure shall be in accordance with one of the following methods:

(a) Linear Dynamic Analysis by either the Modal Response Spectrum Method or the Numerical Integration Linear Time History Method using a structural model that complies with the requirements of Sentence 4.1.8.3.(8), or (See Appendix A)

(b) Non-Linear Dynamic Analysis, in which case a special study shall be performed. (See Appendix A.)

(2) The spectral acceleration values used in the Modal Response Spectrum Method shall be the design spectral acceleration values, S(T), defined in Sentence 4.1.8.4.(7).

(3) The ground motion histories used in the Numerical Integration Linear Time History Method shall be compatible with a response spectrum constructed from the design spectral acceleration values, S(T), defined in Sentence 4.1.8.4.(7). (See Appendix A.)

(4) The effects of accidental torsional moments acting concurrently with the lateral earthquake forces that cause them shall be accounted for by the following methods:

(a) the static effects of torsional moments due to $(\pm 0.10\ D_{nx})F_x$ at each level x, where F_x is either determined from the elastic dynamic analysis or determined from Sentence 4.1.8.11.(7) multiplied by $R_d R_o / I_E$, shall be combined with the effects determined by dynamic analysis, or (See Appendix A.)

(b) if B, as defined in Sentence 4.1.8.11.(10), is less than 1.7, it is permitted to use a three-dimensional dynamic analysis with the centres of mass shifted by a distance of $-0.05\ D_{nx}$ and $+0.05\ D_{nx}$.

(5) Except as provided in Sentence (6), the design elastic base shear, V_{ed}, is equal to the elastic base shear, V_e, obtained from a Linear Dynamic Analysis.

(6) For structures located on sites other than Class F that have an SFRS with R_d equal to or greater than 1.5, the elastic base shear obtained from a Linear Dynamic Analysis may be multiplied by the larger of the following factors to obtain the design elastic base shear, V_{ed}:

$$\frac{2S\,(0.2)}{3S\,(T_a)} \leq 1.0$$

and

$$S(0.5) / S(T_a) \leq 1.0$$

(7) The design elastic base shear, V_{ed}, shall be multiplied by the importance factor, I_E, as determined in Article 4.1.8.5., and shall be divided by R_dR_o, as determined in Article 4.1.8.9., to obtain the design base shear, V_d.

(8) Except as required by Sentence (9) or (12), if the base shear, V_d, obtained in Sentence (7) is less than 80% of the lateral earthquake design force, V, of Article 4.1.8.11., V_d shall be taken as 0.8 V.

(9) For irregular structures requiring dynamic analysis in accordance with Article 4.1.8.7., V_d shall be taken as the larger of the V_d determined in Sentence (7) and 100% of V.

(10) Except as required by Sentence (11), the values of elastic *storey* shears, *storey* forces, member forces, and deflections obtained from the Linear Dynamic Analysis, including the effect of accidental torsion determined in Sentence (4), shall be multiplied by V_d/V_e to determine their design values, where V_d is the base shear.

(11) For the purpose of calculating deflections, it is permitted to use a value for V based on the value for T_a determined in Clause 4.1.8.11.(3)(d) to obtain V_d in Sentences (8) and (9).

(12) For *buildings* constructed with more than 4 *storeys* of continuous wood construction, having a timber SFRS consisting of shear walls with wood-based panels, braced frames or moment-resisting frames as defined in Table 4.1.8.9., and whose fundamental lateral period, T_a, is determined in accordance with Clause 4.1.8.11.(3)(d), the design base shear, V_d, shall be taken as the larger value of V_d determined in accordance with Sentence (7) and 100% of V.
(See A-4.1.8.10.(4) in Appendix A.)

4.1.8.13. Deflections and Drift Limits

(1) Except as provided in Sentences (5) and (6), lateral deflections of a structure shall be calculated in accordance with the loads and requirements defined in this Subsection.

(2) Lateral deflections obtained from a linear elastic analysis using the methods given in Articles 4.1.8.11. and 4.1.8.12. and incorporating the effects of torsion, including accidental torsional moments, shall be multiplied by R_dR_o/I_E and increased as required by Sentences 4.1.8.10.(6) and 4.1.8.16.(1) to give realistic values of anticipated deflections.

(3) Based on the lateral deflections calculated in Sentences (2), (5) and (6), the largest interstorey deflection at any level shall be limited to 0.01 h_s for *post-disaster buildings*, 0.02 h_s for High Importance Category *buildings*, and 0.025 h_s for all other *buildings*.

(4) The deflections calculated in Sentence (2) shall be used to account for sway effects as required by Sentence 4.1.3.2.(12). (See Appendix A.)

(5) The lateral deflections of a seismically isolated structure shall be calculated in accordance with Article 4.1.8.20.

(6) The lateral deflections of a structure with supplemental energy dissipation shall be calculated in accordance with Article 4.1.8.22.

4.1.8.14. Structural Separation

(1) Adjacent structures shall be,
(a) separated by a distance equal to at least the square root of the sum of the squares of their individual deflections calculated in Sentence 4.1.8.13.(2), or
(b) connected to each other.

(2) The method of connection required in Sentence (1) shall take into account the mass, stiffness, strength, ductility and anticipated motion of the connected *buildings* and the character of the connection.

(3) Rigidly connected *buildings* shall be assumed to have the lowest R_dR_o value of the *buildings* connected.

(4) *Buildings* with non-rigid or energy-dissipating connections require special studies.

4.1.8.15. Design Provisions

(1) Except as provided in Sentences (2) and (3), diaphragms, collectors, chords, struts and connections shall be designed so as not to yield, and the design shall account for the shape of the diaphragm, including openings, and for the forces generated in the diaphragm due to the following cases, whichever one governs: (See Appendix A.)
(a) forces due to loads determined in Article 4.1.8.11. or 4.1.8.12. applied to the diaphragm are increased to reflect the lateral load capacity of the SFRS, plus forces in the diaphragm due to the transfer of forces between elements of the SFRS associated with the lateral load capacity of such elements and accounting for discontinuities and changes in stiffness in these elements, or
(b) a minimum force corresponding to the design-based shear divided by N for the diaphragm at level x.

(2) Steel deck roof diaphragms in *buildings* of less than 4 *storeys* or wood diaphragms that are designed and detailed according to the applicable referenced design standards to exhibit ductile behaviour shall meet the requirements of Sentence (1), except that they may yield and the forces shall be,
(a) for wood diaphragms acting in combination with vertical wood shear walls, equal to the lateral earthquake design force,
(b) for wood diaphragms acting in combination with other SFRS, not less than the force corresponding to $R_dR_o = 2.0$, and
(c) for steel deck roof diaphragms, not less than the force corresponding to $R_dR_o = 2.0$.

(3) Where diaphragms are designed in accordance with Sentence (2), the struts shall be designed in accordance with Clause (1)(a) and the collectors, chords and connections between the diaphragms and the vertical elements of the SFRS shall be designed for forces corresponding to the capacity of the diaphragms in accordance with the applicable CSA standards. (See Appendix A.)

(4) For single-*storey buildings* with steel deck or wood roof diaphragms designed with a value of R_d greater than 1.5 and where the calculated maximum relative deflection, Δ_D, of the diaphragm under lateral loads exceeds 50% of the average *storey* drift, Δ_B, of the adjoining vertical elements of the SFRS, dynamic magnification of the inelastic response due to the in-plane diaphragm deformations shall be accounted for in the design as follows:
(a) the vertical elements of the SFRS shall be designed and detailed to any one of the following:
  (i) to accommodate the anticipated magnified lateral deformations taken as $R_oR_d(\Delta_B + \Delta_D) - R_o\Delta_D$,
  (ii) to resist the forces magnified by $R_d(1 + \Delta_D/\Delta_B)/(R_d + \Delta_D/\Delta_B)$, or
  (iii) by a special study, and
(b) the roof diaphragm and chords shall be designed for in-plane shears and moments determined while taking into consideration the inelastic higher mode response of the structure.

(See Appendix A.)

(5) In cases where $I_EF_aS_a(0.2)$ is equal to or greater than 0.35, the elements supporting any discontinuous wall, column or braced frame shall be designed for the lateral load capacity of the components of the SFRS they support. (See Appendix A.)

(6) Where structures have vertical variations of R_dR_o satisfying Sentence 4.1.8.9.(4), the elements of the SFRS below the level where the change in R_dR_o occurs shall be designed for the forces associated with the lateral load capacity of the SFRS above that level. (See Appendix A.)

(7) Where earthquake effects can produce forces in a column or wall due to lateral loading along both orthogonal axes, account shall be taken of the effects of potential concurrent yielding of other elements framing into the column or wall from all directions at the level under consideration and as appropriate at other levels. (See Appendix A.)

(8) The design forces associated with the lateral capacity of the SFRS need not exceed the forces determined in accordance with Sentence 4.1.8.7.(1) with R_dR_o taken as 1.0, unless otherwise provided by the applicable referenced design standards for elements, in which case the design forces associated with the lateral capacity of the SFRS need not exceed the forces determined in accordance with Sentence 4.1.8.7.(1) with R_dR_o taken as less than or equal to 1.3. (See Appendix A.)

(9) *Foundations* need not be designed to resist the lateral load overturning capacity of the SFRS, provided the design and the R_d and R_o for the type of SFRS used conform to Table 4.1.8.9. and the *foundation* is designed in accordance with Sentence 4.1.8.16.(4).

(10) *Foundation* displacements and rotations shall be considered as required by Sentence 4.1.8.16.(1).

4.1.8.16. Foundation Provisions

(1) The increased displacements of the structure resulting from *foundation* movement shall be shown to be within acceptable limits for both the SFRS and the structural framing elements not considered to be part of the SFRS. (See Appendix A.)

(2) Except as provided in Sentences (3) and (4), *foundations* shall be designed to have factored shear and overturning resistances greater than the lateral load capacity of the SFRS. (See Appendix A.)

(3) The shear and overturning resistances of the *foundation* determined using a bearing stress equal to 1.5 times the factored bearing strength of the *soil* or *rock* and all other resistances equal to 1.3 times the factored resistances need not exceed the design forces determined in Sentence 4.1.8.7.(1) using $R_dR_o = 1.0$ except that the factor of 1.3 shall not apply to the portion of the resistance to uplift or overturning resulting from gravity loads.

(4) A *foundation* is permitted to have a factored overturning resistance less than the lateral load overturning capacity of the supported SFRS, provided the following requirements are met:

(a) neither the *foundation* nor the supported SFRS are constrained against rotation, and

(b) the design overturning moment of the *foundation* is,

  (i) not less than 75% of the overturning capacity of the supported SFRS, and

  (ii) not less than that determined in Sentence 4.1.8.7.(1) using $R_dR_o = 2.0$.

(See Appendix A.)

(5) The design of *foundations* shall be such that they are capable of transferring earthquake loads and effects between the *building* and the ground without exceeding the capacities of the *soil* and *rock*.

(6) In cases where $I_EF_aS_a(0.2)$ is equal to or greater than 0.35, the following requirements shall be satisfied:

(a) *piles* or *pile* caps, drilled piers, and caissons shall be interconnected by continuous ties in no fewer than two directions, (See Appendix A.)

(b) *piles*, drilled piers, and caissons shall be embedded a minimum of 100 mm into the *pile* cap or structure, and

(c) *piles*, drilled piers, and caissons, other than wood *piles*, shall be connected to the *pile* cap or structure for a minimum tension force equal to 0.15 times the factored compression load on the *pile*.

(7) At sites where $I_EF_aS_a(0.2)$ is equal to or greater than 0.35, *basement* walls shall be designed to resist earthquake lateral pressures from backfill or natural ground. (See Appendix A.)

(8) At sites where $I_E F_a S_a(0.2)$ is greater than 0.75, the following requirements shall be satisfied:

(a) *piles*, drilled piers, or caissons shall be designed and detailed to accommodate cyclic inelastic behaviour when the design moment in the element due to earthquake effects is greater than 75% of its moment capacity, and (See Appendix A.)

(b) spread footings founded on *soil* defined as Site Class E or F shall be interconnected by continuous ties in no fewer than two directions.

(9) Each segment of a tie between elements that is required by Clause (6)(a) or (8)(b) shall be designed to carry by tension or compression a horizontal force at least equal to the greatest factored *pile* cap or column vertical load in the elements it connects, multiplied by a factor of $0.10\ I_E F_a S_a(0.2)$, unless it can be demonstrated that equivalent restraints can be provided by other means. (See Appendix A.)

(10) The potential for liquefaction of the *soil* and its consequences, such as significant ground displacement and loss of *soil* strength and stiffness, shall be evaluated based on the ground motion parameters referenced in Subsection 1.1.2., as modified by Article 4.1.8.4., and shall be taken into account in the design of the structure and its *foundations*. (See Appendix A.)

4.1.8.17. Site Stability

(1) The potential for slope instability and its consequences, such as slope displacement, shall be evaluated based on site-specific material properties and ground motion parameters referenced in Subsection 1.1.2., as modified by Article 4.1.8.4., and shall be taken into account in the design of the structure and its *foundations*. (See Appendix A.)

4.1.8.18. Elements of Structures, Non-Structural Components and Equipment

(See Appendix A.)

(1) Except as provided in Sentences (2), (7) and (16), elements and components of *buildings* described in Table 4.1.8.18. and their connections to the structure shall be designed to accommodate the *building* deflections calculated in accordance with Article 4.1.8.13. and the element or component deflections calculated in accordance with Sentence (9), and shall be designed for a lateral force, V_P, applied through the centre of mass of the element or component that is equal to:

$$V_p = 0.3 F_a S_a(0.2)\ I_E S_p W_p$$

where,

F_a = as defined in Sentence 4.1.8.4.(7),

$S_a(0.2)$ = spectral response acceleration value at 0.2 s, as defined in Sentence 4.1.8.4.(1),

I_E = importance factor for the *building*, as defined in Article 4.1.8.5.,

S_p = $C_p A_r A_x / R_p$ (the maximum value of S_p shall be taken as 4.0 and the minimum value of S_p shall be taken as 0.7), where,

C_p = element or component factor from Table 4.1.8.18.,

A_r = element or component force amplification factor from Table 4.1.8.18.,

A_x = height factor $(1 + 2\ h_x / h_n)$,

R_p = element or component response modification factor from Table 4.1.8.18., and

W_p = weight of the component or element.

(2) For *buildings* other than *post-disaster buildings*, seismically isolated *buildings* and *buildings* with supplemental energy dissipation systems, where $I_E F_a S_a(0.2)$ is less than 0.35, the requirements of Sentence (1) need not apply to Categories 6 through 22 of Table 4.1.8.18.

(3) For the purpose of applying Sentence (1) and Categories 11 and 12 of Table 4.1.8.18., elements or components shall be assumed to be flexible or flexibly connected unless it can be shown that the fundamental period of the element or component and its connection is less than or equal to 0.06 s, in which case the element or component is classified as being rigid or rigidly connected.

(4) The weight of access floors shall include the *dead load* of the access floor and the weight of permanent equipment, which shall not be taken as less than 25% of the floor *live load*.

(5) When the mass of a tank plus its contents or the mass of a flexible or flexibly connected piece of machinery, fixture or equipment is greater than 10% of the mass of the supporting floor, the lateral forces shall be determined by rational analysis.

(6) Forces shall be applied in the horizontal direction that results in the most critical loading for design, except for Category 6 of Table 4.1.8.18., where the forces shall be applied up and down vertically.

(7) Connections to the structure of elements and components listed in Table 4.1.8.18. shall be designed to support the component or element for gravity loads, shall conform to the requirements of Sentence (1), and shall also satisfy these additional requirements:

(a) friction due to gravity loads shall not be considered to provide resistance to seismic forces,
(b) R_p for non-ductile connections, such as adhesives or power actuated fasteners, shall be taken as 1.0,
(c) R_p for anchorage using shallow expansion, chemical, epoxy or cast-in place anchors shall be 1.5, where shallow anchors are those with a ratio of embedment length to diameter of less than 8,
(d) power-actuated fasteners and drop-in anchors shall not be used for tension loads,
(e) connections for non-structural elements or components of Category 1, 2 or 3 of Table 4.1.8.18. attached to the side of a *building* and above the first level above *grade* shall satisfy the following requirements:
    (i) for connections where the body of the connection is ductile, the body shall be designed for values of C_P, A_r and R_p given in Table 4.1.8.18., and all of the other parts of the connection, such as anchors, welds, bolts and inserts, shall be capable of developing 2.0 times the nominal yield resistance of the body of the connection, and
    (ii) connections where the body of the connection is not ductile shall be designed for values of $C_p = 2.0$, $R_p = 1.0$ and A_r given in Table 4.1.8.18., and
(f) a ductile connection is one where the body of the connection is capable of dissipating energy through cyclic inelastic behaviour.

Table 4.1.8.18.
Elements of Structures and Non-Structural Components and Equipment(4)
Forming Part of Sentences 4.1.8.18.(1), (2), (3), (6) and (7)

Category	Part or Portion of *Building*	C_p	A_r	R_p
1	All exterior and interior walls except those in Category 2 or 3	1.00	1.00	2.50
2	Cantilever parapet and other cantilever walls except retaining walls	1.00	2.50	2.50
3	Exterior and interior ornamentations and appendages	1.00	2.50	2.50
4	Floors and roofs acting as diaphragms(1)	---	---	---
5	Towers, *chimneys*, smokestacks and penthouses when connected to or forming part of a *building*	1.00	2.50	2.50
6	Horizontally cantilevered floors, balconies, beams, etc.	1.00	1.00	2.50
7	Suspended ceilings, light fixtures and other attachments to ceilings with independent vertical support	1.00	1.00	2.50
8	Masonry veneer connections	1.00	1.00	1.50
9	Access floors	1.00	1.00	2.50
10	Masonry or concrete fences more than 1.8 m tall	1.00	1.00	2.50
11	Machinery, fixtures, equipment and tanks (including contents) - that are rigid and rigidly connected	1.00	1.00	1.25
	Machinery, fixtures, equipment and tanks (including contents) - that are flexible or flexibly connected	1.00	2.50	2.50
12	Machinery, fixtures, equipment and tanks (including contents) containing toxic or explosive materials, materials having a *flash point* below 38°C or firefighting fluids - that are rigid and rigidly connected	1.50	1.00	1.25
	Machinery, fixtures, equipment and tanks (including contents) containing toxic or explosive materials, materials having a *flash point* below 38°C or firefighting fluids - that are flexible or flexibly connected	1.50	2.50	2.50
13	Flat bottom tanks (including contents) attached directly to a floor at or below *grade* within a *building*	0.70	1.00	2.50
14	Flat bottom tanks (including contents) attached directly to a floor at or below *grade* within a *building* containing toxic or explosive materials, materials having a *flash point* below 38°C or firefighting fluids	1.00	1.00	2.50
15	Pipes, ducts (including contents)	1.00	1.00	3.00
16	Pipes, ducts (including contents) containing toxic or explosive materials	1.50	1.00	3.00
17	Electrical cable trays, bus ducts, conduits	1.00	2.50	5.00
18	Rigid components with ductile material and connections	1.00	1.00	2.50
19	Rigid components with non-ductile material or connections	1.00	1.00	1.00
20	Flexible components with ductile material and connections	1.00	2.50	2.50
21	Flexible components with non-ductile material or connections	1.00	2.50	1.00
22	Elevators and Escalators(2) – Machinery and equipment, rigid and rigidly connected	1.00	1.00	1.25
	Elevators and Escalators(2) – Machinery and equipment, flexible or flexibly connected	1.00	2.50	2.50
	Elevators and Escalators(2) – Elevator rails	1.00	1.00	2.50
23	Floor-mounted steel pallet storage racks(3)	1.00	2.50	2.50
24	Floor-mounted steel pallet storage racks on which are stored toxic or explosive materials or materials having a flash point below 38°C(3)	1.50	2.50	2.50
Column 1	2	3	4	5

Notes to Table 4.1.8.18.:
(1) See Sentence 4.1.8.18.(8).
(2) See also ASME A17.1 / CSA B44, “Safety Code for Elevators and Escalators”.
(3) See Sentence 4.1.8.18.(13).
(4) See Appendix A.

(8) Floors and roofs acting as diaphragms shall satisfy the requirements for diaphragms stated in Article 4.1.8.15.

(9) Lateral deflections of elements or components shall be based on the loads defined in Sentence (1) and lateral deflections obtained from an elastic analysis shall be multiplied by R_p/I_E to give realistic values of the anticipated deflections.

(10) The elements or components shall be designed so as not to transfer to the structure any forces unaccounted for in the design, and rigid elements such as walls or panels shall satisfy the requirements of Sentence 4.1.8.3.(6).

(11) Seismic restraint for suspended equipment, pipes, ducts, electrical cable trays, etc. shall be designed to meet the force and displacement requirements of this Article and be constructed in a manner that will not subject hanger rods to bending.

(12) Isolated suspended equipment and components, such as pendant lights, may be designed as a pendulum system provided that adequate chains or cables capable of supporting 2.0 times the weight of the suspended component are provided and the deflection requirements of Sentence (11) are satisfied.

(13) Free-standing steel pallet storage racks are permitted to be designed to resist earthquake effects using rational analysis, provided the design achieves the minimum performance level required by this Subsection. (See Appendix A.)

(14) Except as provided in Sentence (15), the relative displacement of glass in glazing systems, $D_{fallout}$, shall be equal to the greater of,

(a) 13 mm, or

(b) $D_{fallout} \geq 1.25 I_E D_p$,

where,

$D_{fallout}$ = relative displacement at which glass fallout occurs, and

D_p = relative earthquake displacement that the component must be designed to accommodate, calculated in accordance with Article 4.1.8.13. and applied over the height of the glass component.

(See Appendix A.)

(15) Glass need not comply with Sentence (14), provided at least one of the following conditions is met:

(a) $I_E F_a S_a(0.2) < 0.35$,

(b) the glass has sufficient clearance from its frame such that $D_{clear} \geq 1.25\ D_p$ calculated as follows:

$$D_{clear} = 2C_1(1 + h_p C_2/(b_p C_1))$$

where,

D_{clear} = relative horizontal displacement measured over the height of the glass panel, which causes initial glass-to-frame contact,

C_1 = average of the clearances on both sides between the vertical glass edges and the frame,

h_p = height of the rectangular glass panel,

C_2 = average of the top and bottom clearances between the horizontal glass edges and the frame, and

b_p = width of the rectangular glass panel,

(c) the glass is fully tempered, monolithic, installed in a *building* that is not a *post-disaster building*, and no part of the glass is located more than 3 m above a walking surface, or

(d) the glass is annealed or heat-strengthened laminated glass in a single thickness with an interlayer no less than 0.76 mm and captured mechanically in a wall system glazing pocket with the perimeter secured to the frame by a wet, glazed, gunable, curing, elastomeric sealant perimeter bead of 13 mm minimum glass contact width.

(See Appendix Note A-4.1.8.18.(14))

(16) For a structure with supplemental energy dissipation, the following criteria shall apply:
(a) the value of $S_a(0.2)$ used in Sentence (1) shall be determined from the mean 5% damped floor spectral acceleration values at 0.2 s by averaging the individual 5% damped floor spectra at the base of the structure determined using Non-Linear Dynamic Analysis, and
(b) the value of F_a used in Sentence (1) shall be 1.

4.1.8.19. Seismic Isolation

(1) For the purposes of this Article and Article 4.1.8.20., the following terms shall have the meaning stated herein:
(a) "seismic isolation" is an alternative seismic design concept that consists of installing an isolation system with low horizontal stiffness, thereby substantially increasing the fundamental period of the structure,
(b) "isolation system" is a collection of structural elements at the level of the isolation interface that includes all individual isolator units, all structural elements that transfer force between elements of the isolation system, all connections to other structural elements, and may also include a wind-restraint system, energy-dissipation devices, and a displacement restraint system,
(c) "seismically isolated structure" includes the upper portion of the structure above the isolation system, the isolation system, and the portion of the structure below the isolation system,
(d) "isolator unit" is a structural element of the isolation system that permits large lateral deformations under lateral earthquake design forces and is characterized by vertical-load-carrying capability combined with increased horizontal flexibility and high vertical stiffness, energy dissipation (hysteretic or viscous), self-centering capability, and lateral restraint (sufficient elastic stiffness) under non-seismic service lateral loads,
(e) "isolation interface" is the boundary between the isolated upper portion of the structure above the isolation system and the lower portion of the structure below the isolation system, and
(f) "wind-restraint system" is the collection of structural elements of the isolation system that provides restraint of the seismically isolated structure for wind loads and is permitted to be either an integral part of the isolator units or a separate device.

(2) Every seismically isolated structure and every portion thereof shall be analyzed and designed in accordance with,
(a) the loads and requirements prescribed in this Article and Article 4.1.8.20.,
(b) other applicable requirements of this Subsection, and
(c) appropriate engineering principles and current engineering practice.

(See Appendix A.)

(3) For the analysis and modeling of the seismically isolated structure, the following criteria shall apply:
(a) three dimensional Non-Linear Dynamic Analysis of the structure shall be performed in accordance with Article 4.1.8.12, (See Appendix A.)
(b) unless verified from rational analysis, the inherent equivalent viscous damping — excluding the hysteretic damping provided by the isolation system or supplemental energy dissipation devices — used in the analysis shall not be taken as more than 2.5% of the critical damping at the significant modes of vibration,
(c) all individual isolator units shall be modeled with sufficient detail to account for their non-linear force-deformation characteristics, including effects of the relevant loads, and with consideration of variations in material properties over the design life of the structure, and
(d) except for elements of the isolation system, other components of the seismically isolated structure shall be modeled using elastic material properties in accordance with Sentence 4.1.8.3.(8).

(4) The ground motion histories used in Sentence (3) shall be,
(a) appropriately selected and scaled following good engineering practice,
(b) compatible with,
  (i) a response spectrum derived from the design spectral acceleration values, S(T), defined in Sentence 4.1.8.4.(9) for ground conditions of Site Classes A, B and C, and
  (ii) a 5% damped response spectrum based on a site-specific evaluation for ground conditions of Site Classes D, E and F, and

(c) amplitude-scaled in an appropriate manner over the period range of 0.2 T1 to 1.5 T1, where T1 is the period of the isolated structure determined using the post-yield stiffness of the isolation system in the horizontal direction under consideration, or the period specified in Sentence 4.1.8.20.(1) if the post-yield stiffness of the isolation system is not well defined.

(See Appendix A.)

4.1.8.20. Seismic Isolation Design Provisions

(1) The period of the isolated structure, determined using the post-yield stiffness of the isolation system in the horizontal direction under consideration, shall be greater than three times the period of the structure above the isolation interface calculated as a fixed base.

(2) The isolation system shall be configured to produce a restoring force such that the lateral force at the TDD at the centre of mass of the isolated structure above the isolation interface is at least $0.025W_b$ greater than the lateral force at 50% of the TDD at the same location, in each horizontal direction, where W_b is the portion of W above the isolation interface.

(3) The values of *storey* shears, *storey* forces, member forces, and deflections used in the design of all structural framing elements and components of the isolation system shall be obtained from analysis conforming to Sentence 4.1.8.19.(3) using one of the following values, whichever produces the most critical effect:

(a) mean plus I_E times the standard deviation of the results of all Non-Linear Dynamic Analyses, or

(b) $\sqrt{I_E}$ times the mean of the results of all Non-Linear Dynamic Analyses.

(4) The force-deformation and damping characteristics of the isolation system used in the analysis and design of the seismically isolated structures shall be validated by testing at least two full-size specimens of each predominant type and size of isolator unit of the isolation system, which shall include,

(a) the individual isolator units,

(b) separate supplemental damping devices, if used, and

(c) separate sacrificial wind-restraint systems, if used.

(5) The force-deformation characteristics and damping value of a representative sample of the isolator units installed in the *building* shall be validated by tests prior to their installation.

(6) A diaphragm or horizontal structural elements shall provide continuity immediately above the isolation interface to transmit forces due to non-uniform ground motions from one part of the structure to another.

(7) All structural framing elements shall be designed for the forces described in Sentence (3) with $R_dR_o = 1.0$, except,

(a) for structures with $I_E < 1.5$, all the SFRS shall be detailed in accordance with the requirements for $Rd \geq 1.5$ and the applicable referenced design standards, and

(b) for structures with $I_E = 1.5$, all the SFRS shall be detailed in accordance with the requirements for $Rd \geq 2.0$ and the applicable referenced design standards.

(8) The height restrictions noted in Table 4.1.8.9. need not apply to seismically isolated structures.

(9) All isolator units shall be,

(a) designed for the forces described in Sentence (3), and

(b) able to accommodate the TDD determined at the specific location of each isolator unit.

(10) The isolation system, including a separate wind-restraint system if used, shall limit lateral displacement due to wind loads across the isolation interface to a value equal to that required for the least *storey* height in accordance with Sentence 4.1.3.5.(3).

4.1.8.21. Supplemental Energy Dissipation

(1) For the purposes of this Article and Article 4.1.8.22., the following terms shall have the meaning stated herein:
(a) "supplemental energy dissipation device" is a dedicated structural element of the supplemental energy dissipation system that dissipates energy due to relative motion of each of its ends or by alternative means, and includes all pins, bolts, gusset plates, brace extensions and other components required to connect it to the other elements of the structure; a device may be classified as either displacement-dependent or velocity-dependent, or a combination thereof, and may be configured to act in either a linear or non-linear manner, and
(b) "supplemental energy dissipation system" is a collection of energy dissipation devices installed in a structure that supplement the energy dissipation of the SFRS.

(2) Every structure with a supplemental energy dissipation system and every portion thereof shall be designed and constructed in accordance with,
(a) the loads and requirements prescribed in this Article and Article 4.1.8.22.,
(b) other applicable requirements of this Subsection, and
(c) appropriate engineering principles and current engineering practice.

(See Appendix A.)

(3) Where supplemental energy dissipation devices are used across the isolation interface of a seismically isolated structure, displacements, velocities, and accelerations shall be determined in accordance with Article 4.1.8.20.

(4) For the analysis and modeling of structures with supplemental energy dissipation devices, the following criteria shall apply:
(a) a three-dimensional Non-Linear Dynamic Analysis of the structure shall be performed in accordance with Article 4.1.8.12., (See Appendix A.)
(b) for SFRS with $R_d > 1.0$, the non-linear hysteretic behaviour of the SFRS shall be explicitly — with sufficient detail — accounted for in the modeling and analysis of the structure,
(c) unless verified from rational analysis, the inherent equivalent viscous damping — excluding the damping provided by the supplemental energy dissipation devices — used in the analysis shall not be taken as more than 2.5% of the critical damping at the significant modes of vibration,
(d) all supplemental energy dissipation devices shall be modeled with sufficient detail to account for their non-linear force deformation characteristics, including effects of the relevant loads, and with consideration of variations in their properties over the design life of the structure, and
(e) except for the SFRS and elements of the supplemental energy dissipation system, other components of the structure shall be modeled using elastic material properties in accordance with Sentence 4.1.8.3.(8).

(5) The ground motion histories used in Sentence (4) shall be,
(a) appropriately selected and scaled following good engineering practice,
(b) compatible with a 5% damped response spectrum derived from the design spectral acceleration values, S(T), defined in Sentence 4.1.8.4.(9), and
(c) amplitude-scaled in an appropriate manner over the period range of $0.2\ T_1$ to $1.5\ T_1$, where T_1 is the fundamental lateral period of the structure with the supplemental energy dissipation system.

(See Appendix Note A-.4.1.8.19.(4))

4.1.8.22. Supplemental Energy Dissipation Design Considerations

(1) The values of *storey* shears, *storey* forces, member forces, and deflections for the design of all structural framing elements and all supplemental energy dissipation devices shall be obtained from analysis conforming to Sentence 4.1.8.21.(4) using one of the following values, whichever produces the most critical effect:
(a) mean plus I_E times the standard deviation of the results of all Non-Linear Dynamic Analyses, or
(b) $\sqrt{I_E}$ times the mean of the results of all Non-Linear Dynamic Analyses.

(2) The largest interstorey deflection at any level of the structure as determined in accordance with Sentence (1) shall conform to the limits stated in Sentence 4.1.8.13.(3).

(3) The force-deformation and force-velocity characteristics of the supplemental energy dissipation devices used in the analysis and design of structures with supplemental energy dissipation systems shall be validated by testing at least two full-size specimens of each type of supplemental energy dissipation device.

(4) The force-deformation and force-velocity characteristics and damping values of a representative sample of the supplemental energy dissipation devices installed in the *building* shall be validated by tests prior to their installation.

(5) Elements of the supplemental energy dissipation system, except the supplemental energy dissipation devices themselves, shall be designed to remain elastic for the design loads.

(6) All structural framing elements shall be designed,
(a) for an SFRS with R_d =1.0, using the forces referred to in Sentence (1) with R_dR_o = 1.0, except that the SFRS shall be detailed in accordance with the requirements for $R_d \geq 1.5$ and the applicable referenced design standards, or
(b) for an SFRS with $R_d > 1.0$, using the forces referred to in Sentence (1) with R_dR_o = 1.0, except that the SFRS shall be detailed in accordance with the requirements for the selected R_d and the applicable referenced design standards.

(7) Supplemental energy dissipation devices and other components of the supplemental energy dissipation system shall be designed in accordance with Sentence (1) with consideration of the following:
(a) low-cycle, large-displacement degradation due to seismic loads,
(b) high-cycle, small-displacement degradation due to wind, thermal, or other cyclic loads,
(c) forces or displacements due to gravity loads,
(d) adhesion of device parts due to corrosion or abrasion, biodegradation, moisture, or chemical exposure,
(e) exposure to environmental conditions, including, but not limited to, temperature, humidity, moisture, radiation (e.g., ultraviolet light), and reactive or corrosive substances (e.g., salt water),
(f) devices subject to failure due to low-cycle fatigue must resist wind forces without slip, movement, or inelastic cycling,
(g) the range of thermal conditions, device wear, manufacturing tolerances, and other effects that cause device properties to vary during the design life of the device, and
(h) connection points of devices must provide sufficient articulation to accommodate simultaneous longitudinal, lateral, and vertical displacements of the supplemental energy dissipation system.

(8) Means of access for inspection and removal for replacement of all supplemental energy dissipation devices shall be provided.

Section 4.2. Foundations

4.2.1. General

4.2.1.1. Application

(1) This Section applies to *excavations* and *foundation* systems for *buildings*.

4.2.2. Subsurface Investigations and Reviews

4.2.2.1. Subsurface Investigation

(1) A *subsurface investigation*, including *groundwater* conditions, shall be carried out, by or under the direction of a person having knowledge and experience in planning and executing such investigations to a degree appropriate for the *building* and its use, the ground and the surrounding site conditions. (See Appendix A.)

4.2.2.2. Field Review

(1) A field review shall be carried out by the *designer* or by another suitably qualified person to ascertain that the subsurface conditions are consistent with the design and that *construction* is carried out in accordance with the design and good engineering practice.

(2) The review required in Sentence (1) shall be carried out,
(a) on a continuous basis,
  (i) during the *construction* of all *deep foundation units* with all pertinent information recorded for each *foundation unit*,
  (ii) during the installation and removal of retaining structures and related backfilling operations, and
  (iii) during the placement of engineered *fills* that are to be used to support the *foundation units*, and
(b) as required, unless otherwise directed by the *chief building official*,
  (i) in the *construction* of all *shallow foundation units*, and
  (ii) in excavating, dewatering and other related works.

4.2.2.3. Altered Subsurface Condition

(1) If during *construction*, the *soil*, *rock* or *groundwater* is found not to be of the type or in the condition used in design, and as indicated on the drawings, the design shall be reassessed by the *designer*.

(2) If during *construction*, climatic or any other conditions have changed the properties of the *soil*, *rock* or *groundwater*, the design shall be reassessed by the *designer*.

4.2.3. Materials Used in Foundations

4.2.3.1. Wood

(1) Wood used in *foundations* or in support of *soil* or *rock* shall conform to the appropriate requirements of Subsection 4.3.1.

4.2.3.2. Preservation Treatment of Wood

(1) Wood exposed to *soil* or air above the lowest anticipated *groundwater* table shall be treated with preservative in conformance with CAN/CSA-O80 Series, "Wood Preservation", and the requirements of the appropriate commodity standard as follows:
(a) CAN/CSA-O80.2, "Processing and Treatment",
(b) CAN/CSA-O80.3, "Preservative Formulations", or
r11.1 (c) CSA O80.15, "Preservative Treatment of Wood for Building Foundation Systems, Basements, and Crawl Spaces by Pressure Processes".

4.2.3.3. Plain and Reinforced Masonry

(1) Plain or reinforced masonry used in *foundations* or in support of *soil* or *rock* shall conform to the requirements of Subsection 4.3.2.

4.2.3.4. Prevention of Deterioration of Masonry

(1) Where plain or reinforced masonry in *foundations* or in structures supporting *soil* or *rock* may be subject to conditions conducive to deterioration, protection shall be provided to prevent such deterioration.

4.2.3.5. Concrete

(1) Plain, reinforced or prestressed concrete used in *foundation*s or in support of *soil* or *rock* shall conform to the requirements of Subsection 4.3.3.

4.2.3.6. Protection Against Chemical Attack

(1) Where concrete in *foundation*s may be subject to chemical attack, it shall be treated in conformance with the requirements in CSA A23.1, "Concrete Materials and Methods of Concrete Construction".

4.2.3.7. Steel

(1) Steel used in *foundation*s or in support of *soil* or *rock* shall conform with the appropriate requirements of Subsections 4.3.3. or 4.3.4., unless otherwise specified in this Section.

4.2.3.8. Steel Piles

(1) Where steel *piles* are used in *deep foundation*s and act as permanent load-carrying members, the steel shall conform with one of the following standards:

(a) ASTM A252, "Welded and Seamless Steel Pipe Piles",
(b) ASTM A283 / A283M, "Low and Intermediate Tensile Strength Carbon Steel Plates",
(c) ASTM A1008 / A1008M , "Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy, and High-Strength Low-Alloy with Improved Formability, Solution Hardened, and Bake Hardenable",
(d) ASTM A1011 / A1011M, "Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, and Ultra-High Strength", or
r11.1 (e) CSA G40.21, "Structural Quality Steel".

4.2.3.9. High Strength Steel Tendons

(1) Where high strength steel is used for tendons in anchor systems used for the permanent support of a *foundation* or in the erection of temporary support of *soil* or *rock* adjacent to an *excavation*, it shall conform with the requirements of CSA A23.1, "Concrete Materials and Methods of Concrete Construction".

4.2.3.10. Corrosion of Steel

(1) Where conditions are corrosive to steel, adequate protection of exposed steel shall be provided.

4.2.4. Design Requirements

4.2.4.1. Design Basis

(1) The design of *foundation*s, *excavations* and *soil*- and *rock*-retaining structures shall be based on a *subsurface investigation* carried out by a person competent in this field of work, and on any of the following:

(a) application of generally accepted geotechnical and civil engineering principles by a person especially qualified in this field of work as provided in this Section and other Sections of this Part,
(b) established local practice where such practice includes successful experience both with *soils* and *rocks* of similar type and condition and with a *foundation* or *excavation* of similar type, *construction* method, size and depth, or
(c) in situ testing of *foundation units* such as the load testing of *pile*s, anchors or footings carried out by a person competent in this field of work.

(See Appendix A.)

(2) The *foundations* of a *building* shall be capable of resisting all the loads stipulated in Section 4.1., in accordance with limit states design in Subsection 4.1.3.

(3) For the purpose of the application of the load combinations given in Table 4.1.3.2.A., the geotechnical components of loads and the factored geotechnical resistances at ULS shall be determined by a suitably qualified and experienced person. (See Appendix A.)

(4) Geotechnical components of service loads and geotechnical reactions for SLS shall be determined by a suitably qualified and experienced person.

(5) The *foundation* of a *building* shall be designed to satisfy SLS requirements within the limits that the *building* is designed to accommodate, including total settlement and differential settlement, heave, lateral movement, tilt or rotation. (See Appendix A.)

(6) Communication, interaction and coordination between the *designer* and the person responsible for the geotechnical aspects of the project shall take place to a degree commensurate with the complexity and requirements of the project.

4.2.4.2. Subsurface Investigation

(1) A *subsurface investigation* shall be carried out to the depth and extent to which the *building* or *excavation* will significantly change the stress in the *soil* or *rock*, or to such a depth and extent as to provide all the necessary information for the design and *construction* of the *excavation* or the *foundation*s.

4.2.4.3. Identification

(1) The identification and classification of *soil*, *rock* and *groundwater* and descriptions of their engineering and physical properties shall be in accordance with a widely accepted system.

4.2.4.4. Depth of Foundations

(1) Except as permitted in Sentence (2), the *bearing surface* of a *foundation* shall be below the level of potential damage, including damage resulting from *frost action*, and the *foundation* shall be designed to prevent damage resulting from *adfreezing* and frost jacking. (See Appendix A.)

(2) The *bearing surface* of a *foundation* need not be below the level of potential damage from frost where the *foundation*,
(a) is designed against *frost action*, or
(b) overlies material not susceptible to *frost action*.

4.2.4.5. Sloping Ground

(1) Where a *foundation* is to rest on, in or near sloping ground, this particular condition shall be provided for in the design.

4.2.4.6. Eccentric and Inclined Loads

(1) Where there is eccentricity or inclination of loading in *foundation units*, this effect shall be fully investigated and provided for in the design.

4.2.4.7. Dynamic Loading

(1) Where dynamic loading conditions apply, the effects shall be assessed by a special investigation of these conditions and provided for in the design.

4.2.4.8. Hydrostatic Uplift

(1) Where a *foundation* or any part of a *building* is subject to hydrostatic uplift the effects shall be provided for in the design

4.2.4.9. Groundwater Level Change

(1) Where proposed *construction* will result in a temporary or permanent change in the *groundwater level*, the effects of this change on adjacent *buildings* shall be fully investigated and provided for in the design.

4.2.4.10. Permafrost

(1) Where conditions of permafrost are encountered or proven to exist, the design of the *foundation* shall be based upon analysis of these conditions by a person especially qualified in that field of work.

4.2.4.11. Swelling and Shrinking Soils

(1) Where swelling or shrinking *soils*, in which movements resulting from moisture content changes may be sufficient to cause damage to a structure, are encountered or known to exist, such a condition shall be fully investigated and provided for in the design.

4.2.4.12. Expanding and Deteriorating Rock

(1) Where *rock* that expands or deteriorates when subjected to unfavourable environmental conditions or to stress release is known to exist, this condition shall be fully investigated and provided for in the design.

4.2.4.13. Construction on Fill

(1) *Buildings* may be placed on *fill* if it can be shown by *subsurface investigation* that,
(a) the *fill* is or can be made capable of safely supporting the *building*,
(b) detrimental movement of the *building* or services leading to the *building* will not occur, and
(c) explosive gases can be controlled or do not exist.

4.2.4.14. Structural Design

(1) The structural design of the *foundation* of a *building*, the procedures and *construction* practices shall conform with the appropriate Sections of this Code unless otherwise specified in this Section.

4.2.5. Excavations

4.2.5.1. Design of Excavations

(1) The design of *excavations* and of supports for the sides of *excavations* shall conform to the requirements of Subsection 4.2.4. and this Subsection. (See Appendix A.)

4.2.5.2. Excavation Construction

(1) Every *excavation* shall be undertaken in such a manner as to prevent movement that would cause damage to adjacent *buildings* at all phases of *construction*.

(2) Material shall not be placed nor shall equipment be operated or placed in or adjacent to an *excavation* in a manner that may endanger the integrity of the *excavation* or its supports.

4.2.5.3. Supported Excavations

(1) The sides of an *excavation* in *soil* or *rock* shall be supported by a retaining structure conforming with the requirements of Articles 4.2.5.1. and 4.2.5.2., except as permitted in Article 4.2.5.4.

4.2.5.4. Unsupported Excavations

(1) The sides of an *excavation* in *soil* or *rock* may be unsupported where a design is prepared by a person especially qualified in this field of work in conformance with the requirements of Articles 4.2.5.1. and 4.2.5.2.

4.2.5.5. Control of Water Around Excavations

(1) *Surface water*, all *groundwater*, *perched groundwater* and in particular *artesian groundwater* shall be kept under control at all phases of *excavation* and *construction*.

4.2.5.6. Loss of Ground

(1) At all phases of *excavation* and *construction*, loss of ground due to water or any other cause shall be prevented.

4.2.5.7. Protection and Maintenance at Excavations

(1) All sides of an *excavation*, supported and unsupported, shall be continuously maintained and protected from possible deterioration by *construction* activity or by the action of frost, rain and wind.

4.2.5.8. Backfilling

(1) Where an *excavation* is backfilled, the backfill shall be placed so as to,
(a) provide lateral support to the *soil* adjacent to the *excavation*, and
(b) prevent detrimental movements.

(2) The material used as backfill or *fill* supporting a footing, *foundation* or a floor on *grade* shall be of a type that is not subject to detrimental volume change with changes in moisture content and temperature.

4.2.6. Shallow Foundations

4.2.6.1. Design of Shallow Foundations

(1) The design of *shallow foundation*s shall be in conformance with the requirements of Subsection 4.2.4. and this Subsection. (See Appendix A.)

4.2.6.2. Support of Shallow Foundations

(1) Where a *shallow foundation* is to be placed on *soil* or *rock*, the *soil* or *rock* shall be cleaned of loose and unsound material and shall be adequate to support the *design load* taking into account temperature, precipitation, *construction* activities and other factors that may lead to changes of the properties of *soil* or *rock*.

4.2.6.3. Incorrect Placement of Shallow Foundations

(1) Where a *shallow foundation unit* has not been placed or located as indicated on the drawings,
(a) the error shall be corrected, or
(b) the design of the *foundation unit* shall be recalculated for the altered conditions by the *designer*.

4.2.6.4. Damaged Shallow Foundations

(1) Where a *shallow foundation unit* is damaged,
(a) it shall be repaired, or
(b) the *design* of the *foundation unit* shall be recalculated for the damaged condition by the *designer*.

4.2.7. Deep Foundations

4.2.7.1. General

(1) A *deep foundation unit* shall provide support for a *building* by transferring loads by end-bearing to a competent stratum at considerable depth below the structure, or by mobilizing resistance by adhesion or friction, or both, in the *soil* or *rock* in which it is placed. (See Appendix A.)

4.2.7.2. Design for Deep Foundations

(1) *Deep foundation units* shall be designed in conformance with Subsection 4.2.4. and this Subsection. (See Appendix A.)

(2) Where *deep foundation units* are load tested, as required in Clause 4.2.4.1.(1)(c), the determination of the number and type of load test and the interpretation of the results shall be carried out by a person especially qualified in this field of work. (See Appendix A.)

(3) The design of *deep foundations* shall be determined on the basis of geotechnical considerations taking into account,
(a) the method of installation,
(b) the degree of inspection,
(c) the spacing of *foundation units* and group effects,
(d) other requirements of this Subsection, and
(e) the appropriate structural requirements of Section 4.1. and Subsections 4.3.1., 4.3.3. and 4.3.4.

(4) The portion of a *deep foundation unit* permanently in contact with *soil* or *rock* shall be structurally designed as a laterally supported compression member.

(5) The portion of a *deep foundation unit* that is not permanently in contact with *soil* or *rock* shall be structurally designed as a laterally unsupported compression member.

(6) The structural design of prefabricated *deep foundation units* shall allow for all stresses resulting from driving, handling and testing.

4.2.7.3. Tolerance in Alignment and Location

(1) Permissible deviations from the design alignment and the location of the top of *deep foundation units* shall be determined by design analysis and shall be indicated on the drawings.

4.2.7.4. Incorrect Alignment and Location

(1) Where a *deep foundation unit* has not been placed within the permissible deviations referred to in Article 4.2.7.3., the condition of the *foundation* shall be assessed by the *designer*.

4.2.7.5. Installation of Deep Foundations

(1) *Deep foundation units* shall be installed in such a manner as not to impair,
(a) the strength of the *deep foundation units* and the properties of the *soil* or *rock* on or in which they are placed beyond the calculated or anticipated limits,
(b) the integrity of previously installed *deep foundation units*, or
(c) the integrity of neighbouring *buildings*.

4.2.7.6. Damaged Deep Foundation Units

(1) Where inspection shows that a *deep foundation unit* is damaged or not consistent with design or good engineering practice,
(a) such a unit shall be reassessed by the *designer*, and
(b) any necessary changes shall be made and action taken as required.

4.2.8. Special Foundations

4.2.8.1. General

(1) Where special *foundation* systems are used, such systems shall conform to Subsection 4.2.4. and Sentence 4.1.1.4.(2).

4.2.8.2. Use of Existing Foundations

(1) Existing *foundations* may be used to support new or altered *buildings* provided they comply with all pertinent requirements of this Section.

Section 4.3. Design Requirements for Structural Materials

4.3.1. Wood

4.3.1.1. Design Basis for Wood

(1) *Buildings* and their structural members made of wood shall conform to CSA O86, "Engineering Design in Wood".

4.3.1.2. Glue-Laminated Members

(1) Glued-laminated members shall be fabricated in plants conforming to CSA O177, "Qualification Code for Manufacturers of Structural Glued-Laminated Timber".

4.3.1.3. Termites

(1) In areas known to be infested by termites, the requirements in Articles 9.3.2.9., 9.12.1.1. and 9.15.5.1. shall apply.

4.3.2. Plain and Reinforced Masonry

4.3.2.1. Design Basis for Plain and Reinforced Masonry

r11.1 **(1)** *Buildings* and their structural members made of plain and reinforced masonry shall conform to CSA S304, "Design of Masonry Structures".

4.3.3. Plain, Reinforced and Prestressed Concrete

4.3.3.1. Design Basis for Plain, Reinforced and Prestressed Concrete

r11.1 **(1)** *Buildings* and their structural members made of plain, reinforced or prestressed concrete shall conform to CSA A23.3, "Design of Concrete Structures". (See Appendix A.)

4.3.4. Steel

4.3.4.1. Design Basis for Structural Steel

(1) *Buildings* and their structural members made of structural steel shall conform to CSA S16, "Design of Steel Structures". (See Appendix A.)

4.3.4.2. Design Basis for Cold-Formed Steel

r11.1 **(1)** *Buildings* and their structural members made of cold-formed steel shall conform to CSA S136, "North American Specification for the Design of Cold-Formed Steel Structural Members". (See Appendix A.)

4.3.4.3. Steel Building Systems

r5 **(1)** Steel *building* systems shall be manufactured by companies certified in accordance with the requirements of CSA A660, "Certification of Manufacturers of Steel Building Systems". (See Appendix A.)

4.3.5. Aluminum

4.3.5.1. Design Basis for Aluminum

(1) *Buildings* and their structural members made of aluminum shall conform to CAN/CSA-S157 / S157.1, "Strength Design in Aluminum/Commentary on CSA S157-05, Strength Design in Aluminum", using the loads stipulated in Section 4.1., in accordance with limit states design in Subsection 4.1.3.

4.3.6. Glass

4.3.6.1. Design Basis for Glass

r11.1 **(1)** Glass used in *buildings* shall be designed in conformance with,

(a) CAN/CGSB-12.20-M, "Structural Design of Glass for Buildings", using an adjustment factor on the wind load, W, of not less than 0.75, or

(b) ASTM E1300, "Determining Load Resistance of Glass in Buildings", using an adjustment factor on the wind load, W, of not less than 1.0.

(See Appendix A.)

Section 4.4. Design Requirements for Special Structures

4.4.1. Air-Supported Structures

4.4.1.1. Design Basis for Air-Supported Structures

r11.1 **(1)** The structural design of *air-supported structures* shall conform to CSA S367, "Air-, Cable-, and Frame-Supported Membrane Structures" using the loads stipulated in Section 4.1., in accordance with limit states design in Subsection 4.1.3.

4.4.2. Parking Structures

r11.1 4.4.2.1. Design Basis for Parking Structures and Repair Garages

(1) *Storage garages* and *repair garages* shall be designed in conformance with CSA S413, "Parking Structures". (See Appendix A.)

4.4.3. Guards Over Retaining Walls

4.4.3.1. Guards Over Retaining Walls

(1) Every retaining wall that is designated in Sentence 1.3.1.1.(1) of Division A shall be protected by *guards* on all open sides where the public has access to open space at the top of the retaining wall.

4.4.4. Anchor Systems on Building Exterior

4.4.4.1. Anchor Systems on Building Exterior

(1) Where suspended maintenance and window cleaning operations are intended to be carried out on the exterior of a *building* described in Article 1.1.2.2. of Division A, anchor systems shall be provided where any portion of the roof is more than 8 m above adjacent ground level.

(2) Except as provided in Sentence (3), the anchor systems in Sentence (1) shall be designed, installed and tested in conformance with CAN/CSA-Z91, "Health and Safety Code for Suspended Equipment Operations".

(3) Other anchor systems may be used where such systems provide an equal level of safety.

r11.1 **(4)** The anchor system material shall be made of stainless steel, or other corrosion resistant base material, or from steel that is hot dipped galvanized, in accordance with CAN/CSA-G164-M, "Hot Dip Galvanizing of Irregularly Shaped Articles".

4.4.5. Manure Storage Tanks

4.4.5.1. Liquid Manure Storage Tanks

(1) *Liquid manure* storage tanks shall be constructed of steel, reinforced concrete or prestressed concrete.

(2) *Liquid manure* storage tank walls, bases and appurtenances, including piping for the conveyance of *liquid manure* and associated connections and joints, shall be designed and constructed to prevent leakage of contents.

(3) Concrete for *liquid manure* storage tanks shall,
(a) be made from HS or HSb cement,
(b) have a 28-day strength of at least 32 MPa, and
(c) have a water/cement materials ratio of not more than 0.45.

(4) *Liquid manure* storage tanks shall be placed on undisturbed *soil* free of any organic, deleterious and extraneous materials and capable of supporting the superimposed design loads from the tanks.

(5) Where granular *fills* are used between the bases of *liquid manure* storage tanks and the undisturbed *soil*, the granular *fills* shall be compacted to a Standard Proctor density of not less than 95%.

Part 5

Environmental Separation

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Part 5

Environmental Separation (See Appendix A.)

Section 5.1. General

5.1.1. Scope

5.1.1.1. Scope

(1) The scope of this Part shall be as described in Subsection 1.1.2. of Division A. (See Appendix A.)

5.1.2. Application

5.1.2.1. Exposure to Exterior Space or the Ground and Separation of Dissimilar Environments

(1) This Part applies to,

(a) *building* materials, components and assemblies exposed to exterior space or the ground, including those separating interior space from exterior space or separating interior space from the ground,

(b) *building* materials, components and assemblies separating environmentally dissimilar interior spaces, and (See Appendix Note A-5.8.)

(c) site materials, components, assemblies and grading that may affect environmental loads on *building* materials, components and assemblies exposed to exterior space or the ground.

(See Appendix A.)

5.1.3. Definitions

5.1.3.1. Reserved

5.1.4. Resistance to Loads and Deterioration

5.1.4.1. Structural and Environmental Loads (See Appendix A.)

(1) *Building* materials, components and assemblies that separate dissimilar environments or are exposed to the exterior shall be designed and constructed to provide sufficient capacity and integrity to resist or accommodate,

(a) all environmental loads, and effects of those loads, that may reasonably be expected having regard to,

(i) the intended use of the *building*, and

(ii) the environment to which the materials, components and assemblies are subject, and

(b) all structural loads, and effects of those loads, that may be reasonably expected.

r11.1 **(1.1)** Where *building* materials, components or assemblies perform more than one function, they shall satisfy the requirements of all of those functions. (See Appendix A.)

(2) The design and construction required by Clause (1)(a) shall comply with Subsection 5.2.1.

(3) The design and construction required by Clause (1)(b) shall comply with Subsection 5.2.2., with regard to,
(a) materials, components and assemblies, and associated loads, that are identified in Part 4,
(b) air pressure loads imposed on *air barrier systems*,
(c) wind up-lift imposed on roofing, and
(d) hydrostatic pressure imposed on the means of protection from moisture in the ground.

(4) For materials, components, assemblies and loads to which Sentence (3) does not apply, the design and construction required by Clause (1)(b) shall,
(a) comply with Subsection 5.2.2. for individual applicable loads, or
(b) in the case of common materials, components and assemblies, and their installation, be based on proven past performance over a period of several years for individual applicable loads.

(See Appendix A.)

(5) Materials, components and assemblies separating dissimilar environments and assemblies exposed to the exterior, including their connections, that are subject to structural loads referred to in Article 5.2.2.1., shall,
(a) transfer such loads to the *building* structure without adverse effects on the performance of other materials, components or assemblies,
(b) not deflect to a degree that adversely affects the performance of other materials, components or assemblies, and (See Appendix A.)
(c) be designed, and constructed according to that design, to accommodate,
  (i) the maximum relative structural movement that may reasonably be expected, and
  (ii) construction tolerances that may reasonably be expected.

  (See Appendix A.)

5.1.4.2. Resistance to Deterioration (See Appendix A.)

(1) Except as provided in Sentence (2), materials used in *building* components and assemblies that separate dissimilar environments, or in assemblies exposed to the exterior, shall be,
(a) compatible with adjoining materials, and
(b) resistant to any mechanisms of deterioration that may reasonably be expected given,
  (i) the nature and function of the materials,
  (ii) the exposure of the materials, and
  (iii) the climatic conditions in which the materials will be installed.

(2) Material compatibility and deterioration resistance are not required where it can be shown that incompatibility or uncontrolled deterioration will not adversely affect any of,
(a) the health or safety of *building* users,
(b) the intended use of the *building*, or
(c) the operation of *building* services.

(3) Design and construction of assemblies separating dissimilar environments and assemblies exposed to the exterior shall be in accordance with good practice, such as described in CSA S478, "Guideline on Durability in Buildings".

5.1.5. Other Requirements

5.1.5.1. Requirements in Other Parts of the Code

(1) Structural and fire safety requirements in other Parts of the Code shall apply.

Section 5.2. Loads and Procedures

5.2.1. Environmental Loads and Design Procedures

5.2.1.1. Exterior Environmental Loads

(1) Above ground climatic loads shall be determined according to MMAH Supplementary Standard SB-1, "Climatic and Seismic Data".

(2) Except as provided in Sentence (3), below ground exterior environmental loads not described in MMAH Supplementary Standard SB-1, "Climatic and Seismic Data", shall be determined from existing geological and hydrological data or from site tests.

(3) Where local design and construction practice has shown *soil* temperature analysis to be unnecessary, *soil* temperatures need not be determined. (See Appendix A.)

5.2.1.2. Interior Environmental Loads

(1) Interior environmental loads shall be determined in accordance with good engineering practice as described in Sentence 6.2.1.1.(1) based on the intended use of the space. (See Appendix A.)

5.2.1.3. Environmental Load and Transfer Calculations

(1) Calculations related to the transfer of heat, air and moisture and the transmission of sound shall conform to good engineering practice such as that described in the ASHRAE Fundamentals Handbook.

(2) For the purposes of any analysis conducted to indicate conformance to the thermal resistance levels required in Article 5.3.1.2., *soil* temperatures shall be determined based on annual average *soil* temperature, seasonal amplitude of variation and attenuation of variation with depth.

(3) Wind load calculations shall conform to Subsection 4.1.7.

5.2.2. Structural Loads and Design Procedures

5.2.2.1. Determination of Structural Loads and Effects

(1) Where materials, components or assemblies that separate dissimilar environments or are exposed to the exterior, or their connections, are required to be designed for structural loads, these loads shall be determined in accordance with Part 4.

r3 **(2)** Except as provided in Article 4.1.8.18., the structural loads referred to in Sentence (1) and their related effects shall include,

(a) *dead loads* transferred from structural elements,
(b) wind, snow, rain, hydrostatic and earth pressures,
(c) earthquake effects for *post-disaster buildings*, depending on their intended function, (See Appendix A.)
(d) *live loads* due to use and *occupancy*, and
(e) loads due to thermal or moisture-related expansion and contraction, deflection, deformation, creep, shrinkage, settlement, and differential movement.

(3) Where materials, components or assemblies that separate dissimilar environments or are exposed to the exterior, or their connections, can be expected to be subject to loads or other effects not otherwise described in this Subsection or in Part 4, such loads or other effects shall be taken into account in the design based on the most current and applicable information available.

5.2.2.2. Determination of Wind Load (See Appendix A.)

(1) This Article applies to the determination of wind load to be used in the design of materials, components and assemblies, including their connections, that separate dissimilar environments or are exposed to the exterior, where these are,
(a) subject to wind load, and
(b) required to be designed to resist wind load.

(2) Except as provided in Sentence (3), the wind load referred to in Sentence (1) shall be 100% of the specified wind load determined in accordance with Article 4.1.7.1.

(3) Where it can be shown by test or analysis that a material, component, assembly or connection described in Sentence (1) will be subject to less than 100% of the specified wind load, the wind load referred to in Sentence (1) shall be not less than the load determined by test or analysis.

r11.1 **(4)** Except as provided in Sentence (5), the wind uplift resistance of membrane roofing assemblies shall be determined in accordance with the requirements of CSA A123.21, "Dynamic Wind Uplift Resistance of Membrane-Roofing Systems". (See Appendix A.)

r11.1 **(5)** Membrane roofing assemblies with proven past performance for the anticipated wind loads need not comply with Sentence (4).

5.2.2.3. Design Procedures

(1) Structural design shall be carried out in accordance with Subsection 4.1.3. and other applicable requirements in Part 4.

Section 5.3. Heat Transfer (See Appendix A.)

5.3.1. Thermal Resistance of Assemblies

5.3.1.1. Required Resistance to Heat Transfer (See Appendix A.)

(1) Except as provided in Sentence (2), where a *building* component or assembly will be subjected to an intended temperature differential, the component or assembly shall include materials to resist heat transfer or means to dissipate transferred heat in accordance with this Subsection.

(2) The installation of materials to resist heat transfer in accordance with this Subsection is not required where it can be shown that uncontrolled heat transfer will not adversely affect any of,
(a) the health or safety of *building* users,
(b) the intended use of the *building*, or
(c) the operation of *building* services.

5.3.1.2. Properties to Resist Heat Transfer (See Appendix A.)

(1) Materials and components installed to provide the required resistance to heat transfer or the means implemented to dissipate heat shall,

(a) provide sufficient resistance or dissipation,
  (i) to minimize surface condensation on the warm side of the component or assembly,
  (ii) in conjunction with other materials and components in the assembly, to minimize condensation within the component or assembly,
  (iii) in conjunction with systems installed for space conditioning, to meet the interior design thermal conditions for the intended *occupancy*, and
  (iv) to minimize ice damming on sloped roofs, and
(b) take into account the conditions on either side of the environmental separator.

(See Appendix A.)

5.3.1.3. Location and Installation of Materials Providing Thermal Resistance

(1) Where a material required by Article 5.3.1.1. is intersected by a *building* assembly, penetrated by a high conductance component or interrupted by expansion, control or construction joints, and where condensation is likely to occur at these intersections, penetrations or interruptions, sufficient thermal resistance shall be provided so as to minimize condensation at these locations.

(2) Materials providing required thermal resistance shall have sufficient inherent resistance to air flow or be positioned in the assembly so as to prevent convective air flow through and around the material. (See Appendix A.)

r11.1 **(3)** Reserved.

Section 5.4. Air Leakage

5.4.1. Air Barrier Systems

5.4.1.1. Required Resistance to Air Leakage (See Appendix A.)

(1) Where a *building* component or assembly separates interior *conditioned space* from exterior space, interior space from the ground, or environmentally dissimilar interior spaces, the properties and position of the materials and components in those components or assemblies shall be such that they control air leakage or permit venting to the exterior so as to,

(a) provide acceptable conditions for the *building* occupants,
(b) maintain appropriate conditions for the intended use of the *building*,
(c) minimize the accumulation of condensation in and penetration of precipitation into the *building* component or assembly,
(d) control heat transfer to roofs where ice damming can occur, and
(e) not compromise the operation of *building* services.

(2) Except as provided in Sentence (3), an *air barrier system* shall be installed to provide the principal resistance to air leakage.

(3) An *air barrier system* is not required where it can be shown that uncontrolled air leakage will not adversely affect any of,

(a) the health or safety of *building* users,
(b) the intended use of the *building*, or
(c) the operation of *building* services.

5.4.1.2. Air Barrier System Properties

(1) Except as provided in Sentence (2), materials intended to provide the principal resistance to air leakage shall,
r11.1 (a) have an air leakage characteristic not greater than 0.02 L/(s•m^2) measured at an air pressure difference of 75 Pa when tested in accordance with ASTM E2178, "Air Permeance of Building Materials", or
(b) conform to CAN/ULC-S741, "Air Barrier Materials – Specification".

(See Appendix A.)

(2) The air leakage limit specified in Sentence (1) is permitted to be increased where it can be shown that the higher rate of leakage will not adversely affect any of,
(a) the health or safety of *building* users,
(b) the intended use of the *building*, or
(c) the operation of *building* services.

(See Appendix A.)

(3) The *air barrier system* shall be continuous,
(a) across construction, control and expansion joints,
(b) across junctions between different *building* assemblies, and
(c) around penetrations through the *building* assembly.

(4) The structural design of *air barrier systems* installed in assemblies subject to air pressure loads shall comply with Article 5.1.4.1. and Subsection 5.2.2.

Section 5.5. Vapour Diffusion

5.5.1. Vapour Barriers

5.5.1.1. Required Resistance to Vapour Diffusion (See Appendix A.)

(1) Where a *building* component or assembly is subjected to differentials in temperature and water vapour pressure, the properties and position of the materials and components in those components or assemblies shall be such that they control vapour diffusion or permit venting to the exterior so as to minimize accumulation of condensation in the *building* component or assembly.

(2) Except as provided in Sentence (3), a *vapour barrier* shall be installed to provide the principal resistance to water vapour diffusion.

(3) A *vapour barrier* is not required where it can be shown that uncontrolled vapour diffusion will not adversely affect any of,
(a) the health or safety of *building* users,
(b) the intended use of the *building*, or
(c) the operation of *building* services.

5.5.1.2. Vapour Barrier Properties and Installation (See Appendix Note A-5.3.1.2.)

(1) The *vapour barrier* shall have sufficiently low permeance and shall be positioned in the *building* component or assembly so as to,
(a) minimize moisture transfer by diffusion, to surfaces within the assembly that would be cold enough to cause condensation at the design temperature and humidity conditions, or

(b) reduce moisture transfer by diffusion, to surfaces within the assembly that would be cold enough to cause condensation at the design temperature and humidity conditions, to a rate that will not allow sufficient accumulation of moisture to cause deterioration or otherwise adversely affect any of,
  (i) the health or safety of *building* users,
  (ii) the intended use of the *building*, or
  (iii) the operation of *building* services.

(See Appendix A.)

(2) Coatings applied to gypsum wallboard to provide required resistance to vapour diffusion shall conform to the requirements of Sentence (1) when tested in accordance with CAN/CGSB-1.501-M, "Method for Permeance of Coated Wallboard".

r5 **(3)** Coatings applied to materials other than gypsum wallboard to provide required resistance to vapour diffusion shall conform to the requirements of Sentence (1) when tested in accordance with ASTM E96 / E96M, "Water Vapor Transmission of Materials" by the desiccant method (dry cup).

Section 5.6. Precipitation

5.6.1. Protection from Precipitation

5.6.1.1. Required Protection from Precipitation (See Appendix A.)

(1) Except as provided in Sentence (2), where a *building* component or assembly is exposed to precipitation, the component or assembly shall,
(a) minimize ingress of precipitation into the component or assembly, and
(b) prevent ingress of precipitation into interior space.

(2) Protection from ingress of precipitation is not required where it can be shown that such ingress will not adversely affect any of,
(a) the health or safety of *building* users,
(b) the intended use of the *building*, or
(c) the operation of *building* services.

5.6.1.2. Installation of Protective Materials

r11.1 **(1)** Reserved.

r11.1 **(2)** Reserved.

(3) Where protective materials are applied to assemblies to provide the required protection from precipitation, the materials shall be installed so as to shed precipitation or otherwise minimize its entry into the assembly and prevent its penetration through the assembly. (See Appendix A.)

r11.1 **(4)** Where protective materials described in Sentence (3) are part of a vegetative roofing system, they shall be resistant to root and rhizome penetration when tested in accordance with ANSI/GRHC/SPRI VR-1, "Procedure for Investigating Resistance to Root Penetration on Vegetative Roofs". (See Appendix A.)

5.6.2. Sealing, Drainage, Accumulation and Disposal

5.6.2.1. Sealing and Drainage (See Appendix A.)

(1) Except as provided in Sentence (2), materials, components, assemblies, joints in materials, junctions between components and junctions between assemblies exposed to precipitation shall be,
(a) sealed to prevent ingress of precipitation, or
(b) drained to direct precipitation to the exterior.

(2) Sealing or drainage are not required where it can be shown that the omission of sealing and drainage will not adversely affect any of,
(a) the health or safety of *building* users,
(b) the intended use of the *building*, or
(c) the operation of *building* services.

5.6.2.2. Accumulation and Disposal

(1) Where water, snow or ice can accumulate on a *building*, provision shall be made to minimize the likelihood of hazardous conditions arising from such accumulation.

(2) Where precipitation can accumulate on sloped or horizontal assemblies, provision shall be made for drainage conforming with Section 7.4.

(3) Where downspouts are provided and are not connected to a sewer, provisions shall be made to,
(a) divert the water from the *building*, and
(b) prevent *soil* erosion.

(4) Junctions between vertical assemblies, and sloped or horizontal assemblies, shall be designed and constructed to minimize the flow of water from the sloped or horizontal assembly onto the vertical assembly.

5.6.2.3. Solar Collector Systems

(1) A solar collector system is permitted to be installed above roofing materials conforming to Table 5.10.1.1.

r11.1 Section 5.7. Surface and Ground Water (See Appendix A.)

5.7.1. Protection from Surface Water

5.7.1.1. Application

(1) This Subsection applies to the location of *buildings*, the grading of *building* sites, the directing of surface water away from *building* assemblies and the provision of means for drainage.

5.7.1.2. Required Protection

(1) The *building* shall be located, the *building* site shall be graded or surface water shall be directed away from *building* assemblies so as to,

(a) minimize the accumulation of surface water against the *building* in a manner that does not adversely affect adjacent *buildings* or properties, or

(b) accommodate the accumulation of surface water on the property in a manner that does not adversely affect the *building* or adjacent *buildings* or properties.

(2) Drainage shall be provided to direct surface water away from *building* assemblies separating interior space from the ground, except,

(a) where the *building* assembly is designed in accordance with Subsection 5.7.2. to withstand continuous hydrostatic pressure, or

(b) where it can be shown that the lack of drainage will not adversely affect any of,

(i) the health or safety of *building* users,

(ii) the intended use of the *building*, or

(iii) the operation of *building* services.

(See Appendix A.)

5.7.2. Protection from Hydrostatic Pressure

5.7.2.1. Application

(1) This Subsection applies to waterproofing materials, components, assemblies and systems applied to *building* assemblies that separate dissimilar environments and are subjected to hydrostatic pressure.

5.7.2.2. Design of Building Elements under Hydrostatic Loads

(1) Waterproofing materials, components, assemblies and systems described in Article 5.7.2.1. shall be designed in accordance with Subsection 5.1.4.

(2) The hydrostatic design loads shall be determined in accordance with Subsection 5.2.2.

5.7.2.3. Required Protection

(1) Waterproofing materials, components, assemblies and systems described in Article 5.7.2.1. shall comply with Article 5.7.3.2.

5.7.3. Protection from Ground Water

5.7.3.1. Application

(1) This Subsection applies to the protection of *building* assemblies that separate interior space from the ground.

5.7.3.2. Required Protection

(1) Except as provided in Sentence (2) and Article 5.7.3.4., *building* assemblies described in Article 5.7.3.1. shall be protected by waterproofing in accordance with Article 5.7.3.3. so as to minimize the ingress of ground water into the *building* or the accumulation of ground water against the *building*.

(2) Waterproofing is not required where it can be shown that,
(a) a *building* is designed to accommodate the ingress or accumulation of ground water, or
(b) the ingress or accumulation of ground water will not adversely affect any of,
(i) the health or safety of *building* users,
(ii) the intended use of the *building*, or
(iii) the operation of *building* services.

5.7.3.3. Waterproofing

(1) Waterproofing materials, components, assemblies or systems installed to provide the required protection shall form a continuous and impervious barrier to the ingress of ground water and be capable of accommodating,
(a) imperfections, construction joints, control joints and expansion joints, (See Appendix A.)
(b) junctions between different *building* assemblies, and
(c) elements penetrating *building* assemblies.

5.7.3.4. Where Dampproofing is Permitted

(1) Vertical *building* assemblies that separate interior space from the ground are permitted to be dampproofed where,
(a) the *building* assemblies are not subjected to hydrostatic pressure,
(b) the substrate is cast-in-place concrete, and
(c) a drainage layer is installed between the *building* assembly and the *soil*.

(See Appendix A.)

(2) Joints, junctions and penetrations shall be designed and constructed to maintain the continuity of the dampproofing.

r11.1 Section 5.8. Sound Transmission (See Appendix A.)

5.8.1. Protection from Airborne Noise

5.8.1.1. Required Protection

(1) Except as provided in Sentence (2), a *dwelling unit* shall be separated from every other space in a *building* in which noise may be generated by,
(a) a separating assembly and adjoining construction, which, together, provide an *apparent sound transmission class* rating not less than 47, or
(b) a separating assembly that provides a *sound transmission class* rating not less than 50 and adjoining construction that conforms to Article 9.11.1.4.

(2) Construction separating a *dwelling unit* from an elevator shaft or a refuse chute shall have an *STC* rating not less than 55.

5.8.1.2. Determination of Sound Transmission Ratings (See Appendix A.)

(1) The *STC* ratings of separating assemblies shall be determined in accordance with ASTM E413, "Classification for Rating Sound Insulation", using the results from measurements carried out in accordance with ASTM E90, "Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements".

(2) The *ASTC* ratings of separating assemblies and adjoining construction shall be,
(a) determined in accordance ASTM E413, "Classification for Rating Sound Insulation", using the results from measurements carried out in accordance with ASTM E336, "Measurement of Airborne Sound Attenuation Between Rooms in Buildings", or
(b) calculated in accordance with,
  (i) the detailed method described in Article 5.8.1.4., or
  (ii) the simplified method described in Article 5.8.1.5.

5.8.1.3. Compliance with Required Ratings

(1) Compliance with the required *STC* ratings shall be demonstrated through,
(a) measurements carried out in accordance with Sentence 5.8.1.2.(1), or
(b) the construction of separating assemblies conforming to Table 1 or 2 of MMAH Supplementary Standard SB-3, "Fire and Sound Resistance of Building Assemblies", as applicable.

(2) Compliance with the required *ASTC* ratings shall be demonstrated through,
(a) measurements or calculations carried out in accordance with Sentence 5.8.1.2.(2), or
(b) the construction of separating assemblies conforming to Table 1 or 2 of MMAH Supplementary Standard SB-3, "Fire and Sound Resistance of Building Assemblies", as applicable, that have an *STC* rating not less than 50 in conjunction with flanking assemblies constructed in accordance with Article 9.11.1.4.

5.8.1.4. Detailed Method for Calculating ASTC (See Appendix A.)

(1) This Article sets out the detailed method for calculating the *ASTC* ratings of separating assemblies and adjoining construction referred to in Subclause 5.8.1.2.(2)(b)(i).

(2) The sound transmission loss measured in accordance with ASTM E90, "Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements", shall be used in lieu of the sound reduction index required in ISO 15712-1, "Building Acoustics - Estimation of Acoustic Performance of Buildings From the Performance of Elements - Part 1: Airborne Sound Insulation Between Rooms".

(3) The vibration reduction index for the junctions between separating assemblies shall be,
(a) determined using the equations presented in Annex E of ISO 15712-1, "Building Acoustics - Estimation of Acoustic Performance of Buildings From the Performance of Elements - Part 1: Airborne Sound Insulation Between Rooms", or
(b) measured in accordance with Parts 1 to 4 of ISO 10848, "Acoustics - Laboratory Measurement of the Flanking Transmission of Airborne and Impact Sound Between Adjoining Rooms".

(4) The normalized flanking level difference shall be measured in accordance with Parts 1 to 4 of ISO 10848, "Acoustics - Laboratory Measurement of the Flanking Transmission of Airborne and Impact Sound Between Adjoining Rooms".

(5) The direct sound reduction index for the separating assembly in situ shall be determined from sound transmission loss in accordance with Clause (a) or (b), depending on the type of construction:
(a) for a lightweight separating wall or floor assembly with wood or steel framing, the index shall be taken as equal to the sound transmission loss, without correction,
(b) for a heavyweight separating wall or floor assembly of concrete or masonry, the index shall be determined in accordance with the detailed method for structure-borne transmission presented in ISO 15712-1, "Building Acoustics - Estimation of Acoustic Performance of Buildings From the Performance of Elements - Part 1: Airborne Sound Insulation Between Rooms".

(6) The flanking sound reduction index for each flanking path at each edge of the separating assembly shall be determined in accordance with Clause (a), (b) or (c), depending on the type of construction:

(a) for a lightweight separating wall or floor assembly with wood or steel framing and connected lightweight flanking assemblies with wood or steel framing, the index shall be taken as equal to the normalized flanking level difference re-normalized for the *ASTC* field situation in accordance with Annex F of ISO 15712-1, "Building Acoustics - Estimation of Acoustic Performance of Buildings From the Performance of Elements - Part 1: Airborne Sound Insulation Between Rooms",

(b) for a heavyweight separating wall or floor assembly of concrete or masonry and connected flanking assemblies of concrete or masonry, the index shall be determined in accordance with the detailed method for structure-borne transmission presented in ISO 15712-1, "Building Acoustics - Estimation of Acoustic Performance of Buildings From the Performance of Elements - Part 1: Airborne Sound Insulation Between Rooms",

(c) for a mixture of lightweight framed assemblies and heavyweight concrete or masonry assemblies, the index shall be determined in accordance with Clause (a) or (b).

(7) Once the pertinent indices and measurements referred to in Sentences (2) to (6) have been determined based on the type of construction, the apparent sound reduction index shall then be determined in accordance with ISO 15712-1, "Building Acoustics - Estimation of Acoustic Performance of Buildings From the Performance of Elements - Part 1: Airborne Sound Insulation Between Rooms".

(8) The *ASTC* rating shall be calculated in accordance with ASTM E413, "Classification for Rating Sound Insulation", using the apparent sound reduction index determined in Sentence (7), which shall be treated as equivalent to the values of apparent sound transmission loss measured in accordance with ASTM E336, "Measurement of Airborne Sound Attenuation between Rooms in Buildings".

5.8.1.5. Simplified Method for Calculating ASTC (See Appendix Note A-5.8.1.4.)

(1) This Article sets out the simplified method for calculating the *ASTC* ratings of separating assemblies and adjoining construction referred to in Subclause 5.8.1.2.(2)(b)(ii).

(2) The *STC* rating shall be used in lieu of the weighted sound reduction index required in ISO 15712-1, "Building Acoustics - Estimation of Acoustic Performance of Buildings From the Performance of Elements - Part 1: Airborne Sound Insulation Between Rooms".

(3) The vibration reduction index for the junctions between separating assemblies shall be,

(a) determined using the equations presented in Annex E of ISO 15712-1, "Building Acoustics - Estimation of Acoustic Performance of Buildings From the Performance of Elements - Part 1: Airborne Sound Insulation Between Rooms", or

(b) measured in accordance with Parts 1 to 4 of ISO 10848, "Acoustics - Laboratory Measurement of the Flanking Transmission of Airborne and Impact Sound Between Adjoining Rooms".

(4) The weighted normalized flanking level difference shall be determined in accordance with ASTM E413, "Classification for Rating Sound Insulation", using the results from measurements carried out in accordance with Parts 1 to 4 of ISO 10848, "Acoustics - Laboratory Measurement of the Flanking Transmission of Airborne and Impact Sound Between Adjoining Rooms".

(5) The direct weighted sound reduction index for the separating assembly shall be taken as equal to the *STC* rating, without correction.

(6) The weighted flanking sound reduction index for each flanking path at each edge of the separating assembly shall be determined in accordance with Clause (a) or (b), depending on the type of construction:

(a) for a lightweight separating wall or floor assembly with wood or steel framing and connected lightweight flanking assemblies with wood or steel framing, the index shall be taken as equal to the weighted normalized flanking level difference re-normalized for the *ASTC* field situation in accordance with Annex F of ISO 15712-1, "Building Acoustics - Estimation of Acoustic Performance of Buildings From the Performance of Elements - Part 1: Airborne Sound Insulation Between Rooms",

(b) for a heavyweight separating wall or floor assembly of concrete or masonry and connected flanking assemblies of concrete or masonry, the index shall be determined in accordance with the simplified method for structure-borne transmission presented in ISO 15712-1, "Building Acoustics - Estimation of Acoustic Performance of Buildings From the Performance of Elements - Part 1: Airborne Sound Insulation Between Rooms".

(7) Once the pertinent indices and measurements referred to in Sentences (2) to (6) have been determined based on the type of construction, the *ASTC* rating shall then be calculated in accordance with ISO 15712-1, "Building Acoustics - Estimation of Acoustic Performance of Buildings From the Performance of Elements - Part 1: Airborne Sound Insulation Between Rooms".

r11.1 Section 5.9. Reserved

Section 5.10. Standards

5.10.1. Applicable Standards

5.10.1.1. Compliance with Applicable Standards

(1) Except as provided in Sentence (2) and elsewhere in this Part, materials and components, and their installation, shall conform to the requirements of the applicable standards in Table 5.10.1.1. where those materials or components are,

(a) incorporated into environmental separators or assemblies exposed to the exterior, and

(b) installed to fulfill the requirements of this Part.

(See Appendix A.)

(2) The requirements for *flame-spread ratings* contained in thermal insulation standards shall be applied only as required in Part 3.

r11.1

Table 5.10.1.1.
Standards Applicable to Environmental Separators and Assemblies Exposed to the Exterior
Forming Part of Sentence 5.10.1.1.(1)

Issuing Agency	Document Number	Title of Document
ASME	ANSI/ASME B18.6.1	Wood Screws (Inch Series)
ASTM	A123 / A123M	Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products
ASTM	A153 / A153M	Zinc Coating (Hot-Dip) on Iron and Steel Hardware
ASTM	A653 / A653M	Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process
ASTM	C4	Clay Drain Tile and Perforated Clay Drain Tile
ASTM	C73	Calcium Silicate Brick (Sand-Lime Brick)
ASTM	C126	Ceramic Glazed Structural Clay Facing Tile, Facing Brick, and Solid Masonry Units
ASTM	C212	Structural Clay Facing Tile
ASTM	C412M	Concrete Drain Tile (Metric)
ASTM	C444M	Perforated Concrete Pipe (Metric)
ASTM	C553	Mineral Fiber Blanket Thermal Insulation for Commercial and Industrial Applications
ASTM	C612	Mineral Fiber Block and Board Thermal Insulation
ASTM	C700	Vitrified Clay Pipe, Extra Strength, Standard Strength and Perforated
ASTM	C726	Mineral Wood Roof Insulation Board
ASTM	C834(4)	Latex Sealants
ASTM	C840	Application and Finishing of Gypsum Board
ASTM	C920(4)	Elastomeric Joint Sealants
ASTM	C991	Flexible Fibrous Glass Insulation for Metal Buildings
ASTM	C1002	Steel Self-Piercing Tapping Screws for the Application of Gypsum Panel Products or Metal Plaster Bases to Wood Studs or Steel Studs
ASTM	C1177 / C1177M	Glass Mat Gypsum Substrate for Use as Sheathing
ASTM	C1178 / C1178M	Coated Glass Mat Water-Resistant Gypsum Board Backing Panel
ASTM	C1184(4)	Structural Silicone Sealants
ASTM	C1311(4)	Solvent Release Sealants
ASTM	C1330(4)	Cylindrical Sealant Backing for Use with Cold Liquid-Applied Sealants
ASTM	C1396 / C1396M(1)	Gypsum Board
ASTM	C1658 / C1658M(2)	Glass Mat Gypsum Panels
ASTM	D1227	Emulsified Asphalt Used as a Protective Coating for Roofing
ASTM	D2178 / D2178M	Asphalt Glass Felt Used in Roofing and Waterproofing
ASTM	D3019(3)	Lap Cement Used with Asphalt Roll Roofing, Non-Fibered, Asbestos-Fibered, and Non-Asbestos-Fibered
ASTM	D4479 / D4479M	Asphalt Roof Coating - Asbestos-Free
ASTM	D4637 / D4637M	EPDM Sheet Used in Single-Ply Roof Membrane
ASTM	D4811 / D4811M	Nonvulcanized (Uncured) Rubber Sheet Used as Roof Flashing
ASTM	D6878 / D6878M	Thermoplastic Polyolefin Based Sheet Roofing
ASTM	E2190	Insulating Glass Unit Performance and Evaluation
BNQ	BNQ3624-115	Polyethylene (PE) Pipe and Fittings - Flexible Pipes for Drainage - Characteristics and Test Methods
CGSB	CAN/CGSB-11.3-M	Hardboard
CGSB	CAN/CGSB-11.5-M	Hardboard, Precoated, Factory Finished, for Exterior Cladding
CGSB	CAN/CGSB-12.1-M	Tempered or Laminated Safety Glass
CGSB	CAN/CGSB-12.2-M	Flat, Clear Sheet Glass
CGSB	CAN/CGSB-12.3-M	Flat, Clear Float Glass
CGSB	CAN/CGSB-12.4-M	Heat Absorbing Glass
CGSB	CAN/CGSB-12.8	Insulating Glass Units
CGSB	CAN/CGSB-12.10-M	Glass, Light and Heat Reflecting
Column 1	2	3

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Table 5.10.1.1. (Cont'd)
Standards Applicable to Environmental Separators and Assemblies Exposed to the Exterior
Forming Part of Sentence 5.10.1.1.(1)

Issuing Agency	Document Number	Title of Document
CGSB	CAN/CGSB-12.11-M	Wired Safety Glass
CGSB	37-GP-9Ma	Primer, Asphalt, Unfilled, for Asphalt Roofing, Dampproofing and Waterproofing
CGSB	CAN/CGSB-37.50-M	Hot Applied, Rubberized Asphalt for Roofing and Waterproofing
CGSB	CAN/CGSB-37.54	Polyvinyl Chloride Roofing and Waterproofing Membrane
CGSB	37-GP-56M	Membrane, Modified, Bituminous, Prefabricated, and Reinforced for Roofing
CGSB	CAN/CGSB-37.58-M	Membrane, Elastomeric, Cold-Applied Liquid, for Non-Exposed Use in Roofing and Waterproofing
CGSB	CAN/CGSB-41.24	Rigid Vinyl Siding, Soffits and Fascia
CGSB	CAN/CGSB-51.32-M	Sheathing, Membrane, Breather Type
CGSB	CAN/CGSB-51.33-M	Vapour Barrier, Sheet, Excluding Polyethylene, for Use in Building Construction
CGSB	CAN/CGSB-51.34-M	Vapour Barrier, Polyethylene Sheet for Use in Building Construction
CGSB	CAN/CGSB-93.1-M	Sheet, Aluminum Alloy, Prefinished Residential
CGSB	CAN/CGSB-93.2-M	Prefinished Aluminum Siding, Soffits and Facsia for Residential Use
CGSB	CAN/CGSB-93.3-M	Prefinished Galvanized and Aluminum-Zinc Alloy Steel Sheet for Residential Use
CGSB	CAN/CGSB-93.4	Galvanized Steel and Aluminum-Zinc Alloy Coated Steel Siding, Soffits and Fascia, Prefinished, Residential
CSA	A23.1	Concrete Materials and Methods of Concrete Construction
CSA	CAN/CSA-A82	Fire Masonry Brick Made from Clay or Shale
CSA	CAN3-A93-M	Natural Airflow Ventilators for Buildings
CSA	A123.1 / A123.5	Asphalt Shingles Made from Organic Felt and Surfaced with Mineral Granules / Asphalt Shingles Made from Glass Felt and Surfaced with Mineral Granules
CSA	CAN/CSA-A123.2	Asphalt Coated Roofing Sheets
CSA	A123.3	Asphalt Saturated Organic Roofing Felt
CSA	CAN/CSA-A123.4	Asphalt for Constructing Built-Up Roof Coverings and Waterproofing Systems
CSA	A123.17	Asphalt Glass Felt Used in Roofing and Waterproofing
CSA	CAN3-A123.51-M	Asphalt Shingle Application on Roof Slopes 1:3 and Steeper
CSA	CAN3-A123.52-M	Asphalt Shingle Application on Roof Slopes 1:6 to Less than 1:3
CSA	A165.1	Concrete Block Masonry Units
CSA	A165.2	Concrete Brick Masonry Units
CSA	A165.3	Prefaced Concrete Masonry Units
CSA	A179	Mortar and Grout for Unit Masonry
CSA	CAN/CSA-A220 Series	Concrete Roof Tiles
CSA	A371	Masonry Construction for Buildings
CSA	A3001	Cementitious Materials for Use in Concrete
CSA	CAN/CSA-B182.1	Plastic Drain and Sewer Pipe and Pipe Fittings
CSA	G40.21	Structural Quality Steel
CSA	CAN/CSA-G401	Corrugated Steel Pipe Products
CSA	CAN/CSA-O80 Series	Wood Preservation
CSA	O118.1	Western Cedars Shakes and Shingles
CSA	O118.2	Eastern White Cedar Shingles
CSA	O121	Douglas Fir Plywood
CSA	O141	Softwood Lumber
CSA	O151	Canadian Softwood Plywood
CSA	O153	Poplar Plywood
CSA	O325	Construction Sheating
CSA	O437.0	OSB and Waferboard
Column 1	2	3

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Table 5.10.1.1. (Cont'd)
Standards Applicable to Environmental Separators and Assemblies Exposed to the Exterior
Forming Part of Sentence 5.10.1.1.(1)

Issuing Agency	Document Number	Title of Document
HPVA	ANSI/HPVA HP-1	Hardwood and Decorative Plywood
ULC	CAN/ULC-S701	Thermal Insulation, Polystyrene, Boards and Pipe Covering
ULC	CAN/ULC-S702	Mineral Fibre Thermal Insulation for Buildings
ULC	CAN/ULC-S703	Cellulose Fibre Insulation for Buildings
ULC	CAN/ULC-S704	Thermal Insulation, Polyurethane and Polyisocyanurate, Boards, Faced
ULC	CAN/ULC-S705.1	Thermal Insulation - Spray Applied Rigid Polyurethane Foam, Medium Density - Material - Specification
ULC	CAN/ULC-S705.2	Thermal Insulation - Spray Applied Rigid Polyurethane Foam, Medium Density - Application
ULC	CAN/ULC-S706	Wood Fibre Insulating Boards for Buildings
ULC	CAN/ULC-S710.1	Thermal Insulation - Bead-Applied One Component Polyurethane Air Sealant Foam, Part 1: Material Specification
ULC	CAN/ULC-S711.1	Thermal Insulation - Bead-Applied Two Component Polyurethane Air Sealant Foam, Part 1: Material Specification
Column 1	2	3

Notes to Table 5.10.1.1.:

(1) The *flame-spread rating* of gypsum board shall be determined in accordance with CAN/ULC-S102, "Test for Surface Burning Characteristics of Building Materials and Assemblies", in lieu of ASTM E84, "Surface Burning Characteristics of Building Materials", as indicated in ASTM C1396 / C1396M, "Gypsum Board".

(2) The *flame-spread rating* of glass mat gypsum panels shall be determined in accordance with CAN/ULC-S102, "Test for Surface Burning Characteristics of Building Materials and Assemblies", in lieu of ASTM E84, "Surface Burning Characteristics of Building Materials", as indicated in ASTM C1658 / C1658M, "Glass Mat Gypsum Panels".

(3) For the purpose of compliance with Part 5, ASTM D3019, "Lap Cement Used with Asphalt Roll Roofing, Non-Fibered, Asbestos-Fibered, and Non-Asbestos-Fibered", applies only with respect to non-fibered and non-asbestos-fibered (Types I and III) asphalt roll roofing.

(4) See Appendix A.

5.10.2. Windows, Doors and Skylights

5.10.2.1. General

(1) This Subsection applies to windows, doors and skylights, including their components, that separate,
(a) interior space from exterior space, or
(b) environmentally dissimilar interior spaces.

(2) For the purpose of this Subsection, the term "skylight" refers to unit skylights, roof windows and tubular daylighting devices.

(3) Where a wired glass assembly is installed in a required *fire separation*, it need not conform to the requirements of this Subsection. (See Appendix A.)

5.10.2.2. Applicable Standards (See Appendix A.)

(1) Windows, doors and skylights shall conform to the requirements in,
(a) AAMA/WDMA/CSA 101/I.S.2/A440, "NAFS – North American Fenestration Standard/Specification for Windows, Doors, and Skylights", and
(b) CSA A440S1, "Canadian Supplement to AAMA/WDMA/CSA 101/I.S.2/A440, NAFS – North American Fenestration Standard/Specification for Windows, Doors, and Skylights".

(2) Performance grades for windows, doors and skylights shall be selected according to the Canadian Supplement referenced in Clause (1)(b) so as to be appropriate for the conditions and geographic location in which the window, door or skylight will be installed.

(3) Windows, doors and skylights shall conform to the performance grades selected under Sentence (2) when tested in accordance with the standard referenced in Clause (1)(a).

5.10.2.3. Structural Loads, Air Leakage and Water Penetration

(1) Windows, doors, skylights and their components shall be designed and constructed in accordance with,
(a) Article 5.10.2.2., where they are covered in the scope of the standards listed in Sentence 5.10.2.2.(1), or
(b) Article 5.1.4.1. and Sections 5.4. and 5.6., in other cases.

(See Appendix A.)

5.10.2.4. Heat Transfer

(1) Windows, doors and skylights shall meet the heat transfer performance requirements in Section 5.3.

(2) Except as provided in Sentence (3), all metal-framed glazed assemblies separating interior *conditioned space* from interior unconditioned space or exterior space shall incorporate a thermal break to minimize condensation.

(3) Metal-framed glazed assemblies need not comply with Sentence (2) where these assemblies are,
(a) storm windows or doors, or
(b) windows or doors that are required to have a *fire-protection rating*.

(See Appendix A.)

r3.1 5.10.3. Exterior Insulation Finish Systems

5.10.3.1. Applicable Standards

(1) Where exterior insulation finish systems are installed, the systems and their components shall conform to,
(a) Article 5.1.4.1. and Sections 5.3. to 5.6., and
(b) CAN/ULC-S716.1, "Exterior Insulation and Finish Systems (EIFS) – Materials and Systems", if the systems are covered in the scope of that standard.

r11.1 5.10.4. Other Fenestration Assemblies

5.10.4.1. Definition

(1) In this Subsection,

Other fenestration assemblies means curtain walls, window walls, storefronts and glazed architectural structures.

5.10.4.2. Structural and Environmental Loads

(1) *Other fenestration assemblies* and their components shall be designed and constructed in accordance with Article 5.1.4.1.

5.10.4.3. Heat Transfer

(1) *Other fenestration assemblies* and their components shall meet the heat transfer performance requirements set out in Section 5.3.

(2) *Other fenestration assemblies* that are metal-framed and separate interior *conditioned space* from interior unconditioned space or exterior space shall incorporate a thermal break to minimize condensation.

5.10.4.4. Air Leakage

(1) *Other fenestration assemblies* and their components shall be designed and constructed in accordance with Section 5.4.

(2) Except as provided in Sentence (3), *other fenestration assemblies* and their components shall have an air leakage characteristic, measured at an air pressure difference of 75 Pa and tested in accordance with ASTM E283, "Determining Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen", that is not greater than,
(a) 0.2 L/(s•m^2) for fixed portions, including any opaque portions, and
(b) 1.5 L/(s•m^2) for operable portions.

(3) The following need not comply with Sentence (2):
(a) interior windows and interior doors that do not serve as environmental separators,
(b) vehicular access doors, including garage doors,
(c) storm windows and storm doors,
(d) commercial entrance systems,
(e) revolving doors,
(f) smoke and relief air vents,
(g) site-built door systems, and
(h) commercial steel doors.

5.10.4.5. Water Penetration

(1) *Other fenestration assemblies* and their components shall be designed and constructed in accordance with Section 5.6.

(2) Except as provided in Sentence (4), *other fenestration assemblies* and their components shall resist water penetration when tested in accordance with,
(a) ASTM E331, "Water Penetration of Exterior Windows, Skylights, Doors, and Curtain Walls by Uniform Static Air Pressure Difference", or
(b) ASTM E547, "Water Penetration of Exterior Windows, Skylights, Doors, and Curtain Walls by Cyclic Static Air Pressure Difference".

(3) Testing described in Sentence (2) shall be carried out at the driving rain wind pressure as calculated in accordance with CSA A440S1, "Canadian Supplement to AAMA/WDMA/CSA 101/I.S.2/A440-11, NAFS - North American Fenestration Standard/Specification for Windows, Doors, and Skylights".

(4) The following need not comply with Sentence (2):
(a) interior windows and interior doors,
(b) vehicular access doors, including garage doors,
(c) storm windows and storm doors,
(d) commercial entrance systems,
(e) revolving doors,
(f) smoke and relief air vents,
(g) site-built door systems, and
(h) commercial steel doors.

Part 6

Heating, Ventilating and Air-Conditioning

6.1. General

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Part 6

Heating, Ventilating and Air-Conditioning

Section 6.1. General (See Appendix A.)

6.1.1. Application

6.1.1.1. Scope

(1) The scope of this Part shall be as described in Subsection 1.1.2. of Division A.

(2) Where the method of operation of an existing heating, ventilating or *air-conditioning* system is altered, the repair or component replacements that change the capacity or extent of safety of the system shall conform to this Code. (See Appendix A.)

6.1.1.2. Application

(1) This Part applies to systems and equipment for heating, ventilating and *air-conditioning* services.

Section 6.2. Design and Installation

6.2.1. General

6.2.1.1. Good Engineering Practice

(1) Heating, ventilating and *air-conditioning* systems, including related mechanical refrigeration systems, shall be designed, constructed and installed to conform to good engineering practice appropriate to the circumstances such as described in,

(a) the ASHRAE Handbooks as follows:
  (i) Fundamentals,
  (ii) Refrigeration,
  (iii) HVAC Applications,
  (iv) HVAC Systems and Equipment, and
  (v) ANSI/ASHRAE/IESNA 90.1, "Energy Standard for Buildings Except Low-Rise Residential Buildings",

r3.1 (b) CSA F280, "Determining the Required Capacity of Residential Space Heating and Cooling Appliances", and the outside winter design temperatures shall conform to MMAH Supplementary Standard SB-1, "Climatic and Seismic Data",

r3 (c) CAN/CSA-F326-M, "Residential Mechanical Ventilation Systems",

(d) the NFPA Fire Codes,

(e) the HRAI Digest,

(f) the Hydronics Institute Manuals,

(g) the SMACNA Manuals,

r3 (h) ACGIH, "Industrial Ventilation Manual",

(i) CAN/CSA-Z317.2, "Special Requirements for Heating, Ventilation, and Air Conditioning (HVAC) Systems in Health Care Facilities",
r11.1 (j) reserved,
r11.1 (k) CCBFC NRCC 56191, "National Energy Code of Canada for Buildings", and
(l) EPA/625/R-92/016, "Radon Prevention in the Design and Construction of Schools and Other Large Buildings".

6.2.1.2. Design Indoor Air Temperatures

(1) *Buildings* classified as Group B, Division 2 or 3 *occupancies* or Group C *residential occupancies* that are intended for use in the winter months on a continuing basis shall be insulated and be equipped with heating facilities that are capable of maintaining an indoor air temperature of 22°C at the outside winter design temperature referred to in Article 6.2.1.7.

(2) All other *buildings* intended for occupancy in the winter months on a continuing basis should be insulated and shall be equipped with heating facilities to maintain a minimum indoor air temperature of 18°C or commensurate with the use of the *building* at the outside winter design temperature described in Article 6.2.1.7.

6.2.1.3. Structural Movement (See Appendix A.)

(1) Mechanical systems and equipment shall be designed and installed to accommodate the maximum relative structural movement provided for in the *construction* of the *building*.

6.2.1.4. Installation Standards

r5 **(1)** The installation of solid fuel-burning *appliances* for central heating systems shall comply with CSA B365, "Installation Code for Solid-Fuel-Burning Appliances and Equipment" and the manufacturer's installation instructions.

r5 **(2)** The solid fuel-fired *appliances* in Sentence (1) shall conform to CSA B366.1, "Solid-Fuel-Fired Central Heating Appliances".

r6 **(3)** The design and installation of earth energy systems shall conform to CAN/CSA-C448.2, "Design and Installation of Earth Energy Systems for Residential and Other Small Buildings", where such systems use groundwater, submerged heat exchangers or ground heat exchangers to serve,
(a) a *house*, or
(b) a *building*, other than a *house*, where the *conditioned space* is not more than 1 400 m^2.

r6 **(4)** Except for *houses*, the design and installation of earth energy systems shall conform to CAN/CSA-C448.1, "Design and Installation of Earth Energy Systems for Commercial and Institutional Buildings", where such systems use groundwater, submerged heat exchangers or ground heat exchangers to condition a floor space area more than 1 400 m^2.

r5 **(5)** The design and installation of solid fuel-burning *stoves*, ranges and *space heaters*, including the requirements for combustion air, shall conform to the requirements of CSA B365, "Installation Code for Solid-Fuel-Burning Appliances and Equipment" and the manufacturer's installation instructions.

(6) The design and installation of hydronic heating systems shall conform to,
r11.1 (a) CSA B214, "Installation Code for Hydronic Heating Systems", or
(b) good engineering practice appropriate to the circumstances such as described in Article 6.2.1.1.

r3 **(7)** Solid fuel-burning *stoves*, *furnaces* and hydronic heating systems designed to burn solid fuels, other than coal, shall conform to the particulate emission limits of,
(a) CSA B415.1, "Performance Testing of Solid-Fuel-Burning Heating Appliances", or
r11.1 (b) the "Standards of Performance for New Residential Wood Heaters", set out in Subpart AAA of Part 60 of Title 40 of the Code of Federal Regulations, published by the United States Environmental Protection Agency, as it read on March 16, 2015.
(See A-9.33.1.2.(2) in Appendix A.)

6.2.1.5. Fireplaces

(1) Fireplaces shall conform to the requirements of Section 9.22.

6.2.1.6. Heat Recovery Ventilators

(1) Except as provided in Sentence (2), heat recovery ventilators with rated capacities of not less than 25 L/s and not more than 200 L/s shall be installed in accordance with Article 9.32.3.11.

r11.1 **(2)** Where *electric space heating*, other than forced-air electric heating system, is provided in *buildings* of *residential occupancy* within the scope of Part 9, the mechanical ventilation system shall include heat recovery ventilators designed to provide a minimum 55% sensible heat recovery efficiency when tested to the low temperature thermal and ventilation performance test method set out in CAN/CSA-C439, "Rating the Performance of Heat/Energy-Recovery Ventilators", at a Station 1 test temperature of -25°C at an air flow not less than 30 L/s.

6.2.1.7. Outside Design Conditions

(1) The outside conditions to be used in designing heating, ventilating and *air-conditioning* systems shall be determined in conformance with MMAH Supplementary Standard SB-1, "Climatic and Seismic Data".

6.2.1.8. Installation – General

(1) Equipment requiring periodic maintenance and forming part of a heating, ventilating or *air-conditioning* system shall be installed with provision for access for inspection, maintenance, repair and cleaning. (See Appendix A.)

(2) Mechanical equipment shall be provided with guards to prevent injury.

(3) Heating, ventilating or *air-conditioning* systems shall be protected from freezing if they may be adversely affected by freezing temperatures.

6.2.1.9. Expansion, Contraction and System Pressure

(1) Heating and cooling systems shall be designed to allow for expansion and contraction of the heat transfer fluid and to maintain the system pressure within the rated working pressure limits of all components of the system.

6.2.1.10. Asbestos

r11.1 **(1)** Asbestos shall not be used in heating, ventilating or *air-conditioning* systems or equipment.

6.2.1.11. Access Openings

(1) Any covering of an access opening through which a person could enter shall be openable from the inside without the use of keys where there is a possibility of the opening being accidentally closed while the system or equipment is being serviced.

6.2.1.12. Combustible Tubing

(1) *Combustible* tubing for pneumatic controls may be used in *buildings* required to be of *noncombustible construction* provided it has an outside diameter not exceeding 10 mm.

6.2.2. Ventilation

6.2.2.1. Required Ventilation

(1) Except as provided in Sentence (3), all *buildings* shall be ventilated in accordance with this Part.

(2) Except in *storage garages* and *repair garages* covered by Article 6.2.2.3., the rates at which outdoor air is supplied in *buildings* by ventilation systems shall be not less than the rates required by ANSI/ASHRAE 62.1, "Ventilation for Acceptable Indoor Air Quality". (See Appendix A.)

r6 **(3)** Self-contained mechanical ventilation systems serving a *house* or an individual *dwelling unit* shall conform to,
(a) this Part, or
(b) Subsection 9.32.3.

(See Appendix A.)

(4) *Live/work units* shall be mechanically ventilated in accordance with the requirements of Sentence (1).

6.2.2.2. Natural Ventilation

(1) Except as permitted by Sentence (2), the ventilation required by Article 6.2.2.1. shall be provided by mechanical ventilation except that it can be provided by natural ventilation or a combination of natural and mechanical ventilation in,
(a) *buildings* of other than *residential occupancy* having an *occupant load* of not more than one person per 40 m^2 during normal use,
(b) *buildings* of *industrial occupancy* where the nature of the process contained in them permits or requires the use of large openings in the *building* envelope even during the winter, or
(c) seasonal *buildings* not intended to be occupied during the winter.

(2) Where climatic conditions permit, *buildings* containing *occupancies* other than *residential occupancies*, may be ventilated by natural ventilation methods in lieu of mechanical ventilation where engineering data demonstrates that such a method will provide the required ventilation for the type of *occupancy*.

6.2.2.3. Ventilation of Storage and Repair Garages

(1) Except as provided in Sentences (4) and (6), an enclosed *storage garage* shall have a mechanical ventilation system designed to,
(a) limit the concentration of carbon monoxide to not more than 100 parts per million of air when measured between 900 mm and 1 800 mm from the floor, where the majority of the vehicles stored are powered by gasoline fuelled engines,
(b) limit the concentration of nitrogen dioxide to not more than 3 parts per million parts of air when installed in accordance with manufacturer's instructions, where the majority of the vehicles stored are powered by diesel fuelled engines, or
(c) provide, during operating hours, a continuous supply of outdoor air at a rate of not less than 3.9 L/s for each square metre of floor area.

(See Appendix A.)

(2) Mechanical ventilation systems provided in accordance with Clause (1)(a) shall be controlled automatically by carbon monoxide monitoring devices and systems provided in accordance with Clause (1)(b) shall be controlled automatically by nitrogen dioxide or other acceptable monitoring devices, located so as to provide full protection throughout the *storage garage*. (See Appendix A.)

(3) Mechanical ventilation systems provided in accordance with Sentence (1) shall be designed such that the pressure in the *storage garage* is less than the pressure in adjoining *buildings* of other *occupancy*, or in adjacent portions of the same *building* having a different *occupancy*.

(4) In *storage garages* subject to the requirements of Sentence (1), where motor vehicles are parked by mechanical means, the ventilation requirements may be reduced by one half.

(5) Except as provided in Sentence (6), ticket and attendant booths of *storage garages* shall be pressurized with a supply of outdoor air.

(6) The requirements of Sentences (1) to (5) shall not apply to *open-air storeys* in a *storage garage*.

(7) A *repair garage* shall have a mechanical ventilation system designed to limit the exposure of workers to,
(a) carbon monoxide to below the time weighted average concentration of 25 parts per million for a normal 8 hour workday or 40 hour work week, and
(b) nitrogen dioxide from diesel powered vehicles to below 0.72 parts per million for a normal 8 hour workday or 40 hour work week.

(8) In a *repair garage*, when a repair bay is not immediately adjacent to an outside garage door opening, a system capable of providing continuous general ventilation of not less than 700 L/s per internal bay shall be provided.

(9) The general ventilation system described in Sentence (8) shall be designed to,
(a) operate continuously, or
(b) be controlled automatically by carbon monoxide monitoring devices, located so as to provide full protection throughout the *repair garage*.

(10) The general ventilation system described in Sentence (8) is not required when tail pipes of vehicles are directly connected to local mechanical exhaust systems that terminate outdoors.

e8 ## 6.2.2.4. Indoor Air Contaminants (See Appendix A.)

r11.1 **(1)** Air contaminants released within *buildings* shall be removed insofar as possible at their points of origin and shall not be permitted to accumulate in concentrations greater than permitted by good engineering practice appropriate to the circumstances such as that described in the publications listed in Article 6.2.1.1." (See Appendix A.)

r11.1 **(2)** Systems serving spaces that contain sources of contamination and systems serving other occupied parts of the *building* but located in or running through spaces that contain sources of contamination shall be designed in such a manner as to prevent the spread of such contamination to other occupied parts of the *building*. (See Appendix A.)

r11.1 **(3)** Heating, ventilating and *air-conditioning* systems shall be designed to minimize growth and spread of bio-contaminants.

r11.1 **(4)** Mechanical rooms containing refrigeration equipment shall be ventilated in accordance with CSA B52, "Mechanical Refrigeration Code".

6.2.2.5. Hazardous Gases, Dusts or Liquids

r11.1 **(1)** Except as provided in Subsection 6.2.13., systems serving spaces that contain hazardous gases, dusts or liquids shall be designed, constructed and installed in conformance with the provisions of the Fire Code made under the *Fire Protection and Prevention Act, 1997*, or in the absence of requirements pertinent to such systems in the Fire Code, to good engineering practice such as is described in the publications of the National Fire Protection Association and in the CCBFC NRCC 56192, "National Fire Code of Canada". (See Appendix A.)

(2) When indoor piping for Class I *flammable liquids* is installed in a trench, the trench shall be,
(a) provided with positive ventilation to the outdoors, or
(b) designed to prevent the accumulation of flammable vapours.

6.2.2.6. Commercial Cooking Equipment

r11.1 **(1)** Except as provided in Article 3.6.3.5., all commercial cooking equipment shall be provided with ventilation systems designed, constructed and installed to conform to NFPA 96, "Ventilation Control and Fire Protection of Commercial Cooking Operations".

(2) Fire protection systems for high efficiency, high temperature commercial cooking equipment using vegetable oil or animal fat shall conform to,

r5 (a) ANSI/UL 300, "Fire Extinguishing Systems for Protection of Commercial Cooking Equipment", or

(b) ULC/ORD-C1254.6, "Fire Testing of Restaurant Cooking Area Fire Extinguishing System Units".

6.2.2.7. Crawl Spaces and Attic or Roof Spaces

(1) Every crawl space and every *attic or roof space* shall be ventilated by natural or mechanical means. (See Appendix A.)

6.2.3. Air Duct Systems

6.2.3.1. Application

(1) Except as provided in Sentence (2), this Subsection applies to the design, construction and installation of air duct distribution systems serving heating, ventilating and *air-conditioning* systems.

r6 **(2)** This Subsection does not apply to the design, construction and installation of air duct distribution systems serving heating, ventilating and *air-conditioning* systems that serve a *house* or an individual *dwelling unit* within the scope of Part 9.

r11.1 6.2.3.1A. Drain Pans

(1) Dehumidifying cooling coil assemblies and condensate-producing heat exchangers shall be equipped with drain pans beneath them that are,

(a) designed in accordance with Section 5.11, Drain Pans, of ANSI/ASHRAE 62.1, "Ventilation for Acceptable Indoor Air Quality",

(b) provided with an outlet that is piped to the outside of the airstream in a location where condensate can be eliminated,

(c) installed so that water drains freely from the pan, and

(d) provided with a drain line that is *indirectly connected* to a *drainage system* in accordance with Article 7.4.2.1.

6.2.3.2. Materials in Air Duct Systems

r11.1 **(1)** Except as provided in Sentences (2) to (4) and in Article 3.6.4.3., all ducts, duct connectors, associated fittings and *plenums* used in air duct systems shall be constructed of steel, aluminum alloy, copper, clay or similar *noncombustible* material.

(2) Ducts, associated fittings and *plenums* are permitted to contain *combustible* material provided they,

(a) conform to the appropriate requirements for Class 1 duct materials in CAN/ULC-S110, "Test for Air Ducts",

(b) conform to Article 3.1.5.15. in a *building* required to be of *noncombustible construction*,

(c) conform to Subsection 3.1.9.,

(d) are used only in horizontal runs in a *building* required to be of *noncombustible construction*,

(e) are not used in vertical runs serving more than 2 *storeys* in a *building* required to be of *noncombustible construction*, and

(f) are not used in air duct systems in which the air temperature may exceed 120°C.

(3) Duct sealants shall have a *flame-spread rating* of not more than 25 and a smoke developed classification of not more than 50.

(4) Duct connectors that contain *combustible* materials and that are used between ducts and air outlet units shall,
(a) conform to the appropriate requirements for Class 1 air duct materials in CAN/ULC-S110, "Test for Air Ducts",
(b) be limited to 4 m in length,
(c) be used only in horizontal runs, and
(d) not penetrate required *fire separations*.

(5) Materials in Sentences (1) to (4) installed in a location where they may be subjected to excessive moisture shall have no appreciable loss of strength when wet and shall be corrosion-resistant.

(6) All ductwork and fittings shall be constructed and installed in conformance with SMACNA Manuals and ASHRAE Handbooks.

(7) All duct materials and fittings shall be,
(a) suitable for exposure to the temperature and humidity of the air being conveyed, and
(b) resistant to corrosion due to contaminants in the air being conveyed in the duct.

6.2.3.3. Connections and Openings in Air Duct Systems

(1) Air duct systems shall have,
(a) tight-fitting connections throughout, and
(b) no openings other than those required for proper operation, inspection and maintenance of the system.

(2) Access openings shall be provided in duct systems to allow the removal of material that may accumulate in *plenums* and ducts.

6.2.3.4. Duct Coverings, Linings, Adhesives and Insulation (See Appendix A.)

(1) Coverings, linings and associated adhesives and insulation of air ducts, *plenums* and other parts of air duct systems shall be of *noncombustible* material when exposed to heated air or radiation from heat sources that would result in the exposed surface exceeding a temperature of 120°C.

(2) When *combustible* coverings and linings, including associated adhesives and insulation, are used, they shall have a *flame-spread rating* of not more than 25 on any exposed surface or any surface that would be exposed by cutting through the material in any direction, and a smoke developed classification of not more than 50, except that the outer covering of ducts, *plenums* and other parts of air duct systems used within an assembly of *combustible construction* may have an exposed surface *flame-spread rating* of not more than 75 and may have a smoke developed classification greater than 50.

(3) *Combustible* coverings and linings in Sentence (2) shall not flame, glow, smoulder or smoke when tested in accordance with the method of test in ASTM C411, "Hot-Surface Performance of High-Temperature Thermal Insulation" at the maximum temperature to which the coverings and linings are to be exposed in service.

(4) Except as provided in Sentence (5), foamed plastic insulation shall not be used as part of an air duct or for insulating an air duct.

r11.1 **(5)** Foamed plastic insulation may be used in a ceiling space that acts as a return air *plenum* provided the foamed plastic insulation is protected from exposure to the *plenum* in accordance with Article 3.1.5.12A.

(6) *Combustible* coverings and linings of ducts, including associated adhesives and insulation, shall be interrupted at the immediate area of operation of heat sources in a duct system, such as electric resistance heaters or fuel-burning heaters or *furnaces*, and where the duct penetrates a *fire separation*.

(7) Linings of ducts shall be installed so that they will not interfere with the operation of volume or balancing dampers, *fire dampers*, *fire stop flaps* and other closures.

6.2.3.5. Underground Ducts

(1) Underground ducts shall,
(a) be constructed and installed with a slope to provide interior drainage to all low points,
(b) not be connected directly to a sewer, and
(c) be installed and constructed of materials in conformance with ASHRAE Handbooks, SMACNA Manuals and the HRAI Digest.

(2) A clean-out or pump-out connection shall be provided in an underground duct system at every low point of the duct system.

6.2.3.6. Fire Dampers

(1) *Fire dampers* shall conform to the requirements of Subsection 3.1.8.

6.2.3.7. Smoke Detector Control

(1) Air handling systems shall incorporate *smoke detector* control where required by Article 3.2.4.13.

6.2.3.8. Exhaust Ducts and Outlets

(1) Except as provided in Sentence (2), *exhaust ducts* of nonmechanical ventilating systems serving separate rooms or spaces shall not be combined.

(2) *Exhaust ducts* of nonmechanical ventilating systems serving similar *occupancies* may be combined immediately below the point of final delivery to the outside, such as at the base of a roof ventilator.

(3) *Exhaust ducts* of ventilating systems shall have provision for the removal of condensation where this may be a problem.

(4) Exhaust outlets shall be designed to prevent back draft under wind conditions.

(5) Except as permitted in Sentence (6), exhaust systems shall discharge directly to the outdoors. (See Appendix A.)

r3 **(6)** Auxiliary rooms, mechanical rooms or storage rooms are permitted to be ventilated into a *storage garage*, provided that,
(a) they are accessible only from that *storage garage*,
(b) they have no openings or duct penetrations through the walls separating the room from adjacent spaces other than that *storage garage* and other auxiliary, mechanical or storage rooms,
(c) the exhaust contains no contaminants that would adversely affect the air quality in the *storage garage*, and (See Appendix A.)
(d) they are provided with,
  (i) carbon monoxide monitoring devices in accordance with Sentences 6.2.2.3.(1) and (2), or
  (ii) a light switch which is interlocked with the operation of the exhaust fan serving the room.

(See Appendix A.)

(7) *Exhaust ducts* connected to laundry drying equipment shall be,
(a) independent of other *exhaust ducts*,
(b) designed and installed so that the entire duct can be cleaned, and
(c) constructed of smooth corrosion-resistant material.

(See Appendix A.)

(8) Except as provided in Sentence (10) and except for self-contained systems serving individual *dwelling units*, *exhaust ducts* serving rooms containing water closets, urinals, basins, showers or slop sinks shall be independent of other *exhaust ducts*.

(9) Except as provided in Sentence (10) and except for self-contained systems serving individual *dwelling units*, *exhaust ducts* serving rooms containing residential cooking equipment shall be independent of other *exhaust ducts*.

(10) Two or more exhaust systems described in Sentences (8) and (9) may be interconnected or connected with *exhaust ducts* serving other areas of the *building* provided,
(a) the connections are made at the inlet of an exhaust fan, and all interconnected systems are equipped with suitable back pressure devices to prevent passage of odours from one system to another when the fan is not in operation, or
(b) the *exhaust ducts* discharge to a shaft that is served by an exhaust fan having a capacity that is equal to or greater than the combined capacity of the exhaust fans discharging to the *plenum* multiplied by the operation diversity factor, provided that the exhaust fan serving the shaft operates continuously. (See Appendix A.)

(11) Where *exhaust ducts* containing air from *conditioned spaces* pass through or are adjacent to unconditioned spaces, the ducts shall be constructed to prevent condensation from forming inside or outside of the ducts.

(12) Where an *exhaust duct* system is used for smoke removal in a high *building*, the requirements of Article 3.2.6.6. shall apply.

(13) Where *exhaust duct* systems from more than one *fire compartment* are connected to an *exhaust duct* in a *vertical service space*, the requirements of Article 3.6.3.4. shall apply.

(14) Except as provided in Sentence (15), exhaust air shall be provided at a rate not less than 24 L/s for each water closet, urinal, shower or slop sink.

(15) Except as provided in Sentence 6.2.2.1.(3), exhaust air shall be provided for *fixtures* in *dwelling units* in accordance with ANSI/ASHRAE 62.1, "Ventilation for Acceptable Indoor Air Quality".

(16) Except for wash basins (lavatories), sanitary facilities in a *food premises* shall be mechanically ventilated and shall be capable of exhausting air at the rate of not less than 24 L/s for each sanitary fixture listed in Sentence (17).

(17) The mechanical ventilation described in Sentence (16) applies to rooms containing water closets, urinals, basins, showers or slop sinks.

(18) Where collective venting of multiple installations of laundry-drying equipment is used, the ventilation system shall,
(a) be connected to a common *exhaust duct* that is vented by one central exhaust fan,
(b) incorporate one central lint trap,
(c) include an interlock to activate the central exhaust fan when laundry-drying equipment is in use, and
(d) be provided with make-up air.

(See Appendix Note A-6.2.3.8.(7))

(19) *Exhaust ducts* or vents connected to laundry-drying equipment shall discharge directly to the outdoors.

6.2.3.9. Interconnection of Systems

(1) In a *residential occupancy*, air from one *suite* shall not be circulated to any other *suite* or to a *public corridor* or public stairway.

(2) Except as permitted by Sentence (3) and Sentence 6.2.3.8.(6), air duct systems serving *storage garages* shall not be directly interconnected with ductwork serving other areas of the *building*.

(3) Where *exhaust ducts* are provided in conformance with Sentence 6.2.3.8.(6), they may exhaust through an enclosed *storage garage* prior to exhausting to the outdoors provided,

(a) the *storage garage* exhaust system runs continuously,

(b) the capacity of the *storage garage* exhaust system is equal to or exceeds the volume of the exhaust entering the garage, and

r5 (c) a leakage rate 1 smoke/*fire damper* rated in accordance with CAN/ULC-S112.1, "Leakage Rated Dampers for Use in Smoke Control Systems", is provided near the duct outlet location in the *storage garage* to prevent air from the *storage garage* from entering the exhaust ductwork system in the event the *building's* exhaust fan is shut down.

(4) Except for corridors conforming to Sentence 3.3.1.4.(4) or as permitted in Sentences (5) and (6), a *public corridor* or corridor serving the public shall not be used as a portion of a supply, return or exhaust air system serving adjoining areas, other than as part of a supply air system serving toilet rooms, bathrooms, shower rooms and similar auxiliary spaces opening directly to the *public corridor* or corridor used by the public.

(5) A *public corridor* may be used as part of an engineered smoke control system.

(6) Infiltration due to corridor pressurization is permitted into a *residential occupancy* from a *public corridor*.

6.2.3.10. Ducts in Exits

(1) Except as permitted in Sentence (2), duct penetration of *fire separations* separating *exits* from the remainder of the *building* shall be in accordance with Article 3.4.4.4.

(2) Duct penetration of *fire separations* separating *exits* from the remainder of the *building* is permitted if the duct,

(a) is designed for the purposes of Subsection 3.2.6., or

(b) only serves the *exit* from a dedicated roof top air make-up unit.

6.2.3.11. Make-up Air

(1) In ventilating systems that exhaust air to the outdoors, provision shall be made for the admission of a supply of make-up air in sufficient quantity so that the operation of the exhaust system and other exhaust equipment or combustion equipment is not adversely affected.

(2) Make-up air facilities required by Sentence (1) shall be interlocked with the exhaust devices they serve so that both operate together.

(3) Where make-up air facilities are intended to introduce air directly from the outdoors to occupied parts of the *building* in winter, they shall incorporate means of tempering that air to maintain the indoor design temperature.

6.2.3.12. Supply, Return, Intake and Exhaust Air Openings (See Appendix A.)

(1) Supply, return and exhaust air openings located less than 2 000 mm above the floor in rooms or spaces in *buildings* shall be protected by grilles having openings of a size that will not allow the passage of a 15 mm diameter sphere.

(2) Outdoor air intakes and exhaust outlets on the exterior of *buildings* shall be designed or located so that the air entering the *building* system will not contain more contaminants than the normal exterior air of the locality in which the *building* is situated.

(3) Exterior openings for outdoor air intakes and exhaust outlets shall be shielded from the entry of snow and rain and shall be fitted with corrosion-resistant screens of mesh having openings not larger than 15 mm, except where experience has shown that climatic conditions require larger openings to avoid icing over of the screen openings.

(4) Screens required in Sentence (3) shall be accessible for maintenance.

(5) *Combustible* grilles, diffusers and other devices for supply, return and exhaust air openings in rooms shall conform to the *flame-spread rating* and smoke developed classification requirements for the interior finish of the surface on which they are installed.

r11.1 **(6)** Outdoor air intakes shall be located so that they are separated a minimum distance from sources of contaminants in accordance with Table 6.2.3.12.

Table 6.2.3.12.
Minimum Separation Distances Between Exhaust and Air Intake Openings
Forming Part of Sentence 6.2.3.12.(6)

Location	Minimum Separation Distance, m
Garage entry of a garage for 5 or more motor vehicles, automobile loading area and drive-in queue	4.5
Truck loading area or dock, and bus parking	7.6
Driveway, parking space, lane, road and similar locations that carry a low volume of traffic	1.5
Thoroughfare, arterial road, freeway, highway and similar locations that carry a high volume of traffic	7.6
Garbage storage/pick-up area and dumpsters	4.5
Discharge from evaporative cooling tower, evaporative fluid cooler and evaporative condenser	7.6
Sanitary vent	3.5
Kitchen exhaust outlet	3.0
Vent for combustion products from solid fuel-burning *appliances*	3.0
Column 1	2

6.2.3.13. Filters and Odour Removal Equipment

r11.1 **(1)** Air filters for air duct systems shall conform to the requirements for Class 2 air filter units as described in CAN/ULC-S111, "Fire Tests for Air Filter Units".

(2) When electrostatic-type filters are used, they shall be installed so as to ensure that the electric circuit is automatically de-energized when filter access doors are opened and, in *dwelling units*, when the system circulating fan is not operating.

(3) When odour removal equipment of the adsorption type is used it shall be,
(a) installed to provide access so that adsorption material can be reactivated or renewed, and
(b) protected from dust accumulation by air filters installed on the inlet side.

(4) Facilities for flushing and drainage shall be provided where filters are designed to be washed in place.

r11.1 6.2.3.14. Evaporative Cooling Towers, Evaporative Fluid Coolers and Evaporative Condensers

(1) Discharge from evaporative cooling towers to ventilation air intakes shall comply with CAN/CSA-Z317.2, "Special Requirements for Heating, Ventilation, and Air Conditioning (HVAC) Systems in Health Care Facilities".

(2) The distance between the air intakes of evaporative cooling towers, evaporative fluid coolers and evaporative condensers in relation to kitchen exhaust outlets, vegetation or other sources of organic matter shall be not less than 4.6 m.

(3) Evaporative cooling towers, evaporative fluid coolers and evaporative condensers shall be provided with water treatment equipment for biological growth control in accordance with Subsection 7.6.2. of ASHRAE Guideline 12, "Minimizing the Risk of Legionellosis Associated with Building Water Systems".

(4) Evaporative cooling towers, evaporative fluid coolers and evaporative condensers shall be provided with access ports, service platforms, fixed ladders and restraint connections to allow visual inspection, maintenance and testing.

(5) Evaporative cooling towers shall comply with the requirements of NFPA 214, "Water-Cooling Towers".

r11.1 6.2.3.14A. Evaporative Cooling Sections, Evaporative Air Coolers, Misters, Atomizers, Air Washers and Humidifiers

(1) The filter and water evaporation medium of every air washer and evaporative cooling section enclosed within a *building* shall be made of *noncombustible* material.

(2) Sumps for air washer and evaporative cooling sections shall be constructed and installed so that they can be flushed and drained.

(3) Evaporative air coolers, misters, atomizers, air washers and humidifiers shall be designed in accordance with Sections 8 and 9 of ASHRAE Guideline 12, "Minimizing the Risk of Legionellosis Associated with Building Water Systems".

(4) Evaporative cooling sections shall comply with the requirements of NFPA 214, "Water-Cooling Towers".

6.2.3.15. Fans and Associated Air Handling Equipment

(1) Fans for heating, ventilating and *air-conditioning* systems shall be located and installed so that their operation,
(a) does not adversely affect the draft required for proper operation of fuel-fired *appliances*, and
(b) does not allow the air in the air duct system to be contaminated by air or gases from the *boiler*-room or *furnace*-room.

(2) Fans and associated air handling equipment, such as air washers, filters and heating and cooling units, when installed on the roof or elsewhere outside the *building*, shall be of a type designed for outdoor use.

6.2.3.16. Vibration Isolation Connectors

(1) Vibration isolation connectors in air duct systems shall be *noncombustible*, except that *combustible* fabric connectors are permitted provided they,
(a) do not exceed 250 mm in length,
(b) comply with the flame-resistance requirements of CAN/ULC-S109, "Flame Tests of Flame-Resistant Fabrics and Films", and
(c) are not used in a location where they are exposed to heated air or radiation from heat sources that may cause the exposed surface to exceed a temperature of 120°C.

6.2.3.17. Tape

(1) Tape used for sealing joints in air ducts, *plenums* and other parts of air duct systems shall meet the flame-resistance requirements for fabric in CAN/ULC-S109, "Flame Tests of Flame-Resistant Fabrics and Films".

6.2.3.18. Construction and Installation of Ducts and Plenums

(1) Rectangular panels in *plenums* and ducts more than 300 mm wide shall be shaped to provide sufficient stiffness.

(2) Where the installation of heating *supply ducts* in walls and floors creates a space between the duct and construction material, the space shall be fire stopped with *noncombustible* material at each end.

(3) Ducts shall be securely supported by metal hangers, straps, lugs or brackets, except that where zero clearance is permitted, wooden brackets may be used.

(4) All round duct joints shall be tight-fitting and lapped not less than 25 mm.

(5) Rectangular duct connections shall be made with S and drive cleats.

(6) Trunk *supply ducts* shall not be nailed directly to wood members.

(7) Branch ducts shall be supported at suitable spacings to maintain alignment and prevent sagging.

(8) Ducts in or beneath concrete slabs-on-ground shall be watertight, corrosion-, decay- and mildew-resistant.

(9) Where a *supply* or *return duct* is not protected by an insulated exterior wall or where the duct is exposed to an unheated space it shall be insulated to prevent condensation.

6.2.3.19. Clearances of Ducts and Plenums

(1) The clearances from *combustible* material and supply *plenums*, *supply ducts*, boots and register boxes of heating systems shall conform to the requirements of Subsection 6.2.4.

6.2.3.20. Return-Air System

(1) The return-air system shall be designed to handle the entire air supply.

(2) Where any part of a *return duct* will be exposed to radiation from the heat exchanger or other radiating part within the *furnace*, such part of a *return duct* directly above or within 600 mm of the outside *furnace* casing shall be *noncombustible*.

(3) *Return ducts* serving solid fuel-fired *furnaces* shall be constructed of *noncombustible* material.

(4) Where *combustible return ducts* are permitted, they shall be lined with *noncombustible* material below floor registers, at the bottom of vertical ducts and under *furnaces* having a bottom return.

(5) The return-air system shall be designed so that the negative pressure from the circulating fan cannot affect the *furnace* combustion air supply nor draw combustion products from joints or openings in the *furnace* or *flue pipe*.

(6) Return-air inlets shall not be installed in an enclosed room or crawl space that provides combustion air to a fuel-fired *appliance*.

6.2.4. Air Ducts for Low Capacity Systems

6.2.4.1. Application

r6 **(1)** The requirements of this Subsection apply to the design, construction and installation of air duct distribution systems serving heating, ventilating and *air-conditioning* systems that serve a *house* or an individual *dwelling unit* within the scope of Part 9.

6.2.4.2. Duct Design

(1) Materials in *supply ducts* shall conform to Article 6.2.3.2.

(2) Galvanized steel or aluminum *supply ducts* shall conform to Table 6.2.4.2.

(3) The design of fitting for ducts shall conform to SMACNA, "HVAC Duct Construction Standards – Metal and Flexible", except that metal thickness shall conform to Table 6.2.4.2.

r6 **Table 6.2.4.2.**
Minimum Metal Thickness of Ducts
Forming Part of Sentences 6.2.4.2.(2) and (3)

Type of Duct	Maximum Diameter, mm	Maximum Width or Depth, mm	Minimum Metal Thickness, mm	
			Duct Material	
			Galvanized Steel	Aluminum
Round ducts serving an individual *dwelling unit* in a *building* other than a *house*	125 or less	—	0.254	0.30
Round ducts serving a *house* or an individual *dwelling unit* in a *house*	350	—	0.33	0.30
	over 350	—	0.41	0.41
Rectangular, enclosed	—	350	0.33	0.30
	—	over 350	0.41	0.41
Rectangular, not enclosed, with required clearance up to 12 mm	—	350	0.33	0.41
	—	over 350	0.41	0.48
Rectangular, not enclosed, with required clearance of more than 12 mm	—	350	0.41	0.41
	—	over 350	0.48	0.48
Column 1	2	3	4	5

6.2.4.3. Construction and Installation of Ducts and Plenums

(1) Rectangular panels in *plenums* and ducts more than 300 mm wide shall be shaped to provide sufficient stiffness.

(2) Where the installation of heating *supply ducts* in walls and floors creates a space between the duct and construction material, the space shall be fire stopped with *noncombustible* material at each end.

(3) Ducts shall be securely supported by metal hangers, straps, lugs or brackets, except that where zero clearance is permitted, wooden brackets may be used.

(4) All round duct joints shall be tight-fitting and lapped not less than 25 mm.

(5) Rectangular duct connections shall be made with S and drive cleats.

(6) Trunk *supply ducts* shall not be nailed directly to wood members.

(7) Branch ducts shall be supported at suitable spacings to maintain alignment and prevent sagging.

(8) *Combustible* ducts in concrete slabs-on-ground that are connected to a *furnace* supply *plenum* shall be located not closer than 600 mm to that *plenum* and not less than 600 mm from its connection to a riser or register.

(9) Ducts in or beneath concrete slabs-on-ground shall be watertight, corrosion-, decay- and mildew-resistant.

(10) Where a *supply duct* or *return duct* is not protected by an insulated exterior wall or where the duct is exposed to an unheated space it shall be insulated to provide a thermal resistance of not less than RSI 2.1.

e2 **(11)** Where a *supply duct* or *return duct* is located in an unconditioned space or outdoors, all joints of the ductwork shall be sealed to a Class A seal level in accordance with the SMACNA, "HVAC Duct Construction Standards – Metal and Flexible". (See Appendix A.)

e2 **(12)** Where a *supply duct* is located in a conditioned space, the ductwork shall be sealed to a Class C seal level in accordance with the SMACNA, "HVAC Duct Construction Standards – Metal and Flexible". (See A-6.2.4.3.(11) in Appendix A.)

(13) Underground ducts shall,
(a) be constructed and installed with a slope to provide interior drainage to all low points,
(b) not be connected directly to a sewer, and
(c) be installed and constructed of materials in conformance with ASHRAE Handbooks, SMACNA Manuals and the HRAI Digest.

(14) A clean-out or pump-out connection shall be provided in an underground duct system at every low point of the duct system.

6.2.4.4. Warm-Air Supply Outlets (See Appendix A.)

(1) In a *dwelling unit*, a warm-air supply outlet shall be provided in each finished room that is located adjacent to unheated space, exterior air or exterior soil.

(2) Except as provided in Sentence (3), when a room described in Sentence (1) is located adjacent to exterior walls, such outlets shall be located so as to bathe at least one exterior wall or window with warm air, except in bathrooms, utility rooms or kitchens, where this may not be practical.

(3) Where the heating system is also designed to provide ventilation air, ceiling outlets or outlets located high on interior walls may be installed, provided the outlets are,
(a) designed for this purpose, and
(b) installed with diffusers.

(4) At least one warm-air supply outlet shall be provided for each 40 m^2 of floor surface area in unfinished *basements* serving *dwelling units*, located so as to provide adequate distribution of warm air throughout the *basement*.

(5) At least one warm-air supply outlet shall be provided for each 80 m^2 of floor surface area in heated crawl spaces serving *dwelling units*, and it shall be located so as to provide adequate distribution of warm-air throughout the crawl space.

(6) Except for pipeless *furnaces* and floor *furnaces*, the capacity of warm-air supply outlets serving *dwelling units* shall be not less than the design heat loss from the area served and shall not exceed 3 kW per outlet.

(7) In *basements* and heated crawl spaces, the calculated heat gain from the *supply ducts* and *plenum* surfaces may be considered in calculating the design heat loss.

(8) The temperature of supply air at the warm-air supply outlets shall not exceed 70°C.

(9) Warm-air supply outlets located in finished areas shall be provided with diffusers and adjustable openings and shall not be located on a *furnace plenum*.

(10) Air duct systems serving *storage garages* shall not be interconnected with other parts of the *building*.

6.2.4.5. Reserved

6.2.4.6. Adjustable Dampers and Balance Stops

(1) All branch *supply ducts* for residential systems shall be equipped with volume control dampers at the boot to permit balancing or shall be fitted with a diffuser incorporating an adjustable and lockable volume control device that can be set in a fixed position.

6.2.4.7. Return-Air System

(1) The return-air system shall be designed to handle the entire air supply.

(2) Except as provided in Sentences (3) and (4), *return ducts* shall be constructed of material having a surface *flame-spread rating* of not more than 150.

(3) Where any part of a *return duct* will be exposed to radiation from the heat exchanger or other radiating part within the *furnace*, such part of a *return duct* directly above or within 600 mm of the outside *furnace* casing shall be *noncombustible*. (See Appendix A.)

(4) *Return ducts* serving solid fuel-fired *furnaces* shall be constructed of *noncombustible* material.

(5) *Combustible return ducts* shall be lined with *noncombustible* material below floor registers, at the bottom of vertical ducts and under *furnaces* having a bottom return.

(6) Spaces between studs and joists used as *return ducts* shall be separated from the unused portions of such spaces by tight-fitting metal stops or wood blocking.

(7) A vertical *return duct* shall have openings to return air on not more than 1 floor.

(8) A *public corridor* shall comply with Sentences 6.2.3.9.(4) and (5).

(9) The return-air system shall be designed so that the negative pressure from the circulating fan cannot affect the *furnace* combustion air supply nor draw combustion products from joints or openings in the *furnace* or *flue pipe*.

r6 **(10)** Except as provided in Sentence (14), return-air from a *dwelling unit* shall not be recirculated to any other *dwelling unit*.

(11) Except for floor levels that are less than 900 mm above or below an adjacent floor level that is provided with a return-air inlet, at least one return-air inlet shall be provided in each floor level in a *dwelling unit*.

(12) Provision shall be made for the return of air from all rooms by leaving gaps beneath doors, using louvred doors or installing *return duct* inlets.

(13) Return-air inlets shall not be installed in an enclosed room or crawl space that provides combustion air to a *furnace*.

r6 **(14)** In a *house* containing two *dwelling units*, return-air from one *dwelling unit* may be recirculated to the other *dwelling unit*, provided a duct-type *smoke detector* is installed in the supply or return air duct system serving the entire *house* which would turn off the fuel supply and electrical power to the heating system upon activation of such detector.

6.2.4.8. Coverings, Linings and Insulation

r11.1 **(0.1)** Except as permitted in Sentences (1) and (1.1), foamed plastic insulation shall not be used as part of an air duct or for insulating an air duct.

r11.1 **(1)** Foamed plastic insulation may be used in a ceiling space that acts as a return air *plenum*, provided the foamed plastic insulation is protected from exposure to the *plenum* in accordance with Article 3.1.5.12A.

r11.1 **(1.1)** Foamed plastic insulation conforming to Article 9.25.2.2. is permitted to be used to insulate a galvanized steel, stainless steel or aluminum air duct provided,

(a) the foamed plastic insulation applied to the supply ductwork is not less than 3 m from the furnace bonnet,
(b) the temperature within the ductwork where the insulation is installed is not greater than 50°C,
(c) duct joints are taped with a product conforming to Sentence 6.2.4.9.(1),
(d) return air *plenums* are separated from the foamed plastic insulation, and
(e) the foamed plastic insulation is protected in accordance with Article 9.10.17.10.

(2) Linings of ducts shall be installed so that they will not interfere with the operation of volume or balancing dampers.

6.2.4.9. Tape

(1) Tape used for sealing joints in air ducts, *plenums* and other parts of air duct systems shall meet the flame-resistance requirements for fabric in CAN/ULC-S109, "Flame Tests of Flame-Resistant Fabrics and Films".

6.2.4.10. Clearances of Ducts and Plenums (See Appendix A.)

(1) Where the *plenum* clearance is 75 mm or less, the clearance between a *supply duct* and *combustible* material shall,

(a) be equal to the required *plenum* clearance within 450 mm of the *plenum*, and
(b) be not less than 12 mm at a distance of 450 mm or more from the *plenum*, except that this clearance may be reduced to zero beyond a bend or offset in the duct sufficiently large to shield the remainder of the duct from direct radiation from the *furnace* heat exchanger.

(2) Where the *plenum* clearance is more than 75 mm but not more than 150 mm, the clearance between a *supply duct* and *combustible* material shall,

(a) be equal to the required *plenum* clearance within a horizontal distance of 1 800 mm of the *plenum*, and
(b) be not less than 12 mm at a horizontal distance of 1 800 mm or more from the *plenum*, except that this distance may be reduced to zero beyond a bend or offset in the duct sufficiently large to shield the remainder of the duct from direct radiation from the *furnace* heat exchanger.

(3) Where the *plenum* clearance is more than 150 mm, the clearance between a *supply duct* and *combustible* material shall,

(a) be equal to the required *plenum* clearance within a horizontal distance of 1 000 mm of the *plenum*,
(b) be not less than 150 mm within a horizontal distance between 1 000 mm and 1 800 mm from the *plenum*, and
(c) be not less than 25 mm at a horizontal distance of 1 800 mm or more from the *plenum*, except that this distance may be reduced to 8 mm beyond a bend or offset in the duct sufficiently large to shield the remainder of the *supply duct* from direct radiation from the *furnace* heat exchanger.

(4) Where a register is installed in a floor directly over a pipeless *furnace*, a double-walled register box with not less than 100 mm between walls, or a register box with the warm-air passage completely surrounded by the cold-air passage, shall be permitted in lieu of the clearances listed in Sentences (1), (2) and (3).

6.2.4.11. Exhaust Ducts and Outlets

(1) Where an *exhaust duct* passes through or is adjacent to unheated space, the duct shall be insulated to prevent moisture or condensation in the duct.

(2) Exhaust outlets shall be designed to prevent back draft under wind conditions.

(3) *Exhaust ducts* directly connected to laundry drying equipment shall be independent of other *exhaust ducts*.

(4) Exhaust systems shall discharge directly to the outdoors.

6.2.4.12. Make-Up Air

(1) In ventilating systems that exhaust air to the outdoors, provision shall be made for the admission of a supply of make-up air in sufficient quantity so that the operation of the exhaust system and other exhaust equipment or combustion equipment is not adversely affected.

6.2.4.13. Supply, Return, Intake and Exhaust Air Openings

(1) Supply, return and exhaust air openings in rooms or spaces shall be protected by grilles having openings of a size that will not allow the passage of a 15 mm diameter sphere.

(2) Outdoor air intakes and exhaust outlets at the *building* exterior shall be designed or located so that the air entering the *building* system will not contain more contaminants than the normal exterior air.

(3) Exterior openings for outdoor air intakes and exhaust outlets shall be shielded from the entry of snow and rain and shall be fitted with corrosion-resistant screens of mesh having openings not larger than 15 mm, except where climatic conditions may require larger openings.

(4) Screens required in Sentence (3) shall be accessible for maintenance.

(5) *Combustible* grilles, diffusers and other devices for the supply and return air openings installed in walls and ceilings shall have a *flame-spread rating* of,
(a) not more than 200 in bathrooms, and
(b) not more than 150 in rooms or spaces other than bathrooms.

6.2.4.14. Air Filters and Equipment

R11.1 **(1)** Air filters for air duct systems shall conform to the requirements for Class 2 air filter units as described in CAN/ULC-S111, "Fire Tests For Air Filter Units".

(2) When electrostatic-type filters are used, they shall be installed so as to ensure that the electric circuit is automatically de-energized when filter access doors are opened or when the system circulating fan is not operating.

(3) When odour removal equipment of the adsorption type is used it shall be,
(a) installed to provide access so that adsorption material can be reactivated or renewed, and
(b) protected from dust accumulation by air filters installed on the inlet side.

6.2.5. Heating Appliances, General

6.2.5.1. Location of Appliances

(1) Except for *appliances* installed in *dwelling units*, fuel-fired heating *appliances* shall be located, enclosed or separated from the remainder of the *building* in conformance with Section 3.6.

6.2.5.2. Appliances Installed Outside the Building

(1) Fuel-fired *appliances* installed outside a *building* shall be,
(a) designed and constructed for outdoor use,
(b) installed not less than 1 200 mm from the property line, measured horizontally, and
(c) installed not less than 3 m from an adjacent wall of the same *building* when such wall contains an opening or openings within 3 *storeys* above and 5 m horizontally from the *appliance*, unless such openings are protected by a *closure* assembly having a 45 min *fire-protection rating* determined in conformance with Article 3.1.8.4., or by wired glass conforming to Article 3.1.8.14.

6.2.6. Incinerators

6.2.6.1. Applicable Standard

r11.1 **(1)** The design, construction, installation and material alteration of every indoor incinerator shall conform to NFPA 82, "Incinerators and Waste and Linen Handling Systems and Equipment".

6.2.7. Unit Heaters

6.2.7.1. Clearances

(1) Every *unit heater* using either steam or hot water as the heating medium shall be installed such that the clearances between the *appliance* and adjacent *combustible* material conform to Table 6.2.9.3.

6.2.8. Radiators and Convectors

6.2.8.1. Lining or Backing

(1) Every steam or hot water radiator and convector located in a recess or concealed space or attached to the face of a wall of *combustible construction* shall be provided with a *noncombustible* lining or backing.

(2) Every steam or hot water radiator and convector shall be installed to conform to the clearance requirements of Table 6.2.9.3.

6.2.9. Piping for Heating and Cooling Systems

6.2.9.1. Piping Materials and Installation

(1) Piping shall be made from materials designed to withstand the effects of temperatures and pressures that may occur in the system.

(2) Every pipe used in a heating or *air-conditioning* system shall be installed to allow for expansion and contraction due to temperature changes.

(3) Supports and anchors for piping in a heating or *air-conditioning* system shall be designed and installed to ensure that undue stress is not placed on the supporting structure.

6.2.9.2. Insulation and Coverings

(1) Insulation and coverings on pipes shall be composed of material suitable for the operating temperature of the system to withstand deterioration from softening, melting, mildew and mould.

(2) Insulation and coverings on pipes in which the temperature of the fluid exceeds 120°C,
(a) shall be made of *noncombustible* material, or
(b) shall not flame, glow, smoulder or smoke when tested in accordance with ASTM C411, "Hot-Surface Performance of High-Temperature Thermal Insulation", at the maximum temperature to which such insulation or covering is to be exposed in service.

(3) Except as provided in Sentence (7), where *combustible* insulation is used on piping in a *horizontal* or *vertical service space*, the insulation and coverings on such pipes shall have a *flame-spread rating* throughout the material of not more than 25 in *buildings* of *noncombustible construction* and not more than 75 in *buildings* of *combustible construction*.

(4) Except as provided in Sentence (7), insulation and coverings on piping located in rooms and spaces other than the *service spaces* described in Sentence (3) shall have a *flame-spread rating* of not more than that required for the interior finish for the ceiling of the room or space.

(5) Except as provided in Sentence (7), where *combustible* insulation and covering is used on piping in *buildings* described in Subsection 3.2.6., they shall have a smoke developed classification of not more than 100.

(6) Exposed piping or equipment subject to human contact shall be insulated so that the temperature of the exposed surface does not exceed 70°C. (See Appendix A.)

(7) No *flame-spread rating* or smoke developed classification limitations are required where *combustible* insulation and coverings are used on piping when such piping is,
(a) located within a concealed space in a wall,
(b) located in a floor slab, or
(c) enclosed in a *noncombustible* raceway or conduit.

6.2.9.3. Clearances

(1) Clearances between *combustible* material and bare pipes carrying steam or hot water shall conform to Table 6.2.9.3.

Table 6.2.9.3.
Clearance Between Steam or Hot Water Pipes and Combustible Material
Forming Part of Sentences 6.2.7.1.(1), 6.2.8.1.(2) and 6.2.9.3.(1)

Steam or Water Temperature, °C	Minimum Clearance, mm
not above 95	no clearance
above 95 to 120	15
above 120	25
Column 1	2

6.2.9.4. Surface Temperature

(1) The exposed surface temperature of a steam or hot water radiator shall not exceed 70°C unless precautions are taken to prevent human contact.

6.2.9.5. Protection

(1) Where a pipe carrying steam or hot water at a temperature above 120°C passes through a *combustible* floor, ceiling or wall, the construction shall be protected by a sleeve of metal or other *noncombustible* material not less than 50 mm larger in diameter than the pipe.

(2) Unprotected steam or hot water pipes that pass through a storage space shall be covered with not less than 25 mm of *noncombustible* insulation to prevent direct contact with the material stored.

6.2.9.6. Piping in Shafts

(1) Where piping for heating or *air-conditioning* systems is enclosed in a shaft, the requirements of Article 3.6.3.1. for shafts shall apply.

6.2.10. Refrigerating Systems and Equipment for Air-Conditioning

6.2.10.1. Cooling Units

(1) Where a cooling unit is combined with a fuel-fired *furnace* in the same duct system, the cooling unit shall be installed,
(a) in parallel with the heating *furnace*,
(b) upstream of the *furnace*, provided the *furnace* is designed for such application, or
(c) downstream of the *furnace*, provided the cooling unit is designed to prevent excessive temperature or pressure in the refrigeration system.

6.2.11. Storage Bins

6.2.11.1. Storage Bins

(1) Service pipes passing through a storage bin for solid fuel shall be protected or so located as to avoid damage to the pipes.

(2) Except for fuel-thawing pipes, every pipe designed to operate at a temperature of 50°C or above shall be located where fuel cannot be stored in contact with it.

(3) A storage bin for solid fuel shall not be located above a sewer opening or drain opening.

(4) Storage bins for solid fuel shall be designed and constructed so that the air temperature in the bin or the surface temperature of any part of the floor or walls is below 50°C.

6.2.11.2. Ash Storage Bins

(1) Every ash storage bin shall be constructed of *noncombustible* material.

(2) Every opening in an ash storage bin shall be protected by a tight-fitting metal door with metal frame securely fastened to the bin.

6.2.12. Carbon Monoxide Alarms

6.2.12.1. Application

(1) This Subsection applies to every *building* that,
(a) contains a *residential occupancy*, and
(b) contains a fuel-burning *appliance* or a *storage garage*.

6.2.12.2. Location of Carbon Monoxide Alarms

(1) Where a fuel-burning *appliance* is installed in a *suite* of *residential occupancy*, a carbon monoxide alarm shall be installed adjacent to each sleeping area in the *suite*.

(2) Where a fuel-burning *appliance* is installed in a *service room* that is not in a *suite* of *residential occupancy*, a carbon monoxide alarm shall be installed,
(a) adjacent to each sleeping area in every *suite* of *residential occupancy* that is adjacent to the *service room*, and
(b) in the *service room*.

(3) Where a *storage garage* is located in a *building* containing a *residential occupancy*, a carbon monoxide alarm shall be installed adjacent to each sleeping area in every *suite* of *residential occupancy* that is adjacent to the *storage garage*.

6.2.12.3. Installation and Conformance to Standards

(1) The carbon monoxide alarms required by Article 6.2.12.2. shall,
(a) except as permitted in Sentence (2), be permanently connected to an electrical circuit and shall have no disconnect switch between the overcurrent device and the carbon monoxide alarm,
(b) be wired so that its activation will activate all carbon monoxide alarms within the *suite*, where located within a *suite* of *residential occupancy*,
(c) be equipped with an alarm that is audible within bedrooms when the intervening doors are closed, where located in a *suite* of *residential occupancy*, and
(d) conform to,
  (i) CAN/CSA-6.19, "Residential Carbon Monoxide Alarming Devices", or
  (ii) UL 2034, "Single and Multiple Station Carbon Monoxide Alarms".

(2) Where the *building* is not supplied with electrical power, carbon monoxide alarms are permitted to be battery operated.

6.2.13. Ventilation for Laboratories

6.2.13.1. Application

(1) This Subsection applies to laboratories intended as a location where *flammable liquids* and *combustible liquids* are used in normal laboratory operations in quantities or in a manner that create a fire or explosion hazard.

6.2.13.2. General Ventilation

(1) A laboratory shall be provided with continuous mechanical ventilation designed to ensure that flammable vapours,
(a) do not accumulate in the laboratory,
(b) are prevented from migrating to other parts of the *building*,
(c) do not accumulate in the ventilation system,
(d) are exhausted to the outdoors, and
(e) are not returned to the *building*.

(2) A ventilation system required in this Subsection shall be provided with monitoring devices that,
(a) indicate that the ventilation system is in operation, and
(b) sound an alarm if the ventilation system is malfunctioning.

6.2.13.3. Power-Ventilated Enclosure

(1) A power-ventilated enclosure required by the Fire Code made under the *Fire Protection and Prevention Act, 1997* shall be designed and constructed to conform to Articles 6.2.13.4. and 6.2.13.5.

6.2.13.4. Enclosure Exhaust Ventilation

(1) The ventilation system for a power-ventilated enclosure referred to in Article 6.2.13.3. shall,
(a) conform to NFPA 91, "Exhaust Systems for Air Conveying of Vapors, Gases, Mists and Noncombustible Particulate Solids",
(b) provide continuous exhaust ventilation at an air velocity sufficient to prevent the accumulation of *combustible* or reactive deposits in the power-ventilated enclosure and its *exhaust duct* system,
(c) confine flammable vapours and particles to the area where they are generated and exhaust them to the outdoors,
(d) not return the exhausted air to the *building*, and
(e) be provided with well identified control switches that are,
  (i) located outside the power-ventilated enclosure, and
  (ii) readily accessible in case of an emergency.

(2) *Fire dampers* are permitted to be used within the *exhaust duct* system of the ventilation system for a power-ventilated enclosure referred to in Article 6.2.13.3.

6.2.13.5. Enclosure Construction

(1) The power-ventilated enclosure referred to in Article 6.2.13.3. and its *exhaust duct* system shall,
(a) except as provided in Sentences (2) and (3), be constructed of *noncombustible* materials compatible with and chemically resistant to the flammable vapours and particles being exhausted, and
(b) be provided with access doors to permit inspection and maintenance of the fan assembly and *exhaust ducts*.

(2) *Combustible* materials are permitted in the power-ventilated enclosure described in Sentence (1) and its *exhaust duct* system if,
(a) such materials are required by the corrosive or reactive properties of the chemicals or liquids being used, and
(b) their *flame-spread rating* is not more than 25.

(3) The *flame-spread rating* required in Sentence (2) is permitted to be greater than 25 if an automatic fire suppression system is provided inside the power-ventilated enclosure and its *exhaust duct* system.

Section 6.3. Chimneys and Venting Equipment

6.3.1. General

6.3.1.1. Requirement for Venting

(1) Except as provided in Articles 6.3.1.2. and 6.3.1.3., the products of combustion from solid fuel-burning *appliances* shall be vented in conformance with the requirements in the applicable *appliance* installation standards listed in Article 6.2.1.4.

6.3.1.2. Masonry or Concrete Chimneys

(1) Rectangular *masonry or concrete chimneys* not more than 12 m in height shall conform to Part 9 if they serve,
(a) *appliances* with a combined total rated heat output of 120 kW or less, or
(b) fireplaces.

(2) *Masonry or concrete chimneys* other than those described in Sentence (1) shall be designed and installed in conformance with the appropriate requirements in NFPA 211, "Chimneys, Fireplaces, Vents and Solid Fuel-Burning Appliances".

6.3.1.3. Metal Smoke Stacks

(1) Single wall metal smoke stacks shall be designed and installed in conformance with NFPA 211, "Chimneys, Fireplaces, Vents and Solid Fuel-Burning Appliances".

6.3.1.4. Reserved

6.3.1.5. Access Ladders

(1) Access ladders for *chimneys*, when provided, shall consist of steel or bronze rungs, built into the walls of the *chimneys*.

(2) Rungs for external ladders shall begin at not less than 2 500 mm from ground level.

Part 7

Plumbing

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r5 **(4)** Porcelain enamelled steel fixtures shall conform to ASME A112.19.1 / CSA B45.2, "Enamelled Cast Iron and Enamelled Steel Plumbing Fixtures".

r5 **(5)** Stainless steel fixtures shall conform to ASME A112.19.3 / CSA B45.4, "Stainless Steel Plumbing Fixtures".

r5 **(6)** Plastic fixtures shall conform to CSA B45.5 / IAPMO Z124, "Plastic Plumbing Fixtures".

r5 **(7)** Hydromassage bathtubs shall conform to ASME A112.19.7 / CSA B45.10, "Hydromassage Bathtub Systems".

r11.1 **(8)** Macerating toilet systems shall conform to ASME A112.3.4 / CSA B45.9, "Plumbing Fixtures with Pumped Waste and Macerating Toilet Systems".

7.2.2.3. Showers

(1) Shower receptors shall be constructed and arranged so that water cannot leak through the walls or floor. (See Appendix A.)

(2) Not more than six shower heads shall be served by a single shower drain.

(3) Where two or more shower heads are served by a shower drain, the floor shall be sloped and the drain located so that water from one head cannot flow over the area that serves another head.

(4) Except for column showers, when a battery of shower heads is installed, the horizontal distance between two adjacent shower heads shall be at least 750 mm.

7.2.2.4. Concealed Overflows

(1) A dishwashing sink and a food preparation sink shall not have concealed overflows.

7.2.2.5. Water Closets in Public Washrooms

(1) Except for Eastern-Style toilets, where a water closet is installed in a washroom for *public use* it shall be of the elongated type and provided with a seat of the open front type.

7.2.2.6. Lavatories

(1) A lavatory that does not have an overflow shall be equipped with a centre outlet waste fitting. (See Appendix A.)

7.2.2.7. Trough Urinals

(1) No trough urinal shall be used as part of a *plumbing system*.

7.2.3. Traps and Interceptors

7.2.3.1. Traps

(1) Except as provided for in Sentence (2), every *trap* shall,
(a) have a *trap seal depth* of at least 38 mm,
(b) be so designed that failure of the seal walls will cause exterior leakage, and
(c) have a water seal that does not depend on the action of moving parts.

(2) The *trap seal depth* on *fixtures* draining to an acid waste system shall be a minimum of 50 mm.

(3) Except for a floor-mounted service sink, every *trap* that serves a lavatory, a sink or a laundry tray shall,
(a) be provided with a *cleanout* plug of a minimum ¾ in. *size* located at the lowest point of the *trap* and of the same material as the *trap*, except that a cast iron *trap* shall be provided with a brass *cleanout* plug,
(b) be designed so that the *trap dip* can be completely removed for cleaning purposes, or
(c) be provided with a *cleanout* installed above the floor as close as practical downstream of the *trap* when the *trap* is,
(i) installed below the floor, and
(ii) not readily *accessible* for cleaning as required by Clause (a).
(See Appendix A.)

(4) A bell *trap* or an S-*trap* shall not be installed in a *drainage system*.

(5) A *drum trap* shall not be installed in a *drainage system*.

(6) Except as permitted in Sentence (7), no *bottle trap* shall be used in a *plumbing system*.

(7) A *bottle trap* may be used on a laboratory sink or other *fixture* equipped with corrosion resistant fittings.

(8) No running *trap* shall be installed in a *plumbing system* unless an *accessible* handhole is provided for cleaning of the *trap*, and where the *trap* is too small to accommodate a handhole, a *cleanout* shall be provided.

7.2.3.2. Interceptors

(1) Every *interceptor* shall be designed so that it can be readily cleaned.

(2) Every grease *interceptor* shall be designed so that it does not become air bound.

(3) Where a grease *interceptor* is required by Sentence 7.4.4.3.(1), the *interceptor* shall conform to,
r5 (a) CSA B481.1, "Testing and Rating of Grease Interceptors Using Lard", or
r5 (b) CSA B481.2, "Testing and Rating of Grease Interceptors Using Oil".

r11.1 **(4)** Grease *interceptors* shall be selected and installed in conformance with,
(a) CSA B481.0, "Material, Design, and Construction Requirements for Grease Interceptors", and
(b) CSA B481.3, "Sizing, Selection, Location, and Installation of Grease Interceptors".

7.2.3.3. Tubular Traps

r5 **(1)** Tubular metal or plastic *traps* that conform to ASME A112.18.2 / CSA B125.2, "Plumbing Waste Fittings" shall be used in *accessible* locations.

7.2.4. Pipe Fittings

7.2.4.1. T and Cross Fittings

(1) A T fitting shall not be used in a *drainage system* except to connect a *vent pipe*.

(2) A cross fitting shall not be used in a *drainage system*.

7.2.4.2. Sanitary T Fittings

(1) A double sanitary T fitting shall not be used to connect the *fixture drains* of two urinals where no *cleanout* fitting is provided above the connection.

(2) No pipe fitting, joint or connection that would tend to intercept solids or reduce the flow through a pipe by more than 10 percent shall be used in a *plumbing system*.

7.2.4.3. 90° Elbows

(1) Except as permitted in Sentences (2) and (3), 90° elbows of 4 in. *size* or less that have a centre-line radius that is less than the *size* of the pipe shall not be used to join two *soil* or *waste pipes*.

(2) 90° elbows of 4 in. *size* or less in *sanitary drainage systems* may be used,
(a) to change the direction of piping from horizontal to vertical, in the direction of flow,
(b) where a *trap arm* enters a wall, or
(c) to connect *trap arms* as permitted by Sentence 7.5.6.3.(2).

(3) A 90° elbow that is part of the pre-engineered wastewater heat recovery system is permitted to have a centre-line radius that is less than the *size* of the pipe.

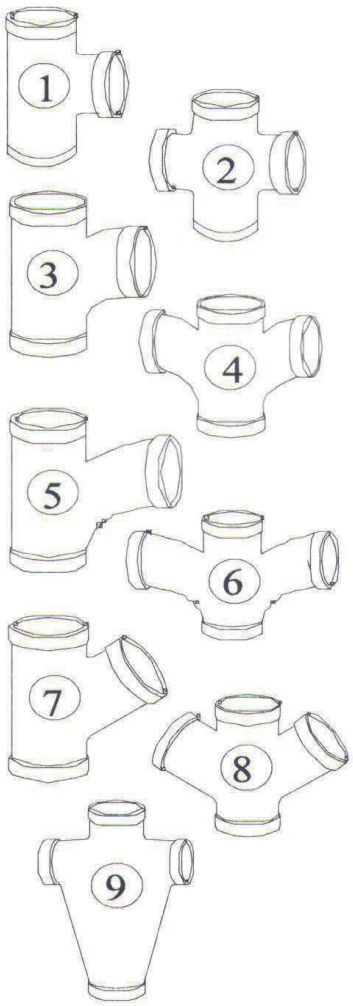
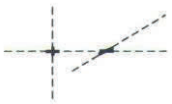
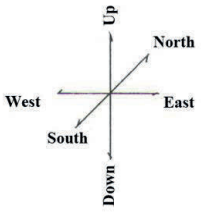
7.2.4.4. Fittings Restricted in Use

(1) No double Y, double TY, double T or double waste fitting shall be installed in a *nominally horizontal soil* or *waste pipe*.

7.2.4.5. Assembled Pipe or Tubing

(1) Pipe or tubing assembled to comprise a standard drain waste and venting system shall be connected with drain, waste and vent fittings in conformance with Table 7.2.4.5.

Table 7.2.4.5.
Pipe Arrangement for DWV Fittings
Forming Part of Sentence 7.2.4.5.(1)

Pipe Arrangement	Fittings	
	Acceptable	Type
	①③⑤⑦	
	②④⑥⑧⑨	
	①③⑤⑦	
	③⑤⑦	
	④*⑥⑧⑨*	
	⑤⑦	
	LEGEND (DWV BRANCH FITTINGS) Vent pipe – – – – – – – – – – – Drainage pipe ——————— * Acceptable only if vertical run is of 3 inches size or larger and horizontal branches are of 1¼, 1½, or 2 inches size	

1. Straight T
2. Double T or Cross
3. Sanitary T or Short Turn TY
4. Double Sanitary T or Short Turn Double TY
5. Combination Y & ⅛ Bend or Long Turn TY
6. Double Combination Y & ⅛ Bend or Double Long Turn TY
7. Y
8. Double Y
9. Double Waste Fitting

7.2.5. Non-Metallic Pipe and Fittings

r11.1 ### 7.2.5.1. Reserved

7.2.5.2. Reserved

7.2.5.3. Concrete Pipe and Fittings

(1) Concrete pipe shall conform to CSA A257 Series, "Standards for Concrete Pipe and Manhole Sections".

r11.1 **(2)** Joints with external elastomeric gaskets shall be made with corrosion resistant external band type flexible mechanical couplings that conform to CSA B602, "Mechanical Couplings for Drain, Waste, and Vent Pipe and Sewer Pipe".

(3) Concrete fittings field fabricated from lengths of pipe shall not be used. (See Appendix A.)

(4) Concrete pipe shall not be used above ground inside a *building*.

r11.1 **(5)** Precast reinforced circular concrete manhole sections, catch basins and fittings shall conform to CSA A257.4, "Precast Reinforced Circular Concrete Manhole Sections, Catch Basins, and Fittings".

7.2.5.4. Vitrified Clay Pipe and Fittings

(1) Vitrified clay pipe and fittings shall be certified to CSA A60.1-M, "Vitrified Clay Pipe".

(2) Couplings and joints for vitrified clay pipe shall be certified to CSA A60.3-M, "Vitrified Clay Pipe Joints".

(3) Vitrified clay pipe and fittings shall not be used except for an underground part of a *drainage system*.

7.2.5.5. Polyethylene Pipe and Fittings

r11.1 **(1)** Polyethylene water pipe, tubing and fittings shall be certified to, and have a pressure rating meeting the requirements of, Series 160 or a higher series of CSA B137.1, "Polyethylene (PE) Pipe, Tubing and Fittings for Cold Water Pressure Services".

(2) Except as permitted in Sentence 7.2.5.7.(1), polyethylene water pipe shall not be used except for a *water service pipe*.

(3) Butt fusion fittings for polyethylene pipe shall conform to ASTM D3261, "Butt Heat Fusion Polyethylene (PE) Plastic Fittings for Polyethylene (PE) Plastic Pipe and Tubing".

7.2.5.6. Polyethylene Pipe Used Underground

r11.1 **(1)** Polyethylene pipe used underground in a *drainage system* for rehabilitation of existing systems using trenchless technology shall conform to ASTM F714, "Polyethylene (PE) Plastic Pipe (DR-PR) Based on Outside Diameter" and shall be HDPE 3408, SDR 17 or heavier. (See Appendix A.)

7.2.5.7. Crosslinked Polyethylene Pipe and Fittings

r11.1 **(1)** Crosslinked polyethylene pipe and its associated fittings used in hot and cold *potable water systems* shall be certified to CSA B137.5, "Crosslinked Polyethylene (PEX) Tubing Systems for Pressure Applications". (See Appendix A.)

7.2.5.8. PVC Pipe and Fittings

r11.1 **(1)** PVC water pipe, fittings and solvent cement shall be certified to CSA B137.3, "Rigid Polyvinylchloride (PVC) Pipe and Fittings for Pressure Applications" or CSA B137.2, "Polyvinylchloride (PVC) Injection-Moulded Gasketed Fittings for Pressure Applications", and have a minimum pressure rating of 1 100 kPa.

(2) PVC water pipe and fittings in Sentence (1) shall not be used in a hot *water system*.

7.2.5.9. CPVC Pipe, Fittings and Solvent Cements

r11.1 **(1)** CPVC hot and cold water pipe, fittings and solvent cements shall be certified to CSA B137.6, "Chlorinated Polyvinylchloride (CPVC) Pipe, Tubing and Fittings for Hot and Cold Water Distribution Systems".

r11.1 **(2)** The design temperature and design pressure of a CPVC piping system shall conform to Table 7.2.5.9.

Table 7.2.5.9.
Maximum Permitted Pressure for CPVC Piping at Various Temperatures
Forming Part of Sentence 7.2.5.9.(2)

Maximum Temperature of Water, °C	Maximum Permitted Pressures, kPa
10	3150
20	2900
30	2500
40	2100
50	1700
60	1300
70	1000
82	690
Column 1	2

7.2.5.10. Plastic Pipe, Fittings and Solvent Cement Used Underground
(See Appendix A.)

(1) Plastic pipe, fittings and solvent cement used underground outside a *building* or under a *building* in a *drainage system* shall be certified to,

(a) ASTM F628, "Acrylonitrile-Butadiene-Styrene (ABS) Schedule 40 Plastic Drain, Waste and Vent Pipe With a Cellular Core",
(b) CAN/CSA-B181.1, "Acrylonitrile-Butadiene-Styrene (ABS) Drain, Waste, and Vent Pipe and Pipe Fittings",
(c) CAN/CSA-B181.2, "Polyvinylchloride (PVC) and Chlorinated Polyvinylchloride (CPVC) Drain, Waste, and Vent Pipe and Pipe Fittings",
(d) CAN/CSA-B182.1, "Plastic Drain and Sewer Pipe and Pipe Fittings",
(e) CAN/CSA-B182.2, "PSM Type Polyvinylchloride (PVC) Sewer Pipe and Fittings",
(f) CAN/CSA-B182.4, "Profile Polyvinylchloride (PVC) Sewer Pipe and Fittings",
(g) CAN/CSA-B182.6, "Profile Polyethylene (PE) Sewer Pipe and Fittings for Leak-Proof Sewer Applications",
r11.1 (g.1) CAN/CSA-B182.8, "Profile Polyethylene (PE) Storm Sewer and Drainage Pipe and Fittings", for Type 1 joints and non-perforated pipes,
r11.1 (h) CSA B137.2, "Polyvinylchloride (PVC) Injection-Moulded Gasketed Fittings for Pressure Applications", or
r11.1 (i) CSA B137.3, "Rigid Polyvinylchloride (PVC) Pipe and Fittings for Pressure Applications".

(2) Except as permitted in Clauses (h) and (i), plastic pipe used as described in Sentence (1) shall have a stiffness equal or greater than 320 kPa.

7.2.5.11. Transition Solvent Cement (See Appendix A.)

(1) Solvent cement for transition joints shall conform to,
(a) CAN/CSA-B181.1, "Acrylonitrile-Butadiene-Styrene (ABS) Drain, Waste, and Vent Pipe and Pipe Fittings", or
(b) CAN/CSA-B181.2, "Polyvinylchloride (PVC) and Chlorinated Polyvinylchloride (CPVC) Drain, Waste, and Vent Pipe and Pipe Fittings".

(2) Transition solvent cement shall only be used for joining an ABS *plumbing system* to a PVC *plumbing system*.

7.2.5.12. Plastic Pipe, Fittings and Solvent Cement Used in Buildings (See Appendix A.)

(1) Plastic pipe, fittings and solvent cement used inside or under a *building* in a *sanitary drainage system* or *venting system* shall be certified to,
(a) ASTM F628, "Acrylonitrile-Butadiene-Styrene (ABS) Schedule 40 Plastic Drain, Waste, and Vent Pipe With a Cellular Core",
(b) CAN/CSA-B181.1, "Acrylonitrile-Butadiene-Styrene (ABS) Drain, Waste, and Vent Pipe and Pipe Fittings", or
(c) CAN/CSA-B181.2, "Polyvinylchloride (PVC) and Chlorinated Polyvinylchloride (CPVC) Drain, Waste, and Vent Pipe and Pipe Fittings".

(2) Plastic pipe, fittings and solvent cement used inside a *building* in a *storm drainage system* shall be certified to,
(a) ASTM F628, "Acrylonitrile-Butadiene-Styrene (ABS) Schedule 40 Plastic Drain, Waste, and Vent Pipe With a Cellular Core",
(b) CAN/CSA-B181.1, "Acrylonitrile-Butadiene-Styrene (ABS) Drain, Waste, and Vent Pipe and Pipe Fittings",
(c) CAN/CSA-B181.2, "Polyvinylchloride (PVC) and Chlorinated Polyvinylchloride (CPVC) Drain, Waste, and Vent Pipe and Pipe Fittings",
(d) CAN/CSA-B182.1, "Plastic Drain and Sewer Pipe and Pipe Fittings", or
(e) CAN/CSA-B182.2, "PSM Type Polyvinylchloride (PVC) Sewer Pipe and Fittings".

(3) Plastic pipe used as described in Sentence (2) shall have a pipe stiffness equal or greater than 320 kPa.

(4) Requirements for *combustible* piping in relation to fire safety shall conform to Sentences 3.1.5.16.(1) and 9.10.9.6.(2) to (8) and Articles 3.1.9.4. and 9.10.9.7.

(5) Where *noncombustible* piping pierces a *fire separation* or a *fire block*, the requirements for fire stopping of Subsection 3.1.9., Sentence 9.10.9.6.(1) and Article 9.10.16.4. shall apply.

7.2.5.13. Polyethylene/Aluminum/Polyethylene Composite Pipe and Fittings

r11.1 **(1)** PE/AL/PE composite pipe and fittings used for *potable water systems* shall conform to CSA B137.9, "Polyethylene/Aluminum/Polyethylene (PE-AL-PE) Composite Pressure-Pipe Systems". (See Appendix A.)

(2) Except as provided in Sentences (3) and (4), PE/AL/PE pipe and fittings shall not be used in a hot *water system*.

(3) PE/AL/PE pipe with a pressure rating of 690 kPa or greater at 82ºC shall be permitted in a hot *water system*.

r11.1 **(4)** PE/AL/PE pipe with a pressure rating of 690 kPa or greater at 82ºC shall be used with fittings that conform to CSA B137.10, "Crosslinked Polyethylene/Aluminum/Crosslinked Polyethylene (PEX-AL-PEX) Composite Pressure-Pipe Systems", in a hot *water system*.

7.2.5.14. Crosslinked Polyethylene/Aluminum/Polyethylene Composite Pipe and Fittings

r11.1 **(1)** PEX/AL/PEX composite pipe and fittings used for *potable water systems* shall conform to CSA B137.10, "Crosslinked Polyethylene/Aluminum/Crosslinked Polyethylene (PEX-AL-PEX) Composite Pressure-Pipe Systems". (See Appendix A.)

7.2.5.15. Polypropylene Pipe and Fittings

r11.1 **(1)** Polypropylene pipe and fittings used for hot and cold *potable water systems* shall conform to CSA B137.11, "Polypropylene (PP-R) Pipe and Fittings for Pressure Applications". (See Appendix A.)

7.2.6. Ferrous Pipe and Fittings

e8 ### 7.2.6.1. Cast Iron Frames, Covers, Drainage and Vent Pipe and Fittings

(1) Drainage piping, vent piping and fittings made of cast iron shall be certified to CAN/CSA-B70, "Cast Iron Soil Pipe, Fittings and Means of Joining".

(2) Cast iron *soil pipe* and fittings shall not be used in a *water system*.

r11.1 **(3)** Cast iron frames and covers for maintenance holes and catch basins shall conform to CAN/CSA-B70.1, "Frames and Covers for Maintenance Holes and Catchbasins".

r11.1 ### 7.2.6.2. Reserved

7.2.6.3. Threaded Cast Iron Drainage Fittings

r5 **(1)** Threaded cast iron drainage fittings shall conform to ASME B16.12, "Cast Iron Threaded Drainage Fittings".

(2) Threaded cast iron drainage fittings shall not be used in a *water system*.

7.2.6.4. Cast Iron Water Pipe

r5 **(1)** Cast iron water pipes shall conform to ANSI/AWWA C151/A21.51, "Ductile-Iron Pipe, Centrifugally Cast".

(2) Cement-mortar lining for cast iron water pipes shall conform to ANSI/AWWA C104 / A21.4, "Cement-Mortar Lining for Ductile-Iron Pipe and Fittings".

(3) Cast iron fittings for cast iron or ductile-iron water pipes shall conform to ANSI/AWWA C110 / A21.10, "Ductile-Iron and Gray-Iron Fittings".

(4) Rubber gasket joints for cast iron and ductile-iron pressure pipe for water piping shall conform to ANSI/AWWA C111 / A21.11, "Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings".

7.2.6.5. Screwed Cast Iron Water Fittings

r5 **(1)** Screwed cast iron water fittings shall conform to ASME B16.4, "Gray Iron Threaded Fittings: Classes 125 and 250".

(2) Screwed cast iron water fittings used in a *water system* shall be cement-mortar lined or galvanized.

(3) Screwed cast iron water fittings shall not be used in a *drainage system*.

7.2.6.6. Screwed Malleable Iron Water Fittings

r5 **(1)** Screwed malleable iron water fittings shall conform to ASME B16.3, "Malleable Iron Threaded Fittings: Classes 150 and 300".

(2) Screwed malleable iron water fittings used in a *water system* shall be cement-mortar lined or galvanized.

(3) Screwed malleable iron water fittings shall not be used in a *drainage system*.

7.2.6.7. Steel Pipe

(1) Except as provided in Sentences (2) and (3), welded and seamless steel pipe shall not be used in a *plumbing system*.

(2) Galvanized steel pipe may be used in a *drainage system* or a *venting system* above ground inside a *building*.

(3) Galvanized steel pipe and fittings shall not be used in a *water distribution system* except,
(a) in *buildings* of *industrial occupancy*, or
(b) for the repair of existing galvanized steel piping systems.
(See Appendix A.)

(4) Galvanized steel pipe and fittings shall conform to ASTM A53 / A53M, "Pipe, Steel, Black and Hot Dipped, Zinc-Coated Welded and Seamless".

(5) Where galvanized steel pipe is used in a *drainage system*, it shall be used with drainage fittings.

(6) All steel pipe of 4 in. *size* and smaller shall be schedule 40 or heavier and fittings of less than 2 in. *size* shall be galvanized screw fittings.

7.2.6.8. Corrugated Steel Pipe and Couplings

(1) Corrugated steel pipe and couplings shall be certified to CAN/CSA-G401, "Corrugated Steel Pipe Products".

(2) Corrugated steel pipe shall only be used underground outside a *building* in a *storm drainage system*.

(3) Couplings for corrugated steel pipe shall be constructed so that when installed they shall,
(a) maintain the pipe alignment,
(b) resist the separation of adjoining lengths of pipe,
(c) prevent root penetration, and
(d) prevent the infiltration of surrounding material.

7.2.6.9. Sheet Metal Leaders

(1) A sheet metal *leader* shall not be used except above ground outside a *building*.

r11.1 7.2.6.10. Stainless Steel Pipe

(1) Stainless steel pipe shall conform to,
(a) ASME B36.19M, "Stainless Steel Pipe", and
(b) ASTM A312 / A312M, "Seamless, Welded, and Heavily Cold Worked Stainless Steel Pipes".

(2) Only grade 304/304L or 316/316L stainless steel pipe shall be used.

r11.1 7.2.6.11. Stainless Steel Butt Weld Pipe Fittings

(1) Stainless steel butt weld pipe fittings shall conform to,
(a) ASME B16.9, "Factory-Made Wrought Buttwelding Fittings", and
(b) ASTM A403 / A403M, "Wrought Austenitic Stainless Steel Piping Fittings".

(2) Stainless steel butt weld pipe fittings shall be made of a material that matches the grade of the pipe material used.

r11.1 7.2.6.12. Stainless Steel Pipe Flanges

(1) Stainless steel pipe flanges shall,
(a) conform to ASME B16.5, "Pipe Flanges and Flanged Fittings: NPS ½ through NPS 24 Metric/Inch Standard", and
(b) conform to ASTM A182 / A182M, "Forged or Rolled Alloy and Stainless Steel Pipe Flanges, Forged Fittings, and Valves and Parts for High-Temperature Service", or AWWA C228, "Stainless-Steel Pipe Flanges For Water Service – Sizes 2 in. through 72 in. (50 mm through 1 800 mm)".

(2) Stainless steel pipe flanges shall be made of a material that matches the grade of the pipe material used.

r11.1 7.2.6.13. Stainless Steel Threaded Fittings

(1) Stainless steel threaded fittings shall be Schedule 40 or greater and shall conform to,
(a) ASTM A182 / A182M, "Forged or Rolled Alloy and Stainless Steel Pipe Flanges, Forged Fittings, and Valves and Parts for High-Temperature Service", or
(b) ASTM A351 / A351M, "Castings, Austenitic, for Pressure-Containing Parts".

(2) Stainless steel threaded fittings shall be made of a material that matches the grade of the pipe material used.

r11.1 7.2.6.14. Stainless Steel Tube

(1) Stainless steel tube shall conform to,
(a) ASME B16.9, "Factory-Made Wrought Buttwelding Fittings", and
(b) ASTM A269, "Seamless and Welded Austenitic Stainless Steel Tubing for General Service".

(2) Only grade 304/304L or 316/316L stainless steel tubes shall be used.

r11.1 7.2.6.15. Stainless Steel Pipe and Tube

(1) The use of stainless steel pipe and tube shall conform to Table 7.2.6.15.

Table 7.2.6.15.
Permitted Use of Stainless Steel Tube and Pipe
Forming Part of Sentence 7.2.6.15.(1)

Stainless Steel Tube or Pipe	*Water Distribution System*		*Building Sewer*	*Drainage System*		*Venting System*	
	Underground	Above-ground		Underground	Above-ground	Underground	Above-ground
Stainless steel pipe	P	P	P	P	P	P	P
Stainless steel tube	P	P	N	N	N	N	N
Column 1	2	3	4	5	6	7	8

Notes to Table 7.2.6.15.:
P — Permitted
N — Not Permitted

7.2.7. Non-Ferrous Pipe and Fittings

7.2.7.1. Copper and Brass Pipe

(1) Copper pipe shall conform to ASTM B42, "Seamless Copper Pipe, Standard Sizes".

(2) Brass pipe shall conform to ASTM B43, "Seamless Red Brass Pipe, Standard Sizes".

7.2.7.2. Brass or Bronze Pipe Flanges and Flanged Fittings

(1) Brass or bronze pipe flanges and flanged fittings shall conform to ASME B16.24, "Cast Copper Alloy Pipe Flanges and Flanged Fittings: Classes 150, 300, 600, 900, 1500 and 2500".

7.2.7.3. Brass or Bronze Threaded Water Fittings

r5 **(1)** Brass or bronze threaded water fittings shall conform to ASME B16.15, "Cast Copper Alloy Threaded Fittings: Classes 125 and 250".

(2) Brass or bronze threaded water fittings shall not be used in a *drainage system*.

7.2.7.4. Copper Tube

(1) Copper tube in a *plumbing system* shall,
(a) be certified to ASTM B88, "Seamless Copper Water Tube", or
(b) comply with ASTM B306, "Copper Drainage Tube (DWV)".

(2) The use of copper tube shall conform to Table 7.2.7.4.

r11.1

Table 7.2.7.4.
Permitted Use of Copper Tube and Pipe
Forming Part of Sentence 7.2.7.4.(2)

Type of Copper Tube or Pipe	*Water Distribution System*		*Building Sewer*	*Drainage System*		*Venting System*	
	Underground	Above-ground		Underground	Above-ground	Underground	Above-ground
K & L hard	N	P	P	P	P	P	P
K & L soft	P	P	N	N	N	N	N
M hard	N	P	N	N	P	N	P
M soft	N	N	N	N	N	N	N
DWV	N	N	N	N	P	N	P
Column 1	2	3	4	5	6	7	8

Notes to Table 7.2.7.4.:
P — Permitted
N — Not Permitted

(3) Copper tube used in a *plumbing appliance* shall conform to,
(a) ASTM B88, "Seamless Copper Water Tube", or
r5 (b) ASTM B68 / B68M, "Seamless Copper Tube, Bright Annealed".

(4) Type K or L copper tube shall be used for the *potable* water side of a heat exchanger in a pre-engineered wastewater heat recovery system.

r11.1 **(5)** Copper tube shall not be used for the *fixture drain* or the portion of the *vent pipe* below the *flood level rim* of manually flushing or waterless urinals.

7.2.7.5. Solder-Joint Drainage Fittings

(1) Solder-joint fittings for *drainage systems* shall conform to,
(a) ASME B16.23, "Cast Copper Alloy Solder Joint Drainage Fittings: DWV", or
(b) ASME B16.29, "Wrought Copper and Wrought Copper Alloy Solder Joint Drainage Fittings – DWV".

(2) Solder-joint fittings for *drainage systems* shall not be used in a *water system*.

7.2.7.6. Solder-Joint Water Fittings

(1) Except as provided in Sentence (2), solder-joint fittings for *water systems* shall conform to,
(a) ASME B16.18, "Cast Copper Alloy Solder Joint Pressure Fittings", or
(b) ASME B16.22, "Wrought Copper and Copper Alloy Solder Joint Pressure Fittings".

(2) Solder-joint fittings for *water systems* not made by casting or the wrought process shall conform to the applicable requirements of ASME B16.18, "Cast Copper Alloy Solder Joint Pressure Fittings".

7.2.7.7. Flared-Joint Fittings for Copper Tube Water Systems

(1) Flared-joint fittings for copper tube *water systems* shall conform to ASME B16.26, "Cast Copper Alloy Fittings for Flared Copper Tubes".

(2) Flared-joint fittings for copper tube *water systems* not made by casting shall conform to the applicable requirements of ASME B16.26, "Cast Copper Alloy Fittings for Flared Copper Tubes".

7.2.7.8. Lead Waste Pipe and Fittings

(1) Lead *waste pipe* and fittings shall not be used in a *water system* or for a *building sewer*.

(2) When there is a change in *size* of a lead closet bend, the change shall be in the vertical section of the bend or made in such a manner that there shall be no retention of liquid in the bend.

7.2.8. Corrosion Resistant Materials

7.2.8.1. Pipe and Fittings

(1) Pipes and fittings to be used for drainage and venting of acid and corrosive wastes shall conform to,
(a) ASTM A518 / A518M, "Corrosion-Resistant High-Silicon Iron Castings",
r11.1 (b) ASTM C1053, "Borosilicate Glass Pipe and Fittings for Drain, Waste, and Vent (DWV) Applications", or
(c) CAN/CSA-B181.3, "Polyolefin and Polyvinylidene Fluoride (PVDF) Laboratory Drainage Systems".

7.2.9. Jointing Materials

7.2.9.1. Cement-Mortar

(1) Cement-mortar shall not be used for jointing.

7.2.9.2. Solder and Fluxes

(1) Solders for solder joint fittings shall conform to ASTM B32, "Solder Metal" in accordance with the recommended use.

(2) Solders and fluxes having a lead content in excess of 0.2 percent shall not be used in a *potable water system*.

r5 **(3)** Fluxes for soldered joints shall conform to ASTM B813, "Liquid and Paste Fluxes for Soldering of Copper and Copper Alloy Tube".

r11.1 **(4)** Brazing alloys shall conform to ANSI/AWS A5.8M / A5.8, "Filler Metals for Brazing and Brazed Welding", BCuP range.

7.2.10. Miscellaneous Materials

7.2.10.1. Floor Flanges

(1) Brass floor flanges shall be certified to CSA B158.1, "Cast Brass Solder Joint Drainage, Waste and Vent Fittings".

(2) ABS floor flanges shall be certified to CAN/CSA-B181.1, "Acrylonitrile-Butadiene-Styrene (ABS) Drain, Waste, and Vent Pipe and Pipe Fittings".

(3) PVC floor flanges shall be certified to CAN/CSA-B181.2, "Polyvinylchloride (PVC) and Chlorinated Polyvinylchloride (CPVC) Drain, Waste, and Vent Pipe and Pipe Fittings".

(4) Cast iron, copper and aluminum floor flanges shall be suitable for the purpose.

7.2.10.2. Screws, Bolts, Nuts and Washers

(1) Every screw, bolt, nut and washer shall be of materials that are resistant to corrosion, when used,

r11.1 (a) to connect a water closet to a floor flange,

r11.1 (b) to anchor the floor flange to the floor,

(c) to anchor the water closet to the floor, or

(d) to hold *cleanout* covers or floor drain grates.

7.2.10.3. Cleanout Fittings

(1) Every plug, cap, nut or bolt that is intended to be removable from a ferrous fitting shall be of a non-ferrous material.

(2) A *cleanout* fitting that as a result of normal maintenance operations cannot withstand the physical stresses of removal and reinstallation or cannot ensure a gas-tight seal shall not be installed.

(3) A screw cap or test cap shall not be used as a *cleanout* plug or cover.

7.2.10.4. Mechanical Couplings

(1) Groove and shoulder type mechanical pipe couplings shall conform to CSA B242, "Groove and Shoulder Type Mechanical Pipe Couplings".

r11.1 **(2)** Mechanical Couplings for DWV and Sewer Pipe shall be certified to CSA B602, "Mechanical Couplings for Drain, Waste, and Vent Pipe and Sewer Pipe".

7.2.10.5. Saddle Hubs

(1) Except as provided in Sentence (2), a saddle hub or fitting shall not be installed in *drainage systems*, *venting systems* or *water systems*.

(2) A saddle hub or saddle clamp may be installed in a *building drain* or *building sewer* of nominal diameter not less than 8 in. and that is in service provided that the connecting *branch* is at least two pipe *sizes* smaller than the run of the *building drain* or *building sewer* to which it is connected.

7.2.10.6. Supply and Waste Fittings

r3 **(1)** Supply fittings shall conform to ASME A112.18.1 / CSA B125.1, "Plumbing Supply Fittings" or CSA B125.3, "Plumbing Fittings".

r5 **(2)** Waste fittings shall conform to ASME A112.18.2 / CSA B125.2, "Plumbing Waste Fittings".

7.2.10.7. Linings and Coatings of Domestic Water Tanks

(1) Linings and coatings of domestic water tanks that come into contact with *potable* water shall be certified to NSF/ANSI 61, "Drinking Water System Components - Health Effects".

7.2.10.8. Direct Flush Valves

(1) Every direct flush valve shall,
(a) open fully and close positively under service pressure,
(b) complete its cycle of operation automatically,
(c) be provided with a means of regulating the volume of water that it discharges, and
(d) be provided with a *vacuum breaker* unless the *fixture* is designed so that *back-siphonage* cannot occur.

7.2.10.9. Drinking Fountain Bubblers

(1) The orifice of every drinking fountain bubbler shall,
(a) be of the shielded type, and
(b) direct the water upward to an angle of approximately 45°.

(2) Every drinking fountain bubbler shall include a means of regulating the flow to the orifice.

7.2.10.10. Back-Siphonage Preventers and Backflow Preventers

r5 **(1)** Except as provided in Sentence (2), *back-siphonage preventers* and *backflow preventers* shall be certified to,
(a) CSA B64.0, "Definitions, General Requirements and Test Methods for Vacuum Breakers and Backflow Preventers",
(b) CSA B64.1.1, "Atmospheric Vacuum Breakers (AVB)",
(c) CSA B64.1.2, "Pressure Vacuum Breakers (PVB)",
(d) CSA B64.1.3, "Spill-resistant Pressure Vacuum Breakers (SRPVB)",
(e) CSA B64.1.4, "Vacuum Breaker, Air Space Type (ASVB)",
(f) CSA B64.2, "Hose Connection Vacuum Breakers (HCVB)",
(g) CSA B64.2.1, "Hose Connection Vacuum Breakers (HCVB) with Manual Draining Feature",
(h) CSA B64.2.1.1, "Hose Connection Dual Check Vacuum Breakers (HCDVB)",
(i) CSA B64.2.2, "Hose Connection Vacuum Breakers (HCVB) with Automatic Draining Feature",
(j) CSA B64.3, "Dual Check Valve Backflow Preventers with Atmospheric Port (DCAP)",
(k) CSA B64.3.1, "Dual Check Valve Backflow Preventers with Atmospheric Port for Carbonators (DCAPC)",
(l) CSA B64.4, "Reduced Pressure Principle (RP) Backflow Preventers",

(m) CSA B64.5, "Double Check Valve (DCVA) Backflow Preventers",
(n) CSA B64.6, "Dual Check Valve (DuC) Backflow Preventers",
(o) CSA B64.7, "Laboratory Faucet Vacuum Breakers (LFVB)",
(p) CSA B64.8, "Dual Check Valve Backflow Preventers with Intermediate Vent (DuCV)", or
(q) CSA B64.10, "Selection and Installation of Backflow Preventers".

r3 **(2)** *Back-siphonage preventers* (anti-siphon fill valves) for tank type water closets shall be certified to CSA B125.3, "Plumbing Fittings".

7.2.10.11. Relief Valves

r11.1 **(1)** Temperature relief, pressure relief, combined temperature and pressure relief and vacuum relief valves shall conform to ANSI Z21.22 / CSA 4.4, "Relief Valves for Hot Water Supply Systems".

7.2.10.12. Reducing Valves

(1) Direct acting water pressure reducing valves for domestic water supply systems shall conform to CAN/CSA-B356, "Water Pressure Reducing Valves for Domestic Water Supply Systems".

7.2.10.13. Solar Domestic Hot Water

r11.1 **(1)** Equipment forming part of a packaged system for solar heating of *potable* water, shall conform to CAN/CSA-F379.1, "Packaged Solar Domestic Hot Water Systems (Liquid-to-Liquid Heat Transfer) for All-Season Use".

7.2.10.14. Vent Pipe Flashing

(1) Flashing fabricated on site for *vent pipes* shall be fabricated from,
(a) copper sheet at least 0.33 mm thick,
(b) aluminum sheet at least 0.48 mm thick,
(c) alloyed zinc sheet at least 0.35 mm thick,
(d) lead sheet at least 1.73 mm thick,
(e) galvanized steel sheet at least 0.33 mm thick, or
(f) polychloroprene (neoprene) at least 2.89 mm thick.

(2) Prefabricated flashing for *vent pipes* shall be certified to CSA B272, "Prefabricated Self-Sealing Roof Vent Flashings".

7.2.10.15. Water Hammer Arresters

(1) Factory built water hammer arresters shall conform to ANSI/ASSE 1010, "Water Hammer Arresters".

7.2.10.16. Air Admittance Valves

(1) Air admittance valves shall conform to ASSE 1051, "Individual and Branch Type Air Admittance Valves for Sanitary Drainage Systems". (See Appendix A.)

7.2.10.17. Drinking Water Treatment Systems

(1) A drinking water treatment system or device shall be certified to CAN/CSA-B483.1, "Drinking Water Treatment Systems".

7.2.11. Water Service Pipes and Fire Service Mains

7.2.11.1. Design, Construction, Installation and Testing

(1) Except as provided in Articles 7.2.11.2. to 7.2.11.4., and 7.3.7.2, the design, construction, installation and testing of *fire service mains* and *water service pipe* combined with *fire service mains* shall be in conformance with NFPA 24, "Installation of Private Fire Service Mains and Their Appurtenances".

7.2.11.2. Certification or Conformance

(1) *Water service pipes* and *fire service mains* shall be certified or conform to the standards for the materials listed in Table 7.2.11.2.

r11.1

Table 7.2.11.2.
Water Service Pipe and Fire Service Main Materials
Forming Part of Sentence 7.2.11.2.(1)

	Material	Standard	Limitations
	Polyethylene pipe and fittings	Certified to Series 160 or a higher series of CSA B137.1, "Polyethylene (PE) Pipe, Tubing and Fittings for Cold Water Pressure Services"	
	Crosslinked polyethylene pressure pipe or tube and fittings	Certified to CSA B137.5, "Crosslinked Polyethylene (PEX) Tubing Systems for Pressure Applications"	
r5	PVC pipe and fittings	Certified to CSA B137.3, "Rigid Polyvinylchloride (PVC) Pipe and Fittings for Pressure Applications", or certified to CSA B137.2, "Polyvinylchloride (PVC) Injection-Moulded Gasketed Fittings for Pressure Applications"	Pipe and fittings must have a rated working pressure of 1 100 kPa or more
	CPVC pipe and fittings	Certified to CSA B137.6, "Chlorinated Polyvinylchloride (CPVC) Pipe, Tubing and Fittings for Hot and Cold Water Distribution Systems"	The design temperature and pressure shall conform to the requirements of the CSA B137.6, "Chlorinated Polyvinylchloride (CPVC) Pipe, Tubing and Fittings for Hot and Cold Water Distribution Systems"
r5	Cast iron water pipe	Conform to ANSI/AWWA C151 / A21.51, "Ductile-Iron Pipe, Centrifugally Cast"	Pipe shall have a cement-mortar lining conforming to ANSI/AWWA C104 / A21.4, "Cement-Mortar Lining for Ductile-Iron Pipe and Fittings"
	Iron fittings for cast iron or ductile-iron water pipes	Conform to ANSI/AWWA C110 / A21.10, "Ductile-Iron and Gray-Iron Fittings"	Pipe shall have a cement-mortar lining conforming to ANSI/AWWA C104 / A21.4, "Cement-Mortar Lining for Ductile-Iron Pipe and Fittings"
	Rubber gasket joints for cast iron and ductile-iron water pipes	Conform to ANSI/AWWA C111 / A21.11, "Rubber Gasket Joints for Ductile-Iron Pressure Pipe and Fittings"	
r5	Screwed cast iron water fittings	Conform to ASME B16.4, "Gray Iron Threaded Fittings: Classes 125 and 250"	Screwed cast iron water fittings shall be cement-mortar lined or galvanized
	Type K soft copper tube	Certified to ASTM B88, "Seamless Copper Water Tube"	
	Solder-joint fittings for copper water systems	Conform to ASME B16.18, "Cast Copper Alloy Solder Joint Pressure Fittings", or conform to ASME B16.22, "Wrought Copper and Copper Alloy Solder-Joint Pressure Fittings"	Solder-joint fittings not made by casting or the wrought process shall conform to the applicable requirements of ASME B16.18, "Cast Copper Alloy Solder-Joint Pressure Fittings"
	Flared-joint fittings for copper water systems	Conform to ASME B16.26, "Cast Copper Alloy Fittings for Flared Copper Tubes"	Flared-joint fittings not made by casting shall conform to ASME B16.26, "Cast Copper Alloy Fittings for Flared Copper Tubes"
	PE/AL/PE pipe and fittings	Certified to CSA B137.9, "Polyethylene/Aluminum/ Polyethylene (PE-AL-PE) Composite Pressure-Pipe Systems"	
	PEX/AL/PEX pipe and fittings	Certified to CSA B137.10, "Crosslinked Polyethylene/ Aluminum/Crosslinked Polyethylene (PEX-AL-PEX) Composite Pressure-Pipe Systems"	
	Column 1	2	3

7.2.11.3. Tracer Wire

(1) Except as provided in Sentence (2), a 14 gauge TW solid copper light coloured plastic coated tracer wire shall be attached to every non-metallic *water service pipe* or *fire service main*.

(2) Where a *water service pipe* or *fire service main* is detectable without the tracer wire referenced in Sentence (1), the tracer wire may be omitted.

7.2.11.4. Required Check Valve

(1) Where a *water service pipe* is supplied with water by more than one *drinking water system*, a *check valve* shall be installed at each connection with a *drinking water system*.

(2) Where a *fire service main* is supplied with water by more than one source, a *check valve* shall be installed at each connection with a source of water.

Section 7.3. Piping

7.3.1. Application

7.3.1.1. Application

(1) This Section applies to the *construction* and use of joints and connections, and the arrangement, protection, support and testing of piping.

7.3.2. Construction and Use of Joints

7.3.2.1. Caulked Lead Drainage Joints

(1) Every caulked lead drainage joint shall be firmly packed with oakum and tightly caulked with lead to a depth of at least 25 mm.

(2) No paint, varnish or other coating shall be applied on the lead until after the joint has been tested.

(3) Caulked lead drainage joints shall not be used except for cast iron pipe in a *drainage system* or *venting system*, or between such pipe and,
(a) other ferrous pipe,
(b) brass and copper pipe,
(c) a caulking ferrule, or
(d) a *trap standard*.

(4) A length of hub and spigot pipe and pipe fittings in a *drainage system* shall be installed with the hub at the upstream end.

7.3.2.2. Wiped Joints

(1) Wiped joints shall not be used except for sheet lead or lead pipe, or between such pipe and copper pipe or a ferrule.

(2) Every wiped joint in straight pipe shall,
(a) be made of solder,
(b) have an exposed surface on each side of the joint at least 19 mm wide, and
(c) be at least 10 mm thick at the thickest part.

(3) Every wiped flanged joint shall be reinforced with a lead flange that is at least 19 mm wide.

7.3.2.3. Screwed Joints

(1) In making a screwed joint, the ends of the pipe shall be reamed or filed out to the *size* of the bore and all chips and cuttings shall be removed.

(2) No pipe-joint cement or paint shall be applied to the internal threads.

7.3.2.4. Solder Joints

(1) Soldered joints shall be made in accordance with ASTM B828, "Making Capillary Joints by Soldering of Copper and Copper Alloy Tube and Fittings".

7.3.2.5. Flared Joints

(1) In making a flared joint, the pipe shall be expanded with a proper flaring tool.

(2) Flared joints shall not be used for hard (drawn) copper tube.

7.3.2.6. Mechanical Joints

(1) Mechanical joints shall be made with compounded elastomeric couplings or rings held by stainless steel or cast iron clamps or contained within a compression connection or groove and shoulder type mechanical coupling. (See Appendix A.)

7.3.2.7. Cold-Caulked Joints

(1) Cold-caulked joints shall not be used except for bell and spigot pipe in a *water system*, a *drainage system* or a *venting system*.

(2) The caulking compound used in cold-caulked joints shall be applied according to the manufacturer's directions.

(3) Every cold-caulked joint in a *drainage system* shall be firmly packed with oakum and tightly caulked with cold caulking compound to a depth of at least 25 mm.

r11.1 7.3.2.8. Stainless Steel Welded Joints

(1) Stainless steel welded joints shall conform to ASME B31.9, "Building Services Piping".

(2) Butt weld pipe fittings shall be at least as thick as the wall of the pipe used.

7.3.3. Joints and Connections

7.3.3.1. Drilled and Tapped Joints

(1) Except as provided in Sentences (2) to (4), no water *distributing pipe*, drainage pipe or fittings shall be drilled, tapped or swaged.

(2) A water *distributing pipe* may be drilled or tapped to provide for a mechanically extracted T in copper tubing of Type L or K provided that all branch connections shall be notched and dimpled to limit depth of insertion and conform to the inner contour of the main.

(3) A copper water *distributing pipe* of 1 in. *size* or larger may be mechanically swaged to permit the joining of other copper pipe of equal *size*.

(4) A drainage pipe or fitting may be drilled or tapped,
(a) to provide for the connection of a *trap* seal primer line,
(b) to connect a device designed to dispense germicidal or odour control chemicals or *trap* seal water to a floor drain downstream of a *vacuum breaker* or flush valve in a flush tube connected to a *sanitary unit*,
(c) to provide a hole for a *branch* connection to a drainage pipe, where the *branch* connection is made with a saddle hub as permitted by Article 7.2.10.5. and where the hole is drilled to provide a smooth clean hole of the required *size* and orientation, or
(d) to provide for the connection of pipe or fittings to metal or rigid plastic pipe and fittings where the pipe or fittings are thick enough to be threaded or are bossed for tapping.

(5) No pipe adaption shall be made by the use of a bushing that leaves a square edge or shoulder on the inside of the pipe or fitting.

7.3.3.2. Reserved

7.3.3.3. Prohibition of Welding of Pipes and Fittings

(1) Cast iron *soil pipe* and fittings shall not be welded.

(2) Galvanized steel pipe and fittings shall not be welded.

7.3.3.4. Unions and Slip Joints

(1) Running thread and packing nut connections and unions with a gasket seal shall not be used downstream of a *trap weir* in a *drainage system* or in a *venting system*.

(2) A slip joint shall not be used,
(a) in a *venting system*, or
(b) in a *drainage system*, except to connect a *fixture trap* to a *fixture drain* in an *accessible* location.

7.3.3.5. Increaser or Reducer

(1) Every connection between two pipes of different *size* shall be made with an increaser or a reducer fitting installed so that it will permit the system to be completely drained.

7.3.3.6. Connection of Dissimilar Materials

(1) Adapters, connectors or mechanical joints used to join dissimilar materials shall be designed to accommodate the required transition.

7.3.3.7. Connection of Roof Drain to Leader

(1) Every *roof drain* shall be securely connected to a *leader* and provision shall be made for expansion.

7.3.3.8. Connection of Floor Outlet Fixtures

r11.1 **(1)** Every pedestal urinal, floor-mounted water closet or S-*trap standard* shall be connected to a *fixture drain* by a floor flange or other means of connection, except that a cast iron *trap standard* may be caulked to a cast iron pipe.

(2) Except as provided in Sentence (3), every floor flange shall be of brass.

(3) Where cast iron or plastic pipe is used, a floor flange of the same material may be used.

r11.1 **(4)** Every floor flange and *fixture* shall be securely set on a firm base and fastened to the floor or *trap* flange of the *fixture*.

r11.1 **(4.1)** Every joint in a floor flange or between a *fixture* and the *drainage system* shall be sealed with a resilient, watertight and gas-tight seal.

(5) Where a lead water closet stub is used, the length of the stub below the floor flange shall be at least 75 mm.

7.3.3.9. Expansion and Contraction

(1) The design and installation of every piping system shall, where necessary, include means to accommodate expansion and contraction of the piping system caused by temperature change or *building* shrinkage. (See Appendix A.)

7.3.3.10. Copper Tube

(1) Types M and DWV copper tube shall not be bent.

(2) Bends in copper tubing of soft or bending temper shall be made with tools manufactured and sized for the purpose.

7.3.3.11. Indirect Connections

(1) Where a *fixture* or device is *indirectly connected*, the connections shall be made by terminating the *fixture drain* above the *flood level rim* of a *directly connected fixture* to form an *air break*.

(2) The size of the *air break* shall be at least 25 mm.

7.3.3.12. Copper Joints Used Underground

(1) Except as provided in Sentence (2), joints in copper tubes installed underground shall be,
(a) made with either flared or compression fittings, or
(b) brazed using a brazing alloy within the American Welding Society's AWS-BCuP range.

(2) Compression fittings shall not be used underground under a *building*.

7.3.4. Support of Piping

7.3.4.1. Capability of Support

(1) Piping shall be provided with support that is capable of keeping the pipe in alignment and bearing the weight of the pipe and its contents.

(2) Every floor or wall mounted water closet bowl shall be securely attached to the floor or wall by means of a flange and shall be stable.

(3) Every wall mounted *fixture* shall be supported so that no strain is transmitted to the piping.

7.3.4.2. Independence of Support

(1) Piping, *fixtures*, tanks or devices shall be supported independently of each other.

7.3.4.3. Insulation of Support

r11.1 **(1)** Where a hanger or support for copper tube or brass or copper pipe is of a material other than brass or copper, it shall be suitably separated and electrically insulated from the pipe or tube to prevent galvanic action.

r11.1 **(2)** Where a hanger or support for stainless steel pipe or tube is of a material other than stainless steel, it shall be suitably separated and electrically insulated from the pipe or tube.

7.3.4.4. Support for Vertical Piping

(1) Except as provided in Sentence (2), vertical piping shall be supported at its base and at the floor level of alternate *storeys* by rests, each of which can bear the weight of pipe that is between it and the rest above it.

(2) The maximum spacing of supports shall be 7.5 m.

7.3.4.5. Support for Horizontal Piping

(1) *Nominally horizontal* piping that is inside a *building* shall be braced to prevent swaying and buckling and to control the effects of thrust.

(2) *Nominally horizontal* piping shall be supported so that,

(a) galvanized iron or steel pipe is supported at intervals not exceeding,
  (i) 3.75 m if the pipe *size* is 6 in. or more, and
  (ii) 2 500 mm if the pipe *size* is less than 6 in.,
(b) lead pipe is supported throughout its length,
(c) cast iron pipe is supported,
  (i) at or adjacent to each hub or joint,
  (ii) at intervals not exceeding 3 m, and
  (iii) at intervals not exceeding 1 000 mm if the pipe has mechanical joints and the length of pipe between adjacent fittings is 300 mm or less,
r11.1 (d) reserved
(e) ABS or PVC plastic DWV pipe is supported,
  (i) at intervals not exceeding 1 200 mm,
  (ii) at the ends of *branches*,
  (iii) at changes of direction or elevation, and
  (iv) if the pipe is a *fixture drain* that is more than 1 000 mm in length, as close as possible to the *trap*,
(f) plastic water pipe is supported at intervals not exceeding 1 000 mm,

(g) copper tube and copper and brass pipe is supported at intervals not exceeding,
  (i) 3 m if the tube or pipe is hard temper and larger than 1 in. in *size*,
  (ii) 2 500 mm if the tube or pipe is hard temper and 1 in. in *size* or less, and
  (iii) 2 500 mm if the tube is soft temper,
(h) aluminum DWV pipe is supported,
  (i) at intervals not greater than 3 m,
  (ii) at both sides of all joints,
  (iii) at all *branch* ends,
  (iv) at all points where there is a change in direction, and
  (v) as close to all *traps* as possible,
(i) supports and hangers for aluminum DWV pipe shall have a broad support base and shall be free of burrs and rough edges to prevent abrasion of the pipe,
(j) where joints in the piping are less rigid than the pipe, the support points shall be selected so as to minimize the shear and bending forces imposed on the joints,
(k) PE/AL/PE or PEX/AL/PEX composite pipe is supported at intervals not exceeding 1 000 mm,
(l) PP-R plastic pipe is supported,
  (i) at intervals not exceeding 1 000 mm,
  (ii) at the end of *branches*, and
  (iii) at changes of direction and elevation, and
r11.1 (m) stainless steel pipe or tube is supported at intervals not exceeding,
  (i) 3 000 mm if the pipe or tube *size* is 1 in. or more, and
  (ii) 2 500 mm if the pipe or tube *size* is less than 1 in.

(3) Where plastic pipe or a composite pipe incorporating a plastic component is installed,
(a) the pipe shall be aligned without added strain on the piping,
(b) the pipe shall not be bent or pulled into position after being welded or joined, and
(c) hangers shall not compress, cut or abrade the pipe.

(4) Reserved

(5) Where hangers are used to support *nominally horizontal* piping, the hangers shall be,
(a) supported by metal rods of not less than,
  (i) 6 mm diam for supporting pipe 2 in. or less in size,
  (ii) 8 mm diam for supporting pipe 4 in. or less in size, and
  (iii) 13 mm diam for supporting pipe over 4 in. in size, or
(b) solid or perforated metal straps not less than,
  (i) 0.6 mm nominal thickness, 12 mm wide for pipe 2 in. or less in size, and
  (ii) 0.8 mm nominal thickness, 18 mm wide for pipe 4 in. or less in size.

(6) Where a hanger is attached to concrete or masonry, it shall be fastened by metal or expansion-type plugs that are inserted or built into the concrete or masonry.

7.3.4.6. Support for Underground Horizontal Piping

(1) Except as provided in Sentence (2), *nominally horizontal* piping that is underground shall be supported on a base that is firm and continuous under the whole of the pipe. (See Appendix A.)

(2) *Nominally horizontal* piping installed underground that is not supported as described in Sentence (1) may be installed using hangers fixed to a foundation or structural slab provided that the hangers are capable of,
(a) keeping the pipe in alignment, and
(b) supporting the weight,
  (i) of the pipe,
  (ii) its contents, and
  (iii) the fill over the pipe.

7.3.4.7. Support for Vent Pipe Above a Roof

(1) Where a *vent pipe* terminates above the surface of a roof, it shall be supported or braced to prevent misalignment.

7.3.4.8. Compression Fittings

(1) No compression fitting connecting to plain end pipe or tube shall be used in a *plumbing system* unless the pipe or tube and fittings are sufficiently stayed, clamped, anchored or buttressed so as to prevent separation during normal service of the system allowing for surge pressures.

7.3.4.9. Thrust Restraint of Water Service Pipes (See Appendix A.)

(1) Pipe clamps and tie-rods, thrust blocks, locked mechanical or push-on joints, mechanical joints utilizing set screw retainer glands, or other suitable means of thrust restraint shall be provided at each change of direction of a *water service pipe* 4 in. or more in *size* and at all tees, plugs, caps and bends.

(2) Backing for underground *water service pipes* shall be placed,
(a) between undisturbed earth and the fitting to be restrained and shall be of sufficient bearing area to provide adequate resistance to the thrust to be encountered, and
(b) so that the joints will be *accessible* for inspection and repair.

(3) Concrete thrust blocks shall have a minimum compressive strength of not less than 10 MPa after 28 days.

(4) Thrust blocks shall not be used to restrain vertical pipe.

7.3.5. Protection of Piping

7.3.5.1. Backfill of Pipe Trench

(1) Where piping is installed underground, the backfill shall be carefully placed and tamped to a height of 300 mm over the top of the pipe and shall be free of stones, boulders, cinders and frozen earth. (See Appendix A.)

7.3.5.2. Protection of Non-Metallic Pipe

r11.1 **(1)** Where vitrified clay is located less than 600 mm below a basement floor and the floor is constructed of other than 75 mm or more of concrete, the pipe shall be protected by a 75 mm layer of concrete installed above the pipe.

7.3.5.3. Isolation from Loads

(1) Where piping passes through or under a wall, it shall be installed so that the wall does not bear on the pipe.

7.3.5.4. Protection from Frost

(1) Where piping may be exposed to freezing conditions, it shall be protected from the effects of freezing. (See Appendix A.)

7.3.5.5. Protection from Mechanical Damage

(1) *Plumbing*, piping and equipment exposed to mechanical damage shall be protected.

7.3.5.6. Protection from Condensation

(1) Piping used for internal *leaders*, which may be subject to condensation, shall be installed in a manner that limits the risk of damage to the *building* due to condensation.

7.3.5.7. Spatial Separation (See Appendix A.)

(1) Except as permitted in Sentences (2) and (3), a buried *water service pipe* shall be separated from the *building drain*, *building sewer* and a *private sewage disposal system*, by not less than 2 440 mm measured horizontally, of undisturbed or compacted earth.

(2) The *water service pipe* may be closer than 2 440 mm or be placed in the same trench with the *building drain* or *building sewer* if,

(a) the following conditions are met:

(i) the bottom of the *water service pipe* at all points is at least 500 mm above the top of the *building drain* or *building sewer*, and

(ii) when in a common trench with the *building drain* or *building sewer*, the *water service pipe* is placed on a shelf at one side of the common trench,

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(2) Adjacent compartments within every oil *interceptor* shall be connected to each other by a *vent* opening.

(3) Where a secondary receiver for oil is installed in conjunction with an oil *interceptor*, it shall be vented in accordance with the manufacturer's recommendations, and the *vent pipe* shall,
(a) in no case be less than 1½ in. in *size*,
(b) extend independently to *open air*, and
(c) terminate not less than 2 000 mm above ground.

(4) The *vent pipes* referred to in Sentence (1) are permitted to be one *size* smaller than the largest connected drainage pipe but not less than 1¼ in. in *size*, or can be sized in accordance with the manufacturer's recommendations.

(5) Every *vent pipe* that serves an oil or grease *interceptor* and is located outside a *building* shall be not less than 3 in. in *size* in areas where it may be subject to frost closure.

(6) Every grease *interceptor* shall have a *vent pipe* that is not less than 1½ in. in *size* connected to the outlet pipe, that connects to the *plumbing venting system*.

(7) A *vent pipe* shall be provided within 1 500 mm of the inlet to a grease *interceptor* complete with a *cleanout* to provide cleaning of the *vent pipe*.

(8) Where an acid waste dilution tank is installed, it shall be provided with a *vent pipe* connected at the top of the tank and that is sized in accordance with Article 7.5.7.7.

7.5.5.3. Venting of Corrosive Drain Piping and Dilution Tanks

(1) *Venting systems* for drain piping or dilution tanks conveying corrosive waste shall extend independently and terminate in *open air*.

7.5.5.4. Fresh Air Inlets

(1) Where a *building trap* is installed, a *fresh air inlet* not less than 4 in. in *size* shall be connected upstream and within 1 200 mm of the *building trap* and downstream of any other connection.

7.5.5.5. Provision for Future Installations

(1) Where provision is made for a *fixture* to be installed in the future, the *drainage system* and *venting system* shall be sized accordingly and provision made for the necessary future connections.

r11.1 **(2)** Except as required in Sentence 7.5.7.7.(2), where a *plumbing system* is installed in a *building*, every *storey* in which *plumbing* is or may be installed, including the *basement* of the *building*, shall have extended into it or passing through it a *vent pipe* that is at least 1½ in. in *size* for the provision of future connections.

7.5.6. Arrangement of Vent Pipes

7.5.6.1. Drainage of Vent Pipes

(1) Every *vent pipe* shall be installed without depression in which moisture can collect.

(2) Every *waste pipe* shall be installed and *back vented* at the same time.

7.5.6.2. Vent Pipe Connections (See Appendix A.)

(1) Every *vent pipe* in a *plumbing system* shall be installed so as to be direct as possible to a *vent stack* or *open air*, as the case may be, and so that any horizontal run below the flood level of the *fixture* to which the *vent pipe* is installed is eliminated where structurally possible.

(2) Except for *wet vents*, where a *vent pipe* is connected to a *nominally horizontal soil* or *waste pipe*, the connection shall be above the horizontal centre line of the *soil* or *waste pipe*.

(3) Unused *vent pipes* installed for future connections shall be permanently capped with an end *cleanout* or an adapter and plug.

7.5.6.3. Location of Vent Pipes

(1) Except as provided in Sentences (2) and (3), a *vent pipe* that protects a *fixture trap* shall be located so that,
(a) the *developed length* of the *trap arm* is not less than twice the *size* of the *fixture drain*,
(b) the total fall of the *trap arm* is not greater than its inside diameter, and
(c) the *trap arm* does not have a cumulative change in direction of more than 135°.

(2) The *trap arm* of water closets, S-*trap standards* or any other *fixture* that also discharges vertically and depends on siphonic action for its proper functioning shall not have a cumulative change in direction of more than 225°.

(3) A *vent pipe* that protects a water closet or any other *fixture* that also depends on siphonic action for its proper functioning shall be located so that the distance between the connections of the *fixture drain* to the *fixture* and the *vent pipe* shall not exceed,
(a) 1 000 mm in the vertical plane, and
(b) 3 m in the horizontal plane.

(4) The maximum length and minimum slope of every *trap arm* shall conform to Table 7.5.6.3.

(5) The *vent pipe* from a water closet or any other *fixture* that has an integral siphonic flushing action may be connected to the *vertical leg* of its drainage pipe.

Table 7.5.6.3.
Length of Trap Arm
Forming Part of Sentence 7.5.6.3.(4)

Size of *Trap* Served, in.	Maximum *Trap Arm*, m	Minimum Slope
1¼	1.5	1 in 50
1½	1.8	1 in 50
2	2.4	1 in 50
3	3.6	1 in 50
4	4.9	1 in 50
4	9.8	1 in 100
Column 1	2	3

7.5.6.4. Connection of Vents Above Fixtures Served

(1) Except for a *wet vent*, every *vent pipe* shall extend above the *flood level rim* of every *fixture* that it serves before being connected to another *vent pipe*.

Table 7.5.8.4.
Size and Developed Length of Stack Vents and Vent Stacks
Forming Part of Sentence 7.5.8.4.(1)

Size of *Soil* or *Waste Stack*, in.	Total Hydraulic Load Being Vented, *fixture units*	Water Occupied Area	*Size* of *Stack Vent* or *Vent Stack*, in.									
			1¼	1½	2	3	4	5	6	8	10	12
			Maximum Length of *Stack Vent* or *Vent Stack*, m									
1¼	2	0.29	9	Not Limited								
1½	8	0.25	15	46	Not Limited							
2	12	0.25	9	23	61	Not Limited						
	24	.29	8	15	46	Not Limited						
3	10	0.15	Not Permitted	13	46	317	Not Limited					
	21	.20		10	33.5	247	Not Limited					
	53	.25		8	28.5	207	Not Limited					
	102	.29		7.5	26	189	Not Limited					
4	43	0.15	Not Permitted		10.5	76	299	Not Limited				
	140	.20			8	61	229	Not Limited				
	320	.25			7	52	195	Not Limited				
	540	.29			6.5	46	177	Not Limited				
5	190	0.15	Not Permitted			25	97.5	302	Not Limited			
	490	.20				29	76	232	Not Limited			
	940	.25				16	64	204	Not Limited			
	1 400	.29				15	58	180	Not Limited			
6	500	0.15	Not Permitted			10	39.5	122	305	Not Limited		
	1 100	.20				8	30.5	94.5	238	Not Limited		
	2 000	.25				6.5	25.5	79	201	Not Limited		
	2 900	.29				6	23.5	73	183	Not Limited		
8	1 800	0.15	Not Permitted				9.5	29	73	287	Not Limited	
	3 400	.20					7	22	58	219.5	Not Limited	
	5 600	.25					6	19	49	186	Not Limited	
	7 600	.29					5.5	17	43	70.5	Not Limited	
10	4 000	0.15	Not Permitted					9.5	24	94.5	292.5	Not Limited
	7 200	.20						7	18	73	225.5	Not Limited
	11 000	.25						6	15.5	61	192	Not Limited
	15 000	.29						5.5	14	55	174	Not Limited
12	7 300	0.15	Not Permitted						9.5	36.5	116	287
	13 000	.20							7	28.5	91	219.5
	20 000	.25							6	24	76	186
	26 000	.29							5.5	22	70	152
15	15 000	0.15	Not Permitted							12	39.5	94.5
	25 000	.20								9.5	29	73
	38 000	.25								8	24.5	62
	50 000	.29								7	22.5	55
Column 1	2	3	4	5	6	7	8	9	10	11	12	13

7.5.8.5. Lengths for other Vent Pipes

(1) When sizing an *additional circuit vent*, *offset relief vent*, *relief vent*, *yoke vent* and the *vent pipe* for an *interceptor*, dilution tank, *sanitary sewage* tank or sump, or manhole, length is not taken into consideration.

7.5.9. Air Admittance Valves

7.5.9.1. Air Admittance Valve as a Vent Terminal

r11.1 **(1)** *Individual vents* and *dual vents* are permitted to terminate with a connection to an *air admittance valve* as provided in Articles 7.5.9.2. and 7.5.9.3.

7.5.9.2. Air Admittance Valves

(1) *Air admittance valves* shall only be used to vent,
(a) *fixtures* in *buildings* undergoing renovation, and
(b) installations where connection to a *vent* may not be practical.

(2) The *air admittance valves* shall be located,
(a) above the *flood level rim* of the *fixture* it serves,
(b) within the maximum *developed length* permitted for the *vent*,
(c) not less than 150 mm above insulation materials, and
(d) installed in a location not subject to back pressure.

(3) *Air admittance valves* shall,
(a) only vent *fixtures* located on the same *storey*, and
(b) be connected to the horizontal *fixture drain*.

7.5.9.3. Installation Conditions

(1) *Air admittance valves* shall not be installed in supply or return air *plenums*, or in locations where they may be exposed to freezing temperatures.

(2) *Air admittance valves* shall be installed in accordance with the manufacturer's installation instructions.

(3) *Air admittance valves* shall be rated for the *size* of *vent pipe* to which they are connected.

(4) Installed *air admittance valves* shall be,
(a) *accessible*, and
(b) located in a space that allows air to enter the valve.

r3 **(5)** Every *drainage system* shall have one *vent* that terminates to *open air* in conformance with Sentence 7.5.6.5.(1).

r5 (c) *Class 1 fire sprinkler/standpipe systems* not covered by Clause (b) as well as *Class 2* and *Class 3 fire sprinkler/standpipe systems* shall be protected by a double *check valve backflow preventer* conforming to CSA B64.5.1, "Double Check Valve Backflow Preventers for Fire Protection Systems (DCVAF)", provided that the systems do not use antifreeze or other additives of any kind,

r5 (d) *Class 1, Class 2* or *Class 3 fire sprinkler/standpipe systems*, in which antifreeze or other additives are used, shall be protected by a reduced pressure principle *backflow preventer* conforming to CSA B64.4.1, "Reduced Pressure Principle Backflow Preventers for Fire Protection Systems (RPF)", installed on the portion of the system that uses the additives and the balance of the system shall be protected as required by Clause (b) or (c),

r5 (e) *Class 4* and *Class 5 fire sprinkler/standpipe systems* shall be protected by a reduced pressure principle *backflow preventer* conforming to CSA B64.4.1, "Reduced Pressure Principle Backflow Preventers for Fire Protection Systems (RPF)",

(f) *Class 6 fire sprinkler/standpipe systems* shall be protected,

r5 (i) by a double *check valve backflow preventer* conforming to CSA B64.5.1, "Double Check Valve Backflow Preventers for Fire Protection Systems (DCVAF)", or

r5 (ii) where a severe hazard may be caused by *backflow*, by a reduced pressure principle *backflow preventer* conforming to CSA B64.4.1, "Reduced Pressure Principle Backflow Preventers for Fire Protection Systems (RPF)", and

(g) *backflow preventers* on fire sprinkler and standpipe systems shall be selected and installed in conformance with Table 7.6.2.4.

Table 7.6.2.4.
Backflow Preventers on Fire Sprinkler and Standpipe Systems
Forming Part of Sentence 7.6.2.4.(2)

CSA Standard Number	Type of Device(1)	System Made with Potable Water System Materials		System Not Made with Potable Water System Materials	
		Minor Hazard(2) Residential Partial Flow-Through System	Minor Hazard(2) Class 1 System	Moderate Hazard(2) Class 1, 2, 3 and 6 Systems	Severe Hazard(2) – Any Class of System in which Antifreeze or Other Additives Are Used
B64.6.1	DuCF	P	NP	NP	NP
B64.9	SCVAF	P	P	NP	NP
B64.5.1	DCVAF	P	P	P	NP
B64.4.1	RPF	P	P	P	P
Column 1	2	3	4	5	6

Notes to Table 7.6.2.4.:
P – Permitted
NP – Not Permitted
(1) The product is only permitted for use on fire sprinkler and standpipe systems.
(2) Minor Hazard, Moderate Hazard and Severe Hazard have the same meaning as indicated in CSA B64.10 "Selection and Installation of Backflow Preventers".

(3) The *backflow preventer* required by Sentence (2) shall be installed upstream of the fire department pumper connection.

r5 **(4)** Where a reduced pressure principle *backflow preventer* is required on the *water service pipe* at a service connection located on the same premises as the *fire service main* in *Class 3, 4, 5* and *6 fire sprinkler/standpipe systems*, a reduced pressure principle *backflow preventer* conforming to CSA B64.4.1, "Reduced Pressure Principle Backflow Preventers for Fire Protection Systems (RPF)", shall also be provided on the fire service connection.

7.6.2.5. Backflow from Buildings with a Solar Domestic Hot Water System
(See Appendix A.)

(1) Except as permitted by Sentence (2) and as provided in Sentences (3) and (4), a *potable water system* shall be protected against *backflow* where the heat transfer loop of a solar domestic hot water system is *directly connected* to the *potable water system*.

(2) Where the heat transfer loop of the solar domestic hot water system consists of direct flow-through of *potable* water only, protection against *backflow* is not required.

r11.1 **(3)** A *potable water system* that is *directly connected* to the heat transfer loop of a solar domestic hot water system that serves a *residential occupancy* within the scope of Part 9 shall be provided with a *backflow preventer* selected in accordance with CAN/CSA-F379.1, "Packaged Solar Domestic Hot Water Systems (Liquid-to-Liquid Heat Transfer) for All-Season Use".

r11.1 **(4)** Where a solar domestic hot water system includes a single wall heat exchanger and contains only a relatively harmless heat transfer fluid as described in CAN/CSA-F379.1, "Packaged Solar Domestic Hot Water Systems (Liquid-to-Liquid Heat Transfer) for All-Season Use", the *backflow* prevention required in Sentence (1) is permitted to be a dual *check valve backflow preventer* conforming to CSA B64.3, "Dual Check Valve Backflow Preventers with Atmospheric Port (DCAP)".

7.6.2.6. Premise Isolation (See Appendix A.)

(1) *Buildings* or facilities where a moderate hazard or severe hazard may be caused by *backflow* shall be provided with premise isolation of the *potable water system* by the installation of a *backflow preventer* selected in accordance with Clauses 5.3.4.2.(b) and (c) of CSA B64.10, "Selection and Installation of Backflow Preventers".

(2) *Buildings* of *residential occupancy* within the scope of Part 9 are not required to be isolated unless they have access to an *auxiliary water supply*.

r11.1 **(3)** Except as provided in Sentence (1), where no direct connection exists between the *auxiliary water supply* and the *potable water system*, premise isolation shall be provided by a dual *check valve backflow preventer* conforming to CSA B64.6, "Dual Check Valve (DuC) Backflow Preventers".

7.6.2.7. Reserved

7.6.2.8. Cleaning of Systems

(1) A newly installed part of a *potable water system* shall be cleaned and then flushed with *potable* water before the system is put into operation. (See Appendix A.)

7.6.2.9. Air Gap

(1) An *air gap* shall not be located in a noxious environment.

(2) Every *air gap* shall be not less than 25 mm high and at least twice the diameter of the opening of the water supply outlet in height.

7.6.2.10. Vacuum Breakers and Flood Levels

r11.1 **(1)** Where the *critical level* is not marked on an atmospheric *vacuum breaker*, pressure *vacuum breaker* or spill-resistant pressure *vacuum breaker*, the *critical level* shall be taken as the lowest point on the device.

(2) Where an atmospheric *vacuum breaker* is installed, it shall be located on the downstream side of the *fixture* control valve or faucet so that it will be subject to water supply pressure,
(a) only when the *fixture* control valve or faucet is open, and
(b) for periods of use not to exceed 12 h continuous.

(3) An atmospheric *vacuum breaker* shall be installed so that the *critical level* is at least the distance specified by the manufacturer at which the device will operate safely but not less than 25 mm above,
(a) the *flood level rim* of a *fixture* or tank, or
(b) the highest point open to atmosphere in an irrigation system.

r11.1 **(4)** A pressure *vacuum breaker* or spill-resistant pressure *vacuum breaker* shall be installed with its *critical level* at least 300 mm above,
(a) the *flood level rim* of a *fixture* or tank, or
(b) the highest point open to atmosphere in an irrigation system.

7.6.3. Size and Capacity of Pipes

7.6.3.1. Design, Construction and Installation

(1) Every *water distribution system* shall be designed to provide peak demand flow when the flow pressures at the supply openings conform to the plumbing supply fitting manufacturer's specifications.

(2) A *potable water system* shall be designed, constructed and installed to conform to good engineering practice appropriate to the circumstances, such as that described in the ASHRAE Handbooks and ASPE Data Books. (See Appendix A.)

(3) Every pipe that supplies a *fixture* shall have a capacity that will produce a flow in the *fixture* that will flush the *fixture* and keep it in a sanitary condition.

7.6.3.2. Hydraulic Load

(1) Except as provided in Sentence (3), the hydraulic load of a *fixture* or device that is listed in Table 7.6.3.2.A. shall be the number of *fixture units* given in the Table.

(2) Except as provided in Sentences (1) and (3), the hydraulic load of a *fixture* that is not listed in Table 7.6.3.2.A. is the number of *fixture units* listed in Table 7.6.3.2.D.

(3) Where *fixtures* are supplied with both hot and cold water, the hydraulic loads for maximum separate demands shall be 75% of the hydraulic load of the *fixture units* given in Tables 7.6.3.2.A. and 7.6.3.2.D. when using a detailed engineering design method.

(4) The hydraulic load of urinals and water closets with direct flush valves shall be the number of *fixture units* listed in Tables 7.6.3.2.B. and 7.6.3.2.C.

Table 7.6.3.2.A.
Sizing of Water Distribution Systems(1)(2)
Forming Part of Sentences 7.6.3.2.(1) to (3) and 7.6.3.4.(2), (3) and (5)

Fixture or Device	Minimum *Size* of Supply Pipe, in.	*Private Use* Hydraulic Load, *fixture units*			*Public Use* Hydraulic Load, *fixture units*		
		Cold	Hot	Total	Cold	Hot	Total
Bathroom group with 6 LPF flush tank(3)	N/A	2.7	1.5	3.6	-	-	-
Bathroom group with greater than 6 LPF flush tank(3)	N/A	4	3	6	-	-	-
Bathroom group with more than 3 fixtures	-	-	-	(4)	-	-	-
Bathtub with or without shower head	1/2	1	1	1.4	3	3	4
Bathtub with ¾ in. spout	3/4	7.5	7.5	10	7.5	7.5	10
Bedpan washer	1	-	-	-	7.5	7.5	10
Bidet	3/8	1.5	1.5	2	-	-	-
Clothes washer, 3.5 kg	1/2	1	1	1.4	2.25	2.25	3
Clothes washer, 6.8 kg	1/2	-	-	-	3	3	4
Clothes washer, commercial(5)	-	-	-	-	-	-	-
Dental lavatory	3/8	-	-	-	1.5	1.5	2
Dental unit, cuspidor	3/8	-	-	-	1	-	1
Dishwasher, commercial(5)	-	-	-	-	-	-	-
Dishwasher, domestic	3/8	-	1.4	1.4	-	-	-
Drinking fountain or water cooler	3/8	-	-	-	0.25	-	0.25
Hose bibb	1/2	2.5	-	2.5	2.5	-	2.5
Hose bibb	3/4	3	-	3	6	-	6
Hose bibb, combination hot and cold	1/2	1.9	1.9	2.5	1.9	1.9	2.5
Lavatory, 8.3 L/min or less	3/8	0.5	0.5	0.7	1.5	1.5	2
Lavatory, greater than 8.3 L/min	3/8	0.75	0.75	1	1.5	1.5	2
Shower head, 9.5 L/min or less per head	1/2	1	1	1.4	3	3	4
Shower head, greater than 9.5 L/min per head	1/2	1.5	1.5	2	3	3	4
Shower, spray, multi-head, *fixture unit* per head	(5)	1	1	1.4	3	3	4
Sink, bar	3/8	0.75	0.75	1	1.5	1.5	2
Sink, clinic service faucet	1/2	-	-	-	2.25	2.25	3
Sink, clinic service with direct flush valve	1	-	-	-	6	-	6
Sink, kitchen, commercial, per faucet	1/2	-	-	-	3	3	4
Sink, kitchen, domestic, 8.3 L/min or less	3/8	1	1	1.4	1	1	1.4
Sink, kitchen, domestic, greater than 8.3 L/min	3/8	1.5	1.5	2	1.5	1.5	2
Sink, laboratory	3/8	-	-	-	1.5	1.5	2
Sink, laundry (1 or 2 compartments)	3/8	1	1	1.4	1	1	1.4
Sink, service or mop basin	1/2	-	-	-	2.25	2.25	3
Sink, washup, per faucet	1/2	-	-	-	1.5	1.5	2
Column 1	2	3	4	5	6	7	8

(b) the minimum water pressure at the entry to the *building* is 200 kPa, and
(c) the total maximum length of the *water system* is 90 m.
(See Appendix A.)

r6.1 **(6)** Where both hot and cold water is supplied to *fixtures* in a *house* containing only one *dwelling unit*, the *water service pipe* is permitted to be a minimum of ¾ in. in *size* provided,
(a) a minimum ¾ in. water supply piping located in the *basement* or lower level is extended to the base of every hot and cold *riser* that serves a maximum of one *bathroom group* and to the last water supply branch serving any *basement bathroom group*, *fixture* supply or hose bibb, and
(b) the total hydraulic load is not more than 26 *fixture units*, using the values given in Table 7.6.3.2.A.

r6.1 **Table 7.6.3.4.**
Water Pipe Sizing for Buildings Containing More Than One Dwelling Unit
Forming Part of Sentence 7.6.3.4.(5)

Size of Water Pipe, in.	Water Velocity m/s(1)	
	2.4	1.5
	Hydraulic Load, *fixture units*	
½	7	4
¾	16	9
1	31	18
1¼	57	30
Column 1	2	3

Notes to Table 7.6.3.4.:
(1) Table 7.6.3.4. is not intended to limit water velocities that are permitted by Sentence 7.6.3.5.(1).

7.6.3.5. Velocity

(1) The maximum permitted water velocities shall be those recommended by the pipe and fitting manufacturer.

7.6.4. Water Efficiency

7.6.4.1. Water Supply Fittings

(1) The flow rates of fittings that supply water to a *fixture* shall not exceed the maximum flow rates at the test pressures listed for that fitting in Table 7.6.4.1.

r11.1 **Table 7.6.4.1.**
Maximum Flow Rates for Water Supply Fittings
Forming Part of Sentence 7.6.4.1.(1)

Fitting	Maximum Flow, L/min	Test Pressure, kPa
Lavatory Faucets in *Residential Occupancy*	5.7	413
Lavatory Faucets in Other *Occupancies*	1.9	413
Kitchen Faucet	8.35	413
Shower Heads in *Residential Occupancy*	7.6	550
Shower Heads in Other *Occupancies*	9.5	550
Column 1	2	3

(2) Sentence (1) does not apply to a *fixture* located in a *heritage building*.

r11.1 **(3)** Each lavatory in a washroom with *fixtures* for *public use* shall be equipped with a device capable of automatically shutting off the flow of water when the lavatory is not in use. (See Appendix A.)

r11.1 **(4)** An automatic compensating valve serving an individual shower head shall have a manufacturer's minimum-rated water flow rate equal to or less than the shower head it serves. (See Appendix A.)

r11.1 **(5)** Where multiple shower heads installed in a public showering facility are served by one temperature control, each shower head shall be equipped with a device capable of automatically shutting off the flow of water when the shower head is not in use. (See Appendix Note A-7.6.4.1.(3))

7.6.4.2. Plumbing Fixtures

(1) Water closets and urinals shall be certified to CAN/CSA-B45.0, "General Requirements for Plumbing Fixtures".

(2) Except as provided in Sentence (3), the flush cycle for each *fixture* that is a water closet or urinal shall not exceed the maximum water consumption per flush cycle listed for that *fixture* in Table 7.6.4.2.A. (See Appendix A.)

r11.1 **Table 7.6.4.2.A.**
Maximum Water Consumption per Flush Cycle for Sanitary Fixtures
Forming Part of Sentence 7.6.4.2.(2)

Fixture	Maximum Water Consumption per Flush Cycle, LPF
Water Closet (Tank Type)	6.0
Water Closet (Direct Flush)	6.0
Urinal (Tank Type)	1.9
Urinal (Direct Flush)	1.9
Column 1	2

(3) In *buildings* classified as Group C *occupancy*, the flush cycle for each *fixture* that is a water closet or urinal shall not exceed the maximum water consumption per flush cycle listed for that *fixture* in Table 7.6.4.2.B.

r11.1 **Table 7.6.4.2.B.**
Maximum Water Consumption per Flush Cycle for Sanitary Fixtures in a Group C Occupancy
Forming Part of Sentence 7.6.4.2.(3)

Fixture	Maximum Water Consumption per Flush Cycle, LPF
Water Closet (Tank Type)	4.8(1)
Water Closet (Direct Flush)	4.8
Urinal (Tank Type)	1.9
Urinal (Direct Flush)	1.9
Column 1	2

Notes to Table 7.6.4.2.B.:
(1) Water closets which provide a dual flush cycle option of both 4.1 LPF or less and 6.0 LPF are deemed to comply.

(4) Sentences (2) and (3) do not apply to a *fixture* located in an existing *building* where the *chief building official* is satisfied that compliance with the requirement is impracticable because of maintenance or operational difficulties. (See Appendix A.)

r11.1 **(5)** Urinals shall be equipped with a device capable of preventing automatic flush cycles when not in use.

7.6.5. Water Temperature Control (See Appendix A.)

7.6.5.1. Maximum Temperature of Hot Water

(1) Except as provided in Sentences (2) and 7.6.5.3.(1), the maximum temperature of hot water supplied by fittings to *fixtures* in a *residential occupancy* shall not exceed 49°C.

(2) Sentence (1) does not apply to hot water supplied to installed dishwashers or clothes washers.

7.6.5.2. Showers

r3 **(1)** Except as provided for in Sentences (2) and (3), all valves supplying fixed location shower heads, shall be individually pressure-balanced or thermostatic-mixing valves, conforming to ASME A112.18.1 / CSA B125.1, "Plumbing Supply Fittings".

r11.1 **(2)** An individually pressure-balanced or thermostatic-mixing valve is not required for shower heads having a single tempered water supply that is controlled by an automatic compensating valve conforming to CSA B125.3, "Plumbing Fittings".

r11.1 **(3)** Deck-mounted, hand-held, flexible-hose spray attachments are exempt from the thermal shock requirements of Sentences (1) and (4).

r11.1 **(4)** Pressure-balanced, thermostatic-mixing or combination pressure-balanced and thermostatic-mixing type valves shall be,

(a) capable of limiting thermal shock, and
(b) designed so that the outlet temperature does not exceed 49°C or equipped with high-limit stops which shall be adjusted to a maximum hot water setting of 49°C.

7.6.5.3. Temperature Control Devices

(1) A *water distribution system* supplying hot water to any bathtub, shower or hand basin that is accessible to a patient or resident in a Group B, Division 2 or 3 occupancy or a resident of a group home, *home for special care* or residence for adults with developmental disabilities shall have one or more temperature gauges and control devices that are,

(a) accessible only to supervisory staff, and
(b) capable of being adjusted to ensure that the temperature of the water supplied to the *fixtures* does not exceed 49°C.

Section 7.7. Non-Potable Water Systems

7.7.1. Connection

7.7.1.1. Non-Potable Connection

(1) Except as permitted by Sentences (2) and (3), a non-*potable water system* shall not be connected to a *potable water system*.

(2) Make-up water may be supplied to the non-*potable water system* by,
(a) a reduced pressure *backflow preventer*, or
(b) an *air gap*.

r5 **(3)** Where a clothes washer is supplied by a *rainwater* system and a *potable water system*, the *potable water system* shall be protected by dual *check valve backflow preventers* conforming to CSA B64.6, "Dual Check Valve (DuC) Backflow Preventers" for,
(a) area isolation, and
(b) premise isolation.

7.7.2. Identification

7.7.2.1. Markings Required

(1) Non-*potable* water piping shall be identified by markings that are permanent, distinct and easily recognized.

(2) Non-*potable water system* for re-use purposes shall be marked in accordance with Section 12 of CAN/CSA-B128.1, "Design and Installation of Non-Potable Water Systems".

(3) A sign containing the words **NON-POTABLE WATER, DO NOT DRINK** shall be in letters at least 25 mm high with a 5 mm stroke and posted immediately above a *fixture* that is permitted to receive non-*potable* water.

7.7.3. Location

7.7.3.1. Pipes

(1) Non-*potable* water piping shall not be located,
(a) where food is prepared in a food processing plant,
(b) above food-handling equipment,
(c) above a non-pressurized *potable* water tank, or
(d) above a cover of a pressurized *potable* water tank.

7.7.3.2. Outlets

(1) Except as permitted in Sentence 7.1.5.3.(3), an outlet from a non-*potable water system* shall not be located where it can discharge into,
(a) a sink or lavatory,
(b) a *fixture* into which an outlet from a *potable water system* is discharged, or
(c) a *fixture* that is used for a purpose related to the preparation, handling or dispensing of food, drink or products that are intended for human consumption.

7.7.4. Non-Potable Water Systems for Re-use Purposes

7.7.4.1. Conformance to Standards

(1) Non-*potable water systems* for re-use purposes shall be designed, constructed and installed to conform to good engineering practice appropriate to the circumstances such as described in,
(a) the ASHRAE Handbooks,
(b) ASPE Data Books, or
(c) CAN/CSA-B128.1, "Design and Installation of Non-Potable Water Systems".

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Part 9

Housing and Small Buildings

Section 9.1. General

9.1.1. Application

9.1.1.1. Scope

(1) The scope of this Part shall be as described in Subsection 1.1.2. of Division A.

9.1.1.2. Signs

(1) Signs shall conform to the requirements in Section 3.15.

9.1.1.3. Self-Service Storage Buildings

(1) *Self-service storage buildings* shall conform to the requirements in Section 3.10.

9.1.1.4. Tents and Air-Supported Structures

(1) Tents shall conform to the requirements in Subsection 3.14.1.

(2) *Air-supported structures* shall conform to the requirements in Subsection 3.14.2.

9.1.1.5. Proximity to Existing Above Ground Electrical Conductors

(1) Where a *building* is constructed in close proximity to existing above ground electrical conductors, the requirements of Subsection 3.1.19. shall apply.

9.1.1.6. Food Premises

(1) The requirements of Subsection 3.7.6. apply to all *food premises*.

9.1.1.7. Radon

(1) In addition to all other requirements, a *building* in the following designated areas shall be designed and constructed so that the annual average concentration of radon 222 does not exceed 200 Bq/m^3 of air and the annual average concentration of the short lived daughters of radon 222 does not exceed 0.02 working levels inside the *building* for,

(a) the City of Elliot Lake in the Territorial District of Algoma,
(b) the Township of Faraday in the County of Hastings, and
(c) the geographic Township of Hyman in the Territorial District of Sudbury.

9.1.1.8. Building in Flood Plains

(1) *Buildings* constructed on flood plains shall,
(a) be designed and constructed in accordance with good engineering practice to withstand anticipated vertical and horizontal hydrostatic pressures acting on the structure, and
(b) incorporate floodproofing measures that will preserve the integrity of *exits* and *means of egress* during times of flooding.

9.1.1.9. Site Assembled and Factory-Built Buildings (See Appendix A.)

(1) Except as provided in Sentence (2), a manufactured *building* intended for *residential occupancy* is deemed to comply with this Code if it is designed and constructed in compliance with,
e1 (a) CSA Z240.2.1, "Structural Requirements for Manufactured Homes", if the *building* is constructed in sections not wider than 4.88 m, or
(b) CSA A277, "Procedures for Factory Certification of Buildings".

(2) The requirements of this Code shall apply to,
(a) *building* components designed and constructed outside the place of manufacture, and
(b) site installation of such *buildings*.

9.1.1.10. Public Pools and Public Spas

(1) *Public pools* shall conform to the requirements of Section 3.11. and *public spas* shall conform to the requirements of Section 3.12.

9.1.1.11. Shelf and Rack Storage Systems

(1) *Shelf and rack storage systems* shall conform to the requirements of Section 3.16.

r6 9.1.1.12. Houses

(1) A *house* is permitted above another *house* provided there is not more than one *dwelling unit* in each *house*.

Section 9.2. Reserved

Section 9.3. Materials, Systems and Equipment

9.3.1. Concrete

9.3.1.1. General

r11.1 **(1)** Except as provided in Sentence (2) and Articles 9.3.1.6. and 9.3.1.7., unreinforced and nominally reinforced concrete shall be designed, mixed, placed, cured and tested in accordance with the requirements for "R" class concrete stated in Section 9 of CSA A23.1, "Concrete Materials and Methods of Concrete Construction".

(2) Unreinforced and nominally reinforced site-batched concrete shall be designed, mixed, placed and cured in accordance with Articles 9.3.1.2. to 9.3.1.9.

(3) Except as provided in Sentence (4), Subsection 9.15.4. and Section 9.39., reinforced concrete shall be designed to conform to the requirements of Part 4.

r6 **(4)** For flat insulating concrete form walls described in Clause 9.15.1.1.(1)(c) or 9.20.1.1.(1)(b), the concrete and reinforcing shall comply with Part 4 or,

(a) the concrete shall conform to CSA A23.1, "Concrete Materials and Methods of Concrete Construction", with a maximum aggregate size of 19 mm, and

(b) the reinforcing shall,

r5 (i) conform to CSA G30.18, "Carbon Steel Bars for Concrete Reinforcement",

(ii) have a minimum specified yield strength of 400 MPa, and

(iii) be lapped a minimum of 450 mm for 10M bars and 650 mm for 15M bars.

9.3.1.2. Cement

r11.1 **(1)** Cement shall meet the requirements of CSA A3001, "Cementitious Materials for Use in Concrete".

9.3.1.3. Concrete in Contact With Sulfate Soil

(1) Concrete in contact with sulfate *soil*, which is deleterious to normal cement, shall conform to the requirements in Clause 4.1.1.6. of CSA A23.1, "Concrete Materials and Methods of Concrete Construction".

9.3.1.4. Aggregates

(1) Aggregates shall,

(a) consist of sand, gravel, crushed rock, crushed air-cooled blast furnace slag, expanded shale or expanded clay conforming to CSA A23.1, "Concrete Materials and Methods of Concrete Construction", and

(b) be clean, well-graded and free of injurious amounts of organic and other deleterious material.

9.3.1.5. Water

(1) Water shall be clean and free of injurious amounts of oil, organic matter, sediment or any other deleterious material.

9.3.1.6. Compressive Strength

(1) Except as provided elsewhere in this Part, the compressive strength of unreinforced concrete after 28 days shall be not less than,

(a) 32 MPa for garage floors, carport floors and all exterior flatwork,

(b) 20 MPa for interior floors other than those for garages and carports, and

(c) 15 MPa for all other applications.

r11.1 **(2)** Site-batched concrete used for garage floors, carport floors and exterior flatwork shall have air entrainment of 5 to 8%.

9.3.1.7. Concrete Mixes (See Appendix A.)

r11.1 **(1)** For pre-mixed concrete and for the site-batched concrete mixes described in Table 9.3.1.7., the maximum ratio of water to cementing materials measured by weight shall not exceed,

(a) 0.45 for garage floors, carport floors and all exterior flatwork,

(b) 0.65 for interior floors other than those for garages and carports, and

(c) 0.70 for all other applications.

r11.1 **(2)** The size of aggregate in unreinforced site-batched concrete mixes referred to in Sentence (1) shall not exceed,
(a) 1/5 the distance between the sides of vertical forms, or
(b) 1/3 the thickness of flatwork.

e8 **Table 9.3.1.7.**
Site-Batched Concrete Mixes
Forming Part of Sentence 9.3.1.7.(1)

Maximum Size of Coarse Aggregate, mm	Materials, volume					
	Cement		Fine Aggregate (damp average coarse sand)		Coarse Aggregate (gravel or crushed stone)	
	Parts	L(1)	Parts	L	Parts	L
14	1	28	1.75	49	2	56
20	1	28	1.75	49	2.5	70
28	1	28	2	56	3	84
40	1	28	2	56	3.5	98
Column 1	2	3	4	5	6	7

Notes to Table 9.3.1.7.:
(1) A 40 kg bag of cement contains 28 L.

9.3.1.8. Admixtures

r5 **(1)** Admixtures shall conform to ASTM C260 / C260M, "Air-Entraining Admixtures for Concrete", or ASTM C494 / C494M, "Chemical Admixtures for Concrete", as applicable.

9.3.1.9. Cold Weather Requirements

(1) When the air temperature is below 5°C , concrete shall be,
(a) kept at a temperature of not less than 10°C or more than 25°C while being mixed and placed, and
(b) maintained at a temperature of not less than 10°C for 72 h after placing.

(2) No frozen material or ice shall be used in concrete described in Sentence (1).

9.3.2. Lumber and Wood Products

9.3.2.1. Grade Marking

(1) Lumber for joists, rafters, trusses and beams and for the uses listed in Table 9.3.2.1. shall be identified by a grade stamp to indicate its grade as determined by the NLGA, "Standard Grading Rules for Canadian Lumber".
(See Appendix A.)

(d) Use Category 4.1, where,
  (i) the wood member is used in contact with the ground,
  (ii) the wood member is used in contact with fresh water, or
  (iii) the vertical clearance between the wood element and the finished ground level is less than 150 mm and the wood elements are not separated from permeable supporting materials by a moisture barrier, or
(e) Use Category 4.2, where the wood member is used in critical structural components, including permanent wood *foundations*.

(7) Where wood is protected in accordance with Use Category 1 or Use Category 2 using an inorganic boron preservative, the wood shall be,
(a) protected from direct exposure to water during and after the completion of construction, and
(b) separated from permeable supporting materials by a moisture barrier that is resistant to all expected mechanisms of deterioration in the service environment if the vertical clearance to the ground is less than 150 mm.

(8) Wood that is required by this Article to be treated to resist termites or decay shall be identified by a mark to indicate the type of preservative used and conformance to the relevant required Use Category.

9.3.3. Metal

9.3.3.1. Sheet Metal Thickness

(1) Minimum thicknesses for sheet metal material required in this Part refer to the actual minimum base metal thicknesses measured at any point of the material, and in the case of galvanized steel described in Sentence 9.3.3.2.(1), include the thickness of the galvanizing coating unless otherwise indicated.

9.3.3.2. Galvanized Sheet Steel

(1) Where sheet steel is required to be galvanized, it shall be metallic-coated with zinc or an alloy of 55% aluminum-zinc meeting the requirements of,
r5 (a) ASTM A653 / A653M, "Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process", or
r11.1 (b) ASTM A792 / A792M, "Sheet Steel, 55% Aluminum-Zinc Alloy-Coated by the Hot-Dip Process".

(2) Where galvanized sheet steel is intended for use in locations exposed to the weather or as a flashing material, it shall have a zinc coating not less than the G90 (Z275) coating designation or an aluminum-zinc alloy coating not less than the AZM150 coating designation, as referred to in Sentence (1).

Section 9.4. Structural Requirements

9.4.1. Structural Design Requirements and Application Limitations

9.4.1.1. General (See Appendix A.)

(1) Subject to the application limitations defined elsewhere in this Part, structural members and their connections shall,
(a) conform to requirements provided elsewhere in this Part,
(b) be designed according to good engineering practice such as provided in the CWC, "Engineering Guide for Wood Frame Construction", or
(c) be designed according to Part 4 using the loads and deflection and vibration limits specified in,
  (i) this Part, or
  (ii) Part 4.

r5 **(2)** Where floor framing is designed in accordance with Clause (1)(b) or (c) and where supporting wall framing and fastenings, or footings, are designed according to Clause (1)(a), the specified *live load* on the floor according to Table 4.1.5.3. shall not exceed 2.4 kPa.

(3) Location-specific information for structural design, including snow and wind loads and seismic spectral response accelerations, shall be determined according to MMAH Supplementary Standard SB-1, "Climatic and Seismic Data". (See Appendix A.)

9.4.2. Specified Loads

9.4.2.1. Application

(1) This Subsection applies to light-frame construction whose wall, floor and roof planes are generally comprised of frames of small repetitive structural members, and where,

(a) the roof and wall planes are clad, sheathed or braced on at least one side,
(b) the small repetitive structural members are spaced not more than 610 mm o.c.,
(c) the clear span of any structural member does not exceed 12.20 m,
(d) the maximum deflection of the structural roof members conforms to Article 9.4.3.1.,
(e) the maximum total roof area, notwithstanding any separation of adjoining *buildings* by *firewalls*, is 4 550 m^2, and
(f) for flat roofs, there are no significant obstructions on the roof, such as parapet walls, spaced closer than the distance calculated by,

$$D_o = 10(H_o - 0.8\ S_s / \gamma)$$

where,

D_o = minimum distance between obstructions, m,

H_o = height of the obstruction above the roof, m,

S_s = ground snow load, kPa, and

γ = unit weight of snow, kN/m^3.

(See Appendix A.)

9.4.2.2. Specified Snow Loads

(1) Except as provided in Sentences (2) and (3), specified snow loads shall be not less than those calculated using the following formula:

$$S = C_b \cdot S_s + S_r$$

where,

S = specified snow load,

C_b = basic snow load roof factor, which is 0.45 where the entire width of a roof does not exceed 4.3 m and 0.55 for all other roofs,

S_s = 1-in-50 year ground snow load in kPa, determined according to MMAH Supplementary Standard SB-1, "Climatic and Seismic Data", and

S_r = associated 1-in-50 year rain load in kPa, determined according to MMAH Supplementary Standard SB-1, "Climatic and Seismic Data".

(2) In no case shall the specified snow load be less than 1 kPa.

9.4.4.5. Reserved

9.4.4.6. Walls Supporting Drained Earth (See Appendix A.)

(1) Except where constructed in accordance with Section 9.15., walls supporting drained earth shall be designed,
(a) for a pressure equivalent to that exerted by a fluid with a density of not less than 480 kg/m^3 and a depth equal to that of the retained earth, or
(b) in accordance with Section 4.2. so as to be able to resist the loads and effects described in Article 4.1.2.1.

(2) Walls supporting other than drained earth shall be designed,
(a) for the pressure described in Clause (1)(a) plus the fluid pressure of the surcharge, or
(b) in accordance with Section 4.2. so as to be able to resist the loads and effects described in Article 4.1.2.1.

Section 9.5. Design of Areas, Spaces and Doorways

9.5.1. General

9.5.1.1. Application

(1) Except as otherwise specified in this Part, this Section applies only to *dwelling units* that are intended for use on a continuing or year-round basis as the principal residence of the occupant.

9.5.1.2. Method of Measurement

(1) Except as otherwise specified in this Part, the areas, dimensions and heights of rooms or spaces shall be measured between finished wall surfaces and between finished floor and ceiling surfaces.

9.5.1.3. Floor Areas

(1) Minimum floor areas specified in this Section do not include closets or built-in bedroom cabinets unless otherwise indicated.

9.5.1.4. Combination Rooms (See Appendix A.)

(1) Two or more areas may be considered as a combination room if the opening between the areas occupies the larger of 3 m^2 or 40% or more of the wall measured on the side of the dependent area.

(2) Where the dependent area is a bedroom, direct passage shall be provided between the two areas.

(3) The opening required in Sentence (1) shall not contain doors or windows.

9.5.1.5. Lesser Areas and Dimensions

(1) Areas of rooms and spaces are permitted to be less than required in this Section provided it can be shown that the rooms and spaces are adequate for their intended use, such as by the provision of built-in furniture to compensate for reduced sizes.

9.5.2. Barrier-Free Design

9.5.2.1. General

(1) Except as provided in Sentence (2) and Article 3.8.1.1., every *building* shall be designed in conformance with Section 3.8.

r6 **(2)** The requirements of Section 3.8. need not be provided for *houses*, triplexes and boarding or rooming houses with fewer than eight boarders or roomers.

9.5.2.2. Protection on Floor Areas With a Barrier-Free Path of Travel

(1) Where a *barrier-free* path of travel required in Article 9.5.2.1. is provided to any *storey* above the *first storey*, the requirements in Article 3.3.1.7. shall apply.

9.5.2.3. Stud Wall Reinforcement

r4 **(1)** If wood wall studs or sheet steel wall studs enclose the main bathroom in a *dwelling unit*, reinforcement shall be installed to permit the future installation of the following:

(a) for a water closet, a grab bar described in Clauses 3.8.3.8.(3)(a) and a grab bar described in Clause 3.8.3.8.(3)(c),

r11.1 (b) for a shower, a grab bar described in Clause 3.8.3.13.(2)(g), and

r11.1 (c) for a bathtub, a grab bar described in Clause 3.8.3.13.(4)(e).

(See Appendix A.)

9.5.3. Ceiling Heights

9.5.3.1. Ceiling Heights of Rooms or Spaces

(1) The ceiling heights of rooms or spaces in *residential occupancies* and *live/work units* shall conform to Table 9.5.3.1.

(2) Areas in rooms or spaces over which ceiling height is not less than the minimum specified in Table 9.5.3.1. shall be contiguous with the entry or entries to those rooms or spaces.

9.5.9. Bathrooms and Water Closet Rooms

9.5.9.1. Space to Accommodate Fixtures

(1) In every *dwelling unit* an enclosed space of sufficient size shall be provided to accommodate a water closet, lavatory and bathtub or shower stall.

9.5.9.2. Doors to Rooms Containing Water Closets

(1) A door shall be provided to each room containing a water closet within a *dwelling unit*.

9.5.10. Hallways

9.5.10.1. Hallway Width

(1) The unobstructed width of a hallway within a *dwelling unit* shall be not less than 860 mm, except that the hallway width is permitted to be 710 mm, where,

(a) there are only bedrooms and bathrooms at the end of the hallway furthest from the living area, and

(b) a second *exit* is provided,

(i) in the hallway near the end furthest from the living area, or

(ii) in each bedroom served by the hallway.

9.5.11. Doorway Sizes

9.5.11.1. Doorway Opening Sizes

(1) Except as provided in Articles 9.5.11.3., 9.9.6.2. and 9.9.6.3., doorway openings within *dwelling units* shall be designed to accommodate at least the door sizes in Table 9.5.11.1. for swing-type doors or folding doors.

Table 9.5.11.1.
Minimum Door Sizes
Forming Part of Sentence 9.5.11.1.(1)

At Entrance to:	Minimum Width, mm	Minimum Height, mm
Dwelling unit (required entrance) Vestibule or entrance hall	810	1 980
Stairs to a floor level that contains a finished space All doors in at least one line of passage from the exterior to the *basement* Utility rooms	810	1 980
Walk-in closet	610	1 980
Bathroom, water closet room, shower room(1)	610	1 980
Rooms located off hallways that are permitted to be 710 mm wide	610	1 980
Rooms not mentioned above, exterior balconies	760	1 980
Column 1	2	3

Notes to Table 9.5.11.1.:
(1) See Article 9.5.11.3.

9.5.11.2. Doors to Public Water Closet Rooms

(1) Doors to public water closet rooms shall be not less than 810 mm wide and 2 030 mm high.

9.5.11.3. Doors to Bathrooms

(1) Where a *barrier-free* path of travel conforming to Section 3.8. is provided into a *suite* of *residential occupancy* and where a bathroom within the *suite* is at the level of the *suite* entrance door, the doorway to such bathroom and to each bedroom at the same level as such bathroom shall have, when the door is in the open position, a clear width of not less than,
(a) 760 mm where the door is served by a corridor or space not less than 1 060 mm wide, and
(b) 810 mm where the door is served by a corridor or space less than 1 060 mm wide.

Section 9.6. Glass

9.6.1. General

9.6.1.1. Application

(1) This Section applies to,
(a) glass in,
  (i) interior windows and interior doors and their sidelights,
  (ii) clothes closets,
  (iii) site-built exterior windows, doors and skylights,
  (iv) shower or bathtub enclosures,
  (v) glazed panels and *partitions*, and
(b) the protection of glass.

9.6.1.2. Material Standards for Glass

(1) Glass shall conform to,
(a) CAN/CGSB-12.1-M, "Tempered or Laminated Safety Glass,"
(b) CAN/CGSB-12.2-M, "Flat, Clear Sheet Glass",
(c) CAN/CGSB-12.3-M, "Flat, Clear Float Glass",
r11.1 (d) CAN/CGSB-12.4-M, "Heat Absorbing Glass,"
(e) CAN/CGSB-12.8, "Insulating Glass Units",
(f) CAN/CGSB-12.10-M, "Glass, Light and Heat Reflecting",
(g) CAN/CGSB-12.11-M, "Wired Safety Glass", or
(h) ASTM E2190, "Insulating Glass Unit Performance and Evaluation".

(2) Mirrored glass doors are permitted to be used only at the entrance to clothes closets and shall conform to the requirements of CAN/CGSB-82.6-M, "Doors, Mirrored Glass, Sliding or Folding, Wardrobe". (See Appendix A.)

(3) Mirrored glass doors reinforced with a film backing shall meet the impact resistance requirements specified in CAN/CGSB-12.5-M, "Mirrors, Silvered".

r11.1 9.6.1.3. Structural Sufficiency of Glass

(1) Except as provided in Sentence (2), glass shall be designed in conformance with Article 4.3.6.1.

(2) Where the *building* has an essentially uniform distribution of paths for air leakage, including operable openings, but no large openings that would permit wind gusts to rapidly enter the *building* and the *building* is not in an exceptionally exposed location such as a hilltop, the maximum area of individual panes of glass for windows is permitted to conform to,

(a) Tables 9.6.1.3.A. to 9.6.1.3.C., where the *building* has a height from *grade* to the uppermost roof of 12 m or less and is located in a built-up area, no less than 120 m away from the boundary between this area and open terrain, or

(b) Tables 9.6.1.3.D. to 9.6.1.3.F.

(See Appendix A.)

(3) The maximum area of individual panes of glass for doors shall conform to Table 9.6.1.3.G.

Table 9.6.1.3.A.
Maximum Glass Area for Areas for which the 1-in-50 Hourly Wind Pressure (HWP) is Less than 0.55 kPa(1)
Forming Part of Clause 9.6.1.3.(2)(a)

Glass Thickness, mm	Maximum Glass Area, m^2			
	Annealed Glass	Factory-Sealed Insulated Glass (IG) Units(2)	Heat-Strengthened or Tempered Glass	Wired Glass
2.5	0.58	1.02	1.24	0.27
3	0.96	1.71	1.93	0.45
4	1.47	2.68	2.60	0.68
5	2.04	3.74	3.18	0.93
6	2.84	5.24	3.99	1.31
8	4.74	7.93	5.55	2.15
10	6.65	9.92	6.99	3.07
12	9.74	13.92	9.74	5.03
Column 1	2	3	4	5

Notes to Table 9.6.1.3.A.:

(1) The maximum hourly wind pressure with one chance in fifty of being exceeded in any one year, as provided in MMAH Supplementary Standard SB-1, “Climatic and Seismic Data”.

(2) Maximum glass area values apply to IG units of two identical lites (annealed, heat-strengthened or tempered) spaced at 12.7 mm.

Table 9.6.1.3.B.
Maximum Glass Area for Areas for which the 1-in-50 Hourly Wind Pressure (HWP) is Less than 0.75 kPa(1)
Forming Part of Clause 9.6.1.3.(2)(a)

Glass Thickness, mm	Maximum Glass Area, m^2				
	Annealed Glass	Factory-Sealed Insulated Glass (IG) Units(2)	Heat-Strengthened Glass	Tempered Glass	Wired Glass
2.5	0.42	0.72	0.88	1.18	0.20
3	0.68	1.19	1.46	1.64	0.32
4	1.02	1.85	2.21	2.21	0.50
5	1.42	2.56	2.71	2.71	0.68
6	2.04	3.64	3.39	3.39	0.94
8	3.34	6.01	4.73	4.73	1.55
10	4.70	8.35	5.92	5.92	2.19
12	7.65	11.83	8.29	8.29	3.60
Column 1	2	3	4	5	6

Notes to Table 9.6.1.3.B.:

(1) The maximum hourly wind pressure with one chance in fifty of being exceeded in any one year, as provided in MMAH Supplementary Standard SB-1, “Climatic and Seismic Data”.

(2) Maximum glass area values apply to IG units of two identical lites (annealed, heat-strengthened or tempered) spaced at 12.7 mm.

Table 9.6.1.3.C.
Maximum Glass Area for Areas for which the 1-in-50 Hourly Wind Pressure (HWP) is Less than 1.00 kPa(1)
Forming Part of Clause 9.6.1.3.(2)(a)

Glass Thickness, mm	Maximum Glass Area, m^2				
	Annealed Glass	Factory-Sealed Insulated Glass (IG) Units(2)	Heat-Strengthened Glass	Tempered Glass	Wired Glass
2.5	0.30	0.52	0.65	1.01	0.16
3	0.50	0.86	1.04	1.42	0.26
4	0.77	1.31	1.63	1.90	0.38
5	1.05	1.86	2.26	2.33	0.52
6	1.45	2.57	2.92	2.92	0.71
8	2.40	4.30	4.07	4.07	1.15
10	3.40	6.10	5.10	5.10	1.63
12	5.62	9.89	7.14	7.14	2.69
Column 1	2	3	4	5	6

Notes to Table 9.6.1.3.C.:

(1) The maximum hourly wind pressure with one chance in fifty of being exceeded in any one year, as provided in MMAH Supplementary Standard SB-1, “Climatic and Seismic Data”.

(2) Maximum glass area values apply to IG units of two identical lites (annealed, heat-strengthened or tempered) spaced at 12.7 mm.

Table 9.6.1.3.D.
Maximum Glass Area for Areas for which the 1-in-50 Hourly Wind Pressure (HWP) is Less than 0.55 kPa – Open Terrain(1)
Forming Part of Clause 9.6.1.3.(2)(b)

Glass Thickness, mm	Maximum Glass Area, m^2				
	Annealed Glass	Factory-Sealed Insulated Glass (IG) Units(2)	Heat-Strengthened Glass	Tempered Glass	Wired Glass
2.5	0.46	0.80	0.98	1.25	0.22
3	0.75	1.34	1.74	1.74	0.36
4	1.16	2.11	2.33	2.33	0.55
5	1.60	2.93	2.86	2.86	0.76
6	2.25	4.10	3.59	3.59	1.05
8	3.76	6.90	5.00	5.00	1.75
10	5.32	9.66	6.26	6.26	2.47
12	8.70	12.53	8.78	8.78	4.09
Column 1	2	3	4	5	6

Notes to Table 9.6.1.3.D.:

(1) The maximum hourly wind pressure with one chance in fifty of being exceeded in any one year, as provided in MMAH Supplementary Standard SB-1, "Climatic and Seismic Data".

(2) Maximum glass area values apply to IG units of two identical lites (annealed, heat-strengthened or tempered) spaced at 12.7 mm.

Table 9.6.1.3.E.
Maximum Glass Area for Areas for which the 1-in-50 Hourly Wind Pressure (HWP) is Less than 0.75 kPa – Open Terrain(1)
Forming Part of Clause 9.6.1.3.(2)(b)

Glass Thickness, mm	Maximum Glass Area, m^2				
	Annealed Glass	Factory-Sealed Insulated Glass (IG) Units(2)	Heat-Strengthened Glass	Tempered Glass	Wired Glass
2.5	0.33	0.57	0.70	1.06	0.16
3	0.54	0.94	1.15	1.48	0.26
4	0.83	1.47	1.79	1.99	0.40
5	1.14	2.04	2.44	2.44	0.55
6	1.61	2.85	3.06	3.06	0.76
8	2.67	4.75	4.36	4.36	1.24
10	3.75	6.72	5.34	5.34	1.77
12	6.14	10.97	7.47	7.47	2.93
Column 1	2	3	4	5	6

Notes to Table 9.6.1.3.E.:

(1) The maximum hourly wind pressure with one chance in fifty of being exceeded in any one year, as provided in MMAH Supplementary Standard SB-1, "Climatic and Seismic Data".

(2) Maximum glass area values apply to IG units of two identical lites (annealed, heat-strengthened or tempered) spaced at 12.7 mm.

Table 9.6.1.3.F.
Maximum Glass Area for Areas for which the 1-in-50 Hourly Wind Pressure (HWP) is Less than 1.00 kPa – Open Terrain(1)
Forming Part of Clause 9.6.1.3.(2)(b)

Glass Thickness, mm	Maximum Glass Area, m^2				
	Annealed Glass	Factory-Sealed Insulated Glass (IG) Units(2)	Heat-Strengthened Glass	Tempered Glass	Wired Glass
2.5	0.25	0.42	0.51	0.92	0.12
3	0.40	0.68	0.84	1.28	0.20
4	0.62	1.04	1.30	1.72	0.30
5	0.84	1.46	1.79	2.10	0.41
6	1.17	2.05	2.52	2.63	0.57
8	1.94	3.41	3.69	3.69	0.94
10	2.75	4.87	4.60	4.60	1.31
12	4.50	7.92	6.44	6.44	2.18
Column 1	2	3	4	5	6

Notes to Table 9.6.1.3.F.:

(1) The maximum hourly wind pressure with one chance in fifty of being exceeded in any one year, as provided in MMAH Supplementary Standard SB-1, “Climatic and Seismic Data”.

(2) Maximum glass area values apply to IG units of two identical lites (annealed, heat-strengthened or tempered) spaced at 12.7 mm.

Table 9.6.1.3.G.
Maximum Glass Area for Doors(2)
Forming Part of Sentence 9.6.1.3.(3)

Glass Thickness, mm	Maximum Glass Area, m^2						
	Type of Glass						
	Annealed	Annealed Multiple-Glazed Factory-Sealed Units	Laminated	Wired	Heat Strengthened	Fully Tempered	Fully Tempered Multiple-Glazed Factory-Sealed Units
3	0.50	0.70	(1)	(1)	1.00	1.00	2.00
4	1.00	1.50	(1)	(1)	1.50	4.00	4.00
5	1.50	1.50	(1)	(1)	1.50	No limit	No limit
6	1.50	1.50	1.20	1.00	1.50	No limit	No limit
Column 1	2	3	4	5	6	7	8

Notes to Table 9.6.1.3.G.:

(1) Not generally available.

(2) See Appendix A.

9.6.1.4. Types of Glass and Protection of Glass

r6 **(1)** Glass sidelights greater than 500 mm wide that could be mistaken for doors, glass in storm doors and glass in sliding doors within or at every entrance to a *house* or an individual *dwelling unit* and in public areas shall be,
(a) safety glass of the tempered or laminated type conforming to CAN/CGSB-12.1-M, "Tempered or Laminated Safety Glass", or
(b) wired glass conforming to CAN/CGSB-12.11-M, "Wired Safety Glass".

r6 **(2)** Except as provided in Sentence (4), glass in entrance doors to *houses* or individual *dwelling units* and in public areas, other than the entrance doors described in Sentence (1), shall be safety glass or wired glass of the type described in Sentence (1) where the glass area exceeds 0.5 m^2 and extends to less than 900 mm from the bottom of the door.

(3) Except as provided in Sentence (4), transparent panels that could be mistaken as a *means of egress* shall be protected by barriers or railings.

(4) Sliding glass *partitions* that separate a *public corridor* from an adjacent *occupancy* and that are open during normal working hours need not conform to Sentences (2), (3) and (5), except that such *partitions* shall be suitably marked to indicate their existence and position.

(5) Except as provided in Sentence (4), every glass or transparent door accessible to the public shall be equipped with hardware, bars or other permanent fixtures designed so that the existence and position of such doors is readily apparent.

(6) Glass, other than safety glass, shall not be used for a shower or bathtub enclosure.

Section 9.7. Windows, Doors and Skylights

9.7.1. General

9.7.1.1. Application

(1) This Section applies to,
(a) windows, doors and skylights separating *conditioned space* from unconditioned space or the exterior, and
(b) main entrance doors.

(2) For the purpose of this Section, the term "skylight" refers to unit skylights, roof windows and tubular daylighting devices.

(3) For the purpose of this Section, the term "doors" includes glazing in doors and sidelights for doors.

9.7.2. Required Windows, Doors and Skylights

9.7.2.1. Entrance Doors

(1) A door shall be provided at each entrance to a *dwelling unit*.

(2) Main entrance doors to *dwelling units* shall be provided with,
(a) a door viewer or transparent glazing in the door, or
(b) a sidelight.

r5 9.7.2.2. Other Requirements for Windows, Doors and Skylights

(1) Minimum sizes of doorways and doors within a *barrier-free* path of travel shall conform to Section 9.5.

(2) The protection of window and door openings against persons falling through the window or door opening shall conform to Article 9.8.8.1.

(3) Properties of windows and doors within *exits* shall conform to Section 9.9.

(4) Windows and doors installed to provide the required *means of egress* from bedrooms shall conform to Subsection 9.9.10.

(5) The location and protection of windows, doors and skylights in order to control the spread of fire shall conform to Subsection 9.10.12.

(6) Doors between *dwelling units* and attached garages shall conform to Article 9.10.13.15.

(7) The surface *flame-spread rating* for doors and skylights shall conform to Article 9.10.17.1.

(8) Windows and doors installed to provide the required access to a *building* for firefighting purposes shall conform to Subsection 9.10.20.

(9) Windows and skylights installed to provide required non-heating season ventilation shall conform to Article 9.32.2.1.

9.7.2.3. Minimum Window Areas

(1) Except as required in Article 9.9.10.1. and Sentence (3), the minimum window glass area for rooms in *buildings* of *residential occupancy* or rooms that are used for sleeping shall conform to Table 9.7.2.3.

(2) The unobstructed glass area of a door or skylight is considered equivalent to that of a window.

(3) Work areas in *live/work units* shall conform to Clause 3.7.2.1.(2)(a).

Table 9.7.2.3.
Glass Areas for Rooms of Residential Occupancy
Forming Part of Sentence 9.7.2.3.(1)

Location	Minimum Unobstructed Glass Area With No Electric Lighting	Minimum Unobstructed Glass Area With Electric Lighting
Laundry, *basement* recreation room, unfinished *basement*	4% of area served	Windows not required
Water closet room	0.37 m²	Windows not required
Kitchen, kitchen space, kitchen alcove	10% of area served	Windows not required
Living rooms and dining rooms	10% of area served	10% of area served
Bedrooms and other finished rooms not mentioned above	5% of area served(1)	5% of area served(1)
Column 1	2	3

Notes to Table 9.7.2.3.:
(1) See Subsection 9.9.10.

(4) Where rooms with different requirements for window glass area are combined as described in Sentence 9.5.1.4.(1), the more restrictive requirement shall govern

9.7.3. Performance of Windows, Doors and Skylights

9.7.3.1. General Performance Criteria

(1) Except as provided in Sentences (2) to (4), windows, doors and skylights and their components separating *conditioned space* from unconditioned space or the exterior shall be designed, constructed and installed so that, when in the closed position, they,
(a) resist the ingress of precipitation into interior space,
(b) resist wind loads,
(c) control air leakage,
(d) resist the ingress of insects and vermin,
(e) where required, resist forced entry, and
(f) are easily operable, unless they are fixed units.

(2) Skylights and their components shall be designed, constructed and installed so that, when in the closed position, they resist snow loads.

(3) Main entrance doors and their components shall be designed, constructed and installed so that, when in the closed position, they,
(a) control air leakage,
(b) resist the ingress of insects and vermin,
(c) resist forced entry, and
(d) are easily operable.

r3 **(4)** Storm doors, sliding doors and their components shall be designed, constructed and installed so that, when in the closed position, they,
(a) resist wind loads,
(b) control air leakage to a minimum allowable 5 m^3h/m and a maximum allowable 8.35 m^3h/m,
(c) resist the ingress of insects and vermin, and
(d) are easily operable.

(5) Compliance with the performance requirements described in Sentences (1) to (4) shall be demonstrated by,
(a) compliance with the requirements in,
  (i) Subsection 9.7.4. or 9.7.5., and
  (ii) Subsection 9.7.6., or
(b) design and construction conforming to Part 5.

9.7.3.2. Heat Transfer Performance

(1) Windows, doors and skylights described in Clause 9.7.1.1.(1)(a) and their components shall be designed, constructed and installed to,
(a) minimize surface condensation on the warm side of the component, and (See Appendix A.)
(b) ensure comfortable conditions for the occupants.

(2) Compliance with the heat transfer performance requirements described in Sentence (1) shall be demonstrated by,
(a) compliance with the requirements in Article 9.7.3.3., or
(b) design and construction conforming to Part 5.

9.7.3.3. Thermal Characteristics of Windows, Doors and Skylights

(1) Except as permitted in Sentence (2), metal frames and sash of windows, doors and skylights shall incorporate a thermal break.

(2) Windows and doors described in Sentence (1) do not require a thermal break where they are installed as,
(a) vehicular access doors,
(b) storm windows and doors, or
(c) windows and doors that are required to have a *fire-resistance rating*.

(3) Windows, doors and skylights, with or without storm doors or sash, that are installed in *buildings* where the intended use of the interior space will not result in high moisture generation shall have a maximum thermal transmittance (U-value) or minimum temperature index (I) in accordance with Table 9.7.3.3.

(4) Windows, doors and skylights, with or without storm doors or sash, that are installed in portions of *buildings* where the intended use of the interior space will result in high moisture generation shall be designed in conformance with Subsection 5.3.

Table 9.7.3.3.
Maximum U-value or Minimum Temperature Index (I) for Windows, Doors and Skylights(1)(2)(3)
Forming Part of Sentence 9.7.3.3.(3)

Component	2.5% January Design Temperature			
	Between -15°C and -30°C		Colder than -30°C	
	max. U-value, W/m²K	min. I	max. U-value, W/m²K	min. I
Windows and Doors	2.0	68	1.7	77
Skylights	3.0	(2)	2.7	(2)
Column 1	2	3	4	5

Notes to Table 9.7.3.3.:

r11.1 (1) U-values for specific products can be determined according to measures referenced in AAMA/WDMA/CSA 101/I.S.2/A440, "NAFS - North American Fenestration Standard/Specification for Windows, Doors, and Skylights". Temperature index (I) is determined according to the physical test procedure given in CSA A440.2/A440.3, "Fenestration Energy Performance/User Guide to CSA A440.2-14, Fenestration Energy Performance".

(2) There is no appropriate test procedure available for testing the condensation resistance of sloped glazing.

r6 (3) Where the U-value in this Table differs from the U-value provided in MMA Supplementary Standard SB-10, "Energy Efficiency Requirements" or MMA Supplementary Standard SB-12, "Energy Efficiency for Housing", the most restrictive U-value shall apply.

9.7.4. Manufactured Windows, Doors and Skylights

9.7.4.1. Application

(1) This Subsection applies to windows, doors and skylights that are within the scope of AAMA/WDMA/CSA 101/I.S.2/A440, "NAFS - North American Fenestration Standard/Specification for Windows, Doors, and Skylights".

9.7.4.2. General

(1) Manufactured and pre-assembled windows, doors and skylights and their installation shall conform to,

(a) AAMA/WDMA/CSA 101/I.S.2/A440, "NAFS - North American Fenestration Standard/Specification for Windows, Doors, and Skylights",

r11.1 (b) CSA A440S1, "Canadian Supplement to AAMA/WDMA/CSA 101/I.S.2/A440-11, NAFS - North American Fenestration Standard/Specification for Windows, Doors, and Skylights",

(c) this Subsection, and

(d) the applicable requirements in Subsection 9.7.6.

(See Appendix A.)

9.7.4.3. Performance Requirements

r11.1 **(1)** Performance grades for windows, doors and skylights shall be selected according to CSA A440S1, "Canadian Supplement to AAMA/WDMA/CSA 101/I.S.2/A440-11, NAFS - North American Fenestration Standard/Specification for Windows, Doors, and Skylights" so as to be appropriate for the conditions and geographic location in which the window, door or skylight will be installed.

(2) Windows, doors and skylights shall conform to the performance grades selected under Sentence (1) when tested in accordance with AAMA/WDMA/CSA 101/I.S.2/A440, "NAFS - North American Fenestration Standard/Specification for Windows, Doors, and Skylights".

(3) The minimum level of performance required for windows, doors and skylights shall be that of the Performance Class R.

(4) Exterior wood doors shall conform to CAN/CSA-O132.2 Series, "Wood Flush Doors" and shall have legibly indicated on them,

(a) the name of the manufacturer,

(b) the standard to which they were produced, and

(c) that they are of an exterior type.

9.7.5. Site-Built Windows, Doors and Skylights

9.7.5.1. Application and Compliance

(1) Materials, design, construction and installation of windows, doors and skylights that separate *conditioned space* from unconditioned space or the exterior but that are not within the scope of AAMA/WDMA/CSA 101/I.S.2/A440, "NAFS - North American Fenestration Standard/Specification for Windows, Doors, and Skylights" shall,

(a) conform to,

  (i) this Subsection or Subsection 9.7.4., and

  (ii) the applicable requirements in Subsection 9.7.6., or

(b) conform to Part 5.

(2) Glass for site-built windows, doors, sidelights for doors, and skylights shall comply with Section 9.6.

9.7.5.2. Resistance to Forced Entry for Doors

(1) Except for exterior doors to garages and to other ancillary spaces, this Article applies to,
(a) swinging entrance doors to *dwelling units*,
(b) swinging doors between *dwelling units* and attached garages or other ancillary spaces, and
(c) swinging doors that provide access directly or indirectly from a *storage garage* to a *dwelling unit*.
(See Appendix A.)

(2) Doors, frames and hardware that conform to a security level of at least Grade 10 as described in the Annex to ASTM F476, "Security of Swinging Door Assemblies", are not required to conform to Sentences (3) to (7).
(See Appendix A.)

(3) Except as provided in Sentence (2), wood doors described in Sentence (1) shall,
(a) be solid core or stile-and-rail type,
(b) be not less than 45 mm thick, and
(c) if of the stile-and-rail panel type, have a panel thickness of not less than 19 mm, with a total panel area not more than half of the door area.

(4) Except as provided in Sentence (2), doors described in Sentence (1) shall be provided with,
(a) a deadbolt lock with a cylinder having no fewer than five pins, and
(b) a bolt throw not less than 25 mm long, protected with a solid or hardened free-turning ring or bevelled cylinder housing.

(5) Except as provided in Sentence (2), an inactive leaf in double doors used in locations specified in Sentence (1) shall be provided with heavy-duty bolts top and bottom having an engagement of not less than 15 mm.

(6) Except as provided in Sentence (2), hinges for doors described in Sentence (1) shall be fastened,
(a) to wood doors with wood screws not less than 25 mm long and to wood frames with wood screws such that at least two screws per hinge penetrate not less than 30 mm into solid wood, or
(b) to metal doors and metal frames with machine screws not smaller than No. 10 and not less than 10 mm long.
(See Appendix A.)

(7) Except as provided in Sentence (2), strikeplates for deadbolts described in Sentence (4) shall be fastened,
(a) to wood frames with wood screws that penetrate not less than 30 mm into solid wood, or
(b) to metal frames with machine screws not smaller than No. 8 and not less than 10 mm long.

(8) Except for storm doors or screen doors, doors described in Sentence (1) that swing outward shall be provided with hinges or pins so that the doors cannot be removed when they are in the closed position. (See Appendix A.)

(9) Solid blocking shall be provided on both sides at the lock height between the jambs for doors described in Sentence (1) and the structural framing so that the jambs will resist spreading by force.

9.7.5.3. Resistance to Forced Entry for Windows

(1) In *dwelling units*, windows, any part of which is located within 2 m of adjacent ground level, shall conform to the requirements for resistance to forced entry as described in Clause 5.3.5 of AAMA/WDMA/CSA 101/I.S.2/A440, "NAFS - North American Fenestration Standard/Specification for Windows, Doors, and Skylights". (See Appendix A.)

9.7.6. Installation

9.7.6.1. Installation of Windows, Doors and Skylights

r11.1 **(1)** The installation of windows, doors and skylights shall conform to CAN/CSA-A440.4, "Window, Door, and Skylight Installation", except that,

(a) shims used to support windows, doors and skylights are permitted to be of treated plywood, and

(b) protection from precipitation for walls incorporating windows or doors and for roofs incorporating skylights, and the interfaces of these walls with windows or doors and of roofs with skylights, shall conform to Section 9.27.

(2) The installation of manufactured and pre-assembled windows, doors and skylights and the field assembly of manufactured window and door combination units shall conform to the manufacturer's instructions.

(3) Windows, doors and skylights shall be sealed to air barriers and *vapour barriers*.

9.7.6.2. Sealants, Trim and Flashing

(1) The sealing compound used to seal the glass component of an insulating glazing unit to the sash component shall be compatible with the sealing compound used to edge seal the glass component.

(2) Flashing used to protect openings shall conform to Articles 9.27.3.7. and 9.27.3.8.

(3) Sealants shall be applied between window frames or trim and the exterior cladding or masonry in conformance with Subsection 9.27.4.

(4) All unfinished portions of the frame and other components of aluminum windows, doors or skylights in contact with the edges of masonry, concrete, stucco or plaster shall be protected with an alkali-resistant coating.

e8 Section 9.8. Stairs, Steps, Ramps, Landings, Handrails and Guards

9.8.1. Application

9.8.1.1. General

(1) This Section applies to the design and construction of interior and exterior stairs, steps, ramps, handrails and *guards*.

9.8.1.2. Stairs, Ramps, Landings, Handrails and Guards in Garages

r6 **(1)** Except as provided in Sentence 9.8.6.2.(3), stairs, ramps, landings, handrails and *guards* in a garage that serves a *house* or an individual *dwelling unit* shall conform to the requirements for stairs, ramps, landings, handrails and *guards* within a *dwelling unit*.

9.8.1.3. Exit Stairs, Ramps and Landings

(1) Where a stair, ramp or landing forms part of an *exit*, the appropriate requirements in Sections 9.9. and 9.10. shall also apply.

9.8.1.4. Escalators and Moving Walks

(1) Escalators and moving walks shall conform to the appropriate requirements in Part 3.

9.8.2. Stair Dimensions

9.8.2.1. Stair Width

(1) Except as provided in Sentence (2), required *exit* stairs and public stairs serving *buildings* of *residential occupancy* shall have a width, measured between wall faces or *guards*, of not less than 900 mm.

r6 **(2)** At least one stair between each floor level within a *dwelling unit*, and exterior stairs and required *exit* stairs serving a *house* or an individual *dwelling unit*, shall have a width of not less than 860 mm.

(3) Required *exit* stairs and public stairs serving *buildings* of other than *residential occupancy* shall have a width of not less than the greater of,

(a) 900 mm, or

(b) 8 mm per person based on the *occupant load* limits specified in Table 3.1.17.1.

9.8.2.2. Height Over Stairs

(1) The clear height over stairs shall be,

(a) measured vertically, over the clear width of the stair, from a straight line tangent to the tread and landing nosings to the lowest point above, and

r6 (b) not less than,

(i) 1 950 mm for stairs serving a *house* or an individual *dwelling unit*, and

(ii) 2 050 mm for stairs not serving a *house* or an individual *dwelling unit*.

(b) as part of a *means of egress* from more than one *floor area* and the *floor areas* so served have a total *occupant load* of not more than 60 persons.

(3) Doors that open onto a corridor or other facility that provides *access to exit* from a room or *suite* having an *occupant load* of more than 60 persons shall swing on the vertical axis in the direction of *exit* travel.

(4) Doors that divide a corridor that is not wholly contained within a *suite* shall swing in the direction of *exit* travel.

(5) Where a pair of doors is installed in a corridor that provides *access to exit* in both directions, the doors shall,
(a) swing in opposite directions, with the door on the right hand side swinging in the direction of *exit* travel, or
(b) swing in both directions.

9.9.6.6. Proximity of Doors to Stairs

r6 **(1)** Except as provided in Sentence (2), the distance between a stair riser and the leading edge of a door in its swing, except for doors serving a *house* or an individual *dwelling unit*, shall be not less than 300 mm.

r6 **(2)** Where there is a danger of blockage from ice or snow, an *exit* door, including a door serving a *house* or an individual *dwelling unit*, may open onto not more than one step provided the riser of such step does not exceed 150 mm.

9.9.6.7. Door Latching, Locking and Opening Mechanisms

r6 **(1)** Principal entrance doors, *exit* doors and doors to *suites*, including exterior doors serving a *house* or an individual *dwelling unit*, and other doors in an *access to exit* shall,
(a) be openable from the inside or in travelling to an *exit* without requiring keys, special devices or specialized knowledge of the door opening mechanism, or
r11.1 (b) be controlled by electromagnetic locking mechanisms in accordance with Sentence 3.4.6.16.(4).

r6 **(2)** Except for doors serving a *house* or an individual *dwelling unit* and except for doors to accessory *buildings* and to garages serving a *house* or an individual *dwelling unit*, door release hardware on doors in a *means of egress* shall be operable with one hand and the door shall be openable with not more than one releasing operation.

(3) Door release hardware on doors in a *means of egress* shall be installed not more than 1 200 mm above the finished floor.

(4) Except for *hotels*, a door opening onto a *public corridor* that provides *access to exit* from *suites* shall be designed not to lock automatically when such doors are equipped with an automatic self-closing device.

9.9.6.8. Effort Required to Open

r6 **(1)** Except as required by Sentence 3.8.3.3.(7), every *exit* door, except doors serving a *house* or an individual *dwelling unit*, shall be designed and installed so that when the latch is released the door will open in the direction of *exit* travel under a force of not more than 90 N applied to the door release hardware.

9.9.7. Access to Exits

9.9.7.1. Egress from Roof Area, Podiums, Terraces, Platforms and Contained Open Spaces

r3 **(1)** An *access to exit* shall be provided from every roof intended for occupancy and from every podium, terrace, platform or contained open space.

(2) Where a roof is intended for an *occupant load* of more than 60 persons, at least two separate *means of egress* shall be provided from the roof to stairs designed in conformance with the requirements for *exit* stairs and located remote from each other.

(3) Where a podium, terrace, platform or contained open space is provided, egress requirements shall conform to the appropriate requirements for rooms or *suites* in Article 9.9.7.4.

9.9.7.2. Means of Egress from Suites

(1) Except as required by Sentence 9.9.9.3.(1), each *suite* in a *floor area* occupied by more than one *suite* shall have,
(a) an exterior *exit* doorway,
(b) a doorway to a *public corridor*, or
(c) a doorway to an exterior passageway.

(2) Except as provided in Sentences 9.9.7.3.(1) and 9.9.8.2.(2), from the point where a doorway described in Clause (1)(b) or (c) enters the *public corridor* or exterior passageway, it shall be possible to go in opposite directions to each of two separate *exits*.

9.9.7.3. Dead-End Corridors

(1) A dead-end *public corridor* is permitted in an *occupancy* shown in Table 9.9.7.3., where,
(a) the dead-end corridor,
  (i) does not exceed the distance of travel measured from the most remote point of the dead-end to a point where it is possible to go in opposite directions to each of two separate *exits*, and
  (ii) is provided with doors equipped with self-closing devices, or
(b) there is a second and separate egress doorway from each room or *suite* not leading into the dead-end corridor.

(2) Dead-end *public corridors* in *residential occupancies* and *business and personal services occupancies* shall contain only *suite* door openings arranged so that not more than two such doors have to be passed to reach the nearest *exit*.

(3) The area of wired glass in doors required by Sentence (2) shall not exceed 645 cm^2.

Table 9.9.7.3.
Dead-End Public Corridors
Forming Part of Sentence 9.9.7.3.(1)

Occupancy	Maximum Length of Dead-End *Public Corridor,* m	Maximum *Occupant Load* or *Suites* Served by Dead-End *Public Corridor*
Group C	6	4 *suites*
Group D	6	30
Group E	9	30
Group F	9	30
Column 1	2	3

9.9.7.4. Number and Spacing of Egress Doors

(1) Except for *dwelling units*, at least two egress doors shall be provided where,
(a) the area of a room or *suite* exceeds 200 m^2 in a Group D, E, F2 and F3 *occupancy*, or 150 m^2 in a Group C *occupancy*, or
(b) the distance measured from any point within a room or *suite* to the nearest egress door exceeds 25 m.

9.9.9. Egress from Dwelling Units

9.9.9.1. Travel Limit to Exits or Egress Doors

(1) Except as provided in Sentences (2) and (3), every *dwelling unit* containing more than 1 *storey* shall have *exits* or egress doors located so that it shall not be necessary to travel up or down more than 1 *storey* to reach a level served by,
(a) an egress door to a *public corridor*, enclosed *exit* stair or exterior passageway, or
(b) an *exit* doorway not more than 1 500 mm above adjacent ground level.

(2) Where a *dwelling unit* is not located above or below another *suite*, the travel limit from a floor level in the *dwelling unit* to an *exit* or egress door is permitted to exceed 1 *storey* where that floor level is served by an openable window or door,
(a) providing an unobstructed opening of not less than 1 000 mm in height and 550 mm in width, and
(b) located so that the sill is not more than,
  (i) 1 000 mm above the floor, and
  (ii) 7 m above adjacent ground level.

(3) The travel limit from a floor level in a *dwelling unit* to an *exit* or egress door is permitted to exceed 1 *storey* where that floor level has direct access to a balcony.

9.9.9.2. Two Separate Exits

(1) Except as provided in Sentence 9.9.7.3.(1), where an egress door from a *dwelling unit* opens onto a *public corridor* or exterior passageway it shall be possible from the location where the egress door opens onto the corridor or exterior passageway to go in opposite directions to two separate *exits* unless the *dwelling unit* has a second and separate *means of egress*.

9.9.9.3. Shared Egress Facilities

(1) A *dwelling unit* shall be provided with a second and separate *means of egress* where an egress door from the *dwelling unit* opens onto,
(a) an *exit* stairway serving more than one *suite*,
(b) a *public corridor*,
  (i) serving more than one *suite*, and
  (ii) served by a single *exit*,
(c) an exterior passageway,
  (i) serving more than one *suite*,
  (ii) served by a single *exit* stairway or ramp, and
  (iii) more than 1.5 m above adjacent ground level, or
(d) a balcony,
  (i) serving more than one *suite*,
  (ii) served by a single *exit* stairway or ramp, and
  (iii) more than 1.5 m above adjacent ground level.

9.9.10. Egress from Bedrooms

9.9.10.1. Egress Windows or Doors for Bedrooms

(1) Except where a door on the same floor level as the bedroom provides direct access to the exterior, every floor level containing a bedroom in a *suite* shall be provided with at least one outside window that,
(a) is openable from the inside without the use of tools,
(b) provides an individual, unobstructed open portion having a minimum area of 0.35 m^2 with no dimension less than 380 mm, and

(c) maintains the required opening described in Clause (b) without the need for additional support.
(See Appendix A.)

(2) Except for *basement* areas, the window required in Sentence (1) shall have a maximum sill height of 1 000 mm above the floor. (See Appendix A.)

(3) When sliding windows are used, the minimum dimension described in Sentence (1) shall apply to the openable portion of the window.

(4) Where the sleeping area within a *live/work unit* is on a *mezzanine* with no obstructions more than 1 070 mm above the floor, the window required in Sentence (1) may be provided on the main level of the *live/work unit* provided the *mezzanine* is not more than 25% of the area of the *live/work unit* or 20 m^2, whichever is less, and an unobstructed direct path of travel is provided from the *mezzanine* to this window.

(5) Where a window required in Sentence (1) opens into a window well, a clearance of not less than 550 mm shall be provided in front of the window. (See Appendix A.)

(6) Where the sash of a window referred to in Sentence (5) swings towards the window well, the operation of the sash shall not reduce the clearance in a manner that would restrict escape in an emergency.

(7) Where a protective enclosure is installed over the window well referred to in Sentence (5), such enclosure shall be openable from the inside without the use of keys, tools or special knowledge of the opening mechanism.

9.9.11. Signs

9.9.11.1. Application

r6 **(1)** This Subsection applies to all *exits* except those serving a *house* or an individual *dwelling unit*.

9.9.11.2. Visibility of Exits

(1) *Exits* shall be located so as to be clearly visible or their locations shall be clearly indicated.

r11.1 **(2)** Where an *exit* door leading directly to the outside is subject to being obstructed by a parked vehicle or storage because of its location, a visible sign prohibiting such obstructions shall be permanently mounted on the exterior side of the door.

9.9.11.3. Exit Signs

(1) Except as required in Sentence (7), every *exit* door shall have an *exit* sign placed over it or adjacent to it if the *exit* serves,
(a) a *building* that is 3 *storeys* in *building height*,
(b) a *building* having an *occupant load* of more than 150, or
(c) a room or *floor area* that has a fire escape as part of a required *means of egress*.

(2) Except as required in Sentence (6), every *exit* sign shall,
(a) be visible on approach to the *exit*,
r11.1 (b) consist of a green pictogram and a white or lightly tinted graphical symbol meeting the colour specifications referred to in ISO 3864-1, "Graphical Symbols – Safety Colours and Safety Signs – Part 1: Design Principles for Safety Signs and Safety Markings", and
r11.1 (c) conform to ISO 7010, "Graphical Symbols – Safety Colours and Safety Signs – Registered Safety Signs", for the following symbols:
(i) E001 emergency exit left,
(ii) E002 emergency exit right,

(iii) E005 90-degree directional arrow, and
(iv) E006 45-degree directional arrow.

(3) Internally illuminated *exit* signs shall be continuously illuminated, and,
r11.1 (a) where illumination of the sign is powered by an electrical circuit, be constructed in conformance with CSA C22.2 No. 141, "Emergency Lighting Equipment", or
r5 (b) where illumination of the sign is not powered by an electrical circuit, be,
r11.1 (i) constructed in conformance with CAN/ULC-S572, "Photoluminescent and Self-Luminous Exit Signs and Path Marking Systems", and
(ii) labelled in accordance with the time duration for which they have been tested and *listed*.

(4) Externally illuminated *exit* signs shall be illuminated at all times by a light fixture supplied by an electrical circuit.

(5) The circuitry serving lighting for externally and internally illuminated *exit* signs shall,
(a) serve no equipment other than emergency lighting in the area where the *exit* signs are installed, and
(b) be connected to an emergency power supply as described in Sentences 9.9.12.3.(2), (3) and (7).

(6) An *exit* sign conforming to Clauses (2)(b) and (c) with an arrow or other indicator pointing at the direction of egress shall be provided where no *exit* is visible from,
(a) a *public corridor*,
(b) a corridor used by the public, or
(c) a principal route serving an open *floor area* having an *occupant load* of more than 150.

(7) Except for *suite* doors opening directly to the exterior, every *exit* serving a *hotel* shall have an *exit* sign placed over it or adjacent to it.

9.9.11.4. Signs for Stairs and Ramps at Exit Level

(1) In *buildings* that are 3 *storeys* in *building height*, any part of an *exit* ramp or stairway that continues up or down past the lowest *exit level* shall be clearly marked to indicate that it does not lead to an *exit* where the portion below *exit level* may be mistaken as the direction of *exit* travel.

9.9.11.5. Floor Numbering

(1) Arabic numerals indicating the assigned floor number shall be,
(a) except in *hotels*, mounted permanently on the stair side of the wall at the latch side of doors to *exit* stair shafts,
(b) in *hotels*, mounted permanently on each side of the *exit* doors to the *exit* stair shaft,
(c) not less than 60 mm high, raised approximately 0.8 mm above the surface,
(d) located 1 500 mm from the finished floor and not more than 300 mm from the door, and
(e) contrasting in colour with the surface on which they are applied.

9.9.12. Lighting

9.9.12.1. Application

(1) This Subsection applies to the lighting of all *means of egress* except those within *dwelling units*.

9.9.12.2. Required Lighting in Egress Facilities

(1) Every *exit*, *public corridor* or corridor providing *access to exit* for the public shall be equipped to provide illumination to an average level of not less than 50 lx at floor or tread level and at all points such as angles and intersections at changes of level where there are stairs or ramps.

(2) The minimum value of the illumination required by Sentence (1) shall be not less than 10 lx.

9.9.12.3. Emergency Lighting

(1) Emergency lighting shall be provided in,
(a) *exits*,
(b) principal routes providing *access to exit* in an open *floor area*,
(c) corridors used by the public,
(d) underground walkways, and
(e) *public corridors*.

(2) Emergency lighting required in Sentence (1) shall be provided from a source of energy separate from the electrical supply for the *building*.

(3) Lighting required in Sentence (1) shall be designed to be automatically actuated for a period of not less than 30 min when the electric lighting in the affected area is interrupted.

(4) Illumination from lighting required in Sentence (1) shall be provided to average levels of not less than 10 lx at floor or tread level.

(5) The minimum value of the illumination required by Sentence (4) shall be not less than 1 1x.

(6) Where incandescent lighting is provided, lighting equal to 1 W/m^2 of *floor area* shall be considered to meet the requirement in Sentence (4).

(7) Where self-contained emergency lighting units are used, they shall conform to CSA C22.2 No. 141, "Emergency Lighting Equipment".

Section 9.10. Fire Protection

9.10.1. Definitions and Application

9.10.1.1. Support of Noncombustible Construction

(1) Where an assembly is required to be of *noncombustible construction* and to have a *fire-resistance rating*, it shall be supported by *noncombustible construction*.

9.10.1.2. Sloped Roofs

r3 **(1)** For the purposes of this Section, roofs with slopes of 60° or more to the horizontal and that are adjacent to a room or space intended for occupancy shall be considered as a wall.

9.10.1.3. Items Under Part 3 Jurisdiction

(1) Tents, *air-supported structures*, transformer vaults, *walkways*, elevators and escalators shall conform to Part 3.

(2) Where rooms or spaces are intended for an *assembly occupancy*, such rooms or spaces shall conform to Part 3.

(3) *Basements* containing more than 1 *storey* or exceeding 600 m^2 in area shall conform to Part 3.

(4) Where rooms or spaces are intended for the storage, manufacture or use of hazardous or explosive material, such rooms or spaces shall conform to Part 3.

(a) the *suite* in which it is located, where there is more than one *suite* in the *storey*, or
(b) the *storey* in which it is located, in all other cases.

(2) *Mezzanines* shall not be considered as *storeys* for the purpose of determining *building height* where they occupy an aggregate area not exceeding 40% of the area of the room or the *storey* in which they are located provided the space above the *mezzanine* floor has no visual obstructions more than 1 070 mm above such floors.

9.10.4.2. More Than One Level of Mezzanine

(1) Where more than 1 level of *mezzanine* is provided in a *storey*, each level additional to the first shall be considered as a *storey*.

9.10.4.3. Basement Storage Garages

(1) Where a *basement* is used primarily as a *storage garage*, the *basement* is permitted to be considered as a separate *building* for the purposes of this Section provided the floor above the *basement* and the exterior walls of the *basement* above the adjoining ground level are constructed as *fire separations* of masonry or concrete having a *fire-resistance rating* of not less than 2 h.

e3 9.10.4.4. Rooftop Enclosures

r11.1 **(1)** Rooftop enclosures provided for elevator machinery, stairways or *service rooms*, used for no purpose other than for service to the *building*, shall not be considered as a *storey* in calculating the *building height*.

9.10.5. Permitted Openings in Wall and Ceiling Assemblies

9.10.5.1. Permitted Openings in Wall and Ceiling Membranes

(1) Except as permitted in Sentences (2) and (4), a membrane forming part of an assembly required to have a *fire-resistance rating* shall not be pierced by openings into the assembly unless the assembly has been tested and rated for such openings.

(2) A wall or ceiling membrane forming part of an assembly required to have a *fire-resistance rating* is permitted to be pierced by openings for electrical and similar service outlet boxes provided such outlet boxes are tightly fitted.

(3) Where boxes referred to in Sentence (2) are located on both sides of walls required to provide a *fire-resistance rating*, they shall be offset where necessary to maintain the integrity of the *fire separation*.

r11.1 **(4)** A membrane ceiling forming part of an assembly assigned a *fire-resistance rating* on the basis of Table 2 of MMAH Supplementary Standard SB-3, "Fire and Sound Resistance of Building Assemblies", is permitted to be pierced by openings leading to ducts within the ceiling space provided the ducts, the amount of openings and their protection conform to Sentence 9.10.13.14.(1) and the requirements in MMAH Supplementary Standard SB-2, "Fire Performance Ratings".

9.10.6. Construction Types

9.10.6.1. Combustible Elements in Noncombustible Construction

(1) Where a *building* or part of a *building* is required to be of *noncombustible construction*, *combustible* elements shall be limited in conformance with the requirements in Subsection 3.1.5.

9.10.6.2. Heavy Timber Construction

(1) *Heavy timber construction* shall be considered to have a 45 min *fire-resistance rating* when it is constructed in accordance with the requirements for *heavy timber construction* in Article 3.1.4.7.

9.10.7. Steel Members

9.10.7.1. Protection of Structural Steel Members

(1) Except as provided in Article 3.2.2.3., structural steel members used in construction required to have a *fire-resistance rating* shall be protected to provide the required *fire-resistance rating*.

r1 9.10.8. Fire-Resistance, Combustibility and Sprinklers in Relation to Occupancy, Height and Supported Elements

9.10.8.1. Fire-Resistance Ratings for Floors and Roofs

(1) Except as otherwise provided in this Subsection, the *fire-resistance ratings* of floors and roofs shall conform to Table 9.10.8.1.

Table 9.10.8.1.
Fire Resistance Ratings for Structural Members and Assemblies
Forming Part of Sentence 9.10.8.1.(1)

Major Occupancy	Maximum *Building Height*, *Storeys*	Minimum *Fire-Resistance Rating* by *Building* Element, min		
		Floors Except Floors over Crawl Spaces	*Mezzanine* Floors	Roofs
Residential (Group C)	3	45	45	—
All other *occupancies*	2	45	—	—
	3	45	45	45
Column 1	2	3	4	5

9.10.8.2. Fire-Resistance Ratings in Sprinklered Buildings

(1) Except for roofs that support an *occupancy*, the requirements in Table 9.10.8.1. for roof assemblies to have a *fire-resistance rating* are permitted to be waived in *sprinklered buildings* where,
(a) the sprinkler system is electrically supervised in conformance with Sentence 3.2.4.10.(3), and
(b) the operation of the sprinkler system will cause a signal to be transmitted to the fire department in conformance with Sentence 3.2.4.8.(4).

9.10.8.3. Fire-Resistance Ratings for Walls, Columns and Arches

(1) Except as otherwise provided in this Subsection, all *loadbearing* walls, columns and arches in the *storey* immediately below a floor or roof assembly shall have a *fire-resistance rating* of not less than that required for the supported floor or roof assembly.

r6 9.10.8.4. Reserved

(6) Electrical wires or cables, single or grouped, with *combustible* insulation or jacketing that is not totally enclosed in raceways of *noncombustible* material, are permitted to partly or wholly penetrate an assembly required to have a *fire-resistance rating* without being incorporated in the assembly at the time of testing as required in Sentence (3), provided the overall diameter of the wiring is not more than 25 mm.

(7) *Combustible* totally enclosed raceways that are embedded in a concrete floor slab are permitted in an assembly required to have a *fire-resistance rating* without being incorporated in the assembly at the time of testing as required in Sentence (3), where the concrete provides at least 50 mm of cover between the raceway and the bottom of the slab.

(8) *Combustible* outlet boxes are permitted in an assembly required to have a *fire-resistance rating* without being incorporated in the assembly at the time of testing as required in Sentence (3), provided the opening through the membrane into the box does not exceed 160 cm^2.

(9) *Combustible* water distribution piping is permitted to partly or wholly penetrate a *fire separation* that is required to have a *fire-resistance rating* without being incorporated in the assembly at the time of testing as required in Sentence (3), provided the piping is protected with a *fire stop* in conformance with Sentence 3.1.9.4.(4).

(10) *Combustible* sprinkler piping is permitted to penetrate a *fire separation* provided the *fire compartments* on each side of the *fire separation* are *sprinklered*.

r11.1 **(11)** Sprinklers are permitted to penetrate a *fire separation* or a membrane forming part of an assembly required to have a *fire-resistance rating* without having to meet the *fire stop* requirements of Sentence (1), provided the annular space created by the penetration of a fire sprinkler is covered by a metal escutcheon plate in accordance with NFPA 13, "Installation of Sprinkler Systems".

(12) *Combustible* piping for central vacuum systems is permitted to penetrate a *fire separation* provided the installation conforms to the requirements that apply to *combustible* piping in Sentences 9.10.9.7.(2) to (6).

(13) *Fire dampers* are permitted to penetrate a *fire separation* or a membrane forming part of an assembly required to have a *fire-resistance rating* without having to meet the *fire stop* requirements of Sentence (1), provided the *fire damper* is,
(a) installed in conformance with NFPA 80, "Fire Doors and Other Opening Protectives," or
(b) designed specifically with a *fire stop*.

9.10.9.7. Combustible Piping

(1) Except as permitted in Sentences (2) to (6), *combustible* piping shall not be used where any part of a piping system partly or wholly penetrates a *fire separation* required to have a *fire-resistance rating* or penetrates a membrane that contributes to the required *fire-resistance rating* of an assembly.

r3 **(2)** *Combustible* piping not located in a vertical shaft is permitted to penetrate a *fire separation* required to have a *fire-resistance rating* or a membrane that forms part of an assembly required to have a *fire-resistance rating*, provided the piping is sealed at the penetration by a *fire stop* system that has an F rating not less than the *fire-resistance rating* required for the *fire separation*.

(3) The rating referred to in Sentence (2) shall be based on CAN/ULC-S115, "Fire Tests of Firestop Systems", with a pressure differential of 50 Pa between the exposed and unexposed sides, with the higher pressure on the exposed side.

(4) *Combustible* drain piping is permitted to penetrate a horizontal *fire separation* or a membrane that contributes to the required *fire-resistance rating* of a horizontal *fire separation*, provided it leads directly from a *noncombustible* water closet through a concrete floor slab.

(5) *Combustible* piping is permitted,
(a) on one side of a vertical *fire separation* provided it is not located in a vertical shaft, and

(b) to penetrate a vertical or horizontal *fire separation* when the *fire compartment* on each side of the *fire separation* is *sprinklered*.

r6 **(6)** In a *house* containing two *dwelling units*, *combustible* piping is permitted on one side of a horizontal *fire separation*.

9.10.9.8. Collapse of Combustible Construction

(1) *Combustible construction* that abuts on or is supported by a *noncombustible fire separation* shall be constructed so that its collapse under fire conditions will not cause collapse of the *fire separation*.

9.10.9.9. Reduction in Thickness of Fire Separation by Beams and Joists

(1) Where pockets for the support of beams or joists are formed in a masonry or concrete *fire separation*, the remaining total thickness of solid masonry and/or grout and/or concrete shall be not less than the required equivalent thickness shown for Type S monolithic concrete in Table 2.1.1. of MMAH Supplementary Standard SB-2, "Fire Performance Ratings", for the required *fire-resistance rating*.

9.10.9.10. Concealed Spaces Above Fire Separations

(1) Except as provided in Sentence (2), a *horizontal service space* or other concealed space located above a required vertical *fire separation* shall be divided at the *fire separation* by an equivalent *fire separation* within the space.

(2) Where a *horizontal service space* or other concealed space is located above a required vertical *fire separation* other than a vertical shaft, such space need not be divided as required in Sentence (1) provided the construction between such space and the space below is constructed as a *fire separation* having a *fire-resistance rating* not less than that required for the vertical *fire separation*, except that where the vertical *fire separation* is not required to have a *fire-resistance rating* greater than 45 min, the *fire-resistance rating* of the ceiling is permitted to be reduced to 30 min.

9.10.9.11. Separation of Residential Occupancies

(1) Except as provided in Sentences (2) and (4), *residential occupancies* shall be separated from all other *major occupancies* by a *fire separation* having a *fire-resistance rating* of not less than 1 h.

(2) Except as provided in Sentence (3), a *major occupancy* classified as a *residential occupancy*, including *live/work units*, shall be separated from other *major occupancies* classified as *mercantile* or *medium hazard industrial occupancies* by a *fire separation* having a *fire-resistance rating* of not less than 2 h.

(3) Where not more than 2 *dwelling units* or *live/work units* are located in a *building* containing a *mercantile occupancy*, such *mercantile occupancy* shall be separated from the *dwelling units* or *live/work units* by a *fire separation* having not less than 1 h *fire-resistance rating*.

(4) The requirement for *fire separations* between *major occupancies* in Sentence (1) is waived for the *occupancies* allowed within *live/work units*.

9.10.9.12. Residential Suites, Live/Work Units and Industrial Buildings

(1) Except as provided in Sentence (2), not more than 1 *suite* of *residential occupancy* shall be contained within a *building* classified as a Group F, Division 2 *major occupancy*.

(2) Except where a Group F Division 2 *major occupancy* is directly related to *live/work units*, not more than one *suite* of *residential occupancy* shall be contained within a *building* classified as Group F, Division 2 *major occupancy*.

9.10.10.2. Service Room Floors

(1) The *fire-resistance rating* requirements in this Subsection do not apply to the floor assembly immediately below a *service room*.

9.10.10.3. Separation of Service Rooms

(1) Except as provided in Sentence (2) and Articles 9.10.10.5. and 9.10.10.6., *service rooms* shall be separated from the remainder of the *building* by a *fire separation* having a *fire-resistance rating* of not less than 1 h when the *floor area* containing the *service room* is not *sprinklered*.

(2) Where a room contains a limited quantity of service equipment and the service equipment does not constitute a fire hazard, the requirements in Sentence (1) shall not apply.

9.10.10.4. Appliances and Equipment to be Located in a Service Room

(1) Except as provided in Sentences (2) and (3) and Article 9.10.10.5., fuel-fired *appliances* shall be located in a *service room* separated from the remainder of the *building* by a *fire separation* having not less than a 1 h *fire-resistance rating*.

r6 **(2)** Except as required in the *appliance* installation standards referenced in Sentences 6.2.1.4.(1) and 9.33.1.2.(1), fuel-fired *space-heating appliances*, space-cooling *appliances* and *service water heaters* need not be separated from the remainder of the *building* as required in Sentence (1) where the equipment serves,

(a) not more than one room or *suite*,
(b) a *house*, or
(c) a *building*, other than a *house*, with a *building* area of not more than 400 m^2 and a *building height* of not more than 2 *storeys*.

(3) Sentence (1) does not apply to fireplaces and cooking *appliances*.

9.10.10.5. Incinerators

(1) *Service rooms* containing incinerators shall be separated from the remainder of the *building* by a *fire separation* having a *fire-resistance rating* of not less than 2 h.

r11.1 **(2)** The design, construction, installation and alteration of each indoor incinerator shall conform to NFPA 82, "Incinerators and Waste and Linen Handling Systems and Equipment".

(3) Every incinerator shall be connected to a *chimney flue* conforming to the requirements in Section 9.21. and serving no other *appliance*.

(4) An incinerator shall not be located in a room with other fuel-fired *appliances*.

9.10.10.6. Storage Rooms

(1) Rooms for the temporary storage of *combustible* refuse in all *occupancies* or for public storage in *residential occupancies* shall be separated from the remainder of the *building* by a *fire separation* having not less than a 1 h *fire-resistance rating*, except that a 45 min *fire separation* is permitted where the *fire-resistance rating* of the floor assembly is not required to exceed 45 min, or where such rooms are *sprinklered*.

9.10.10.7. Emergency Power Installations

(1) Where a generator intended to supply emergency power for lighting, fire safety and life safety systems is located in a *building*, it shall be located in a room that,

(a) is separated from the remainder of the *building* by a *fire separation* with a *fire-resistance rating* not less than,
  (i) 1 h, if the floor assembly is not required to have a *fire-resistance rating* of more than 1 h, and
  (ii) 2 h, if the floor assembly is required to have a *fire-resistance rating* of more than 1 h, and
(b) contains only the generating set and equipment that is related to the emergency power supply system.

9.10.11. Firewalls

9.10.11.1. Required Firewalls

(1) Except as provided in Articles 9.10.11.2. and 9.10.11.4., a *party wall* on a property line shall be constructed as a *firewall*.

9.10.11.2. Firewalls Not Required

r6 **(1)** A *party wall* on a property line need not be constructed as a *firewall* provided it is constructed as a *fire separation* having not less than a 1 h *fire-resistance rating* if,
(a) the property line is between *houses*, or
(b) the property line is between *dwelling units* in a *building* of *residential occupancy*, other than a *house*, in which there is no *dwelling unit* above another *dwelling unit*.

(2) The wall described in Sentence (1) shall provide continuous protection from the top of the footings to the underside of the roof deck.

(3) Any space between the top of the wall described in Sentence (1) and the roof deck shall be tightly filled with mineral wool or *noncombustible* material.

9.10.11.3. Construction of Firewalls

(1) Where *firewalls* are used, the requirements in Part 3 shall apply.

9.10.11.4. Firewalls in Detached Garages

r6 **(1)** Where a garage is detached from the *house* or the individual *dwelling unit* it serves but attached to another garage on the adjacent property, the *party wall* so formed shall be constructed as a *fire separation* having a *fire-resistance rating* of not less than 45 min.

9.10.12. Prevention of Fire Spread at Exterior Walls and Between Storeys

9.10.12.1. Termination of Floors or Mezzanines

(1) Except as provided in Sentence (2) and in Articles 9.10.1.3. and 9.10.9.5., the portions of a *floor area* or *mezzanine* that do not terminate at an exterior wall, a *firewall* or a vertical shaft, shall terminate at a vertical *fire separation* having a *fire-resistance rating* not less than that required for the floor assembly that terminates at the separation.

(2) A *mezzanine* need not terminate at a vertical *fire separation* where the *mezzanine* is not required to be considered as a *storey* in Articles 9.10.4.1. and 9.10.4.2.

9.10.12.2. Location of Skylights

(1) Where a wall in a *building* is exposed to a fire hazard from an adjoining roof of a separate unsprinklered *fire compartment* in the same *building*, the roof shall contain no skylights within a horizontal distance of 5 m of the windows in the exposed wall.

9.10.13.6. Steel Door Frames

r5 **(1)** Steel door frames forming part of a *closure* in a *fire separation*, including anchorage requirements, shall conform to CAN/ULC-S105, "Fire Door Frames Meeting the Performance Required by CAN/ULC-S104".

9.10.13.7. Glass Block as a Closure

(1) Glass block that has not been tested in accordance with Article 9.10.3.1. is permitted as a *closure* in a *fire separation* required to have a *fire-resistance rating* of not more than 1 h.

9.10.13.8. Maximum Size of Opening

(1) The size of an opening in an interior *fire separation*, even where protected with a *closure*, shall not exceed 11 m², with no dimension greater than 3.7 m, if a *fire compartment* on either side of the *fire separation* is not *sprinklered*.

(2) The size of an opening in an interior *fire separation*, even where protected with a *closure*, shall not exceed 22 m², with no dimension greater than 6 m, when the *fire compartments* on both sides of the *fire separation* are *sprinklered*.

9.10.13.9. Door Latch

(1) Every swing type door in a *fire separation* shall be equipped with a latch.

9.10.13.10. Self-Closing Device

(1) Except as described in Sentence (2), every door in a *fire separation* shall have a self-closing device.

(2) Self-closing devices are not required between *public corridors* and *suites* in *business and personal services occupancies*, except in,
(a) dead-end corridors, or
(b) a corridor that serves a *hotel*.

9.10.13.11. Hold-Open Devices

(1) Where hold-open devices are used on doors in required *fire separations*, they shall be installed in accordance with Article 3.1.8.12.

9.10.13.12. Service Room Doors

(1) Swing-type doors shall open into *service rooms* containing fuel-fired equipment where such doors lead to *public corridors* or rooms used for assembly but shall swing outward from such rooms in all other cases.

9.10.13.13. Fire Dampers

(1) Except as permitted in Sentences (2) to (5) and Sentence 9.10.5.1.(4), a duct that penetrates an assembly required to be a *fire separation* with a *fire-resistance rating* shall be equipped with a *fire damper* in conformance with Articles 3.1.8.4. and 3.1.8.9.

(2) A *fire damper* is not required where a *noncombustible* branch duct pierces a required *fire separation* provided the duct,
(a) has a melting point not below 760°C,
(b) has a cross-sectional area less than 130 cm², and
(c) supplies only *air-conditioning* units or combined *air-conditioning* and heating units discharging air at not more than 1.2 m above the floor.

(3) A *fire damper* is not required where a *noncombustible* branch duct pierces a required *fire separation* around an *exhaust duct* riser in which the air flow is upward provided,
(a) the melting point of the branch duct is not below 760°C,
(b) the branch duct is carried up inside the riser at least 500 mm, and
(c) the *exhaust duct* is under negative pressure as described in Article 9.10.9.18.

(4) *Noncombustible* ducts that penetrate a *fire separation* separating a *vertical service space* from the remainder of the *building* need not be equipped with a *fire damper* at the *fire separation* provided,
(a) the ducts have a melting point above 760°C, and
(b) each individual duct exhausts directly to the outside at the top of the *vertical service space*.

(5) A duct serving commercial cooking equipment and piercing a required *fire separation* need not be equipped with a *fire damper* at the *fire separation*.

9.10.13.14. Fire Stop Flaps

r11.1 **(1)** *Fire stop flaps* in ceiling membranes required in Sentence 9.10.5.1.(4) shall
(a) conform to CAN/ULC-S112.2, "Fire Test of Ceiling Firestop Flap Assemblies", and
(b) activate at a temperature approximately 30°C above the normal maximum temperature that occurs in the ducts, whether the air duct system is operating or shut down.

r6 9.10.13.15. Doors Between Garages and Houses or Dwelling Units

(1) A door between an attached or built-in garage and the *house* or the individual *dwelling unit* it serves shall be tight-fitting and weatherstripped to provide an effective barrier against the passage of gases and exhaust fumes and shall be fitted with a self-closing device.

(2) A doorway between an attached or built-in garage and the *house* or the individual *dwelling unit* it serves shall not be located in a room intended for sleeping.

9.10.13.16. Door Stops

(1) Where a door is installed so that it may damage the integrity of a *fire separation* if its swing is unrestricted, door stops shall be installed to prevent such damage.

9.10.14. Spatial Separation Between Buildings

9.10.14.1. Application

(1) Except as permitted in Subsection 9.10.15., this Subsection applies to all *buildings*.

9.10.14.2. Area and Location of Exposing Building Face

(1) The area of an *exposing building face* shall be,
(a) taken as the exterior wall area facing in one direction on any side of a *building*, and
(b) calculated as,
  (i) the total area measured from the finished ground level to the uppermost ceiling, or
  (ii) the area for each *fire compartment*, where a *building* is divided into *fire compartments* by *fire separations* with *fire-resistance ratings* not less than 45 min.

(2) For the purpose of using Table 9.10.14.4. to determine the maximum aggregate area of *unprotected openings* permitted in an irregularly-shaped or skewed exterior wall, the location of the *exposing building face* shall be taken as a

9.10.16. Fire Blocks

9.10.16.1. Required Fire Blocks in Concealed Spaces

(1) Concealed spaces in interior walls, ceilings, floors and crawl spaces shall be separated by *fire blocks* from concealed spaces in exterior walls and *attic or roof spaces*.

(2) *Fire blocks* shall be provided at all interconnections between concealed vertical and horizontal spaces in interior coved ceilings, drop ceilings and soffits where the exposed construction materials within the concealed spaces have a surface *flame-spread rating* greater than 25.

r11.1 **(3)** *Fire blocks* shall be provided at the top and bottom of each stair where the stair passes through a floor containing concealed space in which the exposed construction materials within the space have a surface *flame-spread rating* greater than 25.

r11.1 **(4)** Unsprinklered concealed spaces of *combustible construction* created by a ceiling, roof space or unoccupied attic space shall be separated by *fire blocks* into,

(a) compartments having no dimension greater than 60 m, if such space contains exposed construction materials having a surface *flame-spread rating* of 25 or less, and

(b) compartments of not more than 300 m^2 in area, if such space contains exposed construction materials having a surface *flame-spread rating* greater than 25.

r11.1 **(5)** No dimension of the compartment described in Clause (4)(b) shall exceed 20 m.

(6) Concealed spaces in mansard or gambrel style roofs, exterior cornices, balconies and canopies of *combustible construction* in which the exposed construction materials within the space have a surface *flame-spread rating* exceeding 25 shall have vertical *fire blocks* at intervals of not more than 20 m and at points where such concealed spaces extend across the ends of required vertical *fire separations*.

9.10.16.2. Required Fire Blocks in Wall Assemblies

(1) Except as permitted in Sentence (2), *fire blocks* shall be provided to block off concealed spaces within wall assemblies, including spaces created by furring,

(a) at each floor level,

(b) at each ceiling level where the ceiling contributes to part of the required *fire-resistance rating*, and

(c) at other locations within the wall, so that the distance between *fire blocks* does not exceed 20 m horizontally and 3 m vertically.

(2) *Fire blocks* required in Sentence (1) need not be provided, if,

(a) the insulated wall assembly contains not more than one concealed air space and the horizontal thickness of that air space is not more than 25 mm,

(b) the exposed construction materials within the space are *noncombustible*, or

(c) the exposed construction materials within the space, including insulation, but not including wiring, piping or similar services, have a *flame-spread rating* of not more than 25.

9.10.16.3. Fire Block Materials

(1) Except as permitted in Sentences (2) and (3), *fire blocks* shall be constructed of materials that will remain in place and prevent the passage of flames for not less than 15 min when subjected to the standard fire exposure in CAN/ULC-S101, "Fire Endurance Tests of Building Construction and Materials".

(2) *Fire blocks* are deemed to comply with Sentence (1), if they are constructed of not less than,

(a) 0.38 mm sheet steel,

(b) 12.7 mm gypsum wallboard,

(c) 12.5 mm plywood, OSB or waferboard, with joints having continuous supports,
(d) 2 layers of 19 mm lumber with joints staggered, or
(e) 38 mm lumber.

(3) In a *building* permitted to be of *combustible construction*, semi-rigid fibre insulation board produced from glass, rock or slag, is permitted to be used to block the vertical space in a double-frame wall assembly formed at the intersection of the floor assembly and the walls, provided the width of the vertical space is not more than 25 mm and the insulation board,
(a) has a density not less than 45 kg/m^3,
(b) is securely fastened to one set of studs,
(c) extends from below the bottom of the top plates in the lower *storey* to above the top of the bottom plate in the upper *storey*, and
(d) completely fills the nominal gap of 25 mm between the headers and between the wall plates.

9.10.16.4. Penetration of Fire Blocks

(1) Where *fire blocks* are pierced by pipes, ducts or other elements, the effectiveness of the *fire blocks* shall be maintained around such elements.

9.10.17. Flame Spread Limits

9.10.17.1. Flame-Spread Rating of Interior Surfaces

(1) Except as otherwise provided in this Subsection, the exposed surface of every interior wall and ceiling, including skylights and glazing, shall have a surface *flame-spread rating* of not more than 150.

(2) Except as permitted in Sentence (3), doors need not conform to Sentence (1) provided they have a surface *flame-spread rating* of not more than 200.

(3) Doors within *dwelling units*, other than vehicle garage doors, need not conform to Sentences (1) and (2).

9.10.17.2. Ceilings in Exits or Public Corridors

(1) At least 90% of the exposed surface of every ceiling in an *exit* or unsprinklered ceiling in a *public corridor* shall have a surface *flame-spread rating* of not more than 25.

9.10.17.3. Walls in Exits

(1) Except as provided in Sentence (2), at least 90% of the exposed surfaces of every wall in an *exit* shall have a surface *flame-spread rating* of not more than 25.

(2) At least 75% of the wall surface of a lobby used as an *exit* in Article 9.9.8.5. shall have a surface *flame-spread rating* of not more than 25.

9.10.17.4. Exterior Exit Passageways

(1) Where an exterior *exit* passageway provides the only *means of egress* from the rooms or *suites* it serves, the wall and ceiling finishes of that passageway, including the soffit beneath and the *guard* on the passageway, shall have a surface *flame-spread rating* of not more than 25, except that up to 10% of the total wall area and 10% of the total ceiling area is permitted to have a surface *flame-spread rating* of not more than 150.

9.10.17.5. Walls in Public Corridors

(1) At least 90% of the total wall surface in any unsprinklered *public corridor* shall have a surface *flame-spread rating* of not more than 75, or at least 90% of the upper half of such walls shall have a surface *flame-spread rating* of not more than 25.

9.10.17.6. Calculation of Wall and Ceiling Areas

(1) Skylights, glazing, *combustible* doors, and *combustible* light diffusers and lenses shall not be considered in the calculation of wall and ceiling areas in this Subsection.

9.10.17.7. Corridors Containing an Occupancy

(1) Where a *public corridor* or a corridor used by the public contains an *occupancy*, the interior finish materials used on the walls or ceiling of such *occupancy* shall have a surface *flame-spread rating* in conformance with that required for *public corridors*.

9.10.17.8. Light Diffusers and Lenses

(1) Light diffusers and lenses having *flame-spread ratings* that exceed those permitted for the ceiling finish, shall conform to the requirements of Sentence 3.1.13.4.(1).

9.10.17.9. Combustible Skylights

(1) Individual *combustible* skylights in corridors required to be separated from the remainder of the *building* by *fire separations* shall not exceed 1 m^2 in area and shall be spaced not less than 1.2 m apart.

r11.1 9.10.17.10. Protection of Foamed Plastics

(1) Except as provided in Sentences (2) and (4), foamed plastics that form part of a wall or ceiling assembly shall be protected from adjacent space in the *building*, other than adjacent concealed spaces within *attic or roof spaces*, crawl spaces, wall assemblies and ceiling assemblies, by any of the following:

(a) one of the finishes described in Subsections 9.29.4. to 9.29.9.,

(b) provided the *building* does not contain a Group C *major occupancy*, sheet metal that,

  (i) is mechanically fastened to the supporting assembly independent of the insulation,

  (ii) is not less than 0.38 mm thick, and

  (iii) has a melting point not less than 650°C, or

(c) any thermal barrier that meets the requirements of Sentence 3.1.5.12A.(2).

(2) A walk-in cooler or freezer consisting of factory-assembled wall, floor or ceiling panels containing foamed plastics is permitted to be used, provided the panels,

(a) are protected on both sides by sheet metal not less than 0.38 mm thick having a melting point not less than 650°C,

(b) do not contain an air space, and

(c) have a *flame-spread rating* that is not more than that permitted for the room or space in which they are located or that they bound.

(3) The *flame-spread rating* of panels required in Clause (2)(c) shall be determined by subjecting a sample panel with an assembled joint typical of field installation to the applicable test described in Subsection 3.1.12.

(4) Thermosetting foamed plastic insulation having a *flame-spread rating* of not more than 200 is permitted to be used in factory-assembled doors in *storage garages* serving *buildings* of *residential occupancy* provided that,
(a) the insulation is covered on the interior with a metallic foil,
(b) the assembly has a surface *flame-spread rating* of not more than 200, and
(c) the assembly incorporates no air spaces.

9.10.17.11. Walls and Ceilings in Bathrooms

(1) The interior finish of walls and ceilings in bathrooms within *suites* of *residential occupancy* shall have a surface *flame-spread rating* of not more than 200.

9.10.17.12. Coverings or Linings of Ducts

(1) Where a covering or a lining is used with a duct, such lining or covering shall have a *flame-spread rating* conforming to Part 6.

9.10.18. Alarm and Detection Systems

9.10.18.1. Access Provided Through a Firewall

(1) Where access is provided through a *firewall*, the requirements in this Subsection shall apply to the *floor areas* on both sides of the *firewall* as if they were in the same *building*.

9.10.18.2. Fire Alarm System Required

(1) Except as provided in Sentence (2), a fire alarm system shall be installed,
(a) in every *building* that contains more than 3 *storeys*, including *storeys* below the *first storey*,
(b) where the total *occupant load* exceeds 300, or
(c) when the *occupant load* for any *major occupancy* in Table 9.10.18.2. is exceeded.

(2) A fire alarm system is not required in a *residential occupancy* where an *exit* or *public corridor* serves not more than 4 *suites* or where each *suite* has direct access to an exterior *exit* facility leading to ground level.

Table 9.10.18.2.
Maximum Occupant Load for Buildings Without Fire Alarm Systems
Forming Part of Sentence 9.10.18.2.(1)

Major Occupancy Classification	*Occupant Load* Above which Fire Alarm System is Required
Residential	10 (sleeping accommodation)
Business and personal services, *mercantile*	150 above or below the *first storey*
Low- or *medium-hazard industrial*	75 above or below the *first storey*
Column 1	2

9.10.18.3. Design and Installation Requirements

(1) Except as provided in Sentence (2), fire alarm, fire detection and smoke detection devices and systems, and their installation, shall conform to Subsection 3.2.4. and Articles 3.2.7.8. and 3.2.7.10. (See Appendix A.)

(2) Articles 3.2.4.1., 3.2.4.11., 3.2.4.12., 3.2.4.13., 3.2.4.14., 3.2.4.22. and 3.2.4.23. do not apply to Part 9 *buildings*.

9.10.18.4. Rooms and Spaces Requiring Heat Detectors or Smoke Detectors

(1) Where a fire alarm system is required, every *public corridor* in *buildings* of *residential occupancy* and every *exit* stair shaft shall be provided with *smoke detectors*.

(2) Except as provided in Sentence (3), if a fire alarm system is required in a *building*, *fire detectors* shall be installed in the following spaces:
(a) storage rooms not within *dwelling units*,
(b) *service rooms* not within *dwelling units*,
(c) janitors' rooms,
(d) rooms in which hazardous substances are to be used or stored,
(e) elevator hoistways, chutes and dumbwaiter shafts, and
(f) laundry rooms in *buildings* of *residential occupancy*, except those within *dwelling units*.

(3) Except as required in Sentence (4), *heat detectors* and *smoke detectors* described in Sentence (2), are not required in *dwelling units* or in *sprinklered buildings* in which the sprinkler system is electrically supervised and equipped with a water flow alarm.

(4) Where a fire alarm system is required in a *hotel*, *heat detectors* shall be installed in every room in a *suite* and in every room not located in a *suite* in a *floor area* containing a *hotel*, other than washrooms within a *suite*, saunas, refrigerated areas and swimming pools.

9.10.18.5. Smoke Detectors in Recirculating Air Handling Systems

(1) Except for a recirculating air system serving not more than one *dwelling unit*, where a fire alarm system is required to be installed, every recirculating air handling system shall be designed to prevent the circulation of smoke upon a signal from a duct-type *smoke detector* where such system supplies more than one *suite* on the same floor or serves more than 1 *storey*.

9.10.18.6. Portions of Buildings Considered as Separate Buildings

(1) Except as provided in Sentence (2), where a vertical *fire separation* having a *fire-resistance rating* of at least 1 h separates a portion of a *building* from the remainder of the *building* and there are no openings through the *fire separation* other than those for piping, tubing, wiring and conduit, the requirements for fire alarm and detection systems is permitted to be applied to each portion so separated as if it were a separate *building*.

(2) The permission in Sentence (1) to consider separated portions of a *building* as separate *buildings* does not apply to *service rooms* and storage rooms.

9.10.18.7. Central Vacuum Systems

(1) A central vacuum cleaning system serving more than one *suite* or *storey* in a *building* equipped with a fire alarm system shall be designed to shut down upon activation of the fire alarm system.

9.10.18.8. Open-Air Storage Garages

(1) Except as required in Article 9.10.18.1., a fire alarm system is not required in a *storage garage* conforming to Article 3.2.2.83. provided there are no other *occupancies* in the *building*.

9.10.18.9. Fire Alarm System in a Hotel

(1) If a fire alarm system is required in a *building* containing a *hotel*, a single stage fire alarm system shall be provided.

9.10.18.10. Commissioning of Life Safety and Fire Protection Systems

r11.1 **(1)** Where fire protection and life safety systems, and systems with fire protection and life safety functions, are integrated with each other, the systems shall be tested as a whole in accordance with CAN/ULC-S1001, "Integrated Systems Testing of Fire Protection and Life Safety Systems", to verify that the systems have been properly integrated.

(2) Sentence (1) does not apply to a *building* that contains only *dwelling units* and has no *dwelling unit* above another *dwelling unit*.

9.10.19. Smoke Alarms

e3 ### 9.10.19.1. Required Smoke Alarms (See Appendix A.)

r11.1 **(1)** Except as permitted in Article 9.10.19.8., *smoke alarms* conforming to CAN/ULC-S531, "Smoke Alarms", shall be installed in,
(a) each *dwelling unit*,
(b) each sleeping room not within a *dwelling unit*, and
(c) each interior shared *means of egress* and common area in a *house*.

r5 **(2)** *Smoke alarms* required in Sentence (1) shall have a visual signalling component conforming to the requirements in 18.5.3. (Light, Color and Pulse Characteristics) of NFPA 72, "National Fire Alarm and Signaling Code".

r5 **(3)** The visual signalling component required in Sentence (2) need not,
(a) be integrated with the *smoke alarm* provided it is interconnected to it,
(b) be on battery backup, or
r11.1 (c) have synchronized flash rates, when installed in a *house* or an individual *dwelling unit*.

r5 **(4)** The luminous intensity for visual signalling components required in Sentence (2) that are installed in sleeping rooms shall be a minimum of 175 cd.

r5 **(5)** *Smoke alarms* required in Sentence (1) shall be installed on or near the ceiling.

9.10.19.2. Sound Patterns of Smoke Alarms

(1) The sound patterns of *smoke alarms* shall,
e7 (a) meet the temporal patterns of *alarm signals*, or (See A-3.2.4.20.(2) in Appendix A.)
(b) be a combination of temporal pattern and voice relay.

e3 ### 9.10.19.3. Location of Smoke Alarms (See Appendix A.)

r11.1 **(1)** Except as permitted in Article 9.10.19.8., within *dwelling units*, sufficient *smoke alarms* shall be installed so that,
(a) there is at least one *smoke alarm* installed on each *storey*, including *basements*, and
(b) on any *storey* of a *dwelling unit* containing sleeping rooms, a *smoke alarm* is installed,
(i) in each sleeping room, and
(ii) in a location between the sleeping rooms and the remainder of the *storey*, and if the sleeping rooms are served by a hallway, the *smoke alarm* shall be located in the hallway.
(See Appendix A.)

r11.1 **(2)** Except as permitted in Article 9.10.19.8., within a *house* that contains an interior shared *means of egress* or common area, a *smoke alarm* shall be installed in each shared *means of egress* and common area.

r6 **(3)** A *smoke alarm* required in Sentences (1) and (2) shall be installed in conformance with CAN/ULC-S553, "Installation of Smoke Alarms".

r6 **(4)** A *smoke alarm* required in Sentences (1) and (2) shall have a visual signalling component conforming to the requirements in 18.5.3. (Light, Color and Pulse Characteristics) of NFPA 72, "National Fire Alarm and Signaling Code".

r6 **(5)** The visual signalling component required in Sentence (4) need not,
(a) be integrated with the *smoke alarm* provided it is interconnected to it,
(b) be on battery backup, or
(c) have synchronized flash rates, when installed in a *house* or an individual *dwelling unit*.

r6 **(6)** The luminous intensity for visual signalling components required in Sentence (4) that are installed in sleeping rooms shall be a minimum of 175 cd.

r6 **(7)** *Smoke alarms* required in Sentences (1) and (2) shall be installed on or near the ceiling.

9.10.19.4. Power Supply

r6 **(1)** Except as provided in Sentences (2) and (3), *smoke alarms* required in Sentences 9.10.19.1.(1) and 9.10.19.3.(2) shall,
(a) be installed with permanent connections to an electrical circuit,
(b) have no disconnect switch between the overcurrent device and the *smoke alarm*, and
(c) in case the regular power supply to the *smoke alarm* is interrupted, be provided with a battery as an alternative power source that can continue to provide power to the *smoke alarm* for a period of not less than 7 days in the normal condition, followed by 4 min of alarm.

(2) Where the *building* is not supplied with electrical power, *smoke alarms* are permitted to be battery operated.

(3) *Suites* of *residential occupancy* are permitted to be equipped with *smoke detectors* in lieu of *smoke alarms*, provided the *smoke detectors*,
(a) are capable of independently sounding audible signals within the individual *suites*,
(b) except as provided by Sentence (4), are installed in conformance with CAN/ULC-S524, "Installation of Fire Alarm Systems", and
(c) form part of the fire alarm system.

(4) *Smoke detectors* permitted to be installed in lieu of *smoke alarms* as provided in Sentence (3) are permitted to sound localized alarms within individual *suites*, and need not sound an alarm throughout the rest of the *building*.

9.10.19.5. Interconnection of Smoke Alarms

(1) Where more than one *smoke alarm* is required in a *dwelling unit*, the *smoke alarms* shall be wired so that the activation of one alarm will cause all alarms within the *dwelling unit* to sound.

9.10.19.6. Silencing of Smoke Alarms

r6 **(1)** Except as permitted in Sentence (2), a manually operated device shall be incorporated within the circuitry of a *smoke alarm* installed in a *house* or an individual *dwelling unit* so that the signal emitted by the *smoke alarm* can be silenced for a period of not more than 10 min, after which the *smoke alarm* will reset and sound again if the level of smoke in the vicinity is sufficient to reactuate it.

(2) *Suites* of *residential occupancy* equipped with *smoke detectors* installed to CAN/ULC-S524, "Installation of Fire Alarm Systems", which are part of the fire alarm system in lieu of *smoke alarms* as permitted in Sentence 9.10.19.4.(3), need not incorporate the manually operated device required in Sentence (1).

9.10.19.7. Instructions for Maintenance and Care

(1) Where instructions are necessary to describe the maintenance and care required for *smoke alarms* to ensure continuing satisfactory performance, they shall be posted in a location where they will be readily available to the occupants for reference.

r11.1 9.10.19.8. Residential Fire Warning Systems

(1) Except where a fire alarm system is installed or required in a *building, smoke detectors* forming part of a residential fire warning system installed in conformance with CAN/ULC-S540 "Residential Fire and Life Safety Warning Systems: Installation, Inspection, Testing and Maintenance", are permitted to be installed in lieu of all *smoke alarms* required by Articles 9.10.19.1. and 9.10.19.3., provided that the fire warning system,

(a) is capable of sounding audible signals in accordance with Articles 9.10.19.2. and 9.10.19.5.,
(b) is powered in accordance with Article 9.10.19.4., and
(c) is equipped with a silencing device conforming to Article 9.10.19.6.

9.10.20. Firefighting

9.10.20.1. Windows or Access Panels Required

(1) Except as provided in Sentence (3), a window or access panel providing an opening not less than 1 100 mm high and 550 mm wide and having a sill height of not more than 900 mm above the floor shall be provided on the second and third *storeys* of every *building* in at least one wall facing on a *street* if such *storeys* are not *sprinklered*.

(2) Access panels required in Sentence (1) shall be readily openable from both inside and outside or be glazed with plain glass.

r6 **(3)** Access panels required in Sentence (1) need not be provided in *houses*.

9.10.20.2. Access to Basements

r6 **(1)** Except in *basements* of *houses*, each unsprinklered *basement* exceeding 25 m in length or width shall be provided with direct access to the outdoors to at least one *street*.

(2) Access required in Sentence (1) is permitted to be provided by a door, window or other means that provides an opening not less than 1 100 mm high and 550 mm wide, the sill height of which shall not be more than 900 mm above the floor.

(3) Access required in Sentence (1) is also permitted to be provided by an interior stair accessible from the outdoors.

9.10.20.3. Fire Department Access to Buildings

(1) Access for fire department equipment shall be provided to each *building* by means of a *street*, private roadway or yard. (See Appendix A.)

(2) Where access to a *building* as required in Sentence (1) is provided by means of a roadway or yard, the design and location of such roadway or yard shall take into account connection with public thoroughfares, weight of firefighting equipment, width of roadway, radius of curves, overhead clearance, location of fire hydrants, location of fire department connections and vehicular parking.

r3 ### 9.10.20.4. Portable Fire Extinguishers

(1) Portable fire extinguishers shall be installed in all *buildings*, except within *dwelling units*, in conformance with the provisions of the Fire Code made under the *Fire Protection and Prevention Act, 1997*.

9.10.20.5. Freeze Protection for Fire Protection Systems

(1) Equipment forming part of a fire protection system that may be adversely affected by freezing temperatures and that is located in an unheated area shall be protected from freezing.

9.10.21. Fire Protection for Construction Camps

9.10.21.1. Requirements for Construction Camps

(1) Except as provided in Articles 9.10.21.2. to 9.10.21.9., *camps for housing of workers* shall conform to Subsections 9.10.1. to 9.10.20.

9.10.21.2. Separation of Sleeping Rooms

(1) Except for sleeping rooms within *dwelling units*, sleeping rooms in a *building* in a *camp for housing of workers* shall be separated from each other and from the remainder of the *building* by a *fire separation* having not less than a 30 min *fire-resistance rating*.

9.10.21.3. Floor Assemblies Between the First and Second Storey

(1) Except in a *dwelling unit*, a floor assembly in a *building* in a *camp for housing of workers* separating the *first storey* and the second *storey* shall be constructed as a *fire separation* having not less than a 30 min *fire-resistance rating*.

9.10.21.4. Walkways Connecting Buildings

(1) *Walkways* of *combustible construction* connecting *buildings* shall be separated from each connected *building* by a *fire separation* having not less than a 45 min *fire-resistance rating*.

9.10.21.5. Spatial Separations

(1) *Buildings* in a *camp for housing of workers* shall be separated from each other by a distance of not less than 10 m unless otherwise permitted in Subsection 9.10.14.

9.10.21.6. Flame-Spread Ratings

(1) Except in *dwelling units* and except as provided in Sentence (2), the surface *flame-spread rating* of wall and ceiling surfaces in corridors and *walkways*, exclusive of doors, shall not exceed 25 over not less than 90 percent of the exposed surface area and not more than 150 over the remaining surface area.

(2) Except within *dwelling units*, corridors that provide *access to exit* from sleeping rooms and that have a *fire-resistance rating* of not less than 45 min shall have a *flame-spread rating* conforming to the appropriate requirements in Subsection 9.10.17.

9.10.21.7. Smoke Detectors

(1) Except in *dwelling units*, corridors providing *access to exit* from sleeping rooms in every *building* in a *camp for housing of workers* with sleeping accommodation for more than 10 persons shall have a *smoke detector* connected to the *building* alarm system.

9.10.21.8. Portable Fire Extinguishers

(1) Each *building* in a *camp for housing of workers* shall be provided with portable fire extinguishers in conformance with the provisions of the Fire Code made under the *Fire Protection and Prevention Act, 1997*.

9.10.21.9. Hose Stations

(1) Every *building* in a *camp for housing of workers* providing sleeping accommodation for more than 30 persons shall be provided with a hose station that is protected from freezing and equipped with a hose of sufficient length so that every portion of the *building* is within the range of a hose stream.

(2) Hose stations required in Sentence (1) shall be located near an *exit*.

(3) Hoses referred to in Sentence (1) shall be not less than 19 mm inside diam and shall be connected to a central water supply or to a storage tank having a capacity of at least 4 500 L with a pumping system capable of supplying a flow of at least 5 L/s at a gauge pressure of 300 kPa.

e8 ## 9.10.22. Fire Protection for Gas, Propane and Electric Cooktops (See Appendix A.)

9.10.22.1. Installation of Ranges

(1) Reserved

(2) Clearances for and protection around gas, propane and electric ranges shall be not less than those provided in Articles 9.10.22.2. and 9.10.22.3.

9.10.22.2. Vertical Clearances Above Cooktops

(1) Except as provided in Sentence (2), framing, finishes and cabinetry installed directly above the location of the *cooktop* shall be not less than 750 mm above the level of *cooktop* burners or elements.

(2) The vertical clearance described in Sentence (1) for framing, finishes and cabinets located directly above the location of the *cooktop* is permitted to be reduced to 600 mm above the level of the elements or burners provided the framing, finishes and cabinets,

(a) are *noncombustible*, or

r11.1 (b) are are protected by a metal hood with a 125 mm projection beyond the framing, finishes and cabinets.

9.10.22.3. Protection Around Cooktops

(1) Except as provided in Sentences (2) and (3), *combustible* wall framing, finishes or cabinets within 450 mm of the area where the *cooktop* is to be located shall be protected above the level of the heating elements or burners by material providing fire resistance not less than that of a 9.5 mm thickness of gypsum board.

(2) Countertop splash boards or back plates that extend above the level of the heating elements or burners need not be protected as described in Sentence (1).

(3) Except for cabinetry described in Article 9.10.22.2., cabinetry located not less than 450 mm above the level of the heating elements or burners need not be protected as described in Sentence (1).

r11.1 Section 9.11. Sound Transmission (See Appendix A.)

9.11.1. Protection from Airborne Noise

9.11.1.1. Required Protection

(1) Except as provided in Sentence (2), a *dwelling unit* and a *suite* in *hotels* shall be separated from every other space in a *building* in which noise may be generated by,

(a) a separating assembly and adjoining construction, which, together, provide an *apparent sound transmission class* rating of not less than 47, or

(b) a separating assembly that provides a *sound transmission class* rating of at least 50 and adjoining construction that conforms to Article 9.11.1.4.

(See Appendix Note A-9.11.1.4.)

(2) Construction separating a *dwelling unit* or *suite* in a *hotel* from an elevator shaft or refuse chute shall have an *STC* rating of at least 55.

9.11.1.2. Determination of Sound Transmission Ratings

(1) The *STC* ratings shall be determined in accordance with ASTM E413, "Classification for Rating Sound Insulation", using the results from measurements carried out in accordance with ASTM E90, "Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements".

(2) The *ASTC* ratings shall be,

(a) determined in accordance with ASTM E413, "Classification for Rating Sound Insulation", using the results from measurements carried out in accordance with ASTM E336, "Measurement of Airborne Sound Attenuation between Rooms in Buildings", or

(b) calculated in accordance with Article 5.8.1.4. or Article 5.8.1.5.

9.11.1.3. Compliance with Required Ratings

(1) Compliance with the required *STC* ratings shall be demonstrated through,

(a) measurements carried out in accordance with Sentence 9.11.1.2.(1), or

(b) the construction of separating assemblies conforming to Table 1 or 2 of MMAH Supplementary Standard SB-3, "Fire and Sound Resistance of Building Assemblies", as applicable.

(2) Compliance with the required *ASTC* ratings shall be demonstrated through,

(a) measurements or calculations carried out in accordance with Sentence 9.11.1.2.(2), or

(b) the construction of separating assemblies conforming to Table 1 or 2 of MMAH Supplementary Standard SB-3, "Fire and Sound Resistance of Building Assemblies", as applicable, that have an *STC* rating of not less than 50 in conjunction with flanking assemblies constructed in accordance with Article 9.11.1.4. (See Appendix A.)

9.11.1.4. Adjoining Construction (See Appendix A.)

(1) This Article applies where the required protection is provided in accordance with Clause 9.11.1.1.(1)(b) and compliance is demonstrated in accordance with Clause 9.11.1.3.(2)(b).

(2) Flanking wall assemblies connected to a separating floor or ceiling assembly shall be constructed with,

(a) concrete or concrete block having a mass per area greater than 200 kg/m^2, or

(b) gypsum board finish that,

  (i) is supported on wood or steel framing, and

  (ii) ends or is interrupted where it meets the structure of the separating floor or ceiling assembly.

(3) Flanking wall and ceiling assemblies connected to a separating wall assembly shall be constructed with,
(a) concrete or concrete block having a mass per area greater than 300 kg/m^2, or
(b) gypsum board finish that,
  (i) is supported on wood or steel framing, and
  (ii) ends or is interrupted where it meets the structure of the separating wall assembly or, for double-stud walls, where it meets the space between the two lines of studs.

(4) Flanking floor assemblies connected to a separating wall assembly shall be,
(a) constructed,
  (i) with concrete having a mass per area greater than 300 kg/m^2, or
  (ii) in accordance with Section 9.16., or
(b) supported on joists or trusses that are not continuous across the junction and are covered with floor treatments in accordance with Table 9.11.1.4. for the applicable wall construction.

Table 9.11.1.4.
Floor Treatments for Flanking Wood-Framed Floor Assemblies in Horizontally Adjoining Spaces
Forming Part of Sentence 9.11.1.4.(4)

Type of Separating Wall Assembly with *STC* ≥ 50 from MMAH Supplementary Standard SB-3, "Fire and Sound Resistance of Building Assemblies"	Minimum Requirements for Floor Treatments Applied over Subfloor of Wood-Framed Flanking Floor Assemblies on Both Sides of Floor/Wall Junction
W5, W6, W10, W12 (staggered studs)	(a) Wood strip flooring not less than 16 mm thick aligned parallel to separating wall, (b) one layer OSB or plywood not less than 15.5 mm thick plus finished flooring, or (c) one additional material layer plus finished flooring having a combined mass per area not less than 8 kg/m²
W4, W11 (staggered studs)	(a) One layer of OSB or plywood not less than 12.5 mm thick plus hardwood strip flooring not less than 19 mm thick aligned parallel to separating wall, or (b) one additional material layer plus finished flooring having a combined mass per area 16 kg/m²
W8, W9 (staggered studs)	(a) Concrete or gypsum concrete topping not less than 19 mm thick bonded to the subfloor plus finished flooring, or (b) one additional material layer plus finished flooring having a combined mass per area not less than 32 kg/m²
W13, W14, W15 (double stud walls)	Where a continuous subfloor or other rigid materials at the floor/wall junction provide structural connection between the two rows of studs in the separating wall: (a) hardwood strip flooring not less than 16 mm thick aligned parallel to separating wall, (b) one layer OSB or plywood not less than 15.5 mm thick plus finished flooring, or (c) one additional material layer plus finished flooring having a combined mass per area not less than 8 kg/m² Any finished flooring where the subfloor and other rigid materials are not connected at the floor/wall junction and where there are no structural connections between the two rows of studs in the separating wall
B1 to B10	Any finished flooring
Column 1	2

Notes to Table 9.11.1.4.:
(1) See Appendix A.

Section 9.12. Excavation

9.12.1. General

9.12.1.1. Removal of Topsoil and Organic Matter

(1) The topsoil and vegetable matter in all unexcavated areas under a *building* shall be removed.

(2) In localities where termite infestation is known to be a problem, all stumps, roots and other wood debris shall be removed from the *soil* to a depth of not less than 300 mm in unexcavated areas under a *building*.

(3) The bottom of every *excavation* shall be free of all organic material.

9.12.1.2. Standing Water

(1) *Excavations* shall be kept free of standing water.

9.12.1.3. Protection from Freezing

(1) The bottom of *excavations* shall be kept from freezing throughout the entire construction period.

9.12.1.4. Precautions During Excavation

(1) Every *excavation* shall be undertaken in such a manner to prevent damage to adjacent property, existing structures, utilities, roads and sidewalks at all stages of construction.

(2) Material shall not be placed nor shall equipment be operated or placed in or adjacent to an *excavation* in a manner that may endanger the integrity of the *excavation* or its supports.

9.12.2. Depth

9.12.2.1. Excavation to Undisturbed Soil

(1) *Excavations* for *foundations* shall extend to undisturbed *soil*.

9.12.2.2. Minimum Depth of Foundations

r3 **(1)** Except as provided in Sentences (4) to (7), the minimum depth of *foundations* below finished ground level shall conform to Table 9.12.2.2.

(2) Where a *foundation* is insulated in a manner that will reduce the heat flow to the *soil* beneath the footings, the *foundation* depth shall conform to that required for *foundations* containing no heated space. (See Appendix A.)

(3) The minimum depth of *foundation*s for exterior concrete steps with more than 2 risers shall conform to Sentences (1), (2) and (5).

(4) Concrete steps with 1 and 2 risers are permitted to be laid on ground level.

Table 9.12.2.2.
Minimum Depths of Foundations
Forming Part of Sentence 9.12.2.2.(1)

Type of *Soil*	Minimum Depth of *Foundation* Containing Heated *Basement* or Crawl Space(1)		Minimum Depth of *Foundation* Containing no Heated Space(2)	
	Good *Soil* Drainage	Poor *Soil* Drainage	Good *Soil* Drainage	Poor *Soil* Drainage
Rock	No limit	No limit	No limit	No limit
Coarse grained *soils*	No limit	No limit	No limit	Below the depth of frost penetration
Silt	No limit	No limit	Below the depth of frost penetration(3)	Below the depth of frost penetration
Clay or *soils* not clearly defined(4)	1.2 m(3)	1.2 m	1.2 m but not less than the depth of frost penetration(3)	1.2 m but not less than the depth of frost penetration
Column 1	2	3	4	5

Notes to Table 9.12.2.2.:
(1) *Foundation* not insulated to reduce heat loss through the footings.
(2) Including *foundations* containing heated space insulated to reduce heat loss through the footings.
(3) Good *soil* drainage to not less than the depth of frost penetration.
(4) See Appendix A.

(5) The *foundation* depths required in Sentence (1) are permitted to be decreased where experience with local *soil* conditions shows that lesser depths are satisfactory, or where the *foundation* is designed for lesser depths.

(6) The *foundation* depths required in Sentence (1) do not apply to *foundation*s for,
(a) *buildings,*
  (i) that are not of masonry or masonry veneer construction, and
e1 (ii) whose superstructure conforms with the requirements of the deformation resistance test in CSA Z240.2.1, "Structural Requirements for Manufactured Homes", or
(b) accessory *buildings,*
  (i) that are not of masonry or masonry veneer construction,
  (ii) not more than 1 *storey* in *building height*,
  (iii) not more than 55 m² in *building area*, and
  (iv) where the distance from the finished ground to the underside of the floor joists is not more than 600 mm.

(7) The *foundation* depths required in Sentence (1) do not apply to *foundations* for decks and other accessible exterior platforms,
(a) that are of not more than 1 *storey*,
(b) that are not more than 55 m² in area,
(c) where the distance from the finished ground to the underside of the floor joists is not more than 600 mm,
(d) that are not supporting a roof, and
(e) that are not attached to another structure, unless it can be demonstrated that differential movement will not adversely affect the performance of that structure.

9.12.3. Backfill

9.12.3.1. Placement of Backfill

(1) Backfill shall be placed to avoid damaging the *foundation* wall, the drainage tile, drainage layer, externally applied thermal insulation, waterproofing and dampproofing of the wall.

9.12.3.2. Grading of Backfill

(1) Backfill shall be graded to prevent drainage towards the *foundation* after settling.

9.12.3.3. Deleterious Debris and Boulders

(1) Backfill within 600 mm of the *foundation* shall be free of deleterious debris and boulders larger than 250 mm diam. (See Appendix A.)

(2) Except as permitted in Sentence (3), backfill shall not contain pyritic material or material that is susceptible to ice lensing in concentrations that will damage the *building* to a degree that would adversely affect its stability or the performance of assemblies separating dissimilar environments. (See A-9.4.4.4.(1) in Appendix A.)

(3) Backfill with material of any concentration that is susceptible to ice lensing is permitted where *foundation* walls are cast-in-place concrete, concrete block insulated on the exterior or concrete block protected from the backfill by a material that serves as a slip plane. (See A-9.4.4.4.(1) in Appendix A.)

9.12.3.4. Lateral Support of Foundation Wall

(1) Where the height of *foundation* wall is such that lateral support is required, or where the required concrete strength of the wall has not been reached, the wall shall be braced or laterally supported before backfilling.

9.12.4. Trenches Beneath Footings

9.12.4.1. Compacting or Filling With Concrete

(1) The *soil* in trenches beneath footings for sewers and watermains shall be compacted by tamping up to the level of the footing base, or shall be filled with concrete having a strength not less than 10 MPa to support the footing.

Section 9.13. Dampproofing, Waterproofing and Soil Gas Control

r11.1 9.13.1. General

9.13.1.1. Scope and Application

(1) This Section prescribes measures to control the ingress of water, moisture and *soil* gas.

(2) Subsection 9.13.2. applies to below-ground walls and floors-on-ground where drainage is provided in accordance with Section 9.14. over and along the entire below-ground portion of the *foundation* wall.

(3) Subsection 9.13.3. applies to below-ground walls, floors-on-ground and roofs of underground structures that are subject to hydrostatic pressure.

(4) Subsection 9.13.4. applies to walls, roofs and floors that are in contact with the ground.

r11.1 9.13.2. Dampproofing

9.13.2.1. Dampproofing

(1) Except as provided in Sentence (4) and Article 9.13.3.1., where the exterior finished ground level is at a higher elevation than the ground level inside the *foundation* walls, exterior surfaces of *foundation* walls below ground level shall be dampproofed.

(2) Except as provided in Sentence (3) and Article 9.13.3.1., floors-on-ground shall be dampproofed.

(3) Floors in garages, floors in unenclosed portions of *buildings* and floors installed over granular *fill* in conformance with Article 9.16.2.1. need not be dampproofed.

(4) Dampproofing in Sentence (1) is not required where the exterior surfaces of *foundation* walls below ground level are waterproofed.

9.13.2.2. Dampproofing Materials

(1) Materials installed to provide required dampproofing shall be,
(a) capable of protecting assemblies against moisture transfer from the ground,
(b) compatible with adjoining materials, and
(c) resistant to mechanisms of deterioration that may reasonably be expected, given the nature, function and exposure of the materials.

(2) Except as otherwise specified in this Section, materials used for exterior dampproofing shall,
(a) conform to one of the following standards:
  (i) ASTM D1227 “Emulsified Asphalt Used as a Protective Coating for Roofing”, Type III, Class I,
  (ii) ASTM D4479 / D4479M, “Asphalt Roof Coatings - Asbestos-Free”, Type III,
  (iii) CAN/CGSB-51.34-M, "Vapour Barrier, Polyethylene Sheet for Use in Building Construction", or
  (iv) CAN/CSA-A123.4, "Asphalt for Constructing Built-Up Roof Coverings and Waterproofing Systems", or
(b) have a water vapour permeance of not more than 43 ng/Pa•s•m^2 when tested in accordance with Procedure A (wet cup) of ASTM E96 / E96M, “Water Vapor Transmission of Materials”, and consist of one of the following material types:
  (i) a vapour-resistant coating,
  (ii) a cold-fluid-applied or hot-rubberized bituminous dampproofing membrane,
  (iii) a liquid-applied or spray-applied asphalt-based emulsion dampproofing, or
  (iv) a Type III hot-applied asphalt.

9.13.2.3. Preparation of Surface

(1) The area in which dampproofing is to be carried out shall be kept free of water during the application and curing of the dampproofing system.

(2) The surface to be dampproofed shall be prepared in accordance with the instructions of the dampproofing material manufacturer.

(3) Where the dampproofing material is to be applied on insulating concrete form (ICF) walls, the instructions of the ICF wall manufacturer shall be followed.

(4) Unit masonry walls to be dampproofed shall be parged on the exterior face below ground level with not less than 6 mm of mortar conforming to Section 9.20. coved over the footing.

(5) Concrete walls to be dampproofed shall have holes and recesses sealed with cement mortar or a mastic or sealant that is suitable for vertical applications and compatible with the dampproofing material.

(6) The surface required to be dampproofed shall be clean and dry and free of ice, snow, frost, dust, dirt, oil, grease, cracks, projections, depressions, loose particles and debris that could be detrimental to the performance of the membrane to be applied.

9.13.2.4. Application of Dampproofing Material

(1) Exterior dampproofing shall be applied from finished ground level to the top of the exterior of the footing.

(2) Unless otherwise stated in this Subsection, dampproofing shall be installed in accordance with the manufacturer's instructions with regard to,
(a) surface priming,
(b) conditions during application,
(c) application quantity and rate, and
(d) curing times.

(3) Joints, cracks and penetrations shall be sealed to maintain the continuity of the dampproofing, where the dampproofing material is not capable of bridging such discontinuities.

9.13.2.5. Moisture Protection for Interior Finishes (See Appendix A.)

(1) The interior surface of *foundation* walls below ground level shall be protected by means that minimize the ingress of moisture from the *foundation* wall into interior spaces where,
(a) a separate interior finish is applied to a concrete or unit masonry wall that is in contact with the *soil*, or
(b) wood members are placed in contact with such walls for the installation of insulation or finish.

(2) Except as provided in Sentence (3), where the protection of interior finishes required in Sentence (1) consists of membranes or coatings,
(a) the membrane or coating shall extend from the *basement* floor surface up to the highest extent of the interior insulation or finish, but not higher than the exterior finished ground level, and
(b) no membrane or coating with a permeance less than 170 ng/(Pa·s·m^2) shall be applied to the interior surface of the *foundation* wall above ground level between the insulation and the *foundation* wall.

(3) Where insulation functions as both moisture protection for interior finishes and as a *vapour barrier* in accordance with Subsection 9.25.4., it shall be applied over the entire interior surface of the *foundation* wall.

9.13.2.6. Dampproofing of Floors-on-Ground

(1) Where dampproofing is installed below the floor, it shall consist of,
(a) polyethylene not less than 0.15 mm thick with joints lapped not less than 100 mm,
(b) Type S roll roofing with joints lapped not less than 100 mm, or
(c) rigid extruded/expanded polystyrene with sealed or ship-lapped joints that has,
  (i) sufficient compressive strength to support the floor assembly, and
  (ii) a water vapour permeance complying with Clause 9.13.2.2.(2)(b).

(See Appendix A.)

(2) Where dampproofing is installed between a floor-on-ground and a finished floor, it shall consist of,
(a) rigid extruded/expanded polystyrene with sealed or ship-lapped joints that has,
  (i) sufficient compressive strength to support the floor assembly, and
  (ii) a water vapour permeance complying with Clause 9.13.2.2.(2)(b), or
(b) polyethylene not less than 0.05 mm with joints lapped not less than 100 mm.

9.13.2.7. Dampproofing of Preserved Wood Foundation Walls

(1) Preserved wood *foundation* walls shall be dampproofed as described in CSA S406, "Permanent Wood Foundations for Housing and Small Buildings".

r11.1 9.13.3. Waterproofing

9.13.3.1. Required Waterproofing

(1) Where hydrostatic pressure occurs, waterproofing is required for assemblies separating interior space from the ground to prevent the ingress of water into *building* assemblies and interior spaces.

(2) Waterproofing is required for roofs of underground structures to prevent the ingress of water into *building* assemblies and interior spaces.

9.13.3.2. Waterproofing Materials

(1) Materials installed to provide required waterproofing shall be,
(a) compatible with adjoining materials, and
(b) resistant to mechanisms of deterioration that may reasonably be expected, given the nature, function and exposure of the materials.

(2) Materials used for exterior waterproofing shall conform to,
(a) ASTM D1227, "Emulsified Asphalt Used as a Protective Coating for Roofing", in which case, they shall be installed in accordance with Sentence 9.13.3.3.(3),
(b) ASTM D3019, "Lap Cement Used with Asphalt Roll Roofing, Non-Fibered, Asbestos-Fibered, and Non-Asbestos-Fibered", but only with respect to non-fibered and non-asbestos-fibered (Types I and III) asphalt roll roofing,
(c) ASTM D4479 / D4479M, "Asphalt Roof Coatings - Asbestos-Free", in which case, they shall be installed in accordance with Sentence 9.13.3.3.(3) and with reinforcing material,
(d) ASTM D4637 / D4637M, "EPDM Sheet Used In Single-Ply Roof Membrane",
(e) ASTM D4811 / D4811M, "Nonvulcanized (Uncured) Rubber Sheet Used as Roof Flashing",
(f) ASTM D6878 / D6878M, "Thermoplastic Polyolefin Based Sheet Roofing",
(g) CGSB 37-GP-9Ma, "Primer, Asphalt, Unfilled, for Asphalt Roofing, Dampproofing and Waterproofing", where a primer is required,
(h) CAN/CGSB-37.50-M, "Hot-Applied, Rubberized Asphalt for Roofing and Waterproofing",
(i) CAN/CGSB-37.54, "Polyvinyl Chloride Roofing and Waterproofing Membrane",
(j) CGSB 37-GP-56M, "Membrane, Modified, Bituminous, Prefabricated, and Reinforced for Roofing",
(k) CAN/CGSB-37.58-M, "Membrane, Elastomeric, Cold-Applied Liquid, for Non-Exposed Use in Roofing and Waterproofing",
(l) CAN/CSA-A123.2, "Asphalt-Coated Roofing Sheets",
(m) CAN/CSA-A123.4, "Asphalt for Constructing Built-Up Roof Coverings and Waterproofing Systems", in which case, they shall be installed with reinforcing material, or
(n) CSA A123.17, "Asphalt Glass Felt Used in Roofing and Waterproofing".

9.13.3.3. Preparation of Surface

(1) Surfaces to be waterproofed shall be prepared in accordance with the instructions of the waterproofing material manufacturer.

(2) Where the waterproofing material is to be applied on insulating concrete form (ICF) walls, the instructions of the ICF wall manufacturer shall be followed.

(3) Unit masonry walls that are to be waterproofed shall be parged on exterior surfaces below ground level with not less than 6 mm of mortar conforming to Section 9.20. coved over the footing.

(4) Concrete walls that are to be waterproofed shall have all holes and recesses sealed with mortar or waterproofing material.

(5) Surfaces required to be waterproofed shall be clean and dry and free of ice, snow, frost, dust, dirt, oil, grease, cracks, projections and depressions, loose particles and debris that could be detrimental to the performance of the waterproofing material.

9.13.3.4. Application of Waterproofing Membranes

(1) Unless otherwise stated in this Subsection, waterproofing shall be installed in accordance with the manufacturer's instructions with regard to,
(a) surface priming,
(b) conditions during application,
(c) the required number of layers of reinforcing fabric on *foundations*, footings, floors, walls and structural slabs,
(d) application quantity and rate, and
(e) curing times.

(2) Waterproofing shall be continuous across joints and at junctions between different *building* elements.

(3) The waterproofed surface shall be protected with a suitable material to minimize mechanical damage during backfilling.

(4) The area in which the waterproofing is to be carried out shall be kept free of water during the application and curing of the waterproofing system.

9.13.3.5. Floor Waterproofing System

(1) *Basement* floors-on-ground to be waterproofed shall have a system of membrane waterproofing provided between 2 layers of concrete, each of which shall be not less than 75 mm thick, with the floor membrane made continuous with the wall membrane to form a complete seal.

9.13.4. Soil Gas Control (See Appendix A.)

9.13.4.1. Soil Gas Control

(1) Where methane or radon gases are known to be a problem, construction shall comply with the requirements for *soil* gas control in MMAH Supplementary Standard SB-9, "Requirements for Soil Gas Control".

9.13.4.2. Required Soil Gas Control

(1) Except as provided in Sentence (2), all wall, roof and floor assemblies in contact with the ground shall be constructed to resist the leakage of *soil* gas from the ground into the *building*.

(2) Construction to resist leakage of *soil* gas into the *building* is not required for,
(a) garages and unenclosed portions of *buildings*,
(b) *buildings* constructed in areas where it can be demonstrated that *soil* gas does not constitute a hazard, or
r6 (c) *houses* that are constructed to provide for subfloor depressurization in accordance with MMAH Supplementary Standard SB-9, "Requirements for Soil Gas Control".

(3) Where *soil* gas control is required, a *soil* gas barrier shall be installed at walls and roofs in contact with the ground according to MMAH Supplementary Standard SB-9, "Requirements for Soil Gas Control".

(4) Where *soil* gas control is required, it shall consist of one of the following at floors in contact with the ground:

(a) a *soil* gas barrier installed according to MMAH Supplementary Standard SB-9, "Requirements for Soil Gas Control", or

r6 (b) for *houses,* a subfloor depressurization system installed according to MMAH Supplementary Standard SB-9, "Requirements for Soil Gas Control".

9.13.4.3. Material Standards

(1) Materials used to provide a barrier to *soil* gas ingress through floors-on-ground shall conform to CAN/CGSB-51.34-M, "Vapour Barrier, Polyethylene Sheet, for Use in Building Construction".

Section 9.14. Drainage

9.14.1. Scope

9.14.1.1. Application

(1) This Section applies to subsurface drainage and to surface drainage.

9.14.1.2. Crawl Spaces

(1) Drainage for crawl spaces shall conform to Section 9.18.

9.14.1.3. Floors-on-Ground

(1) Drainage requirements beneath floors-on-ground shall conform to Section 9.16.

9.14.2. Foundation Drainage

9.14.2.1. Foundation Wall Drainage

(1) Unless it can be shown to be unnecessary, drainage shall be provided at the bottom of every *foundation* wall that contains the *building* interior.

(2) Except as provided in Sentences (4) and (5), where the insulation on a *foundation* wall extends to more than 900 mm below the adjacent exterior ground level,

(a) a drainage layer shall be installed adjacent to the exterior surface of a *foundation* wall consisting of,

(i) not less than 19 mm mineral fibre insulation with a density of not less than 57 kg/m^3, or

(ii) not less than 100 mm of free draining granular material, or

(b) a system shall be installed that can be shown to provide equivalent performance to that provided by the materials described in Clause (a).

(See Appendix A.)

(3) Where mineral fibre insulation, crushed rock backfill or other drainage layer medium is provided adjacent to the exterior surface of a *foundation* wall,

(a) the insulation, backfill or other drainage layer medium shall extend to the footing level to facilitate drainage of ground water to the *foundation* drainage system, and

(b) any pyritic material in the crushed rock shall be limited to a concentration that will not damage the *building* to a degree that would adversely affect its stability or the performance of assemblies separating dissimilar environments.

(4) Except when the insulation provides the drainage layer required in Clause (2)(a), when exterior insulation is provided, the drainage layer shall be installed on the exterior face of the insulation.

(5) The drainage layer required in Sentence (2) is not required,

(a) when the *foundation* wall is not required to be dampproofed, or

(b) when the *foundation* wall is waterproofed.

(6) Where drainage is required in Sentence (1), the drainage shall conform to Subsection 9.14.3. or 9.14.4.

9.14.3. Drainage Tile and Pipe

9.14.3.1. Material Standards

(1) Drain tile and drain pipe for *foundation* drainage shall conform to,

(a) ASTM C4, "Clay Drain Tile and Perforated Clay Drain Tile",

(b) ASTM C412M, "Concrete Drain Tile (Metric)",

(c) ASTM C444M, "Perforated Concrete Pipe (Metric)",

(d) ASTM C700, "Vitrified Clay Pipe, Extra Strength, Standard Strength and Perforated",

r11.1 (e) CAN/CSA-B182.1, "Plastic Drain and Sewer Pipe and Pipe Fittings",

r11.1 (f) CAN/CSA-G401, "Corrugated Steel Pipe Products", or

r11.1 (g) BNQ 3624-115, "Polyethylene (PE) Pipe Fittings – Flexible Pipes for Drainage – Characteristics and Test Methods".

9.14.3.2. Minimum Size

(1) Drain tile or pipe used for *foundation* drainage shall be not less than 100 mm in diam.

9.14.3.3. Installation

(1) Drain tile or pipe shall be laid on undisturbed or well-compacted *soil* so that the top of the tile or pipe is below the bottom of the floor slab or the ground cover of the crawl space.

(2) Drain tile or pipe with butt joints shall be laid with 6 mm to 10 mm open joints.

(3) The top half of joints referred to in Sentence (2) shall be covered with sheathing paper, 0.10 mm polyethylene or No. 15 asphalt or tar-saturated felt.

(4) The top and sides of drain pipe or tile shall be covered with not less than 150 mm of crushed stone or other coarse clean granular material containing not more than 10% of material that will pass a 4 mm sieve.

9.14.4. Granular Drainage Layer

9.14.4.1. Type of Granular Material

(1) Granular material used to drain the bottom of a *foundation* shall consist of a continuous layer of crushed stone or other coarse clean granular material containing,
(a) not more than 10% of material that will pass a 4 mm sieve, and
(b) no pyritic material in a concentration that would adversely affect its stability or the performance of assemblies separating dissimilar environments.

9.14.4.2. Installation

(1) Granular material described in Article 9.14.4.1. shall be laid on undisturbed or compacted *soil* to a minimum depth of not less than 125 mm beneath the footing of the *building* and extend not less than 300 mm beyond the outside edge of the footings.

9.14.4.3. Grading

(1) The bottom of an *excavation* drained by a granular layer shall be graded so that the entire area described in Article 9.14.4.2. is drained to a sump conforming to Article 9.14.5.2.

9.14.4.4. Wet Site Conditions

(1) Where because of wet site conditions *soil* becomes mixed with the granular drainage material, sufficient additional granular material shall be provided so that the top 125 mm is kept free of *soil*.

9.14.5. Drainage Disposal

9.14.5.1. Drainage Disposal

(1) *Foundation* drains shall drain to a sewer, drainage ditch or dry well.

9.14.5.2. Sump Pits

(1) Where gravity drainage is not practical, a covered sump with an automatic pump shall be installed to discharge the water into a sewer, drainage ditch or dry well.

(2) Covers for sump pits shall be,
(a) designed to resist removal by children, and
(b) sealed in accordance with Sentence 9.25.3.3.(16).

9.14.5.3. Dry Wells

(1) Dry wells are permitted to be used only when located in areas where the natural *groundwater* level is below the bottom of the dry well.

(2) Dry wells shall be not less than 5 m from the *building foundation* and located so that drainage is away from the *building*.

9.14.6. Surface Drainage

9.14.6.1. Surface Drainage

(1) The *building* shall be located or the *building* site graded so that water will not accumulate at or near the *building* and will not adversely affect adjacent properties.

9.14.6.2. Drainage away from Wells or Leaching Beds

(1) Surface drainage shall be directed away from the location of a water supply well or *leaching bed*.

9.14.6.3. Window Wells

(1) Every window well shall be drained to the footing level or other suitable location.

9.14.6.4. Catch Basin

(1) Where runoff water from a driveway is likely to accumulate or enter a garage, a catch basin shall be installed to provide adequate drainage.

9.14.6.5. Downspouts

(1) Downspouts shall conform to Article 9.26.18.2.

Section 9.15. Footings and Foundations

9.15.1. Application

9.15.1.1. General (See Appendix A and A-9.4.4.6.)

(1) Except as provided in Articles 9.15.1.2. and 9.15.1.3., this Section applies to,

(a) concrete or unit masonry *foundation* walls and concrete footings not subject to surcharge,
  (i) on stable *soils* with an *allowable bearing pressure* of 75 kPa or greater, and
  (ii) for *buildings* of wood frame or masonry construction,

(b) wood frame *foundation* walls and wood or concrete footings not subject to surcharge,
  (i) on stable *soils* with an *allowable bearing pressure* of 75 kPa or greater, and
  (ii) for *buildings* of wood frame construction, and

(c) flat insulating concrete form *foundation* walls and concrete footings not subject to surcharge,
  (i) on stable *soils* with an *allowable bearing pressure* of 75 kPa or greater, and
  (ii) for *houses* of light frame or flat insulating concrete form construction that are not more than 2 *storeys* in *building height*, with a maximum floor to floor height of 3 m.

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(See Appendix A.)

(2) *Foundations* for applications other than as described in Sentence (1) shall be designed in accordance with Section 9.4.

(3) Where a *foundation* is erected on filled ground, peat or sensitive clay, the footing sizes shall be designed in conformance with Section 4.2.

(4) For the purpose of Sentence (3), sensitive clay means the grain size of the majority of the particles is smaller than 0.002 mm, including leda clay.

9.15.1.2. Permafrost

(1) *Buildings* erected on permafrost shall have *foundations* designed by a *designer* competent in this field in accordance with the appropriate requirements of Part 4.

9.15.1.3. Foundations for Deformation Resistant Buildings

e1 **(1)** Where the superstructure of a detached *building* conforms to the requirements of the deformation resistance test in CSA Z240.2.1, "Structural Requirements for Manufactured Homes", the *foundation* shall be constructed in conformance with,

(a) this Section, or

r11.1 (b) CSA Z240.10.1, "Site Preparation, Foundation, and Installation of Buildings".

9.15.2. General

9.15.2.1. Concrete

(1) Concrete shall conform to Section 9.3.

9.15.2.2. Unit Masonry Construction

r11.1 **(1)** Concrete block shall conform to CSA A165.1, "Concrete Block Masonry Units", and shall have a compressive strength over the average net cross-sectional area of the block of not less than 15 MPa.

(2) Mortar, grout, mortar joints, corbelling and protection for unit masonry shall conform to Section 9.20.

(3) For concrete block *foundation* walls required to be reinforced,

r11.1 (a) mortar shall be Type S, conforming to CSA A179, "Mortar and Grout for Unit Masonry",

r11.1 (b) grout shall be coarse, conforming to CSA A179, "Mortar and Grout for Unit Masonry", and

r11.1 (c) placement of grout shall conform to CSA A371, "Masonry Construction for Buildings".

9.15.2.3. Pier Type Foundations

(1) Where pier type *foundations* are used, the piers shall be designed to support the applied loads from the superstructure.

(2) Where piers are used as a *foundation* system in a *building* of 1 *storey* in *building height*, the piers shall be installed to support the principal framing members and shall be spaced not more than 3.5 m apart along the framing, unless the piers and their footings are designed for larger spacings.

(3) The height of piers described in Sentence (2) shall not exceed 3 times their least dimension at the base of the pier.

(4) Where concrete block is used for piers described in Sentence (2), they shall be laid with cores placed vertically, and where the width of the *building* is 4.3 m or less, placed with their longest dimension at right angles to the longest dimension of the *building*.

9.15.2.4. Wood Frame Foundations

(1) *Foundations* of wood frame construction shall conform to,

r11.1 (a) CSA S406, "Permanent Wood Foundations for Housing and Small Buildings", or

(b) Part 4.

(See Appendix A.)

9.15.3. Footings

9.15.3.1. Footings Required

(1) Footings shall be provided under walls, pilasters, columns, piers, fireplaces and *chimneys* that bear on *soil* or *rock*, except that footings are permitted to be omitted under piers or monolithic concrete walls if the safe *loadbearing* capacity of the *soil* or *rock* is not exceeded.

9.15.3.2. Support of Footings

(1) Footings shall rest on undisturbed *soil*, *rock* or compacted granular *fill*.

(2) Granular *fill* shall not contain pyritic material in a concentration that would adversely affect its stability or the performance of assemblies separating dissimilar environments.

9.15.3.3. Application of Footing Width and Area Requirements

(1) Except as provided in Sentence 9.15.3.4.(2), the minimum footing width or area requirements provided in Articles 9.15.3.4. to 9.15.3.7. shall apply to footings where,

(a) the footings support,

(i) *foundation* walls of masonry, concrete, or flat insulating concrete form walls,

(ii) above ground walls of masonry, flat insulating concrete form walls or light wood frame construction, and

(iii) floors and roofs of light wood frame construction,

(b) the span of supported joists does not exceed 4.9 m, and

(c) the specified *live load* on any floor supported by the footing does not exceed 2.4 kPa.

(2) Except as provided in Sentence 9.15.3.4.(2), where the span of the supported joists exceeds 4.9 m, footings shall be designed in accordance with Section 4.2.

(3) Where the specified *live load* exceeds 2.4 kPa footings shall be designed in accordance with Section 4.2.

9.15.3.4. Basic Footing Widths and Areas

(1) Except as provided in Sentences (2) and (3) and in Articles 9.15.3.5. to 9.15.3.7., the minimum footing width or area shall comply with Table 9.15.3.4.

Table 9.15.3.4.
Minimum Footing Sizes
Forming Part of Sentence 9.15.3.4.(1)

Number of Floors Supported	Minimum Width of Strip Footings, mm		Minimum Footing Area for Columns Spaced 3 m o.c.(1), m^2
	Supporting Exterior Walls(2)	Supporting Interior Walls(3)	
1	250	200	0.40
2	350	350	0.75
3	450	500	1.0
Column 1	2	3	4

Notes to Table 9.15.3.4.:
(1) See Sentence 9.15.3.7.(1).
(2) See Sentences 9.15.3.5.(1).
(3) See Sentence 9.15.3.6.(1).

(2) Where the supported joist span exceeds 4.9 m in *buildings* with light wood frame walls, floors and roofs, footing widths shall be determined according to,
(a) Section 4.2., or
(b) the following formula:

$$W = w \bullet [\sum sjs / (storeys \bullet 4.9)]$$

where,

W = minimum footing width,

w = minimum width of footings supporting joists not exceeding 4.9 m, as defined by Table 9.15.3.4.,

$\sum$ sjs = the sum of the supported joist spans on each *storey* whose load is transferred to the footing, and

storeys = number of *storeys* supported by the footing.

(See Appendix A.)

(3) Where a *foundation* rests on gravel, sand or silt in which the water table level is less than the width of the footings below the *bearing surface*,
(a) the footing width for walls shall be not less than twice the width required by Sentences (1) and (2), and Articles 9.15.3.5. and 9.15.3.6., and
(b) the footing area for columns shall be not less than twice the area required by Sentences (1) and (2), and Article 9.15.3.7.

9.15.3.5. Adjustments to Footing Widths for Exterior Walls

(1) The strip footing widths for exterior walls shown in Table 9.15.3.4. shall be increased by,
(a) 65 mm for each *storey* of masonry veneer over wood frame construction supported by the *foundation* wall,
(b) 130 mm for each *storey* of masonry construction supported by the *foundation* wall, and
(c) 150 mm for each *storey* of flat insulating concrete form wall construction supported by the *foundation* wall.

9.15.3.6. Adjustments to Footing Widths for Interior Walls

(1) The minimum strip footing widths for interior *loadbearing* masonry walls shown in Table 9.15.3.4. shall be increased by 100 mm for each *storey* of masonry construction supported by the footing.

(2) Footings for interior non-*loadbearing* masonry walls shall be not less than 200 mm wide for walls up to 5.5 m high and the width shall be increased by 100 mm for each additional 2.7 m of height.

9.15.3.7. Adjustments to Footing Area for Columns

(1) The footing area for column spacings other than shown in Table 9.15.3.4. shall be adjusted in proportion to the distance between columns.

9.15.3.8. Footing Thickness

(1) Footing thickness shall be not less than the greater of,
(a) 100 mm, or
(b) the width of the projection of the footing beyond the supported element.

9.15.3.9. Step Footings

(1) Where step footings are used,
(a) the vertical rise between horizontal portions shall not exceed 600 mm, and
(b) the horizontal distance between risers shall be not less than 600 mm.

9.15.4. Foundation Walls

9.15.4.1. Permanent Form Material

r11.1 **(1)** Insulating concrete form units shall be manufactured of polystyrene conforming to the performance requirements of CAN/ULC-S701.1, "Thermal Insulation, Polystyrene Boards", for Type 2, 3 or 4 polystyrene.

9.15.4.2. Foundation Wall Thickness and Required Lateral Support

(1) Except as required in Sentence (2), the thickness of *foundation* walls made of unreinforced concrete block or solid concrete and subject to lateral earth pressure shall conform to Table 9.15.4.2.A. for walls not exceeding 3.0 m in unsupported height.

Table 9.15.4.2.A.
Thickness of Solid Concrete and Unreinforced Concrete Block Foundation Walls
Forming Part of Sentence 9.15.4.2.(1)

Type of *Foundation* Wall	Minimum Wall Thickness, mm	Maximum Height of Finish Ground Above *Basement* Floor or Crawl Space Ground Cover, m			
		Height of *Foundation* Wall Laterally Unsupported at the Top[1][2]	Height of *Foundation* Wall Laterally Supported at the Top[1][2]		
		≤ 3.0 m	≤ 2.5 m	> 2.5 m and ≤ 2.75 m	> 2.75 m and ≤ 3.0 m
Solid concrete, 15 MPa min. strength	150	0.8	1.5	1.5	1.4
	200	1.2	2.15	2.15	2.1
	250	1.4	2.3	2.6	2.5
	300	1.5	2.3	2.6	2.85
Solid concrete, 20 MPa min. strength	150	0.8	1.8	1.6	1.6
	200	1.2	2.3	2.3	2.2
	250	1.4	2.3	2.6	2.85
	300	1.5	2.3	2.6	2.85
Unreinforced concrete block	140	0.6	0.8	—	—
	190	0.9	1.2	[3]	[3]
	240	1.2	1.8	[3]	[3]
	290	1.4	2.2	—	—
Column 1	2	3	4	5	6

e1 Notes to Table 9.15.4.2.A.:
(1) See Article 9.15.4.3.
(2) See Article 9.15.4.6.
(3) See Table 9.15.4.2.B.

(2) The thickness of concrete in flat insulating concrete form *foundation* walls shall be not less than the greater of,
(a) 140 mm, or
(b) the thickness of the concrete in the wall above.

(3) *Foundation* walls made of flat insulating concrete form units shall be laterally supported at the top and at the bottom.

(4) The thickness and reinforcing of *foundation* walls made of reinforced concrete block and subject to lateral earth pressure shall conform to Table 9.15.4.2.B. and Sentences (5) to (8) where,
(a) the walls are laterally supported at the top,
(b) average stable *soils* are encountered, and
(c) wind loads on the exposed portion of the *foundation* are no greater than 0.70 kPa.

(5) For concrete block walls required to be reinforced, continuous vertical reinforcement shall,
(a) be provided at wall corners, wall ends, wall intersections, at changes in wall height, at the jambs of all openings and at movement joints,
(b) extend from the top of the footing to the top of the *foundation* wall, and
(c) where *foundation* walls are laterally supported at the top, have not less than 50 mm embedment into the footing, if the floor slab does not provide lateral support at the wall base.

Table 9.15.4.5.A.
Vertical Reinforcement for 140 mm Flat Insulating Concrete Form Foundation Walls
Forming Part of Sentence 9.15.4.5.(2)

Maximum Height of Finished Ground Above Finished *Basement* Floor, m	Minimum Vertical Reinforcement		
	Maximum Unsupported *Basement* Wall Height		
	2.44 m	2.75 m	3.00 m
1.35	10M at 400 mm o.c.	10M at 400 mm o.c.	10M at 400 mm o.c.
1.60	10M at 400 mm o.c.	10M at 380 mm o.c.	10M at 380 mm o.c.
2.00	10M at 380 mm o.c.	10M at 380 mm o.c.	10M at 380 mm o.c.
2.20	10M at 250 mm o.c.	10M at 250 mm o.c.	10M at 250 mm o.c.
2.35	n/a	10M at 250 mm o.c.	10M at 250 mm o.c.
2.60	n/a	10M at 250 mm o.c.	10M at 250 mm o.c.
3.00	n/a	n/a	10M at 250 mm o.c.
Column 1	2	3	4

Table 9.15.4.5.B.
Vertical Reinforcement for 190 mm Flat Insulating Concrete Form Foundation Walls
Forming Part of Sentence 9.15.4.5.(2)

Maximum Height of Finished Ground Above Finished *Basement* Floor, m	Minimum Vertical Reinforcement		
	Maximum Unsupported *Basement* Wall Height		
	2.44 m	2.75 m	3.00 m
2.20	none required	10M at 400 mm o.c.	10M at 400 mm o.c.
2.35	n/a	10M at 300 mm o.c.	10M at 300 mm o.c.
2.60	n/a	10M at 300 mm o.c.	15M at 400 mm o.c.
3.00	n/a	n/a	15M at 400 mm o.c.
Column 1	2	3	4

Table 9.15.4.5.C.
Vertical Reinforcement for 240 mm Flat Insulating Concrete Form Foundation Walls
Forming Part of Sentence 9.15.4.5.(2)

Maximum Height of Finished Ground Above Finished *Basement* Floor, m	Minimum Vertical Reinforcement		
	Maximum Unsupported *Basement* Wall Height		
	2.44 m	2.75 m	3.00 m
2.20	none required	none required	none required
2.60	n/a	15M at 400 mm o.c.	15M at 400 mm o.c.
3.00	n/a	n/a	15M at 400 mm o.c.
Column 1	2	3	4

9.15.4.6. Extension Above Ground Level

(1) Exterior *foundation* walls shall extend not less than 150 mm above finished ground level.

9.15.4.7. Reduction in Thickness

(1) Where the top of a *foundation* wall is reduced in thickness to permit the installation of floor joists, the reduced section shall be not more than 350 mm high and not less than 90 mm thick.

(2) Where the top of a *foundation* wall is reduced in thickness to permit the installation of a masonry exterior facing, the reduced section shall be,
(a) not less than 90 mm thick, and
(b) tied to the facing material with metal ties conforming to Sentence 9.20.9.4.(3) spaced not more than,
  (i) 200 mm o.c. vertically, and
  (ii) 900 mm o.c. horizontally.

(3) The space between wall and facing described in Sentence (2) shall be filled with mortar.

9.15.4.8. Corbelling

(1) Corbelling of masonry *foundation* walls supporting *cavity walls* shall conform to Article 9.20.12.2.

9.15.4.9. Crack Control Joints

(1) Crack control joints shall be provided in *foundation* walls more than 25 m long at intervals of not more than 15 m.

(2) Joints required in Sentence (1) shall be designed to resist moisture penetration and shall be keyed to prevent relative displacement of the wall portions adjacent to the joint.

9.15.4.10. Interior Masonry Walls

(1) Interior masonry *foundation* walls not subject to lateral earth pressure shall conform to Section 9.20.

9.15.5. Support of Joists and Beams on Masonry Foundation Walls

9.15.5.1. Support of Floor Joists

r11.1 **(1)** Except as permitted in Sentence (2), *foundation* walls of hollow masonry units supporting floor joists shall be capped with,
(a) not less than 50 mm of concrete,
(b) *solid masonry units* that are 100% solid and not less than 50 mm high, or
(c) semi-solid or hollow *solid masonry units* that have the top course completely filled with mortar, grout or concrete.

(2) Capping required in Sentence (1) is permitted to be omitted,
(a) in localities where termites are not known to occur,
(b) when the joists are supported on a wood plate not less than 38 mm by 89 mm, and
(c) when the siding overlaps the *foundation* wall not less than 12 mm.

9.15.5.2. Support of Beams

(1) Not less than a 190 mm depth of solid masonry shall be provided beneath beams supported on masonry.

(2) Where the beam referred to in Sentence (1) is supported below the top of the *foundation* walls, the ends of such beams shall be protected from the weather.

9.15.5.3. Pilasters

(1) Pilasters shall be provided under beams that frame into unit masonry *foundation* walls 140 mm or less in thickness.

(2) Pilasters required in Sentence (1) shall be not less than 90 mm by 290 mm and shall be bonded or tied into the wall.

r11.1 **(3)** The top 200 mm of pilasters required in Sentence (1) shall be *solid masonry* with the cells of hollow or semi-solid units filled with mortar, grout or concrete.

9.15.6. Parging and Finishing of Foundation Walls

9.15.6.1. Foundation Walls Below Ground

(1) Concrete block *foundation* walls shall be parged on the exterior face below ground level as required in Section 9.13.

9.15.6.2. Foundation Walls Above Ground

(1) Exterior surfaces of concrete block *foundation* walls above ground level shall have tooled joints, or shall be rendered, parged or otherwise suitably finished.

9.15.6.3. Form Ties

(1) All form ties shall be removed at least flush with the concrete surface.

Section 9.16. Floors-on-Ground

9.16.1. Scope

9.16.1.1. Application

(1) This Section applies to floors that are supported on ground or granular *fill* and that do not provide structural support for the superstructure.

9.16.1.2. Structural Floor Slabs

(1) Floors-on-ground that support loads from the superstructure shall be designed in conformance with Part 4.

9.16.1.3. Required Floors-on-Ground

(1) All spaces within *dwelling units*, except crawl spaces, shall be provided with a floor-on-ground, where,
(a) access is provided to the space, and
(b) a floor supported by the structure is not provided.

9.16.1.4. Dampproofing and Waterproofing

(1) Dampproofing and waterproofing shall conform to Section 9.13.

9.16.2. Material Beneath Floors

9.16.2.1. Required Installation of Granular Fill

(1) Except as provided in Sentence (2), not less than 100 mm of coarse clean granular material containing not more than 10% of material that will pass a 4 mm sieve shall be placed beneath floors-on-ground.

(2) Granular material need not be installed under,
(a) slabs in garages, carports or accessory *buildings*, or
(b) *buildings* of *industrial occupancy* where the nature of the process contained in the *occupancy* permits or requires the use of large openings in the *building* envelope even during the winter.

9.16.2.2. Support of Floors

(1) Material that is susceptible to changes in volume due to variations in moisture content or chemical-microbiological oxidation shall not be used as *fill* beneath floors-on-ground in a concentration that will damage the *building* to a degree that would adversely affect its stability or the performance of assemblies separating dissimilar environments.

(2) Material that is susceptible to changes in volume due to freezing shall not be used as *fill* beneath floors-on-ground that will be subjected to freezing temperatures.

(3) Except as provided in Sentence (4), *fill* beneath floors-on-ground shall be compacted.

(4) *Fill* beneath floors-on-ground need not be compacted where the material is clean coarse aggregate containing not more than 10% of material that will pass a 4 mm sieve.

9.16.3. Drainage

9.16.3.1. Control of Water Ingress

(1) Except as provided in Article 9.16.3.2. or where it can be shown to be unnecessary, ingress of water underneath a floor-on-ground shall be prevented by grading or drainage.

9.16.3.2. Hydrostatic Pressure

(1) Where *groundwater* levels may cause hydrostatic pressure beneath a floor-on-ground, the floor-on-ground shall be,
(a) a cast-in-place concrete slab, and
(b) designed to resist such pressures.

9.16.3.3. Floor Drains

(1) When floor drains are required, the floor surface shall be sloped so that no water can accumulate.

9.16.4. Concrete

9.16.4.1. Surface Finish

(1) The finished surface of concrete floor slabs shall be trowelled smooth and even.

(2) Dry cement shall not be added to the floor surfaces to absorb surplus water.

9.16.4.2. Topping Course

(1) Where a topping course is provided for a concrete floor slab, it shall consist of 1 part cement to 2.5 parts clean, well graded sand by volume, with a water/cement ratio approximately equal to that of the base slab.

(2) When concrete topping is provided it shall not be less than 20 mm thick.

9.16.4.3. Thickness

(1) Concrete slabs shall be not less than 75 mm thick exclusive of concrete topping. (See Appendix A.)

9.16.4.4. Bond Break

(1) A bond-breaking material shall be placed between the slab and footings or *rock*.

9.16.4.5. Compressive Strength

(1) Where dampproofing is not provided, the concrete used for floors-on-ground shall have a compressive strength of not less than 25 MPa after 28 days.

(2) Where dampproofing is provided as described in Article 9.13.2.7., the concrete used for floors-on-ground shall have a compressive strength of not less than 15 MPa after 28 days.

9.16.5. Wood

9.16.5.1. Wood Frame Floors

r11.1 **(1)** Floors-on-ground constructed of wood shall conform to CSA S406, "Permanent Wood Foundations for Housing and Small Buildings".

Section 9.17. Columns

9.17.1. Scope

9.17.1.1. Application

(1) This Section applies to columns used to support,
(a) beams carrying loads from not more than 2 wood frame floors where,
  (i) the supported length of joists bearing on such beams does not exceed 5 m, and
  (ii) the *live load* on any floor does not exceed 2.4 kPa,
(b) beams or header joists carrying loads from not more than 2 levels of wood frame balconies, decks or other accessible exterior platforms, or 1 level and the roof, where,
  (i) the supported length of joists bearing on such beams or joists does not exceed 5 m,
  (ii) the sum of the specified snow load and the load due to use and *occupancy* does not exceed 4.8 kPa, and
  (iii) the platform serves only a single *suite* of *residential occupancy*, or
(c) carport roofs.

(2) Columns for applications other than as described in Sentence (1) shall be designed in accordance with Part 4.

9.17.2. General

9.17.2.1. Location

(1) Columns shall be centrally located on a footing conforming to Section 9.15.

9.17.2.2. Lateral Support

(1) Columns shall be securely fastened to the supported member to reduce the likelihood of lateral differential movement between the column and the supported member.

(2) Except as permitted by Sentence (3), columns shall be laterally supported,
(a) directly, or
(b) by connection to the supported members.
(See Appendix A.)

(3) Columns need not be provided with lateral support as described in Sentence (2) where,
(a) the length of the columns are not more than 600 mm measured from the finished ground to the underside of the supported member, and
(b) the columns support a deck with no superstructure.

9.17.3. Steel Columns

9.17.3.1. Size and Thickness

(1) Except as permitted by Sentence (2), steel pipe columns shall have an outside diameter of not less than 73 mm and a wall thickness of not less than 4.76 mm.

(2) Columns of sizes other than as specified in Sentence (1) are permitted to be used where the *loadbearing* capacities are shown to be adequate.

9.17.3.2. End Bearing Plates

(1) Except as permitted in Sentence (2), steel columns shall be fitted with not less than 100 mm by 100 mm by 6.35 mm thick steel plates at each end, and where the column supports a wooden beam, the top plate shall extend across the full width of the beam.

(2) The top plate required in Sentence (1) need not be provided where a column supports a steel beam and provision is made for the attachment of the column to the beam.

9.17.3.3. Paint

(1) Exterior steel columns susceptible to corrosion shall be treated on the outside surface with at least one coat of rust-inhibitive paint.

9.17.3.4. Design of Adjustable Steel Columns (See Appendix A.)

(1) Where the imposed load does not exceed 36 kN, adjustable steel columns shall conform to CAN/CGSB-7.2, "Adjustable Steel Columns".

(2) Adjustable steel columns other than those described in Sentence (1) shall be designed in accordance with Part 4.

9.17.4. Wood Columns

9.17.4.1. Column Sizes

(1) The width or diameter of a wood column shall be not less than the width of the supported member.

(2) Except as provided in Article 9.35.4.2., columns shall be not less than 184 mm for round columns and 140 mm by 140 mm for rectangular columns, unless calculations are provided to show that lesser sizes are adequate.

9.17.4.2. Materials

(1) Wood columns shall be either solid, glue-laminated or built-up.

(2) Built-up columns shall consist of not less than 38 mm thick full-length members,
(a) bolted together with not less than 9.52 mm diam bolts spaced not more than 450 mm o.c., or
(b) nailed together with not less than 76 mm nails spaced not more than 300 mm o.c.

(3) Glued-laminated columns shall conform to Section 4.3.

9.17.4.3. Columns in Contact With Concrete

(1) Wood columns shall be separated from concrete in contact with the ground by 0.05 mm polyethylene film or Type S roll roofing.

9.17.4.4. Wood Column Termite Protection

(1) Where termites are known to exist, exterior wood columns, such as porch supports, shall be,
(a) pressure-treated with a chemical that is toxic to such termites, in accordance with Article 9.3.2.9., or
(b) supported on non-cellulosic material extending not less than 150 mm above the finished ground and shall be located not less than 50 mm from the exterior wall of an adjacent *building*.

9.17.5. Unit Masonry Columns

9.17.5.1. Materials

(1) Unit masonry columns shall be built of masonry units,
r11.1 (a) conforming to CSA A165.1, "Concrete Block Masonry Units", and
(b) having a compressive strength over the net area of the block of not less than 15 MPa.

9.17.5.2. Sizes

(1) Unit masonry columns shall be not less than 290 mm by 290 mm or 240 mm by 380 mm in size.

9.17.6. Solid Concrete Columns

9.17.6.1. Materials

(1) Concrete shall conform to Section 9.3.

9.17.6.2. Sizes

(1) Concrete columns shall be not less than 200 mm by 200 mm for rectangular columns and 230 mm diam for circular columns.

Section 9.18. Crawl Spaces

9.18.1. General

9.18.1.1. Application

(1) In this Section, a crawl space refers to an enclosed space between the underside of a floor assembly and the ground cover directly below, with a clearance less than 1 800 mm in height.

9.18.1.2. Foundations

(1) *Foundation* walls enclosing crawl spaces shall conform to Section 9.15.

9.20.2. Masonry Units

9.20.2.1. Masonry Unit Standards

(1) Masonry units shall comply with,
(a) ASTM C73, "Calcium Silicate Brick (Sand-Lime Brick)",
(b) ASTM C126, "Ceramic Glazed Structural Clay Facing Tile, Facing Brick, and Solid Masonry Units",
(c) ASTM C212, "Structural Clay Facing Tile",
r11.1 (d) CAN/CSA-A82 "Fire Masonry Brick Made from Clay or Shale",
r11.1 (e) CSA A165.1, "Concrete Block Masonry Units",
r11.1 (f) CSA A165.2, "Concrete Brick Masonry Units", or
r11.1 (g) CSA A165.3, "Prefaced Concrete Masonry Units".

9.20.2.2. Used Brick

(1) Used bricks shall be free of old mortar, soot or other surface coating and shall conform to Article 9.20.2.1.

9.20.2.3. Glass Blocks

(1) Glass blocks shall not be used as *loadbearing* units or in the construction of fireplaces or *chimneys*.

9.20.2.4. Cellular Concrete

(1) Masonry made with cellular concrete shall not be used in contact with the *soil* or exposed to the weather.

9.20.2.5. Stone

(1) Stone shall be sound and durable.

9.20.2.6. Concrete Units Exposed to the Weather

r11.1 **(1)** Concrete blocks exposed to the weather shall have weight and water absorption characteristics conforming to Classes A, B, C or D, described in CSA A165.1, "Concrete Block Masonry Units".

9.20.2.7. Compressive Strength

(1) The compressive strength of concrete blocks shall conform to Table 9.20.2.7.

Table 9.20.2.7.
Compressive Strength of Concrete Blocks
Forming Part of Sentence 9.20.2.7.(1)

Type of Block	Minimum Compressive Strength Over Net Area, MPa	
	Exposed to Weather	Not Exposed to Weather
Solid or hollow concrete blocks	15	10
Solid *loadbearing* cellular blocks	Not permitted	5
Solid non-*loadbearing* cellular blocks	Not permitted	2
Column 1	2	3

9.20.3. Mortar

9.20.3.1. Mortar Materials

r11.1 **(1)** Cementitious materials and aggregates for mortar and grout shall comply with CSA A179, "Mortar and Grout for Unit Masonry".

(2) Water and aggregate shall be clean and free of significant amounts of deleterious materials.

(3) Lime used in mortar shall be hydrated.

(4) If lime putty is used in mortar, it shall be made by slaking quicklime in water for not less than 24 h or soaking hydrated lime in water for not less than 12 h.

9.20.3.2. Mortar and Grout Mixes

(1) Mortar types shall conform to Table 9.20.3.2.A.

(2) Mortar for glass block masonry shall be,
(a) Type S Portland cement-lime where exposed to the exterior, or
(b) Type S or N where protected from the exterior.

(3) Mortar mix proportions shall conform to Table 9.20.3.2.B., with sufficient water to bring the mixture to a consistency adequate for laying masonry units.

(4) Grout mix proportions shall conform to Table 9.20.3.2.C., with sufficient water to provide a suitable flow to fill all voids completely, without excessive segregation or bleeding.

(5) Except as provided in Sentence (6), mortar shall be used and placed in final position,
(a) within 1.5 h after mixing when the air temperature is 25°C or higher, and
(b) within 2.5 h after mixing when the air temperature is less than 25°C.

(6) Mortar and grout containing a set-control admixture shall be manufactured off-site in a batching plant and shall be used and placed in final position within a time not exceeding the useful life as stipulated by the manufacturer.

r11.1 **(7)** Grout used for reinforced masonry shall be placed in accordance with the requirements of CSA A371, "Masonry Construction for Buildings".

Table 9.20.3.2.A.
Mortar Use
Forming Part of Sentence 9.20.3.2.(1)

Location	*Building* Element	Mortar Type
Exterior, above ground	*Loadbearing* walls and columns	S
	Non-*loadbearing* walls and columns	N or S
	Parapets, *chimneys* and masonry veneer	N or S
Exterior, at or below ground	*Foundation* walls and *chimneys*	S
Interior	*Loadbearing* walls and columns	N
	Non-*loadbearing* walls and columns	N
Column 1	2	3

r3

Table 9.20.3.2.B.
Mortar Mix Proportions (by Volume)
Forming Part of Sentence 9.20.3.2.(3)

Mortar Type	Portland Cement	Lime	Masonry Cement Type N	Masonry Cement Type S	Fine Aggregate (damp, loose-state sand)
S	1	½	—	—	3½ to 4½
	—	—	—	1	2¼ to 3
	½	—	1	—	3½ to 4½
N	1	1	—	—	4½ to 6
	—	—	1	—	2¼ to 3
Column 1	2	3	4	5	6

Table 9.20.3.2.C.
Grout Mix Proportions (by Volume)
Forming Part of Sentence 9.20.3.2.(4)

Portland Cement	Lime	Fine Aggregate (sand)	Coarse Aggregate
1	0 to 1/10	2¼ to 3 times the sum of the cement and lime volumes	1 to 2 times the sum of the cement and lime volumes
Column 1	2	3	4

9.20.4. Mortar Joints

9.20.4.1. Thickness

(1) Except as provided in Sentence (2), mortar joint thickness for burned clay brick and concrete masonry units shall be 10 mm.

(2) Permitted tolerances in head and bed joints shall be -5 mm to +10 mm.

r11.1 ### 9.20.4.2. Masonry Units

(1) Hollow masonry units shall be laid with mortar applied to head and bed joints of both inner and outer face shells.

(2) Vertically aligned webs of hollow masonry units shall be laid in a full bed of mortar,
(a) under the starting course,
(b) in all courses of columns, and
(c) where adjacent to cells or cavities that are to be filled with grout.

(3) Except for head joints left open for weep holes and ventilation, *solid masonry units* shall be laid with full head and bed joints.

9.20.5. Masonry Support

9.20.5.1. Masonry Support

(1) All masonry shall be supported on masonry, concrete or steel, except that masonry veneer walls are permitted to be supported on *foundations* of wood frame constructed in conformance with Sentence 9.15.2.4.(1). (See Appendix A.)

(2) Every masonry wall shall be at least as thick as the wall it supports, except as otherwise permitted in Article 9.20.12.2.

9.20.5.2. Lintels or Arches

(1) Masonry over openings shall be supported by steel, reinforced concrete lintels or masonry arches designed to support the imposed loads.

(2) Except as provided in Sentences (3) and (6), steel angle lintels supporting masonry above openings shall conform to Table 9.20.5.2.A.

(3) Steel angle lintels supporting masonry veneer above openings shall conform to Table 9.20.5.2.B.

(4) Steel lintels described in Sentences (2) and (3) shall,
(a) have even and level bearing and shall have not less than 150 mm length of bearing at end supports, and
(b) bear on masonry, concrete or steel.

(5) Steel angle lintels supporting masonry shall be primed or painted or otherwise protected from corrosion.

(6) Steel beams supporting masonry veneer and wood stud walls above openings shall conform to Table 9.20.5.2.C.

(7) Steel beams described in Sentence (6) shall be supported at each end by a steel column, and have a minimum 6 mm plate welded to the flange to support the masonry veneer.

9.20.6. Thickness and Height

9.20.6.1. Thickness of Exterior Walls

(1) Masonry exterior walls, other than *cavity walls*, in 1 *storey buildings* and the top *storeys* of 2 and 3 *storey buildings* shall be not less than 140 mm thick provided the walls are not more than 2.8 m high at the eaves and 4.6 m high at the peaks of gable ends.

(2) The exterior walls of the bottom *storeys* of 2 *storey buildings*, and exterior walls of the bottom 2 *storeys* of 3 *storey buildings* shall be not less than 190 mm thick.

(3) In exterior walls composed of more than one wythe, each wythe shall be not less than 90 mm thick.

9.20.6.2. Cavity Walls

(1) *Cavity walls* shall be made with not less than 90 mm wide units if the joints are raked and not less than 75 mm wide units if the joints are not raked.

(2) The width of a cavity in a *cavity wall* shall be not less than 50 mm and not greater than 150 mm.

(3) The minimum thickness of *cavity walls* above the supporting base shall be 230 mm for the top 7.6 m and 330 mm for the remaining portion, except that where 75 mm wide units are used, the wall height above the top of the *foundation* wall shall not exceed 6 m.

9.20.6.3. Thickness of Interior Walls

(1) The thickness of *loadbearing* interior walls shall be determined on the basis of the maximum lateral support spacing as provided in Sentences 9.20.10.1.(2) and (3).

(2) The thickness of interior non-*loadbearing* walls shall be,
(a) determined on the basis of the maximum lateral support spacing as provided in Sentences 9.20.10.1.(2) and (3), and
(b) in any case, not less than 65 mm.

9.20.6.4. Masonry Veneer

r11.1 **(1)** Except for masonry veneer where each masonry unit is supported individually by the structural backing, masonry veneer shall consist of *solid masonry units* not less than 70 mm thick.

(2) Veneer described in Sentence (1) over wood frame walls shall have not less than a 25 mm air space behind the veneer.

(3) Masonry veneer less than 90 mm thick shall have unraked joints.

(4) Masonry veneer shall conform to Subsection 4.3.2. where the masonry units are required to be individually supported by the structural backing.

r11.1 9.20.6.5. Parapet Walls

(1) The height of a parapet wall above the adjacent roof surface shall be not more than three times the parapet wall thickness.

(2) A parapet wall shall be *solid masonry* that extends from the top of the parapet wall to not less than 300 mm below the adjacent roof level.

(3) Where semi-solid or hollow units are used in a parapet wall, the cells of those units shall be filled with mortar, grout or concrete.

9.20.6.6. Stone or Concrete Facings

(1) Slab and panel facings of precast concrete and natural or artificial stone shall conform to Subsection 4.3.2.

9.20.7. Chases and Recesses

9.20.7.1. Maximum Dimensions

(1) Except as provided in Sentence 9.20.7.2.(2) and Article 9.20.7.4., the depth of any chase or recess shall not exceed one-third the thickness of the wall, and the width of the chase or recess shall not exceed 500 mm.

9.20.7.2. Minimum Wall Thickness

(1) Except as provided in Sentence (2) and Article 9.20.7.4., no chase or recess shall be constructed in any wall 190 mm or less in thickness.

(2) Recesses may be constructed in 190 mm walls provided they do not exceed 100 mm in depth, 750 mm in height and 500 mm in width.

9.20.7.3. Separation of Chases and Recesses

(1) Chases and recesses shall be not less than,
(a) four times the wall thickness apart, and
(b) 600 mm away from any pilaster, cross wall, buttress or other vertical element providing required lateral support for the wall.

9.20.7.4. Non-Conforming Chases or Recesses

(1) Chases or recesses that do not conform to the limits specified in Articles 9.20.7.1. to 9.20.7.3. shall be considered as openings, and any masonry supported above such a chase or recess shall be supported by a lintel or arch as provided in Article 9.20.5.2.

9.20.7.5. Chases or Recesses Cut into Walls

(1) Chases or recesses shall not be cut into walls made with hollow units after the masonry units are in place.

9.20.8. Support of Loads

9.20.8.1. Capping of Hollow Masonry Walls

(1) Except as permitted in Sentence (2), *loadbearing* walls of hollow masonry units supporting roof or floor framing members shall be capped with not less than 50 mm of solid masonry or have the top course filled with concrete.

(2) Capping required in Sentence (1) may be omitted where the roof framing is supported on a wood plate not less than 38 mm by 89 mm.

9.20.8.2. Cavity Walls Supporting Framing Members

r11.1 **(1)** Floor joists supported on *cavity walls* shall be supported on *solid masonry units* not less than 57 mm high.

(2) Floor joists described in Sentence (1) shall not project into the cavity.

(3) Roof and ceiling framing members bearing on *cavity walls* shall be supported on,

r11.1 (a) *solid masonry units* not less than 57 mm high, bridging the full thickness of the wall, or

(b) a wood plate not less than 38 mm thick, bearing not less than 50 mm on each wythe.

9.20.8.3. Bearing of Beams and Joists

(1) The bearing area under beams and joists shall be sufficient to carry the supported load.

(2) In no case shall the minimum length of end bearing of beams supported on masonry be less than 90 mm.

(3) The length of end bearing of floor, roof or ceiling joists supported on masonry shall be not less than 40 mm.

9.20.8.4. Support of Beams and Columns

(1) Beams and columns supported on masonry walls shall be supported on pilasters where the thickness of the masonry wall or wythe is less than 190 mm.

(2) Not less than 190 mm depth of solid masonry or concrete shall be provided under the beam or column referred to in Sentence (1).

(3) Pilasters required in Sentence (1) shall be bonded or tied to masonry walls.

(4) Concrete pilasters required in Sentence (1) shall be not less than 50 mm by 300 mm.

(5) Unit masonry pilasters required in Sentence (1) shall be not less than 100 mm by 290 mm.

r11.1 9.20.8.5. Projection of Masonry Veneer Beyond Supporting Members

(1) Masonry veneer of *solid masonry units* resting on a bearing support shall not project more than one-third of the thickness of the veneer. (See Appendix A.)

(2) Where the masonry veneer described in Sentence (1) is rough stone masonry,

(a) the projection shall be measured as the average projection of the units, and

(b) the thickness of the veneer shall be measured as the average thickness of the veneer.

9.20.9. Bonding and Tying

9.20.9.1. Joints to be Offset or Reinforced

(1) Vertical joints in adjacent masonry courses shall be offset unless each wythe of masonry is reinforced with the equivalent of no fewer than two corrosion-resistant steel bars of 3.76 mm diam placed in the horizontal joints at vertical intervals not exceeding 460 mm.

(2) Where joints in the reinforcing referred to in Sentence (1) occur, the bars shall be lapped not less than 150 mm.

9.20.9.2. Bonding or Tying of Other Than Masonry Veneer

(1) Except as provided in Article 9.20.9.5 for masonry veneer, masonry walls that consist of two or more wythes shall have the wythes bonded or tied together with masonry bonding units as described in Article 9.20.9.3. or with metal ties as described in Articles 9.20.9.4.

9.20.9.3. Bonding

(1) Where wythes are bonded together with masonry units, the bonding units shall comprise not less than 4 percent of the wall surface area.

(2) Bonding units described in Sentence (1) shall be spaced not more than 600 mm vertically and horizontally in the case of brick masonry and 900 mm o.c. in the case of block or tile.

(3) Units described in Sentence (1) shall extend not less than 90 mm into adjacent wythes.

9.20.9.4. Tying

(1) Where two or more wythes are tied together with metal ties of the individual rod type, the ties shall conform to the requirements in Sentences (3) to (6).

(2) Other ties may be used where it can be shown that such ties provide walls that are at least as strong and as durable as those made with the individual rod type.

(3) Metal ties of the individual rod type shall,
(a) be corrosion-resistant,
(b) have a minimum cross-sectional area of not less than 17.8 mm^2, and
(c) have not less than a 50 mm portion bent at right angles at each end.

(4) Metal ties of the individual rod type shall,
(a) extend from within 25 mm of the outer face of the wall to within 25 mm of the inner face of the wall,
(b) be completely embedded in mortar except for the portion exposed in *cavity walls*, and
(c) be staggered from course to course.

(5) Where two or more wythes in walls other than *cavity walls* and masonry veneer/masonry back-up walls are tied together with metal ties of the individual rod type, the space between wythes shall be completely filled with mortar.

(6) Ties described in Sentence (5) shall be,
(a) located within 300 mm of openings and spaced not more than 900 mm apart around openings, and
(b) spaced not more than 900 mm apart horizontally and 460 mm apart vertically at other locations.

(7) Except as required in Sentences (8) and (9), where the inner and outer wythes of *cavity walls* are tied with individual wire ties, the ties shall be spaced not more than 900 mm apart horizontally and 400 mm apart vertically.

(8) Within 100 mm of the bottom of each floor or roof assembly where the cavity extends below the assemblies, the ties described in Sentence (7) shall be spaced not more than 600 mm apart horizontally.

(9) Within 300 mm of any openings, the ties described in Sentence (7) shall be spaced not more than 900 mm apart.

9.20.9.5. Ties for Masonry Veneer

(1) Masonry veneer 70 mm or more in thickness and resting on a bearing support shall be tied to masonry back-up or to wood framing members with straps that are,
(a) corrosion-resistant,

(b) not less than 0.76 mm thick,
(c) not less than 22 mm wide,
(d) shaped to provide a key with the mortar, and
(e) spaced in accordance with Table 9.20.9.5.

r11.1

Table 9.20.9.5.
Veneer Tie Spacing
Forming Part of Sentence 9.20.9.5.(1)

Maximum Vertical Spacing, mm	Maximum Horizontal Spacing, mm
406	813
508	610
610	406
Column 1	2

(2) The straps described in Sentence (1) that are fastened to the wood framing members shall be,
(a) bent at a right angle within 6 mm from the fastener, and
(b) fastened with corrosion resistant 3.18 mm diam screws or spiral nails having a wood penetration of not less than 30 mm.

(3) Masonry veneer individually supported by masonry or wood frame back-up shall be secured to the back-up in conformance with Subsection 4.3.2.

(4) The straps described in Sentence (1) may be installed against one of the sheathings listed in Table 9.23.16.2.A. provided that,
(a) the tie is in contact with the exterior surface of the sheathing, and
(b) the sheathing beneath the tie is not compressed.

9.20.9.6. Reinforcing for Glass Block

(1) Glass block shall have horizontal joint reinforcement of two corrosion-resistant bars of not less than 3.76 mm diam or expanded metal strips not less than 75 mm wide,
(a) spaced at vertical intervals of not more than 600 mm for units 190 mm or less in height, and
(b) installed in every horizontal joint for units higher than 190 mm.

(2) Reinforcement required in Sentence (1) shall be lapped not less than 150 mm.

9.20.10. Lateral Support

9.20.10.1. Lateral Support Required

(1) Masonry walls shall be laterally supported by floor or roof construction or by intersecting masonry walls or buttresses.

(2) The spacing of supports required in Sentence (1) shall be not more than,
(a) 20 times the wall thickness for all *loadbearing* walls and exterior non-*loadbearing* walls, and
(b) 36 times the wall thickness for interior non-*loadbearing* walls.

(3) In applying Sentence (2), the thickness of *cavity walls* shall be taken as the greater of,
(a) two-thirds of the sum of the thicknesses of the wythes, or
(b) the thickness of the thicker wythe.

(4) Floor and roof structural elements providing lateral support for walls as required in Sentence (1) shall be constructed to transfer lateral loads to walls or buttresses approximately at right angles to the laterally supported walls.

9.20.11. Anchorage of Roofs, Floors and Intersecting Walls

9.20.11.1. Anchorage of Floor or Roof Assemblies

(1) Where required to receive lateral support, masonry walls shall be anchored to each floor or roof assembly at maximum intervals of 2 m, except that anchorage of floor joists not more than 1 m above grade may be omitted.

(2) Anchors required in Sentence (1) shall be corrosion-resistant and be not less than the equivalent of 40 mm by 4.76 mm thick steel straps.

(3) Anchors required in Sentence (1) shall be shaped to provide a mechanical key with the masonry and shall be securely fastened to the horizontal support to develop the full strength of the anchor.

(4) When joists are parallel to the wall, anchors required in Sentence (1) shall extend across no fewer than three joists.

9.20.11.2. Bonding and Tying of Intersecting Walls

(1) Where required to provide lateral support, intersecting walls shall be bonded or tied together.

(2) Where bonding is used to satisfy the requirements of Sentence (1), 50% of the adjacent masonry units in the intersecting wall, distributed uniformly over the height of the intersection, shall be embedded in the laterally supported wall.

(3) Where tying is used to satisfy the requirements of Sentence (1), the ties shall be,
(a) corrosion-resistant metal,
(b) equivalent to not less than 4.76 mm by 40 mm steel strapping,
(c) spaced not more than 800 mm o.c. vertically, and
(d) shaped at both ends to provide sufficient mechanical key to develop the strength of the ties.

9.20.11.3. Wood Frame Walls Intersecting Masonry Walls

(1) Wood frame walls shall be tied to intersecting masonry walls with not less than 4.76 mm diam corrosion-resistant steel rods spaced not more than 900 mm o.c. vertically.

(2) Ties required in Sentence (1) shall be anchored to the wood framing at one end and shaped to provide a mechanical key at the other end to develop the strength of the tie.

9.20.11.4. Wood Frame Roof Systems

(1) Except as permitted in Sentence (2), roof systems of wood frame construction shall be tied to exterior masonry walls by not less than 12.7 mm diam anchor bolts,
(a) spaced not more than 2.4 m apart,
(b) embedded not less that 90 mm into the masonry, and
(c) fastened to a rafter plate of not less than 38 mm thick lumber.

(2) The roof system described in Sentence (1) is permitted to be anchored by nailing the wall furring strips to the side of the rafter plate.

9.20.11.5. Cornices, Sills and Trim

(1) Cornices, sills or other trim of masonry material that project beyond the wall face shall have not less than 65% of their mass, but not less than 90 mm, within the wall or shall be adequately anchored to the wall with corrosion-resistant anchors.

9.20.11.6. Piers

(1) Where anchor bolts are to be placed in the top of a masonry pier, the pier shall conform to the requirements of Sentence 9.15.2.3.(4) and shall be capped with concrete or reinforced masonry not less than 200 mm thick.

9.20.12. Corbelling

9.20.12.1. Corbelling

r11.1 **(1)** All corbelling shall consist of *solid masonry units*.

(2) The units referred to in Sentence (1) shall be corbelled so that the horizontal projection of any unit does not exceed 25 mm and the total projection does not exceed one-third of the total wall thickness.

9.20.12.2. Corbelling for Cavity Walls

(1) *Cavity walls* of greater thickness than the *foundation* wall on which they rest shall not be corbelled but may project 25 mm over the outer face of the *foundation* wall disregarding parging.

(2) Where the *foundation* wall referred to in Sentence (1) is unit masonry, it is permitted to be corbelled to meet flush with the inner face of a *cavity wall* provided,
(a) the projection of each course does not exceed half the height or one-third the width of the corbelled unit, and
(b) the total corbel does not exceed one-third of the *foundation* wall thickness.
(See Appendix A.)

9.20.12.3. Corbelling for Masonry Veneer

(1) Masonry veneer resting on a bearing support shall not project more than 25 mm beyond the supporting base where the veneer is at least 90 mm thick, and 12 mm beyond the supporting base where the veneer is less than 90 mm thick.

(2) In the case of rough stone veneer, the projection, measured as the average projection of the stone units, shall not exceed one-third the bed width beyond the supporting base.

9.20.13. Control of Rain Water Penetration

9.20.13.1. Materials for Flashing

(1) Materials used for flashing shall conform to Table 9.20.13.1.

(2) Aluminum flashing in contact with masonry or concrete shall be effectively coated or separated from the masonry or concrete by an impervious membrane.

Table 9.20.13.1.
Flashing Materials
Forming Part of Sentence 9.20.13.1.(1)

Material	Minimum Thickness, mm	
	Exposed Flashing	Concealed Flashing
Aluminum	0.48	—
Copper	0.46	0.46
Copper or aluminum laminated to felt or kraft paper	—	0.05
Hot dipped or galvanized steel	0. 33	0.33
Lead sheet	1.73	1.73
Polyethylene	—	0.50
Roll roofing, Type S	—	standard
Zinc	0.46	0.46
Column 1	2	3

9.20.13.2. Fastening of Flashing

(1) Fastening devices for flashing shall be corrosion-resistant and, where metal flashing is used, shall be compatible with the flashing with respect to galvanic action.

9.20.13.3. Location of Flashing

(1) Flashing shall be installed in masonry and masonry veneer walls,
(a) beneath jointed masonry window sills,
(b) over the back and top of parapet walls,
(c) over the heads of glass block panels,
(d) beneath weep holes, and
(e) over the heads of window and door openings in exterior walls when the vertical distance between the top of a window or door frame and the bottom edge of the eave exceeds one-quarter of the horizontal eave overhang.

(2) Throughwall flashing shall be provided in a masonry veneer wall such that any moisture that accumulates in the air space will be directed to the exterior of the *building*.

9.20.13.4. Extension of Flashing

(1) When installed beneath jointed masonry window sills and jointed masonry copings or over the heads of openings, flashing shall extend from the front edge of the masonry up behind the sill or lintel.

(2) A flashing may be omitted when the masonry at the sill of a wall opening or the top of a wall is protected by an impervious non-jointed masonry coping that conforms to Article 9.20.13.12.

9.20.13.5. Flashing for Weep Holes in Masonry Veneer/Masonry Walls

(1) Flashing beneath weep holes in *cavity walls* and masonry veneer/masonry back-up walls shall,
(a) be bedded not less than 25 mm in the inside wythe,
(b) extend to not less than 5 mm beyond the outer face of the *building* element below the flashing, and
(c) be installed with a nominally horizontal slope toward the outside wythe.

9.20.13.6. Flashing for Weep Holes in Masonry Veneer

(1) Flashing beneath weep holes in masonry veneer over masonry back-up walls shall conform to the flashing requirements for *cavity walls* and masonry veneer/masonry back-up walls in Article 9.20.13.5.

(2) Flashing beneath weep holes in masonry veneer over wood frame walls shall be installed so that it extends from a point not less than 5 mm beyond the outer face of the *building* element below the flashing to a point 150 mm up the wood frame wall.

(3) Where the frame wall is sheathed with a sheathing membrane, a non-wood-based rigid exterior insulating sheathing or a semi-rigid insulating sheathing with an integral sheathing membrane, the flashing shall be installed behind the sheathing membrane or insulating sheathing.

(4) Flashing described in Sentence (2) is permitted to conform to the requirements for concealed flashing in Table 9.20.13.1.

9.20.13.7. Flashing Joints

(1) Joints in flashing shall be made watertight.

9.20.13.8. Required Weep Holes

(1) Weep holes spaced not more than 800 mm apart shall be provided at the bottom of,
(a) cavities in *cavity walls*, and
(b) cavities or air spaces in masonry veneer walls.

(2) The cavities or air spaces described in Sentence (1) shall include those above lintels over window and door openings required to be flashed in conformance with Article 9.20.13.3.

(3) The weep holes required in Sentence (1) shall be in a location such that any water that collects in the cavity or space will be directed to the exterior of the *building*.

9.20.13.9. Protection of Interior Finish

(1) Except as provided in Sentence (3), where the interior finish of the exterior walls of a *building* is a type that may be damaged by moisture, exterior masonry walls, other than *cavity walls* or walls that are protected for their full height by a roof of a carport or porch, shall be,
(a) parged on the interior surface, and
(b) covered with No. 15 breather-type asphalt-saturated paper conforming to CAN/CGSB-51.32-M, "Sheathing, Membrane, Breather Type", and shall be lapped not less than 100 mm at the joints.

(2) In situations described in Sentence (1), flashing shall be provided where water will accumulate, to lead it to the exterior.

(3) Where the insulation effectively limits the passage of water vapour and is applied by a waterproof adhesive or by mortar directly to the masonry, the requirements for sheathing paper do not apply. (See Appendix A.)

9.20.13.10. Mortar Droppings

(1) *Cavity walls* shall be constructed so that mortar droppings are prevented from forming a bridge to allow the passage of rain water across the cavity.

9.20.13.11. Caulking at Door and Window Frames

(1) The junction of door and window frames with masonry shall be caulked in conformance with Subsection 9.27.4.

9.20.13.12. Drips Beneath Window Sills

(1) Except for wall openings located less than 150 mm above ground level, where a concealed flashing is not installed beneath window and door sills, such sills shall be provided with an outward slope and a drip located not less than 25 mm from the wall surface.

9.20.14. Protection During Work

9.20.14.1. Laying Temperature of Mortar and Masonry

(1) Mortar and masonry shall be maintained at a temperature not below 5°C during installation and for not less than 48 h after installation.

(2) No frozen material shall be used in the mortar mix.

9.20.14.2. Protection from Weather

(1) The top surface of uncompleted masonry exposed to the weather shall be completely covered with a waterproofing material when construction is not in progress.

9.20.15. Reinforcement for Earthquake Resistance

9.20.15.1. Amount of Reinforcement

(1) Where reinforcement is required in this Section, masonry walls shall be reinforced horizontally and vertically with steel having a total cross-sectional area of not less than 0.002 times the horizontal cross-sectional area of the wall, so that not less than one-third of the required steel area is installed either horizontally or vertically and the remainder in the other direction.

9.20.15.2. Installation Standard

r11.1 **(1)** Where reinforcement for masonry is required in this Section, it shall be installed in conformance with the requirements for reinforced masonry as contained in CSA A371, "Masonry Construction for Buildings".

9.20.16. Corrosion Resistance

9.20.16.1. Corrosion Resistance of Connectors

(1) Carbon steel connectors required to be corrosion-resistant shall be galvanized to at least the minimum standards in Table 9.20.16.1.

Table 9.21.2.5.A.
Diameter of Round Flues for Fireplace Chimneys
Forming Part of Sentence 9.21.2.5.(1)

Fireplace Opening, m²	*Chimney* Height, m							
	3.0 to 4.5		> 4.5 to 5.9		> 5.9 to 8.9		> 8.9 to 12	
	Flue Diameter, mm							
	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.
Up to 0.150	110	170	100	160	90	150	90	150
0.151 to 0.250	150	210	130	190	130	190	120	180
0.251 to 0.350	180	240	160	220	150	210	140	200
0.351 to 0.500	220	280	200	260	190	250	170	230
0.501 to 0.650	260	320	230	290	220	280	200	260
0.651 to 0.800	290	350	260	320	240	300	220	280
0.801 to 1.00	330	390	290	350	270	330	250	310
1.01 to 1.20	360	420	320	380	300	360	270	330
1.21 to 1.40	390	450	350	410	330	390	300	360
1.41 to 1.60	420	480	380	440	350	410	320	380
1.61 to 1.80	—	—	400	460	370	430	340	400
1.81 to 2.00	—	—	—	—	400	460	360	420
2.01 to 2.20	—	—	—	—	—	—	380	440
Column 1	2	3	4	5	6	7	8	9

Table 9.21.2.5.B.
Rectangular Flue Sizes for Fireplace Chimneys
Forming Part of Sentence 9.21.2.5.(1)

Fireplace Opening, m²	*Chimney* Height, m							
	3.0 to 4.5		> 4.5 to 5.9		> 5.9 to 8.9		> 8.9 to 12	
	Flue Size, mm							
	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.
Up to 0.150	200 × 200	200 × 200	100 × 200	100 × 200	100 × 200	100 × 200	100 × 200	100 × 200
0.151 to 0.250	200 × 200	200 × 200	200 × 200	200 × 200	200 × 200	200 × 200	200 × 200	200 × 200
0.251 to 0.350	200 × 300	200 × 300	200 × 200	200 × 300	200 × 200	200 × 200	200 × 200	200 × 200
0.351 to 0.500	300 × 300	300 × 300	200 × 300	200 × 300	200 × 300	200 × 300	200 × 200	200 × 300
0.501 to 0.650	300 × 300	300 × 400	300 × 300	300 × 300	300 × 300	300 × 300	200 × 300	200 × 300
0.651 to 0.800	300 × 400	300 × 400	300 × 300	300 × 400	300 × 300	300 × 300	300 × 300	300 × 300
0.801 to 1.00	400 × 400	400 × 400	300 × 400	300 × 400	300 × 400	300 × 400	300 × 300	300 × 300
1.01 to 1.20	400 × 400	400 × 400	400 × 400	400 × 400	300 × 400	300 × 400	300 × 400	300 × 400
1.21 to 1.40	—	—	400 × 400	400 × 400	400 × 400	400 × 400	300 × 400	300 × 400
1.41 to 1.60	—	—	—	—	400 × 400	400 × 400	400 × 400	400 × 400
1.61 to 1.80	—	—	—	—	—	—	400 × 400	400 × 400
1.81 to 2.00	—	—	—	—	—	—	400 × 400	400 × 400
Column 1	2	3	4	5	6	7	8	9

9.21.2.6. Oval Chimney Flues

(1) The width of an oval *chimney flue* shall be not less than two-thirds its breadth.

9.21.3. Chimney Lining

9.21.3.1. Lining Materials

(1) Every *masonry or concrete chimney* shall have a lining of clay, concrete, firebrick or metal.

9.21.3.2. Joints in Chimney Liners

(1) Joints of *chimney liners* shall be sealed to provide a barrier to the passage of flue gases and condensate into the cavity between the liner and the surrounding masonry.

(2) Joints of clay, concrete or firebrick *chimney liners* shall be struck flush to provide a straight, smooth, aligned *chimney flue*.

9.21.3.3. Clay Liners

(1) Clay liners shall conform to CAN/CSA-A324-M, "Clay Flue Liners".

(2) Liners referred to in Sentence (1) shall be not less than 15.9 mm thick and shall be capable of resisting, without softening or cracking, a temperature of 1100°C.

9.21.3.4. Firebrick Liners

r11.1 **(1)** Firebrick liners shall conform to ASTM C27, "Fireclay and High Alumina Refractory Brick".

(2) Firebrick liners shall be laid with high temperature cement mortar conforming to CAN/CGSB-10.3, "Air Setting Refractory Mortar".

9.21.3.5. Concrete Liners

(1) Concrete *flue* liners shall conform to Clause 4.2.6.4. of CAN/CSA-A405-M, "Design and Construction of Masonry Chimneys and Fireplaces".

9.21.3.6. Metal Liners

(1) Metal liners shall be constructed of at least 0.3 mm thick stainless steel.

(2) Except as provided in Sentence 9.22.10.2.(3), metal liners referred to in Sentence (1) shall only be used in *chimneys* serving gas- or oil-burning *appliances*. (See Appendix A.)

9.21.3.7. Installation of Chimney Liners

(1) *Chimney liners* shall be installed when the surrounding masonry or concrete is placed.

9.21.3.8. Spaces Between Liners and Surrounding Masonry

(1) A space not less than 10 mm wide shall be left between a *chimney liner* and the surrounding masonry.

(2) The space required in Sentence (1) shall not be filled with mortar.

9.21.3.9. Mortar for Chimney Liners

(1) *Chimney liners* used in *chimneys* for solid fuel-burning *appliances* shall be laid in a full bed of,
(a) high temperature cement mortar conforming to CAN/CGSB-10.3, "Air Setting Refractory Mortar", or
(b) mortar consisting of one part Portland cement to three parts sand by volume.

(2) *Chimney liners* used in *chimneys* for oil- or gas-burning *appliances* shall be laid in a full bed of mortar consisting of one part Portland cement to three parts sand by volume.

9.21.3.10. Extension of Chimney Liners

(1) *Chimney liners* shall extend from a point not less than 200 mm below the lowest *flue pipe* connection to a point not less than 50 mm or more than 100 mm above the *chimney* cap.

9.21.4. Masonry and Concrete Chimney Construction

9.21.4.1. Unit Masonry

(1) Unit masonry shall conform to Section 9.20.

9.21.4.2. Concrete

(1) Concrete shall conform to Section 9.3.

9.21.4.3. Footings

(1) Footings for masonry *chimneys* and concrete *chimneys* shall conform to the requirements in Section 9.15.

9.21.4.4. Height of Chimney Flues

(1) A *chimney flue* shall extend not less than,
(a) 900 mm above the highest point at which the *chimney* comes in contact with the roof, and
(b) 600 mm above the highest roof surface or structure within 3 m of the *chimney*.
(See Appendix A.)

9.21.4.5. Lateral Stability

(1) Except as provided in Sentence (2), *chimneys* shall be braced in accordance with Subsection 4.3.2. to provide stability under wind loads.

(2) A *chimney* need not be laterally braced provided,
(a) no horizontal outside dimension is less than 400 mm, and
(b) the *chimney* extends not more than 3.6 m above a roof or the masonry wall of which it forms a part.
(See Appendix A.)

9.21.4.6. Chimney Caps

(1) The top of a *chimney* shall have a waterproof cap of reinforced concrete, masonry or metal.

(2) The cap required in Sentence (1) shall slope from the lining and be provided with a drip not less than 25 mm from the *chimney* wall.

(3) Cast-in-place concrete caps shall be separated from the *chimney liner* by a bond break and be sealed at that location.

(4) Jointed precast concrete or masonry *chimney* caps shall have flashing installed beneath the cap extending from the liner to the drip edge.

9.21.4.7. Cleanout

(1) Except for a *chimney flue* constructed to serve a masonry fireplace, a cleanout opening with a metal frame and tight-fitting metal door shall be installed near the base of the *chimney flue*.

9.21.4.8. Wall Thickness

r11.1 **(1)** The walls of a masonry *chimney* shall be built of *solid masonry units* not less than 70 mm thick.

9.21.4.9. Separation of Flue Liners

(1) *Flue* liners in the same *chimney* shall be separated by not less than 70 mm of masonry or concrete exclusive of liners where clay liners are used, or 90 mm of firebrick where firebrick liners are used.

(2) *Flue* liners referred to in Sentence (1) shall be installed to prevent significant lateral movement.

9.21.4.10. Flashing

(1) Junctions with adjacent materials shall be adequately flashed to shed water.

9.21.5. Clearance from Combustible Construction

9.21.5.1. Clearance from Combustible Materials

(1) The clearance between *masonry or concrete chimneys* and *combustible* framing material shall be not less than,
(a) 50 mm for interior *chimneys*, and
(b) 12 mm for exterior *chimneys*.
(See Appendix A.)

(2) A clearance of not less than 150 mm shall be provided between a cleanout opening and *combustible* material.

(3) *Combustible* flooring, subflooring and ceiling finishes shall have not less than a 12 mm clearance from *masonry or concrete chimneys*.

9.21.5.2. Sealing of Spaces

(1) All spaces between *masonry or concrete chimneys* and *combustible* material shall be sealed top or bottom with *noncombustible* material.

9.21.5.3. Support of Joists or Beams

(1) Joists or beams may be supported on masonry walls that enclose *chimney flues* provided the *combustible* members are separated from the *flue* by a minimum of 290 mm of solid masonry.

9.23.4.2. Spans for Joists, Rafters and Beams (See Appendix A.)

(1) Except as required in Sentence (2) and Article 9.23.13.10., the spans for wood joists and rafters shall conform to the spans shown in Tables A-1 to A-7 for the uniform *live loads* shown in the Tables.

(2) Spans for floor joists that are not selected from Tables A-1 and A-2 and that are required to be designed for the same loading conditions, shall not exceed the design requirements for uniform loading and vibration criteria. (See Appendix A.)

(3) Spans for built-up wood and glued-laminated timber floor beams shall conform to the spans in Tables A-8 to A-11.

(4) Spans for roof ridge beams shall conform to the spans in Table A-12 for the uniform snow load shown.

9.23.4.3. Steel Beams

(1) The spans for steel beams with laterally supported top flanges shall conform to Table 9.23.4.3. for floors and Tables A-20 to A-29 for roofs and floors. (See Appendix A.)

r11.1 **(2)** Beams described in Sentence (1) shall at least meet the requirements for Grade 350 W steel in CSA G40.21, "Structural Quality Steel".

(3) A beam may be considered to be laterally supported if,
(a) the wood joists bear on its top flange at intervals of 610 mm or less over its entire length,
(b) the load being applied to this beam is transmitted through the joists, and
(c) 19 mm by 38 mm wood strips in contact with the top flange are nailed on both sides of the beam to the bottom of the joist supported.

Table 9.23.4.3.
Maximum Spans for Steel Beams Supporting Floors in Dwelling Units(1)
Forming Part of Sentence 9.23.4.3.(1)

	Supported Joist Length, m (Half the sum of joist spans on both sides of the beam)						
	2.4	3.0	3.6	4.2	4.8	5.4	6.0
Section	One *Storey* Supported						
W150 × 22	5.5	5.2	4.9	4.8	4.6	4.5	4.3
W200 × 21	6.5	6.2	5.9	5.7	5.4	5.1	4.9
W200 × 27	7.3	6.9	6.6	6.3	6.1	5.9	5.8
W200 × 31	7.8	7.4	7.1	6.8	6.6	6.4	6.2
W250 × 24	8.1	7.6	7.3	7.0	6.6	6.2	5.9
W250 × 33	9.2	8.7	8.3	8.0	7.7	7.5	7.3
W250 × 39	10.0	9.4	9.0	8.6	8.4	8.1	7.9
W310 × 31	10.4	9.8	9.4	8.9	8.4	8.0	7.6
W310 × 39	11.4	10.7	10.2	9.8	9.5	9.2	9.0
Section	Two *Storeys* Supported						
W150 × 22	4.9	4.4	4.1	3.8	3.5	3.4	3.2
W200 × 21	5.6	5.1	4.6	4.3	4.1	3.8	3.7
W200 × 27	6.4	6.1	5.6	5.3	4.9	4.7	4.4
W200 × 31	6.9	6.5	6.2	5.8	5.4	5.1	4.9
W250 × 24	6.8	6.1	5.6	5.2	4.9	4.6	4.4
W250 × 33	8.2	7.7	7.0	6.5	6.1	5.8	5.5
W250 × 39	8.8	8.3	7.8	7.2	6.8	6.4	6.1
W310 × 31	8.7	7.8	7.2	6.7	6.2	5.9	5.6
W310 × 39	10.0	9.3	8.5	7.9	7.4	7.0	6.7
Column 1	2	3	4	5	6	7	8

Notes to Table 9.23.4.3.:
(1) See Appendix A.

9.23.4.4. Concrete Topping (See Appendix A.)

(1) Except as permitted in Sentence (2), where a floor is required to support a concrete topping, the joist spans shown in Table A-1 or the spacing of the members shall be reduced to allow for the loads due to the topping.

(2) Where a floor is required to support a concrete topping, joist spans are permitted to be selected from Table A-2 provided the concrete,
(a) is 38 to 51 mm thick,
(b) is normal weight,
(c) is placed directly on the subflooring, and
(d) has not less than 20 MPa compressive strength after 28 days.

(3) Where a floor is required to support a concrete topping not more than 51 mm thick, the beam spans shown in Tables A-8 to A-11 shall be multiplied by 0.8 or the supported length of the floor joists shall be reduced to allow for the loads due to the topping.

9.23.4.5. Heavy Roofing Materials

(1) Where a roof is required to support an additional uniform *dead load* from roofing materials such as concrete roofing tile, or materials other than as specified in Section 9.26., such as clay roofing tiles, the additional load shall be allowed for by reducing,
(a) the spans for roof joists and rafters in Tables A-4 to A-7, or the spacing of the members, and
(b) the spans for ridge beams and lintels in Tables A-12 to A-16.

9.23.5. Notching and Drilling

9.23.5.1. Holes Drilled in Framing Members

(1) Holes drilled in roof, floor or ceiling framing members shall be not larger than one-quarter the depth of the member and shall be located not less than 50 mm from the edges, unless the depth of the member is increased by the size of the hole.

9.23.5.2. Notching of Framing Members

(1) Floor, roof and ceiling framing members are permitted to be notched provided the notch is located on the top of the member within half the joist depth from the edge of bearing and is not deeper than one-third the joist depth, unless the depth of the member is increased by the size of the notch.

9.23.5.3. Wall Studs

(1) Wall studs shall not be notched, drilled or otherwise damaged so that the undamaged portion of the stud is less than two-thirds the depth of the stud if the stud is *loadbearing* or 40 mm if the stud is non-*loadbearing*, unless the weakened studs are suitably reinforced.

9.23.5.4. Top Plates

(1) Top plates in walls shall not be notched, drilled or otherwise weakened to reduce the undamaged width to less than 50 mm unless the weakened plates are suitably reinforced.

9.23.5.5. Roof Trusses

(1) Roof truss members shall not be notched, drilled or otherwise weakened unless such notching or drilling is allowed for in the design of the truss.

9.23.6. Anchorage

9.23.6.1. Anchorage of Building Frames

(1) *Building* frames shall be anchored to the *foundation* unless a structural analysis of wind and earth pressures shows anchorage is not required.

(2) Except as provided in Article 9.23.6.3., anchorage shall be provided by embedding the ends of the first floor joists in concrete, or fastening the sill plate to the *foundation* with not less than 12.7 mm diam anchor bolts spaced not more than 2.4 m o.c.

(3) Anchor bolts referred to in Sentence (2) shall be fastened to the sill plate with nuts and washers and shall be embedded not less than 100 mm in the *foundation* and so designed that they may be tightened without withdrawing them from the *foundation*.

9.23.6.2. Anchorage of Columns and Posts

(1) Except as provided in Sentences (2) and (3), exterior columns and posts shall be anchored to resist uplift and lateral movement.

(2) Except as provided in Sentence (3), where columns or posts support balconies, decks, verandas and other exterior platforms, and the columns or posts extend not more than 600 mm above finished ground level, the supported joists or beams shall be,
(a) anchored to a *foundation* to resist uplift and lateral movement, or
(b) directly anchored to the ground to resist uplift.

(3) Anchorage is not required for platforms described in Sentence (2) that,
(a) are not more than 1 *storey*,
(b) are not more than 55 m^2 in area,
(c) do not support a roof, and
(d) are not attached to another structure, unless it can be demonstrated that differential movement will not adversely affect the performance of that structure.

9.23.6.3. Anchorage of Smaller Buildings

R11.1 **(1)** *Buildings* not more than 4.3 m wide and not more than 1 *storey* in *building height* are permitted to be anchored in conformance with the requirements of CSA Z240.10.1, "Site Preparation, Foundation, and Installation of Buildings".

9.23.7. Sill Plates

9.23.7.1. Size of Sill Plates

(1) Where sill plates provide bearing for the floor system they shall be not less than 38 mm by 89 mm material.

9.23.7.2. Levelling of Sill Plates

(1) Sill plates shall be,
(a) levelled by setting them on a full bed of mortar, or
(b) laid directly on the *foundation* where the top of the *foundation* is level.

(2) The joint between the sill plate for exterior walls and the *foundation* shall be sealed in accordance with Subsection 9.25.3.

9.23.8. Beams to Support Floors

9.23.8.1. Bearing for Beams

(1) Beams shall have even and level bearing and shall have not less than 89 mm length of bearing at end supports, except as required in notes to Tables A-8 to A-11.

Table 9.23.13.11.
Maximum Roof Truss Deflections
Forming Part of Sentence 9.23.13.11.(1)

Truss Span	Type of Ceiling	Maximum Deflection
4.3 m or less	Plaster or gypsum board	1/360 of the span
	Other than plaster or gypsum board	1/180 of the span
Over 4.3 m	Plaster or gypsum board	1/360 of the span
	Other than plaster or gypsum board	1/240 of the span
Column 1	2	3

(2) The joint connections used in trusses described in Sentence (1) shall be designed in conformance with the requirements in Subsection 4.3.1. (See Appendix A.)

(3) Where the length of compression web members in roof trusses described in Sentence (1) exceeds 1.83 m, such web members shall be provided with continuous bracing to prevent buckling.

(4) Bracing required in Sentence (3) shall consist of not less than 19 mm by 89 mm lumber nailed at right angles to the web members near their centres with at least two 63 mm nails for each member.

(5) Where the ability of a truss design to satisfy the requirements of Sentence (1) is demonstrated by testing, it shall consist of a full scale load test carried out in conformance with CSA S307-M, "Load Test Procedure for Wood Trusses for Houses and Small Buildings".

r11.1 **(6)** Where the ability of a truss design to satisfy the requirements of Sentence (1) is demonstrated by analysis, it shall be carried out in accordance with good engineering practice such as described in TPIC, "Truss Design Procedures and Specifications for Light Metal Plate Connected Wood Trusses".

9.23.14. Subflooring

9.23.14.1. Subflooring Required

(1) Subflooring shall be provided beneath finish flooring where the finish flooring does not have adequate strength to support the design loads.

9.23.14.2. Material Standards

(1) Except as provided in Sentence (2), wood-based panels for subfloors shall conform to,
r3 (a) CSA O121, "Douglas Fir Plywood",
(b) CSA O151, "Canadian Softwood Plywood",
r11.1 (c) CSA O153, "Poplar Plywood",
r5 (d) CSA O325, "Construction Sheathing", or
(e) CSA O437.0, "OSB and Waferboard".

(2) Particleboard subflooring may be used only where a *building* is constructed in a factory so that the subfloor will not be exposed to the weather.

(3) Subflooring described in Sentence (2) shall conform to grade D-2 or D-3 in ANSI A208.1, "Particleboard".

(4) Subflooring described in Sentence (2) shall have its upper surface and all edges treated to restrict water absorption where the subfloor is used in bathrooms, kitchens, laundry rooms or other areas subject to periodic wetting. (See Appendix A.)

9.23.14.3. Edge Support

(1) Where the edges of panel-type subflooring are required to be supported, such support shall consist of tongue-and-groove panel edges or not less than 38 mm by 38 mm blocking securely nailed between framing members.

9.23.14.4. Direction of Installation

(1) Plywood subflooring shall be installed with the surface grain at right angles to the joists and with joints parallel to floor joists staggered.

r5 **(2)** OSB subflooring conforming to CSA O325, "Construction Sheathing", or to O-1 and O-2 grades in CSA O437.0, "OSB and Waferboard", and waferboard subflooring conforming to R-1 grade in CSA O437.0 shall be installed so that the direction of face orientation is at right angles to the joists and the joints parallel to the floor joists are staggered. (See Appendix A.)

9.23.14.5. Subfloor Thickness or Rating

(1) Except as provided in Sentences (2) and (3), subfloors shall conform to Table 9.23.14.5.A. or 9.23.14.5.B.

r5 **Table 9.23.14.5.A.**
Thickness of Subflooring
Forming Part of Sentences 9.23.14.5.(1) and 9.23.15.7.(1)

Maximum Spacing of Supports, mm	Plywood and OSB, O-2 Grade Minimum Thickness, mm	OSB, O-1 Grade, and Waferboard, R-1 Grade Minimum Thickness, mm	Particleboard Minimum Thickness, mm	Lumber Minimum Thickness, mm
406	15.5	15.9	15.9	17.0
508	15.5	15.9	19.0	19.0
610	18.5	19.0	25.4	19.0
Column 1	2	3	4	5

r5 **Table 9.23.14.5.B.**
Rating for Subfloor when Applying CSA O325
Forming Part of Sentences 9.23.14.5.(1) and 9.23.15.7.(1)

Maximum Spacing of Supports, mm	Subfloor, Panel Mark	Subfloor Used with Panel-Type Underlay, Panel Mark
406	1F16	2F16
508	1F20	2F20
610	1F24	2F24
Column 1	2	3

(2) Where the finished flooring consists of not less than 19 mm matched wood strip flooring laid at right angles to joists, spaced not more than 610 mm o.c., subflooring shall be permitted to consist of not less than,
(a) 12.5 mm thick plywood,
(b) 12.5 mm thick OSB conforming to O-2 grade,
(c) 12.7 mm thick OSB conforming to O-1 grade,
(d) 12.7 mm thick waferboard conforming to R-1 grade, or
(e) OSB conforming to 2R32 / 2F16 grade.

(3) Except where the flooring consists of ceramic tiles applied with adhesive, where a separate panel-type underlay or concrete topping is applied to a subfloor on joists spaced not more than 406 mm o.c., the subfloor may consist of not less than,
(a) 12.5 mm thick plywood,
(b) 12.5 mm thick OSB conforming to O-2 grade,
(c) 12.7 mm thick OSB conforming to O-1 grade,
(d) 12.7 mm thick waferboard conforming to R-1 grade, or
(e) OSB conforming to 2R32 / 2F16 grade.

9.23.14.6. Annular Grooved Nails

(1) When resilient flooring is applied directly to an OSB, waferboard, particleboard or plywood subfloor, the subfloor shall be fastened to the supports with annular grooved nails.

9.23.14.7. Lumber Subflooring

(1) Lumber subflooring shall be laid at an angle of not less than 45° to the joists.

(2) Lumber subflooring shall be fully supported at the ends on solid bearing.

(3) Lumber for subflooring shall be of uniform thickness and not more than 184 mm wide.

9.23.15. Roof Sheathing

9.23.15.1. Required Roof Sheathing

(1) Except as provided in Section 9.26., continuous lumber or panel-type roof sheathing shall be installed to support the roofing.

9.23.15.2. Material Standards

(1) Wood-based panels used for roof sheathing shall conform to the requirements of,
r3 (a) CSA O121, "Douglas Fir Plywood",
(b) CSA O151, "Canadian Softwood Plywood",
r11.1 (c) CSA O153, "Poplar Plywood",
r5 (d) CSA O325, "Construction Sheathing", or
(e) CSA O437.0, "OSB and Waferboard".

9.23.15.3. Direction of Installation

(1) Plywood roof sheathing shall be installed with the surface grain at right angles to the roof framing.

r5 **(2)** OSB roof sheathing conforming to CSA O325, "Construction Sheathing", or to O-1 and O-2 grades as specified in CSA O437.0, "OSB and Waferboard", shall be installed with the direction of face orientation at right angles to the roof framing members.

9.23.15.4. Joints in Panel-Type Sheathing

(1) Panel-type sheathing board shall be applied so that joints perpendicular to the roof ridge are staggered where,
(a) the sheathing is applied with the surface grain parallel to the roof ridge, and
(b) the thickness of the sheathing is such that the edges are required to be supported.

(2) A gap of not less than 2 mm shall be left between sheets of plywood, OSB or waferboard.

9.23.15.5. Lumber Roof Sheathing

(1) Lumber roof sheathing shall not be more than 286 mm wide and shall be applied so that all ends are supported with end joints staggered.

9.23.15.6. Edge Support

(1) Except as permitted in Sentence (2), where panel-type roof sheathing requires edge support, the support shall consist of,
(a) metal H clips, or
(b) not less than 38 mm by 38 mm blocking securely nailed between framing members.

(2) The supports referred to in Sentence (1) are not required when tongued-and-grooved edged panel-type sheathing board is used.

9.23.15.7. Thickness or Rating

(1) The thickness or rating of roof sheathing on a flat roof used as a walking deck shall conform to either Table 9.23.14.5.A. or Table 9.23.14.5.B. for subfloors.

(2) The thickness or rating of roof sheathing on a roof not used as a walking deck shall conform to either Table 9.23.15.7.A. or Table 9.23.15.7.B.

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Table 9.23.15.7.A.
Thickness of Roof Sheathing
Forming Part of Sentence 9.23.15.7.(2)

Maximum Spacing of Supports, mm	Plywood and OSB, O-2 Grade Edges Supported Minimum Thickness, mm	Plywood and OSB, O-2 Grade Edges Unsupported Minimum Thickness, mm	OSB, O-1 Grade and Waferboard, R-1 Grade Edges Supported Minimum Thickness, mm	OSB, O-1 Grade and Waferboard, R-1 Grade Edges Unsupported Minimum Thickness, mm	Lumber Minimum Thickness, mm
305	7.5	7.5	9.5	9.5	17.0
406	7.5	9.5	9.5	11.1	17.0
610	9.5	12.5	11.1	12.7	19.0
Column 1	2	3	4	5	6

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Table 9.23.15.7.B.
Rating for Roof Sheathing When Applying CSA O325
Forming Part of Sentence 9.23.15.7.(2)

Maximum Spacing of Supports, mm	Panel Mark - Edges Supported	Panel Mark - Edges Unsupported
406	2R16	1R16
508	2R20	1R20
610	2R24	1R24
Column 1	2	3

r11.1 **(3)** Asphalt-coated or asphalt-impregnated fibreboard not less than 11.1 mm thick conforming to CAN/ULC-S706.1, "Wood Fibre Insulating Boards for Buildings", is permitted to be used as a roof sheathing over supports spaced not more than 406 mm o.c., provided the roofing consists of,

(a) a continuous sheet of galvanized steel not less than 0.33 mm in thickness, or

(b) a continuous sheet of aluminum not less than 0.61 mm in thickness.

(4) All edges of sheathing described in Sentence (3) shall be supported by blocking or framing.

9.23.16. Wall Sheathing

9.23.16.1. Required Sheathing

(1) Exterior walls and gable ends shall be sheathed when the *exterior cladding* requires intermediate fastening between supports or if the *exterior cladding* requires solid backing.

9.23.16.2. Thickness, Rating and Material Standards

(1) Where wall sheathing is required for the purpose of complying with this Section, it shall conform to Table 9.23.16.2.A. or Table 9.23.16.2.B.

r11.1 **Table 9.23.16.2.A.**
Wall Sheathing Thickness and Specifications
Forming Part of Sentence 9.23.16.2.(1)

Type of Sheathing	With Supports 406 mm o.c. Minimum Thickness, mm(1)	With Supports 610 mm o.c. Minimum Thickness, mm(1)	Material Standards
Fibreboard (insulating)	9.5	11.1	CAN/ULC-S706.1
Gypsum Sheathing	9.5	12.7	ASTM C1177 / C1177M
			ASTM C1396 / C1396M(2)
Lumber	17.0	17.0	See Table 9.3.2.1.
Mineral Fibre, Rigid Board, Type 2	25	25	CAN/ULC-S702
OSB, O-2 Grade	6.0	7.5	CSA O437.0
OSB, O-1 Grade, and Waferboard, R-1 Grade	6.35	7.9	CSA O437.0
Phenolic, faced	25	25	CAN/CGSB-51.25-M
Plywood (exterior type)	6	7.5	CSA O121
			CSA O151
			CSA O153
Polystyrene, Types 1 and 2	38	38	CAN/ULC-S701.1
Polystyrene, Types 3 and 4	25	25	CAN/ULC-S701.1
Polyurethane and Polyisocyanurate Type 1, faced	38	38	CAN/ULC-S704
Polyurethane and Polyisocyanurate Types 2 and 3, faced	25	25	CAN/ULC-S704
Column 1	2	3	4

Notes to Table 9.23.16.2.A.:

(1) See also Sentences 9.27.5.1.(2) and (3).

(2) The *flame-spread rating* of gypsum board shall be determined in accordance with CAN/ULC-S102, "Test for Surface Burning Characteristics of Building Materials and Assemblies".

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Table 9.23.16.2.B.
Rating For Wall Sheathing When Applying CSA O325
Forming Part of Sentence 9.23.16.2.(1)

Maximum Spacing of Supports, mm	Panel Mark
406	W16
508	W20
610	W24
Column 1	2

9.23.16.3. Attachment of Cladding to Sheathing

(1) Gypsum sheathing, rigid insulation and fibreboard shall not be used for the attachment of siding materials.

(2) Nails used in attaching the materials listed in Sentence (1) shall be not less than 3.2 mm diam with a minimum head diameter of 11 mm.

9.23.16.4. Lumber Sheathing

(1) Lumber wall sheathing shall be applied so that all ends are supported.

(2) Where lumber wall sheathing is required to provide bracing according to Article 9.23.10.2., it shall be applied with end joints staggered.

9.23.16.5. Joints in Panel-Type Sheathing

(1) A gap of not less than 2 mm shall be left between sheets of plywood, OSB, waferboard or fibreboard.

9.23.16.6. Mansard Style Roofs

(1) Where the bottom portions of mansard style roofs are vented, the vertical framing members behind the sloping portions shall be considered on the same basis as exterior wall studs and shall conform to the appropriate requirements in Articles 9.27.3.2. to 9.27.3.6.

Section 9.24. Sheet Steel Stud Wall Framing

9.24.1. General

9.24.1.1. Application

(1) This Section applies to sheet steel studs for use in non-*loadbearing* exterior and interior walls.

(2) Where *loadbearing* steel studs are used, they shall be designed in conformance with Part 4.

9.25.2. Thermal Insulation

9.25.2.1. Required Insulation

(1) All walls, ceilings and floors separating heated space from unheated space, the exterior air or the exterior *soil* shall be provided with thermal insulation in conformance with Section 12.2. to prevent moisture condensation on their room side during the winter and to ensure comfortable conditions for the occupants.

9.25.2.2. Insulation Materials

r11.1 **(1)** Except as required in Sentence (2), thermal insulation shall conform to the requirements of,
(a) ASTM C726, "Mineral Wool Roof Insulation Board,"
(b) CAN/CGSB-51.25-M, "Thermal Insulation, Phenolic, Faced",
(c) CGSB 51-GP-27M, "Thermal Insulation, Polystyrene, Loose Fill",
(d) CAN/ULC-S701.1, "Thermal Insulation, Polystyrene Boards",
(e) CAN/ULC-S702 "Mineral Fibre Thermal Insulation for Buildings",
(f) CAN/ULC-S703, "Cellulose Fibre Insulation for Buildings",
(g) CAN/ULC-S704, "Thermal Insulation, Polyurethane and Polyisocyanurate, Boards, Faced",
(h) CAN/ULC-S705.1, "Thermal Insulation - Spray Applied Rigid Polyurethane Foam, Medium Density - Material - Specification", or
(i) CAN/ULC-S706.1, "Wood Fibre Insulating Boards for Buildings".

(2) The *flame-spread rating* requirements contained in the standards listed in Sentence (1) shall not apply. (See Appendix A.)

(3) Insulation in contact with the ground shall be inert to the action of *soil* and water and be such that its insulative properties are not significantly reduced by moisture.

(4) Type 1 expanded polystyrene insulation as described in CAN/ULC-S701, "Thermal Insulation, Polystyrene, Boards and Pipe Covering", shall not be used as roof insulation applied above the roofing membrane.

9.25.2.3. Installation of Thermal Insulation

(1) Insulation shall be installed so that there is a reasonably uniform insulating value over the entire face of the insulated area.

(2) Insulation shall be applied to the full width and length of the space between furring or framing.

(3) Except where the insulation provides the principal resistance to air leakage, thermal insulation shall be installed so that at least one face is in full and continuous contact with an element with low air permeance. (See Appendix A.)

(4) Insulation on the interior of *foundation* walls enclosing a crawl space shall be applied so that there is not less than a 50 mm clearance above the crawl space floor if the insulation is of a type that may be damaged by water.

(5) Insulation around concrete slabs-on-ground shall be located so that heat from the *building* is not restricted from reaching the ground beneath the perimeter, where exterior walls are not supported by footings extending below frost level.

(6) Where insulation is exposed to the weather and subject to mechanical damage, it shall be protected with not less than,
r11.1 (a) reserved,
(b) 6 mm preservative-treated plywood, or
(c) 12 mm cement parging on wire lath applied to the exposed face and edge.

(7) Except as permitted in Sentence (8), insulation and *vapour barrier* shall be protected from mechanical damage by a covering such as gypsum board, plywood, particleboard, OSB, waferboard or hardboard.

(8) In unfinished *basements*, the protection required in Sentence (7) need not be provided for mineral fibre insulation, provided it is covered with polyethylene *vapour barrier* of at least 0.15 mm in thickness.

(9) Insulation in factory-built *buildings* shall be installed so that it will not become dislodged during transportation.

9.25.2.4. Installation of Loose-Fill Insulation

(1) Except as provided in Sentences (2) to (6), loose-fill insulation shall be used on horizontal surfaces only.

(2) Where loose-fill insulation is installed in an unconfined sloped space, such as an attic space over a sloped ceiling, the supporting slope shall not be more than,
(a) 4.5 in 12 for mineral fibre or cellulose fibre insulation, and
(b) 2.5 in 12 for other types of insulation.

(3) Loose-fill insulation may be used in wood frame walls of existing *buildings*. (See Appendix A.)

(4) Where blown-in insulation is installed in above-ground or below-ground wood frame walls of new *buildings*,
(a) the density of the installed insulation shall be sufficient to preclude settlement,
(b) the insulation shall be installed behind a membrane that will permit visual inspection prior to installation of the interior finish,
(c) the insulation shall be installed in a manner that will not interfere with the installation of the interior finish, and
(d) no water shall be added to the insulation, unless it can be shown that the added water will not adversely affect other materials in the assembly.

(5) Water repellent loose-fill insulation may be used between the outer and inner wythes of masonry *cavity walls*. (See Appendix A.)

(6) Where soffit venting is used, measures shall be taken,
(a) to prevent loose-fill insulation from blocking the soffit vents and to maintain an open path for circulation of air from the vents into the *attic or roof space*, and
(b) to minimize air flow into the loose-fill insulation near the soffit vents to maintain the thermal performance of the material.

9.25.2.5. Installation of Spray-Applied Polyurethane

(1) Spray-applied polyurethane insulation shall be installed in accordance with CAN/ULC-S705.2, "Thermal Insulation – Spray-Applied Rigid Polyurethane Foam, Medium Density – Application".

9.25.3. Air Barrier Systems

9.25.3.1. Required Barrier to Air Leakage

(1) Wall, ceiling and floor assemblies that separate *conditioned spaces* from unconditioned spaces or from the ground shall be constructed so as to include an *air barrier system* that will provide a continuous barrier to air leakage,
(a) from the interior of the *building* into wall, floor, *attic or roof spaces* sufficient to prevent excessive moisture condensation in such spaces during the heating season, and
(b) from the exterior inward sufficient to prevent moisture condensation on the room side during the heating season.
(See Appendix A.)

(2) The continuity of the *air barrier system* shall extend throughout the *basement*.

9.25.4.3. Installation of Vapour Barriers

(1) Products installed to function as the *vapour barrier* shall protect the warm side of wall, ceiling and floor assemblies.

(2) Where different products are used for the *vapour barrier* and the insulation, the *vapour barrier* shall be installed sufficiently close to the warm side of the insulation to prevent condensation at design conditions. (See Appendix A and Appendix Note A-9.25.5.1.(1))

(3) Where the same product is used for the *vapour barrier* and the insulation, the product shall be installed sufficiently close to the warm side of the assembly to prevent condensation at design conditions. (See Appendix Notes A-9.25.4.3.(2), A-9.25.5.1.(1) and A-9.25.5.2.)

9.25.5. Properties and Position of Materials in Building Envelope

9.25.5.1. General (See Appendix A.)

r11.1 **(1)** Except as provided in Sentences (2) to (4), sheet and panel-type materials incorporated into assemblies described in Article 9.25.1.1. shall conform to Article 9.25.5.2. where,

(a) the material has,

(i) an air leakage characteristic less than 0.1 L/(s·m^2) at 75 Pa, and

(ii) a water vapour permeance less than 60 ng/(Pa·s·m^2) when measured in accordance with ASTM E96 / E96M, "Water Vapor Transmission of Materials", using the desiccant method (dry cup), and (See Appendix A.)

(b) the intended use of the interior space where the materials are installed will not result in high moisture generation.

(See Appendix A.)

(2) Where the intended use of the interior space will result in high moisture generation, the assembly shall be designed according to Part 5.

(3) Wood-based sheathing materials not more than 12.5 mm thick and complying with Article 9.23.16.2. need not comply with Sentence (1). (See Appendix A.)

r11.1 **(4)** Sheet and panel-type materials need not comply with Sentence (1) where,

(a) the material has,

(i) a water vapour permeance not less than 30 ng/(Pa·s·m^2), and

(ii) a thermal resistance not less than 0.7 (m^2·K)/W, and

(b) the heating degree-days of the *building* location, in degrees Celsius, are less than 6 000.

9.25.5.2. Position of Low Permeance Materials (See Appendix A.)

(1) Sheet and panel-type materials described in Article 9.25.5.1. shall be installed,

(a) on the warm face of the assembly,

(b) at a location where the ratio between the total thermal resistance of all materials outboard of its innermost impermeable surface and the total thermal resistance of all materials inboard of that surface is not less than that required by Table 9.25.5.2., or

(c) outboard of an air space that is vented to the outdoors.

(2) For walls, the air space described in Clause (1)(c) shall be drained and ventilated and shall be not less than 10 mm deep behind the cladding, over the full height and width of the wall.

Table 9.25.5.2.
Ratio of Outboard to Inboard Thermal Resistance
Forming Part of Sentence 9.25.5.2.(1)

Heating Degree Days of *Building* Location(1), Celsius Degree-Days	Minimum Ratio, Total Thermal Resistance Outboard of Material's Inner Surface to Total Thermal Resistance Inboard of Material's Inner Surface
Up to 4 999	0.20
5 000 to 5 999	0.30
6 000 to 6 999	0.35
7 000 to 7 999	0.40
Column 1	2

Notes to Table 9.25.5.2.:
(1) See MMAH Supplementary Standard SB-1, "Climatic and Seismic Data".

Section 9.26. Roofing

9.26.1. General

r11.1 9.26.1.1. Purpose of Roofing

(1) In this Section,
(a) "roof" means sloped or near-horizontal assemblies that protect the spaces beneath them and includes platforms that effectively serve as roofs with respect to the accumulation or drainage of precipitation, and
(b) "roofing" means the primary covering for roofs.

(See Appendix A.)

r11.1 9.26.1.1A. Required Protection

(1) Roofs shall be protected with roofing, including flashing, installed so as to,
(a) effectively shed water,
(b) prevent the ingress of water and moisture into building assemblies and occupied space, and
(c) minimize the ingress of water due to ice damming into building assemblies.

(2) Compliance with Sentence (1) shall be demonstrated by conforming to,
(a) this Section, or
(b) Part 5.

9.26.1.2. Alternate Installation Methods

(1) Methods described in CAN3-A123.51-M, "Asphalt Shingle Application on Roof Slopes 1:3 and Steeper", or CAN3-A123.52-M, "Asphalt Shingle Application on Roof Slopes 1:6 to Less than 1:3", are permitted to be used for asphalt shingle applications not described in this Section.

9.26.1.3. Solar Collector Systems

(1) A solar collector system is permitted to be installed above roofing materials conforming to Sentence 9.26.2.1.(1).

r11.1 9.26.2. Roofing Materials

9.26.2.1. Material Standards

(1) Where materials used for the preparation of the substrate for roofing are covered in the scope of a standard listed in Table 9.26.2.1.A., they shall conform to that standard.

Table 9.26.2.1.A.
Materials for Preparation of the Substrate for Roofing
Forming Part of Sentence 9.26.2.1.(1)

Type of Material	Standards
Sheathing Membranes	CAN/CGSB-51.32-M, "Sheathing, Membrane, Breather Type"
Primers	CGSB 37-GP-9Ma, "Primer, Asphalt, Unfilled, for Asphalt Roofing, Dampproofing and Waterproofing"
Column 1	2

(2) Where roofing materials are covered in the scope of a standard listed in Table 9.26.2.1.B., they shall conform to that standard.

Table 9.26.2.1.B.
Roofing Materials
Forming Part of Sentence 9.26.2.1.(2)

Type of Roof Covering	Standards
Built-up roofing (BUR)	ASTM D3019, "Lap Cement Used with Asphalt Roll Roofing, Non-Fibered, Asbestos-Fibered, and Non-Asbestos-Fibered" (1) ASTM D4479 / D 4479M, "Asphalt Roof Coatings - Asbestos-Free" CGSB 37-GP-56M, "Membrane, Modified, Bituminous, Prefabricated, and Reinforced for Roofing" CAN/CGSB-37.50-M, "Hot-Applied, Rubberized Asphalt for Roofing and Waterproofing" CAN/CSA-A123.2, "Asphalt-Coated Roofing Sheets" CSA A123.3, "Asphalt Saturated Organic Roofing Felt" CAN/CSA-A123.4, "Asphalt for Constructing Built-Up Roof Coverings and Waterproofing Systems" CSA A123.17, "Asphalt Glass Felt Used in Roofing and Waterproofing"
Single-ply membranes	CAN/CGSB-37.54, "Polyvinyl Chloride Roofing and Waterproofing Membrane" CAN/CGSB-37.58-M, "Membrane, Elastomeric, Cold-Applied Liquid, for Non-Exposed Use in Roofing and Waterproofing" ASTM D4637 / D4637M, "EPDM Sheet Used In Single-Ply Roof Membrane" ASTM D4811, "Nonvulcanized (Uncured) Rubber Sheet Used as Roof Flashing" ASTM D6878 / D6878M, "Thermoplastic Polyolefin Based Sheet Roofing"
Shingles, shakes, tiles, panels	CSA A123.1 / A123.5, "Asphalt Shingles Made From Organic Felt and Surfaced with Mineral Granules / Asphalt Shingles Made From Glass Felt and Surfaced with Mineral Granules" CAN/CSA-A220 Series, "Concrete Roof Tiles" CSA O118.1, "Western Red Cedar Shakes and Shingles" CSA O118.2, "Eastern White Cedar Shingles"
Eave protection	CSA A123.22, "Self-Adhering Polymer Modified Bituminous Sheet Materials Used as Steep Roofing Underlayment for Ice Dam Protection"
Flashing	ASTM D4811 / D4811M, "Nonvulcanized (Uncured) Rubber Sheet Used as Roof Flashing"
Column 1	2

Notes to Table 9.26.2.1.B.:

(1) For the purpose of this Subsection, ASTM D3019, "Lap Cement Used with Asphalt Roll Roofing, Non-Fibered, Asbestos-Fibered, and Non-Asbestos-Fibered", applies only with respect to non-fibered and non-asbestos-fibered (Types I and III) asphalt roll roofing.

9.26.2.2. Installation of Materials

(1) Materials listed in Tables 9.26.2.1.A. and 9.26.2.1.B. shall be installed in conformance with the manufacturer's instructions.

9.26.2.3. Nails

(1) Nails used for roofing shall be corrosion-resistant roofing or shingle nails conforming to,
(a) ASTM F1667, "Driven Fasteners: Nails, Spikes, and Staples", or
(b) CSA B111, "Wire Nails, Spikes and Staples".

(2) Nails shall have sufficient length to penetrate through or 12 mm into roof sheathing.

(3) Nails used with asphalt roofing shall have a head diameter of not less than 9.5 mm and a shank thickness of not less than 2.95 mm.

(4) Nails used with wood shingles or shakes shall have a head diameter of not less than 4.8 mm and a shank thickness of not less than 2.0 mm and shall be stainless steel, aluminum or hot-dipped galvanized. (See Appendix A.)

9.26.2.4. Staples

(1) Staples used to apply asphalt or wood shingles shall be corrosion-resistant and shall be driven with the crown parallel to the eaves.

(2) Staples used with asphalt shingles shall be not less than 19 mm long, 1.6 mm diam or thickness, with not less than a 25 mm crown, except that an 11 mm crown may be used as provided in Sentence 9.26.7.4.(2).

(3) Staples used with wood shingles shall be not less than 29 mm long, 1.6 mm diam or thickness, with not less than a 9.5 mm crown and shall be stainless steel or aluminum.

9.26.3. Slope of Roof Surfaces

9.26.3.1. Slope

(1) Except as provided in Sentences (2) and (3), the slopes on which roof coverings may be applied shall conform to Table 9.26.3.1.

(2) Asphalt and gravel or coal tar and gravel roofs may be constructed with lower slopes than required in Sentence (1) when effective drainage is provided by roof drains located at the lowest points on the roofs.

(3) Profiled metal roof cladding systems specifically designed for low-slope applications are permitted to be installed with lower slopes than required in Sentence (1), provided they are installed in conformance with the manufacturer's written recommendations.

(4) Except where back-slope will not adversely affect adjacent supported or supporting elements due to water ingress, roofs and elements that effectively serve as roofs shall be constructed with sufficient slope away from,
(a) exterior walls, and
(b) *guards* that are connected to the roof, or to an element that effectively serves as a roof, by more than pickets or posts.

(5) The slope required in Sentence (4) shall be sufficient to maintain a positive slope,
(a) after expected shrinkage of the *building* frame, where these surfaces are supported by exterior walls and on exterior columns, and
(b) once design loading is taken into consideration, where these surfaces are cantilevered from exterior walls.

r11.1

Table 9.26.3.1.
Roofing Types and Slope Limits
Forming Part of Sentence 9.26.3.1.(1)

Type of Roofing	Minimum Slope	Maximum Slope
Asphalt Shingles		
Low slope application	1 in 6	no limit
Normal application	1 in 3	no limit
Built-up Roofing		
Asphalt base (without gravel)	1 in 25	1 in 2
Asphalt base (gravelled)	1 in 50(1)	1 in 4
Coal-tar base (gravelled)	1 in 50(1)	1 in 25
Cold process	1 in 25	1 in 1.33
Cedar Shakes	1 in 3	no limit
Clay Tile	1 in 2	no limit
Glass Fibre Reinforced Polyester Roofing Panels	1 in 4	no limit
Modified Bituminous Membranes	1 in 50	1 in 4
Profiled Metal Roofing	1 in 4(2)	no limit
Roll Roofing		
480 mm wide selvage asphalt roofing	1 in 6	no limit
Cold application felt	1 in 50	1 in 1.33
Smooth and mineral surfaced	1 in 4	no limit
Sheet Metal Shingles	1 in 4(2)	no limit
Slate Shingles	1 in 2	no limit
Wood Shingles	1 in 4	no limit
Column 1	2	3

Notes to Table 9.26.3.1.:
(1) See Sentence 9.26.3.1.(2).
(2) See Sentence 9.26.3.1.(3).

9.26.4. Flashing at Intersections

r11.1

9.26.4.1. Required Flashing at Intersections (See Appendix A.)

(1) Except where the omission will not adversely affect adjacent supported or supporting elements, flashing shall be installed at junctions between roofs and,
(a) walls that rise above the roof, and
(b) *guards* that are connected to the roof by other than pickets or posts.

9.26.4.2. Materials

(1) Sheet metal flashing shall consist of not less than,
(a) 1.73 mm thick sheet lead,
(b) 0.33 mm thick galvanized steel,
(c) 0.33 mm thick copper,
(d) 0.35 mm thick zinc, or
(e) 0.48 mm thick aluminum.

9.26.4.3. Valley Flashing

(1) Where sloping surfaces of shingled roofs intersect to form a valley, the valley shall be flashed.

(2) Valley flashing shall be installed over continuous sheathing.

(3) Closed valleys shall not be used with rigid shingles on slopes of less than 1 in 1.2.

(4) Closed valley flashing shall consist of sheet metal, self sealing composite membranes consisting of polyethylene and bituminous material or one layer of either Type S smooth surface roll roofing or Type M mineral surface roll roofing (mineral surface down) not less than 600 mm wide, and nails shall not penetrate the flashing within 75 mm of its edge or 124 mm of the bottom of the valley centreline.

(5) Open valleys shall be flashed with,
(a) at least one layer of sheet metal not less than 600 mm wide, or
(b) no fewer than two layers of roll roofing.

(6) The bottom layer of roofing required in Sentence (4) shall consist of not less than Type S smooth roll roofing or Type M mineral surface roll roofing (mineral surface down) not less than 457 mm wide, centred in the valley and fastened with nails spaced not more than 450 mm o.c. located 25 mm away from the edges.

(7) The top layer of roofing required in Sentence (4) shall consist of not less than Type M mineral surface roll roofing (mineral surface up), 914 mm wide, centred in the valley, applied over a 100 mm wide strip of cement along each edge of the bottom layer, and fastened with a sufficient number of nails to hold it in place until the shingles are applied.

9.26.4.4. Intersection of Shingle Roofs and Masonry

(1) The intersection of shingle roofs and masonry walls or *chimneys* shall be protected with flashing.

(2) Counter flashing required in Sentence (1) shall be embedded not less than 25 mm in the masonry and shall extend not less than 150 mm down the masonry and lap the lower flashing not less than 100 mm.

(3) Flashing along the slopes of a roof described in Sentence (1) shall be stepped so that there is not less than a 75 mm head lap in both the lower flashing and counter flashing.

(4) Where the roof described in Sentence (1) slopes upwards from the masonry, the flashing shall extend up the roof slope to a point equal in height to the flashing on the masonry, but not less than 1.5 times the shingle exposure.

9.26.4.5. Intersection of Shingle Roofs and Walls Other Than Masonry

(1) The intersection of shingle roofs and walls clad with other than masonry shall be protected with flashing.

(2) Flashing required in Sentence (1) shall be installed so that it extends up the wall not less than 75 mm behind the sheathing paper, and extends not less than 75 mm horizontally.

(3) Along the slope of the roof, the flashing required in Sentence (1) shall be stepped with not less than a 75 mm head lap.

9.26.4.6. Intersection of Built-Up Roofs and Masonry

(1) The intersection of built-up roofs with masonry walls or *chimneys* shall have a cant strip at the intersection and a roofing membrane shall be mopped over the cant strip and not less than 150 mm up the wall.

(2) Counter flashing installed over the intersection referred to in Sentence (1) shall be embedded not less than 25 mm in the masonry, and shall be of sufficient length to extend down not less than 150 mm, lapping the membrane on the masonry not less than 100 mm.

9.26.4.7. Intersection of Built-Up Roofs and Walls Other Than Masonry

(1) The intersection of built-up roofs with walls clad with other than masonry shall have a cant strip at the intersection.

(2) The roofing membrane shall be mopped over the cant strip referred to in Sentence (1).

(3) Flashing plies shall extend not less than 150 mm up the wall referred to in Sentence (1) behind the sheathing paper.

9.26.4.8. Chimney Saddles

(1) Except as otherwise permitted in Sentence (5), *chimney* saddles shall be installed where the upper side of a *chimney* on a sloping roof is more than 750 mm wide.

(2) *Chimney* saddles shall be covered with sheet metal or roofing material of weight and quality equivalent to the roofing.

(3) Saddles shall be flashed where they intersect the roof.

(4) The intersection of the saddle and the *chimney* shall be flashed and counterflashed as required in Article 9.26.4.4.

(5) A *chimney* saddle need not be installed if the intersection between the *chimney* and roof is protected by sheet metal flashing that extends up the *chimney* to a height equal to at least one-sixth the width of the *chimney*, but not less than 150 mm, and up the roof slope to a point equal in height to the flashing on the c*himney*, but not less than 1.5 times the shingle exposure.

(6) Flashing described in Sentence (5) at the *chimney* shall be counterflashed as required by Article 9.26.4.4.

9.26.5. Eave Protection for Shingles and Shakes

9.26.5.1. Required Eave Protection

(1) Except as provided in Sentence (2), eave protection shall be provided on shingle, shake or tile roofs, extending from the edge of the roof a minimum of 900 mm up the roof slope to a line not less than 300 mm inside the inner face of the exterior wall.

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Section 9.27. Cladding

9.27.1. Application

9.27.1.1. General

(1) Where lumber, wood shingles, shakes, fibre-cement shingles, planks and sheets, plywood, OSB, waferboard, hardboard, vinyl, aluminum and steel, including trim and soffits, are installed as cladding on wood frame walls exposed to precipitation, the cladding assembly shall comply with,
(a) Subsections 9.27.2. to 9.27.12., or
(b) Part 5.

(2) Where stucco is installed as cladding on wood frame or masonry walls exposed to precipitation, the cladding assembly shall comply with,
(a) Subsections 9.27.2. to 9.27.4., and Section 9.28., or
(b) Part 5.

(3) Where masonry serves as cladding on wood frame or masonry walls exposed to precipitation, the cladding assembly shall comply with,
(a) Subsections 9.27.2. to 9.27.4., and Section 9.20., or
(b) Part 5.

(4) Where asphalt shingles are installed as cladding on wood frame walls exposed to precipitation, the cladding assembly shall comply with,
(a) Subsections 9.26.7. and 9.27.2. to 9.27.4., or
(b) Part 5.

r3.1 **(5)** Where an exterior insulation finish system is installed as cladding on wood-frame, masonry, cold-formed steel stud or cast-in-place concrete walls exposed to precipitation, the cladding assembly shall comply with,
(a) Subsections 9.25.5., 9.27.2. to 9.27.4. and 9.27.13., or
(b) Part 5.
e8 (See Appendix A.)

r3.1 **(6)** Where cladding materials or systems other than those described in Sentences (1) to (5) are installed, or where these are installed on substrates other than those identified in Sentences (1) to (5), the cladding materials or systems and their installation shall comply with Part 5.

9.27.2. Required Protection from Precipitation (See Appendix A.)

9.27.2.1. Minimizing and Preventing Ingress and Damage

(1) Except where exterior walls are protected from precipitation or where it can be shown that ingress will not adversely affect occupant health or safety, exterior walls shall be designed and constructed to,
(a) minimize the ingress of precipitation into the assembly, and
(b) prevent ingress into interior space.
(See Appendix A.)

(2) Except where exterior walls are protected from specific mechanisms of deterioration, such as mechanical impact and ultraviolet radiation, exterior walls shall be designed and constructed to minimize the likelihood of their required performance being reduced to an unacceptable level as a result of those mechanisms.

9.27.2.2. Minimum Protection from Precipitation Ingress

(1) Exterior walls exposed to precipitation shall be protected against ingress of precipitation with an exterior cladding assembly consisting of a first plane of protection and a second plane of protection where the wall encloses spaces of *residential occupancy* or spaces that directly serve spaces of *residential occupancy*. (See Appendix A.)

9.27.2.3. First and Second Planes of Protection

(1) Where walls required to provide protection from precipitation comprise assemblies with first and second planes of protection,

(a) the first plane of protection shall,
  (i) consist of cladding, with appropriate trim, accessory pieces and fasteners, and
  (ii) be designed and constructed to minimize the passage of rain and snow into the wall by minimizing holes and managing precipitation ingress caused by kinetic energy of raindrops, surface tension, capillarity, gravity, and air pressure differences,

(b) the second plane of protection shall be designed and constructed to,
  (i) intercept all precipitation that gets past the first plane of protection, and
  (ii) effectively dissipate any precipitation to the exterior, and

(c) the protection provided by the first and second planes of protection shall be maintained at,
  (i) wall penetrations created by the installation of components and services such as windows, doors, ventilation ducts, piping, wiring and electrical outlets, and
  (ii) the interface with other wall assemblies.

9.27.2.4. Protection of Cladding from Moisture

(1) A clearance of not less than 200 mm shall be provided between finished ground and cladding that is adversely affected by moisture, such as untreated wood, plywood, OSB, waferboard and hardboard.

(2) A clearance of not less than 50 mm shall be provided between a roof surface and cladding that is adversely affected by moisture, such as untreated wood, plywood, OSB, waferboard and hardboard.

9.27.3. Second Plane of Protection

9.27.3.1. Elements of the Second Plane of Protection (See Appendix A.)

(1) The second plane of protection shall consist of a drainage plane with appropriate inner boundary and flashing to dissipate rainwater to the exterior.

r3.1 **(2)** The inner boundary of the drainage plane shall comply with,

(a) Articles 9.27.3.2. to 9.27.3.6., or

(b) Subsection 9.27.13.

(3) The protection provided by the second plane of protection shall be maintained,

(a) at wall penetrations created by the installation of components and services such as windows, doors, ventilation ducts, piping, wiring and electrical outlets, and

(b) at the interface with other wall assemblies.

(4) Flashing material and installation shall comply with Articles 9.27.3.7. and 9.27.3.8.

9.27.3.2. Sheathing Membrane Material Standard

(1) Sheathing membranes shall conform to the performance requirements of CAN/CGSB-51.32-M, "Sheathing, Membrane, Breather Type".

9.27.3.3. Required Sheathing Membrane and Installation

(1) Except as provided in Articles 9.27.3.4. to 9.27.3.6., at least one layer of sheathing membrane shall be applied beneath siding, stucco or masonry veneer.

(2) Sheathing membrane required in Sentence (1) shall be applied so that joints are lapped not less than 100 mm.

(3) Where sheathing membrane required in Sentence (1) is applied horizontally, the upper sheets shall overlap the lower sheets.

9.27.3.4. Insulating Sheathing in Lieu of Sheathing Membrane

(1) Where non-wood-based rigid exterior insulating sheathing, or exterior insulating sheathing with an integral sheathing membrane is installed, a separate sheathing membrane is not required.

(2) Where insulating sheathing is installed as provided in Sentence (1),
(a) sheathing panels subject to moisture deterioration shall be sealed at all joints, and
(b) the joints of sheathing panels not subject to moisture deterioration shall be,
  (i) sealed at all joints, or
  (ii) lapped or tongue and groove, and detailed to ensure drainage of water to the exterior.
(See Appendix A.)

9.27.3.5. Sheathing Membranes in Lieu of Sheathing

(1) Except as provided in Article 9.27.3.6., where no sheathing is used, at least two layers of sheathing membrane shall be applied beneath the cladding. (See Appendix A.)

(2) All joints in the sheathing membrane required in Sentence (1) shall occur over framing, and the membrane shall be fastened to the framing with roofing nails or staples spaced not more than 150 mm along the edges of the outer layer of sheathing paper.

(3) Wall sheathing is permitted to be used in lieu of one layer of sheathing membrane required in Sentence (1), and the thickness need not conform to Table 9.23.16.2.A.

9.27.3.6. Face Sealed Cladding (See Appendix A.)

(1) Sheathing membrane is permitted to be omitted beneath cladding when the joints in the cladding are formed to effectively prevent the passage of wind and rain in conformance with Sentence (2) or (3), as applicable.

(2) Cladding consisting of sheets of plywood, hardboard, OSB, waferboard or fibre cement is considered to meet the requirements of Sentence (1), provided the cladding is applied so that,
(a) all edges are directly supported by framing,
(b) the vertical joints between adjacent sheets are sealed and,
  (i) covered with battens,
  (ii) shiplapped, or
  (iii) otherwise matched to provide weathertight joints, and
(c) the horizontal joints between adjacent sheets are sealed and,
  (i) shiplapped, or
  (ii) otherwise matched to provide weathertight joints.

(3) Metal siding consisting of sheets of metal is considered to meet the requirements of Sentence (1) where the joints between sheets are of the locked-seam type.

9.27.3.7. Flashing Materials

(1) Flashing shall consist of not less than,
(a) 1.73 mm thick sheet lead,
(b) 0.33 mm thick galvanized steel,
(c) 0.46 mm thick copper,
(d) 0.46 mm thick zinc,
(e) 0.48 mm thick aluminum, or
(f) 1.02 mm thick vinyl.

9.27.3.8. Flashing Installation

(1) Except as provided in Sentence (2), flashing shall be installed at,
(a) every horizontal junction between claddings elements,
(b) every horizontal offset in the cladding, and
(c) every horizontal line where the cladding substrates change and where,
  (i) the substrates differ sufficiently for stresses to be concentrated along that line, or
  (ii) the installation of the cladding on the lower substrate may compromise the drainage of moisture from behind the cladding above.

(See Appendix A.)

(2) Flashing need not be installed as described in Sentence (1),
(a) where the upper cladding elements overlap the lower cladding elements by not less than 25 mm,
(b) where,
  (i) the cladding above and below the joint is installed outboard of a drained and vented air space, and
  (ii) the horizontal detail is constructed so as to minimize ingress of precipitation into the air space, or
(c) at horizontal construction joints in stucco, where,
  (i) the joint is finished with an expansion-contraction strip, and
  (ii) the cladding is installed outboard of a drained and vented air space.

(3) Flashing shall be installed over exterior wall openings where the vertical distance from the bottom of the eave to the top of the trim is more than one-quarter of the horizontal overhang of the eave. (See Appendix A.)

(4) Flashing described in Sentences (1) and (3) shall,
(a) extend not less that 50 mm upward inboard of the sheathing membrane or sheathing installed in lieu of the sheathing membrane,
(b) have a slope of not less than 6% toward the exterior after the expected shrinkage of the *building* frame,
(c) terminate at each end with an end-dam,
  (i) with a height in millimetres not less than 25 mm or 1/10 of the value of the 1 in 5 driving rain wind pressure in Pa, and
  (ii) at the height defined in Subclause (i), extending to the face of the adjacent cladding,
(d) lap not less than 10 mm vertically over the *building* element below, and
(e) terminate in a drip extending not less than 5 mm outward from the outer face of the *building* element below.

(See Appendix A.)

(5) Where the sills of windows and doors installed in exterior walls are not self-flashing, flashing shall be installed between the underside of the window or door and the wall construction below. (See Appendix A.)

9.27.4. Sealants

9.27.4.1. Required Sealants

(1) Sealant shall be provided where required to prevent the entry of water into the structure.

(2) Sealant shall be provided between masonry, siding or stucco and the adjacent door and window frames or trim, including sills unless such locations are completely protected from the entry of rain.

(3) Sealant shall be provided at vertical joints between different cladding materials unless the joint is suitably lapped or flashed to prevent the entry of rain.

9.27.4.2. Materials

(1) Sealants shall be,
(a) non-hardening types suitable for exterior use,
(b) selected for their ability to resist the effects of weathering, and
(c) compatible with, and adhere to, the substrate to which they are applied.
(See Appendix A.)

(2) Sealants shall conform to,
(a) ASTM C834, "Latex Sealants",
(b) ASTM C920, "Elastomeric Joint Sealants",
(c) ASTM C1184, "Structural Silicone Sealants", or
(d) ASTM C1311, "Solvent Release Sealants".

(3) Backer rod shall conform to ASTM C1330, "Cylindrical Sealant Backing for Use with Cold Liquid-Applied Sealants".

9.27.5. Attachment of Cladding

9.27.5.1. Attachment

r11.1 **(1)** Except as permitted in Sentences (2), (3) and (4), cladding shall be fastened to the framing members or furring members, or to blocking between the framing members.

(2) Vertical lumber and stucco lath or reinforcing are permitted to be attached to sheathing only where the sheathing consists of not less than,
(a) 14.3 mm lumber,
(b) 12.5 mm plywood, or
(c) 12.5 mm OSB or waferboard.

(3) Vertically applied metal siding and wood shingles and shakes are permitted to be attached to the sheathing only where the sheathing consists of not less than,
(a) 14.3 mm lumber,
(b) 7.5 mm plywood, or
(c) 7.5 mm OSB or waferboard.

r11.1 **(4)** Where wood shingles or shakes are applied to sheathing that is not suitable for attaching the shingles or shakes, the shingles or shakes may be attached to a wood lath not less than 38 mm by 9.5 mm thick securely nailed to the framing and applied as described in Article 9.27.7.5.

9.27.5.2. Blocking

(1) Blocking for the attachment of cladding shall be not less than 38 mm by 38 mm lumber securely nailed to the framing and spaced not more than 610 mm o.c.

9.27.5.3. Furring

r11.1 **(1)** Except as permitted in Sentence 9.27.5.1.(4), furring for the attachment of cladding shall be not less than 19 mm by 38 mm lumber when applied over sheathing.

(2) When applied without sheathing, furring referred to in Sentence (1) shall be not less than,
(a) 19 mm by 64 mm lumber on supports spaced not more than 406 mm o.c., or
(b) 19 mm by 89 mm on supports spaced not more than 610 mm o.c.

(3) Furring referred to in Sentence (1) shall be,
(a) securely fastened to the framing, and
(b) spaced not more than 610 mm o.c.

9.27.5.4. Size and Spacing of Fasteners

(1) Nail or staple size and spacing for the attachment of cladding and trim shall conform to Table 9.27.5.4.

r11.1

Table 9.27.5.4.
Attachment of Cladding
Forming Part of Sentence 9.27.5.4.(1)

Type of Cladding	Minimum Nail or Staple Length, mm	Minimum Number of Nails or Staples	Maximum Nail or Staple Spacing, mm (o.c.)
Wood trim	51	—	600
Lumber siding or horizontal siding made from sheet metal	51	—	600
Metal cladding	38	—	600 (nailed to framing) 400 (nailed to sheathing only)
Wood shakes			
up to 200 mm in width	51	2	—
over 200 mm in width	51	3	—
Wood shingles			
up to 200 mm in width	32	2	—
over 200 mm in width	32	3	—
Panel or sheet type cladding			
up to 7 mm thick	38	—	150 (along edges) 300 (along intermediate supports)
more than 7 mm thick	51	—	
Column 1	2	3	4

9.27.5.5. Fastener Materials

(1) Nails or staples for the attachment of cladding and wood trim shall be corrosion-resistant and shall be compatible with the cladding material.

9.27.5.6. Expansion and Contraction

(1) Fasteners for metal or vinyl cladding shall be positioned to permit expansion and contraction of the cladding.

9.27.5.7. Penetration of Fasteners

(1) Fasteners for shakes and shingles shall penetrate through the nail-holding base or not less than 19 mm into the framing.

(2) Fasteners for cladding other than that described in Sentence (1) shall penetrate through the nail-holding base or not less than 25 mm into the framing.

9.27.6. Lumber Siding

9.27.6.1. Materials

(1) Lumber siding shall be sound, free of knot holes, loose knots, through checks or splits.

9.27.6.2. Thickness and Width

(1) Drop, rustic, novelty, lapped board and vertical wood siding shall be not less than 14.3 mm thick and not more than 286 mm wide.

(2) Bevel siding shall be,
(a) not less than 5 mm thick at the top, and
(b) not less than,
  (i) 12 mm thick at the butt for sidings 184 mm or less in width, and
  (ii) 14.3 mm thick at the butt for sidings wider than 184 mm.

(3) Bevel siding shall be not more than 286 mm wide.

9.27.6.3. Joints

(1) Lumber siding shall prevent water from entering at the joints by the use of lapped or matched joints or by vertical wood battens.

(2) Siding shall overlap not less than 1 mm per 16 mm width of lumber, but not less than,
(a) 9.5 mm for matched siding,
(b) 25 mm for lapped bevel siding, or
(c) 12 mm for vertical battens.

9.27.7. Wood Shingles and Shakes

9.27.7.1. Materials

(1) Shingles and shakes shall conform to,
(a) CSA O118.1, "Western Red Cedar Shakes and Shingles", or
(b) CSA O118.2-M, "Eastern White Cedar Shingles".

(2) Western cedar shakes shall be not less than No. 1 grade or Handsplit grade, and western cedar shingles not less than No. 2 grade, except that No. 3 grade may be used for undercoursing.

(3) Eastern white cedar shakes shall be at least B (clear) grade, except that C grade may be used for undercoursing.

9.27.7.2. Width

(1) Shingles and shakes shall be not less than 65 mm or more than 350 mm wide.

9.27.7.3. Fasteners

(1) Shingles or shakes shall be fastened with nails located approximately 20 mm from each edge and not less than 25 mm above the exposure line for single-course applications, or approximately 50 mm above the butt for double-course applications.

9.27.7.4. Offsetting of Joints

(1) In single-course application, joints in succeeding courses shall be offset at least 40 mm so that joints in any two of three consecutive courses are staggered.

(2) In double-course application, joints in the outer course shall be offset from joints in the under-course by not less than 40 mm, and joints in succeeding courses shall be offset not less than 40 mm.

9.27.7.5. Fastening to Lath

es **(1)** When lath is used with double-course application (see Sentence 9.27.5.1.(4)), it shall be spaced according to the exposure and securely fastened to the framing.

(2) The butts of the under-course of the application referred to in Sentence (1) shall rest on the top edge of the lath.

(3) The outer course of the application referred to in Sentence (1) shall be fastened to the lath with nails of sufficient length to penetrate through the lath.

(4) The butts of the shingles or shakes shall be so located that they project not less than 12 mm below the bottom edge of the lath referred to in Sentence (1).

(5) If wood lath is not used, the butts of the under-course shingles or shakes of the application referred to in Sentence (1) shall be located 12 mm above the butts of the outer course.

9.27.7.6. Exposure and Thickness

(1) The exposure and butt thickness of shingles and shakes shall conform to Table 9.27.7.6.

Table 9.27.7.6.
Exposure and Thickness of Wood Shingles and Shakes
Forming Part of Sentence 9.27.7.6.(1)

Shake or Shingle Length, mm	Maximum Exposure, mm		Minimum Butt Thickness, mm
	Single Coursing	Double Coursing	
400	190	305	10
450	216	356	11
600	292	406	13
Column 1	2	3	4

9.27.8. Plywood

9.27.8.1. Material Standards

(1) Plywood cladding shall be exterior type conforming to,

r11.1 (a) ANSI/HPVA HP-1, "Hardwood and Decorative Plywood",

r3 (b) CSA O121, "Douglas Fir Plywood",

(c) CSA O151, "Canadian Softwood Plywood", or

r11.1 (d) CSA O153, "Poplar Plywood".

9.27.8.2. Thickness

(1) Plywood cladding shall be not less than 6 mm thick when applied directly to sheathing.

(2) When applied directly to framing or over furring strips, plywood cladding thickness shall conform to Table 9.27.8.2.

(3) The thickness of grooved or textured plywood shall be measured at the point of least thickness.

Table 9.27.8.2.
Minimum Plywood Cladding Thickness
Forming Part of Sentence 9.27.8.2.(2)

Spacing of Supports, mm	Minimum Thickness, mm, where Face Grain Parallel to Supports	Minimum Thickness, mm, where Face Grain at Right Angles to Supports
406	8	6
610	11	8
Column 1	2	3

9.27.8.3. Edge Treatment

(1) The edges of plywood cladding shall be treated with a suitable paint or sealer.

9.27.8.4. Panel Cladding

(1) Plywood applied in panels shall have all edges supported.

(2) Not less than a 2 mm gap shall be provided between panels referred to in Sentence (1).

(3) Vertical joints in cladding referred to in Sentence (1) shall be protected with batten strips or caulking when the plywood joints are not matched.

(4) Horizontal joints in cladding referred to in Sentence (1) shall be lapped not less than 25 mm or shall be suitably flashed.

9.27.8.5. Lapped Strip Siding

(1) Plywood applied in horizontal lapped strips shall have not less than a 2 mm gap provided at the butted ends, which shall be caulked.

(2) The horizontal joints of siding described in Sentence (1) shall be lapped not less than 25 mm.

(3) Wedges shall be inserted under all vertical butt joints and at all corners when horizontal lapped plywood is applied without sheathing.

9.27.9. Hardboard

9.27.9.1. Material Standards

(1) Factory-finished hardboard cladding shall conform to CAN/CGSB-11.5M, "Hardboard, Precoated, Factory-Finished, for Exterior Cladding".

(2) Hardboard cladding that is not factory finished shall conform to Types 1, 2 or 5 in CAN/CGSB-11.3-M, "Hardboard".

9.27.9.2. Thickness

(1) Type 1 or 2 hardboard cladding shall be not less than,
(a) 6.0 mm thick when applied over sheathing that provides continuous support, and
(b) 7.5 mm thick when applied to furring or framing members not more than 406 mm o.c.

(2) Type 5 hardboard cladding shall be not less than 9.0 mm thick when applied over sheathing that provides continuous support or over furring or framing members spaced not more than 406 mm o.c.

(3) Where hardboard cladding is grooved, the grooves shall not extend more than 1.5 mm into the minimum required thickness. (See Appendix A.)

9.27.9.3. Panel Cladding

(1) Hardboard cladding applied in panels shall have all edges supported with not less than a 5 mm gap provided between sheets.

(2) Vertical joints in cladding described in Sentence (1) shall be protected with batten strips or caulking when the joints are not matched.

(3) Horizontal joints in cladding described in Sentence (1) shall be lapped not less than 25 mm or shall be suitably flashed.

9.27.9.4. Lapped Strip Siding

(1) Hardboard applied in horizontal lapped strips shall have not less than a 5 mm gap provided at the butted ends, which shall be caulked or otherwise protected with suitable mouldings.

(2) The horizontal joints of siding described in Sentence (1) shall overlap not less than 1 mm per 16 mm width of siding board but not less than 9.5 mm for matched joint siding or 25 mm for lapped siding.

9.27.9.5. Clearance

(1) Not less than 3 mm clearance shall be provided between hardboard siding and door or window frames.

9.28.2. Stucco Materials

9.28.2.1. Portland Cement

r11.1 **(1)** Portland cement shall conform to CSA A3001, "Cementitious Materials for Use in Concrete".

9.28.2.2. Aggregate

(1) Aggregate shall be clean, well-graded natural sand or sand manufactured from crushed stone, gravel or air-cooled blast furnace slag and shall contain no significant amounts of deleterious material.

(2) Aggregate grading shall conform to Table 9.28.2.2.

Table 9.28.2.2.
Aggregate Grading for Stucco
Forming Part of Sentence 9.28.2.2.(2)

Sieve Sizes, mm	% Aggregate Passing Sieve	
	Maximum	Minimum
4	—	100
2	—	90
1	90	60
0.5	60	45
0.25	30	10
0.125	5	—
Column 1	2	3

9.28.2.3. Water

(1) Water shall be clean and free of significant amounts of deleterious material.

9.28.3. Fasteners

9.28.3.1. Materials

(1) Fasteners for stucco lath or reinforcing shall be corrosion-resistant and of a material other than aluminum.

9.28.3.2. Nails and Staples

(1) Nails for stucco lath or reinforcing shall be not less than 3.2 mm diam with a head diameter of not less than 11.1 mm.

(2) Staples for stucco lath reinforcing shall be not less than 1.98 mm diam or thickness.

(3) Staples and nails for attaching stucco lath or reinforcing to vertical surfaces shall be of sufficient length to penetrate 25 mm into framing members or to the full depth of the sheathing where the sheathing is used for attachment.

(4) On horizontal surfaces nails for stucco lath or reinforcing shall be not less than 38 mm long.

9.28.4. Stucco Lath

9.28.4.1. Materials

(1) Rib lath or expanded metal stucco mesh shall be,
(a) copper-alloy steel coated with rust-inhibitive paint after fabrication, or
(b) galvanized.

(2) Woven or welded wire mesh shall be galvanized.

9.28.4.2. No Sheathing Required

(1) Sheathing need not be provided beneath stucco where not less than 1.19 mm diam galvanized wire is applied horizontally to the framing at vertical intervals not exceeding 150 mm, or where paper-backed welded wire metal lath is used.

9.28.4.3. Stucco Lath Specifications

(1) Stucco lath shall conform to Table 9.28.4.3.

Table 9.28.4.3.
Stucco Lath(1)
Forming Part of Sentence 9.28.4.3.(1)

Location	Type of Lath	Minimum Diam of Wire, mm	Maximum Mesh Opening	Minimum Mass, kg/m^2
Vertical surfaces	Welded or woven wire	1.15	25 mm	—
		1.30	38 mm	—
		1.50	51 mm	—
	Stucco mesh reinforcing (expanded metal)	—	25.8 cm^2	0.98
Horizontal surfaces	9.5 mm rib lath	—	—	1.84
	Cedar lath	—	—	—
Column 1	2	3	4	5

Notes to Table 9.28.4.3.
(1) See Appendix A.

9.28.4.4. Self-Furring Devices

(1) Stucco lath shall be held not less than 6 mm away from the backing by means of suitable self-furring devices.

9.28.4.5. Application of Stucco Lath

(1) Stucco lath shall be applied with the long dimension horizontal.

(2) Horizontal and vertical joints in stucco lath shall be lapped not less than 50 mm.

(3) End joints of stucco lath shall be staggered and shall occur over framing members.

(4) External corners of stucco lath shall be reinforced with a vertical strip of lath or reinforcing extending not less than 150 mm on both sides of the corner, or the lath or reinforcing shall extend around corners not less than 150 mm.

9.29.7. Hardboard Finish

9.29.7.1. Material Standard

(1) Hardboard shall conform to CAN/CGSB-11.3-M, "Hardboard".

9.29.7.2. Thickness

(1) Hardboard shall be not less than,
(a) 3 mm thick where applied over continuous back-up,
(b) 6 mm thick where applied to supports spaced not more than 406 mm o.c., and
(c) 9 mm thick where applied to supports spaced not more than 610 mm o.c.

9.29.7.3. Nails

(1) Nails for fastening hardboard shall be casing or finishing nails not less than 38 mm long, spaced not more than 150 mm o.c. along edge supports and 300 mm o.c. along intermediate supports.

9.29.7.4. Edge Support

(1) All hardboard edges shall be supported by furring, blocking or framing where the back-up is not continuous.

9.29.8. Insulating Fibreboard Finish

9.29.8.1. Material Standard

r11.1 **(1)** Insulating fibreboard shall conform to CAN/ULC-S706.1, "Wood Fibre Insulating Boards for Buildings".

9.29.8.2. Thickness

(1) Insulating fibreboard sheets shall be not less than 11.1 mm thick on supports not more than 406 mm o.c.

(2) Insulating fibreboard tile shall be not less than 12.7 mm thick on supports spaced not more than 406 mm o.c.

9.29.8.3. Nails

(1) Nails for fastening fibreboard sheets shall be not less than 2.6 mm shank diameter casing or finishing nails of sufficient length to penetrate not less than 20 mm into the supports.

(2) Nails shall be spaced not more than 100 mm o.c. along edge supports and 200 mm o.c. along intermediate supports.

9.29.8.4. Edge Support

(1) All fibreboard edges shall be supported by blocking, furring or framing.

9.29.9. Particleboard, OSB or Waferboard Finish

9.29.9.1. Material Standard

(1) Particleboard finish shall conform to ANSI A208.1, "Particleboard".

(2) OSB or waferboard finish shall conform to,

r5 (a) CSA O325, "Construction Sheathing", or

(b) CSA O437.0, "OSB and Waferboard".

9.29.9.2. Minimum Thickness

(1) Except as provided in Sentences (2) and (3), the minimum thickness of O-2 grade OSB used as an interior finish shall conform to that shown for plywood in Table 9.29.6.1.

(2) Thickness listed in Table 9.29.6.1. shall permit a manufacturing tolerance of -0.4 mm.

(3) No minimum thickness is required where O-2 grade OSB is applied over continuous backing.

(4) OSB conforming to O-1 grade, waferboard conforming to R-1 grade and particleboard shall be,

(a) not less than 6.35 mm thick on supports not more than 406 mm o.c.,

(b) not less than 9.5 mm thick on supports not more than 610 mm o.c., and

(c) not less than 6.35 mm thick on supports not more than 610 mm o.c. in walls where blocking is provided at midwall height.

r5 **(5)** OSB conforming to CSA O325, "Construction Sheathing", shall meet the minimum panel mark of,

(a) W16, on supports not more than 406 mm o.c.,

(b) W24, on supports not more than 610 mm o.c., and

(c) W16, on supports not more than 610 mm o.c. where blocking is provided at midwall height.

9.29.9.3. Nails

(1) Nails for fastening particleboard, OSB or waferboard shall be not less than 38 mm casing or finishing nails spaced not more than 150 mm o.c. along edge supports and 300 mm o.c. along intermediate supports.

9.29.9.4. Edge Support

(1) All particleboard, OSB or waferboard edges shall be supported by furring, blocking or framing.

9.29.10. Wall Tile Finish

9.29.10.1. Tile Application

(1) Ceramic tile shall be set in a mortar base or applied with an adhesive.

(2) Plastic tile shall be applied with an adhesive.

9.29.10.2. Mortar Base

(1) When ceramic tile is applied to a mortar base the cementitious material shall consist of one part Portland cement to not more than one-quarter part lime by volume.

(2) The cementitious material described in Sentence (1) shall be mixed with no fewer than three nor more than five parts of aggregate per part of cementitious material by volume.

(3) Mortar shall be applied over metal lath or masonry.

(4) Ceramic tile applied to a mortar base shall be thoroughly soaked and pressed into place forcing the mortar into the joints while the tile is wet.

9.29.10.3. Adhesives

(1) Adhesives to attach ceramic and plastic tile shall be applied to the finish coat or brown coat of plaster that has been steel-trowelled to an even surface or to gypsum board or to masonry provided the masonry has an even surface.

9.29.10.4. Moisture Resistant Backing

(1) Ceramic and plastic tile installed on walls around bathtubs or showers shall be applied over moisture resistant backing.

9.29.10.5. Joints Between Tiles and Bathtub

(1) The joints between wall tiles and a bathtub or shower shall be suitably caulked with material conforming to CAN/CGSB-19.22-M, "Mildew Resistant Sealing Compound for Tubs and Tile".

Section 9.30. Flooring

9.30.1. General

9.30.1.1. Required Finish Flooring

(1) Finished flooring shall be provided in all *residential occupancies*.

9.30.1.2. Water Resistance

(1) Finished flooring in bathrooms, kitchens, public entrance halls, laundry and general storage areas shall consist of resilient flooring, felted-synthetic-fibre floor coverings, concrete, terrazzo, ceramic tile, mastic or other types of flooring providing similar degrees of water resistance. (See Appendix A.)

9.30.1.3. Sleepers

(1) Wood sleepers supporting finished flooring over a concrete base supported on the ground shall be not less than 19 mm by 38 mm and shall be treated with a wood preservative.

9.30.1.4. Finish Quality

(1) Finished flooring shall have a surface that is smooth, even and free from roughness or open defects.

9.30.2. Panel-Type Underlay

9.30.2.1. Required Underlay

(1) A panel-type underlay shall be provided under resilient flooring, parquet flooring, ceramic tile, felted-synthetic-fibre floor coverings or carpeting laid over lumber subflooring.

(2) A panel-type underlay shall be provided under resilient flooring, parquet flooring, felted-synthetic-fibre floor coverings or carpeting on panel-type subflooring whose edges are unsupported.

(3) Panel-type underlay shall be provided under ceramic tile applied with adhesive.

(4) Panel-type underlay shall be provided under resilient flooring on waferboard or strandboard subflooring.

9.30.2.2. Materials and Thickness

(1) Panel-type underlay shall be not less than 6 mm thick and shall conform to,
(a) ANSI A208.1, "Particleboard",
(b) CAN/CGSB-11.3-M, "Hardboard",
r11.1 (c) ANSI/HPVA HP-1, "Hardwood and Decorative Plywood",
r3 (d) CSA O121, "Douglas Fir Plywood",
(e) CSA O151, "Canadian Softwood Plywood",
r11.1 (f) CSA O153, "Poplar Plywood", or
(g) CSA O437.0, "OSB and Waferboard".

9.30.2.3. Fastening

(1) Panel-type underlay shall be fastened to the subfloor with staples, annular grooved flooring nails or spiral nails, spaced not more than 150 mm o.c. along the edges and 200 mm o.c. both ways at other locations.

(2) Nails for panel-type underlay shall be not less than 19 mm long for 6 mm thick underlay and 22 mm long for 7.9 mm thick underlay.

(3) Staples for panel-type underlay shall,
(a) have not less than a 1.2 mm shank diameter or thickness with a 4.7 mm crown, and
(b) be not less than,
  (i) 22 mm long for 6 mm underlay, and
  (ii) 28 mm long for 7.9 mm and 9.5 mm underlay.

9.30.2.4. Joints Offset

(1) Where panel-type underlay is required to be installed over plywood, or OSB or waferboard, the joints in the underlay shall be offset at least 200 mm from the joints in the underlying subfloor.

9.30.2.5. Surface Defects

(1) Underlay beneath resilient or ceramic floors applied with an adhesive shall have all holes or open defects on the surface patched so that the defects will not be transmitted to the finished surface.

9.30.3. Wood Strip Flooring

9.30.3.1. Thickness

(1) The thickness of wood strip flooring shall conform to Table 9.30.3.1.

Table 9.30.3.1.
Thickness of Wood Strip Flooring
Forming Part of Sentence 9.30.3.1.(1)

Type of Flooring	Maximum Joist Spacing, mm	Minimum Thickness of Flooring, mm	
		With Subfloor	No Subfloor
Matched hardwood (interior use only)	406	7.9	19.0
	610	7.9	33.3
Matched softwood (interior or exterior use)	406	19.0	19.0
	610	19.0	31.7
Square edge softwood (exterior use only)	406	—	25.4
	610	—	38.1
Column 1	2	3	4

9.30.3.2. Strip Direction and End Joints

(1) Wood strip flooring shall not be laid parallel to lumber subflooring unless a separate underlay is provided.

(2) If wood strip flooring is applied without a subfloor, it shall be laid at right angles to the joists so that the end joints are staggered and occur over supports or are end matched.

(3) If the flooring is end matched, it shall be laid so that no two adjoining strips break joints in the same space between supports and each strip bears on no fewer than two supports.

9.30.3.3. Nailing

(1) When nails are used, wood strip flooring shall be toe nailed or face nailed with at least one nail per strip at the spacings shown in Table 9.30.3.3., except that face nailed strips of more than 25 mm in width shall have at least two nails per strip.

(2) Face nails shall be countersunk.

Table 9.30.3.3.
Nailing of Wood Strip Flooring
Forming Part of Sentence 9.30.3.3.(1)

Finish Floor Thickness, mm	Minimum Length of Flooring Nails, mm	Maximum Spacing of Flooring Nails, mm
7.9	38(1)	200
11.1	51	300
19.0	57	400
25.4	63	400
31.7	70	600
38.1	83	600
Column 1	2	3

Notes to Table 9.30.3.3.:
(1) See Article 9.30.3.4.

9.30.3.4. Staples

(1) Staples are permitted to be used to fasten wood strip flooring not more than 7.9 mm in thickness and not more than 50 mm in width provided the staples,
(a) are not less than 29 mm long,
(b) have a shank diameter of not less than 1.19 mm,
(c) have a crown of not less than 4.7 mm, and
(d) are spaced not more than 400 mm o.c.

(2) Staples are permitted to be used to fasten wood strip flooring not more than 19 mm in thickness and not more than 83 mm in width provided the staples,
(a) are not less than 51 mm long,
(b) have a shank diameter of not less than 1.82 mm,
(c) have a crown of not less than 12.7 mm, and
(d) are spaced not more than 400 mm o.c.

9.30.4. Parquet Flooring

9.30.4.1. Adhesive

(1) Adhesive used to attach parquet block flooring shall be suitable for bonding wood to the applicable subfloor material.

9.30.5. Resilient Flooring

9.30.5.1. Materials

r11.1 **(1)** Resilient flooring used on concrete slabs supported on ground shall consist of asphalt, rubber, unbacked vinyl or vinyl with an inorganic type backing.

(2) Flooring described in Sentence (1) shall be attached to the base with a suitable waterproof and alkali-resistant adhesive.

(3) Where the *building* is in a location where the spectral response acceleration, $S_a(0.2)$, is greater than 0.55, *service water heaters* shall be secured to the structure to resist overturning and displacement. (See Appendix A.)

9.31.6.3. Corrosion-Resistant Coating

(1) Where storage tanks for *service water heaters* are steel, they shall be coated with zinc, vitreous enamel (glass lined), hydraulic cement or other corrosion-resistant material.

9.31.6.4. Fuel-Burning Heaters

(1) Fuel-burning *service water heaters* shall be connected to a *chimney flue* conforming to Section 9.21.

9.31.6.5. Heating Coils

(1) Heating coils of *service water heaters* shall not be installed in a *flue* or in the combustion chamber of a *boiler* or furnace heating a *building*.

Section 9.32. Ventilation

9.32.1. General

9.32.1.1. Application

r6 **(1)** This Section applies to the ventilation of rooms and spaces in *residential occupancies* by natural ventilation and to self-contained mechanical ventilation systems serving a *house* or an individual *dwelling unit*.

r6 **(2)** Mechanical ventilation systems, other than self-contained systems serving a *house* or an individual *dwelling unit*, shall conform to Part 6.

(3) Ventilation of rooms and spaces in other than *residential occupancies* shall conform to Part 6.

(4) A *storage garage* for more than five cars shall be ventilated in accordance with Part 6.

r11.1 **(5)** A clothes dryer *exhaust duct* system shall conform to Article 9.32.1.4. or Part 6.

9.32.1.2. Mechanical Ventilation for Dwelling Units

(1) Every *dwelling unit* that is supplied with electrical power shall be provided with a mechanical ventilation system in accordance with Subsection 9.32.3.

9.32.1.3. Ventilation of Rooms and Spaces

r6 **(1)** Except as permitted in Sentence (2), rooms or spaces in a *residential occupancy* shall be ventilated by natural means in accordance with Subsection 9.32.2.

(2) The natural ventilation of rooms or spaces required in Sentence (1) may be provided by mechanical means.

(3) Where a room or space is not provided with natural ventilation as described in Sentence (1), mechanical ventilation shall be provided to exhaust inside air from or to introduce outside air to that room or space at the rate of one-half air change per hour if the room or space is mechanically cooled in summer, and one air change per hour if it is not.

r11.1 ### 9.32.1.4. Venting of Laundry-Drying Equipment

(1) *Exhaust ducts* or vents connected to laundry-drying equipment shall discharge directly to the outdoors.

(2) *Exhaust ducts* connected to laundry-drying equipment shall be,
(a) independent of other *exhaust ducts*,
(b) accessible for cleaning, and
(c) constructed of a smooth corrosion-resistant material.

(3) Where collective venting of multiple installations of laundry-drying equipment is used, the ventilation system shall,
(a) be connected to a common *exhaust duct* that is vented by one central exhaust fan and incorporates one central lint trap,
(b) include an interlock to activate the central exhaust fan when laundry-drying equipment is in use, and
(c) where required by Article 9.32.3.8., be provided with make-up air.

9.32.2. Natural Ventilation

9.32.2.1. Natural Ventilation Area

r6 **(1)** The unobstructed openable ventilation area to the outdoors for rooms and spaces in a *residential occupancy* ventilated by natural means shall conform to Table 9.32.2.1.

(2) Where a vestibule opens directly off a living or dining room within a *dwelling unit*, ventilation to the outdoors for such rooms may be through the vestibule.

Table 9.32.2.1.
Natural Ventilation
Forming Part of Sentence 9.32.2.1.(1)

Location		Minimum Unobstructed Area
Within a *dwelling unit*	Bathrooms or water closet rooms	0.09 m²
	Unfinished *basement* space	0.2 percent of the floor area
	Dining rooms, living rooms, bedrooms, kitchens, combined rooms, dens, recreation rooms and all other finished rooms	0.28 m² per room or combination of rooms
Other than within a *dwelling unit*	Bathrooms or water closet rooms	0.09 m² per water closet
	Sleeping areas	0.14 m² per occupant
	Laundry rooms, kitchens, recreation rooms	4 percent of the floor area
	Corridors, storage rooms and other similar public rooms or spaces	2 percent of the floor area
	Unfinished *basement* space not used on a shared basis	0.2 percent of the floor area
Column 1	2	3

9.32.2.2. Protection from Weather and Insects

(1) Openings for natural ventilation other than windows shall be constructed to provide protection from the weather and insects.

(2) Screening shall be of rust-proof material.

9.32.3. Mechanical Ventilation (See Appendix A.)

9.32.3.1. General

(1) For the purposes of this Subsection a non-solid fuel-fired *appliance* shall be classified as,

(a) direct vented whereby the combustion air is supplied directly from the outdoors to the combustion chamber via a sealed passageway, and the products of combustion are exhausted directly outdoors through an independent sealed vent,

(b) mechanically vented induced draft whereby combustion air is supplied from within the *building* envelope and the products of combustion are positively conveyed to the outdoors by means of a dedicated sealed vent, or

(c) natural draft whereby combustion air is supplied from within the *building* envelope and the products of combustion are conveyed to the outdoors through a *chimney* or Type B vent.

r6 **(2)** For the purposes of this Subsection, a *dwelling unit* shall be categorized as,

(a) Type I when,

(i) all fuel-fired combustion *appliances* serving the *dwelling unit* are direct vented or, except for fireplaces, are mechanically vented induced draft, and

(ii) the *dwelling unit* is not served by a solid fuel-fired combustion *appliance*,

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(5) A *supply duct* from the outdoors to the heat recovery ventilator required in Sentence (3) and a main distribution trunk duct shall be provided and shall be sized according to Part 6, except that the *supply duct* and the main distribution trunk duct may be sized according to Table 9.32.3.7.A. where,
(a) the total duct length from the outdoor hood to any supply register does not exceed 21 m, and
(b) the total number of fittings does not exceed 8.

Table 9.32.3.7.A.
Minimum Outdoor Air Supply and Main Trunk Duct Sizes
Forming Part of Sentence 9.32.3.7.(5)

Number of Bedrooms in *Dwelling Unit*	Minimum Outdoor Air Supply and Main Distribution Trunk Duct Diameter, mm
1	150
2	150
3	175
4	175
5	175
More than 5	System must comply with Sentence 6.2.1.1.(1)
Column 1	2

(6) The outside air *supply duct* required by Sentence (5) shall not be considered to provide combustion and/or dilution air to fuel-burning *appliances*.

(7) Branch *supply ducts* leading from the main distribution trunk duct required by Sentence (5) to the rooms to which outdoor air is to be distributed shall be provided and shall be sized according to Part 6, except that the branch *supply ducts* may be sized according to Table 9.32.3.7.B. where,
(a) the total duct length from the outdoor hood to any supply register does not exceed 21 m, and
(b) the total number of fittings does not exceed 8.

Table 9.32.3.7.B.
Minimum Branch Supply Duct Sizes
Forming Part of Sentence 9.32.3.7.(7)

Room, Space or *Storey* Served	Minimum Branch *Supply Duct* Diameter, mm	
	1 and 2 Bedroom *Dwelling Units*	3, 4 and 5 Bedroom *Dwelling Units*
Master bedroom	100	100
Other bedrooms	75	75
Storey with no bedrooms or living area	75	100
Column 1	2	3

(8) In applying Sentence (7), where the *dwelling unit* has more than 5 bedrooms, ducting shall be sized according to Part 6.

(9) All branch *supply ducts* that are not fitted with diffusers with adjustable balance stops shall be supplied with accessible dampers that can be adjusted and fixed in their adjusted positions and that include devices to indicate the positions of the dampers.

(10) Provision shall be made for the free flow of air to all rooms by leaving gaps beneath doors, using louvred doors or installing grilles in doors.

9.32.3.8. Protection Against Depressurization

(1) When determining the need to provide protection against depressurization, consideration must be given to,
(a) whether the presence of *soil* gas is deemed to be a problem, and
(b) the presence of solid fuel-fired combustion *appliances*.

(2) Where a solid fuel-fired combustion *appliance* is installed, the ventilation system shall include a heat recovery ventilator that is designed to operate so that the flow of exhaust air does not exceed the flow of intake air in any operating mode, and that complies with the requirements of Article 9.32.3.11.

(3) The provision of make-up air is not required for mechanical exhausting devices operating a subfloor depressurization system installed for the purpose of reducing the risk of radon ingress.

9.32.3.9. Fan Ratings

(1) Except as provided in Sentence (4), capacity ratings for required fans shall be determined in accordance with,
(a) CAN/CSA-C260-M, "Rating the Performance of Residential Mechanical Ventilating Equipment", or
(b) HVI 916, "Airflow Test Procedure".

(2) Sound ratings for required fans shall be determined in accordance with,
(a) CAN/CSA-C260-M, "Rating the Performance of Residential Mechanical Ventilating Equipment", or
r11.1 (b) HVI 915, "Loudness Testing and Rating Procedure".

(3) Capacity ratings for required fans shall be based on a static pressure differential of 50 Pa, 25 Pa or 7.5 Pa depending on whether the fan is installed with ductwork connected on both sides, one side or neither side, respectively.

(4) Except for heat recovery ventilators, exhaust fans required to make up any part of the total ventilation capacity required by Article 9.32.3.3. shall have a sound rating not greater than that specified in Table 9.32.3.9.

Table 9.32.3.9.
Fan Sound Rating
Forming Part of Sentence 9.32.3.9.(4)

Fan Application	Maximum Sound Rating, sones	
	Rated according to CAN/CSA-C260-M	Rated according to HVI 915
Principal exhaust fan	2.0	2.5
Supplemental exhaust fans installed in bathrooms and water closet rooms and their make-up air fans	2.5	3.5
Supplemental exhaust fans installed in kitchens and their make-up air fans	no rating required	no rating required
Column 1	2	3

(5) Required fans shall be installed according to the manufacturer's instructions.

r5 **(6)** Mechanical ventilation devices shall conform to CSA C22.2 No. 113, "Fans and Ventilators".

9.32.3.10. Ducts

(1) Ventilation ducts shall conform to the requirements of Part 6 for *supply ducts*, except that *exhaust ducts* that serve only a bathroom or water closet room may be of *combustible* material provided the duct is reasonably airtight and constructed of a material impervious to water.

(2) *Exhaust ducts* shall not discharge into heated or unheated enclosed spaces.

(3) Where an *exhaust duct* passes through or is adjacent to unheated space, the duct shall be insulated to not less than RSI 0.5.

Section 9.35. Garages and Carports

9.35.1. Scope

9.35.1.1. Application

r6 **(1)** This Section applies to garages and carports serving a *house* or an individual *dwelling unit*.

9.35.1.2. Construction Requirements

(1) The construction of a garage or carport shall conform to the requirements for other *buildings* in this Part except as provided in this Section.

9.35.2. General

9.35.2.1. Carport Considered to be Garage

(1) Where a roofed enclosure used for the storage or parking of motor vehicles has more than 60 percent of the total perimeter enclosed by walls, doors or windows, the enclosure shall be considered a garage.

9.35.2.2. Garage Floor

(1) Where an attached or built-in garage is provided, the garage floor shall be sloped to drain liquids to the outdoors.

9.35.3. Foundations

9.35.3.1. Foundation Required

(1) Except as permitted in this Subsection, *foundations* conforming to Sections 9.12. and 9.15. shall be provided for the support of carport and garage super-structures, including that portion beneath garage doors.

r11.1 **(2)** Detached garages of less than 55 m^2 *floor area* and not more than 1 *storey* in height that are not of masonry or masonry veneer construction are permitted to be supported on,

(a) wood mud sills, or

(b) a concrete floor slab having a minimum thickness of not less than 100 mm.

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9.35.3.2. Protection from Damage Due to Soil Movement

r6 **(1)** In clay-type *soils* subject to significant movement with a change in *soil* moisture content, the *foundation* depth of carports or garages connected to a *house* or an individual *dwelling unit* directly or by a breezeway shall be approximately the same depth as the *foundation* of the main *building*.

(2) Where slab-on-ground construction is used, a construction joint shall be provided between the main *building* slab and the garage or breezeway or carport slab.

(3) Except as provided in Section 9.12., *foundations* for attached unheated garages or carports shall be below frost level.

9.35.3.3. Small Garages

r11.1 **(1)** Detached garages of less than 55 m^2 *floor area* and not more than 1 *storey* in height that are not of masonry or masonry veneer construction need not conform with the *foundation* drainage requirements described in Section 9.14. where the finished ground level is at or near the elevation of the garage floor and where the ground slopes away from the *building*.

9.35.3.4. Column Piers

(1) Piers for the support of carport columns shall extend not less than 150 mm above ground level.

(2) Piers referred to in Sentence (1) shall project not less than 25 mm beyond the base of the column but in no case be less than 190 mm by 190 mm in size.

9.35.4. Walls and Columns

9.35.4.1. Interior Finish

(1) Interior finish need not be applied to garage and carport walls.

9.35.4.2. Columns

(1) Columns for garages and carports shall conform to Section 9.17., except that 89 mm by 89 mm wood columns may be used.

9.35.4.3. Anchorage

(1) Garage or carport walls and columns shall be anchored to the *foundation* to resist wind uplift in conformance with Subsection 9.23.6., except that where a garage is supported on the surface of the ground, ground anchors shall be provided to resist wind uplift.

Section 9.36. Cottages

9.36.1. Scope

9.36.1.1. Application

(1) This Section applies to *buildings* of *residential occupancy* used or intended to be used as seasonal recreational *buildings*.

(2) The *buildings* described in Sentence (1) shall comply with all the requirements of this Part, except where they are specifically exempted in this Section.

9.36.2. General

9.36.2.1. Exclusions

(1) Except as provided in Subsection 9.10.15. and Articles 9.36.2.4. and 9.36.3.1., *buildings* used or intended to be used as seasonal recreational *buildings* need not comply with Sections 9.5. to 9.7. and 9.9. to 9.11.

(2) Flooring need not comply with Section 9.30., but tight-fitting floors shall be provided to support the *live* and *dead loads*.

(3) Except as provided in Sentence (4), thermal insulation, *vapour barrier*, air barrier construction, interior finishes, plumbing, heating, mechanical ventilation, *air-conditioning* and electrical facilities, need not be provided, but where any of these are provided, they shall comply with the requirements of this Part.

(4) Where heating and *air-conditioning* are provided, Article 9.33.3.1. need not be complied with.

9.36.2.2. Foundations

(1) Continuous perimeter *foundation* walls are not required, but when they are provided, they shall comply with the requirements of this Part.

(2) Where unit masonry columns are used, the height of such columns shall not exceed,
(a) in the case of hollow masonry units, 4 times the least dimension of the units,
(b) in the case of solid masonry units or hollow units with voids filled with concrete, 10 times the least dimension of the column, or
(c) where the column is reinforced with at least four 13 mm diam bars and filled with concrete, 18 times the least dimension of the column.

(3) Columns in excess of the height limitations of Clauses (2)(a) to (c) shall be designed in accordance with Part 4.

9.36.2.3. Waterproofing and Dampproofing

(1) Where *foundations* below ground level and concrete floors on ground are used, they shall comply with Section 9.13.

9.36.2.4. Smoke Alarms

(1) Every *dwelling unit* within the scope of this Section shall be provided with a *smoke alarm* in accordance with Subsection 9.10.19.

Table 11.5.1.1.A.
Compliance Alternatives for Assembly Occupancies
Forming Part of Article 11.5.1.1.

	C.A. Number	Division B Requirements	*Compliance Alternative*
r11.1	A1	3.1.4.7.	Existing *heavy timber construction* acceptable where *construction* is within 90% of member sizes listed in Part 3.
	A2	3.1.5.2. to 3.1.5.4.; 3.1.5.6.	Existing acceptable.
	A3	3.1.5.7. to 3.1.5.10.	Except for exposed foamed plastics, existing acceptable. To match existing, materials may be added from on or off site.
	A4	3.1.5.15. to 3.1.5.17.; 3.1.5.21.; 3.1.5.23.	Existing acceptable.
	A5	3.1.7.1.	*Fire-resistance ratings* may also be used where they are based on: 1. HUD Rehabilitation Guidelines, "Guideline on Fire Ratings of Archaic Materials and Assemblies". 2. DBR Technical Paper No. 194, "Fire Endurance of Protected Steel Columns and Beams". 3. DBR Technical Paper No. 207, "Fire Endurance of Unit Masonry Walls". 4. DBR Techncial Paper No. 222, "Fire Endurance of Light-Framed and Miscellaneous Assemblies".
	A6	3.1.7.5.(3)	Existing assemblies required to be of *noncombustible construction* may be supported by *combustible construction* having at least the same *fire-resistance rating* as that supported.
	A7	3.1.8.5.(2)	(a) Existing functional and sound doors in existing *buildings* that are either hollow metal or kalamein and containing wired glass at least 6 mm thick and conforming to Sentence 3.1.8.14.(2) are permitted in lieu of doors not required to exceed 45 min, (b) all existing functional and sound hollow metal or kalamein doors which carry existing 1.5 h labels are acceptable in lieu of current 1.5 h labels and may contain wired glass panels not exceeding 0.0645 m², at least 6 mm thick and conforming to Sentence 3.1.8.14.(2), and (c) every fire door, window assembly or glass block used as a *closure* in a required *fire separation* shall be installed in conformance with good engineering practice.
r11.1	A8	3.1.8.7., 3.1.8.8. and 3.1.8.9.	*Fire dampers* or *fire stop flaps* are not required to be installed in existing ducts at penetrations of existing *fire separations*.
	A9	3.1.8.10.(1)	Existing 45 mm solid core wood doors acceptable.
	A10	3.1.8.11.(1)	Existing functionally operable self-closing devices acceptable.
	A11	3.1.8.13.	Existing functionally operable latching devices, excluding draw bolts, are acceptable.
	A12	3.1.8.14.	Existing transoms or sidelights located in required *fire separations* may be retained if wired glass at least 6 mm thick is securely fixed to a steel frame with steel stops. Operable transoms shall be fixed closed.
	A13	3.1.8.15. to 3.1.8.17.	Existing acceptable.
	A14	3.1.11.	Where the concealed space is being materially altered, smoke or heat detection in that space in lieu of *fire blocks* and tied into fire alarm system is acceptable.
	A15	3.1.13.10.	Existing acceptable.
	Column 1	2	3

Table 11.5.1.1.A. (Cont'd)
Compliance Alternatives for Assembly Occupancies
Forming Part of Article 11.5.1.1.

r11.1

C.A. Number	Division B Requirements	*Compliance Alternative*
A16	3.2.2.17.(1)(b) and (c)	Existing sprinkler systems need not comply.
A17	3.2.3.	Existing windows. (a) Existing windows in walls may be relocated to another part of the wall, provided the existing opening is blocked up to provide the same fire rating for the wall, and the projection of the new opening, at a right angle to the property line onto another *building*, lies not closer than 300 mm from a window in such other *building*, where the "opposite" window is less than 2 400 mm from the opposite new opening, and (b) except relocation of units, shall be restricted to the same *fire compartment* and shall conform to the requirements of Article 3.2.3.14. or 9.10.12.3. where applicable, or (c) where a *building* does not satisfy the requirements of Subsection 3.2.3. for the amount of openings facing a yard or space that does not have sufficient *limiting distance*, such existing openings are allowed to be relocated provided: (i) such openings are not increased in size and they are protected with wired glass in steel frames conforming to Sentence 3.1.8.14.(2), or (ii) the *building* is *sprinklered.*
A18	3.2.3.6.(3)	Existing roof soffit projections acceptable.
A19	3.2.4.	(a) Existing fire alarm system may remain except that Article 3.2.4.5. does not apply where the fire safety plan (as described in the Fire Code made under the *Fire Protection and Prevention Act, 1997*) for the *building* addresses the intent of Subsection 3.2.4. (i.e. "stage" system, electrical supervision, detection as required, Fire Department connection and emergency power supply), and (b) extension of an existing system must ensure continuity and compatibility, and integrity of the system.
A20	3.2.4.9.(2)(e)	Does not apply to existing installations in *buildings*.
A21	3.2.4.10.(5)(c)	Does not apply to existing installations in *buildings*.
A22	3.2.5.3.(1) and (2)	Existing acceptable.
A23	3.2.5.4. to 3.2.5.6.	Existing acceptable provided the *building* is *sprinklered*.
A24	3.2.5.7.	Does not apply, except where a change in *major occupancy* occurs from a lesser *hazard index*.
A25	3.2.5.13.	Existing sprinkler systems in existing *buildings* that do not conform to NFPA 13 may be altered, added to, or extended from the existing system without complying with NFPA 13, provided the system is operational and adequate with respect to coverage, water supply and controls, and provided the system is evaluated by a qualified designer.
A26	3.2.9.	(a) Does not apply to *buildings* 6 *storeys* and less. (b) Does not apply to *sprinklered buildings*.
A27	3.3.1.5.	One egress door is allowed where the *occupant load* is not greater than 100 persons, provided *floor area* is *sprinklered* and travel distance does not exceed 25 m.
A28	3.3.1.9.	Existing width of *public corridors* of not less than 914 mm is acceptable.
Column 1	2	3

Table 11.5.1.1.A. (Cont'd)
Compliance Alternatives for Assembly Occupancies
Forming Part of Article 11.5.1.1.

C.A. Number	Division B Requirements	*Compliance Alternative*
A29	3.3.1.9.(8)	An existing dead end corridor is permitted where the *occupant load* is not greater than 20 persons, provided travel distance is not greater than 6 m plus corridor width to "*exit* choice" point.
A30	3.3.1.10.; 3.3.1.11.	Existing door swings may remain in *heritage buildings*, existing or being restored, with no change in *major occupancy* and with *occupant load* no greater than 100.
A31	3.3.1.12.	Existing doors may remain in a *heritage building*, existing or being restored, with no change in *major occupancy*.
A32	3.3.1.18.	Existing stained, etched, bevelled, leaded or figured glass acceptable.
A33	3.3.5.4.(1); 3.3.5.7.(1) to (3)	Need not comply where a gasketed door and self closer are provided in the existing *fire separation*.
A34	3.4.1.5.(1)	Existing acceptable.
A35	3.4.1.5.(2)	Existing acceptable provided the existing *guard* is not less than 914 mm.
A36	3.4.1.8.	Existing stained, etched, bevelled, leaded or figured glass acceptable.
A37	3.4.2.5.(1)	Existing travel distance acceptable where *floor area* is *sprinklered* and where there is no change in *major occupancy*.
A38	3.4.3.2.(5)	Need not comply where there is no increase in *occupant load*.
A39	3.4.3.2.(7)	Existing width of *exits* acceptable provided the *occupant load* is not more than 15% above the *exit* capacity.
A40	3.4.3.4.	Existing acceptable.
A41	3.4.3.5.	Existing headroom clearance of not less than 1 980 mm is acceptable.
A42	3.4.4.4.(8)	Existing washrooms opening directly into an *exit* stairwell shall be separated from the *exit* stairwell by a 45 min *closure*.
A43	3.4.5.1.(2) and (9)	Existing illuminated legible *exit* signs are acceptable.
A44	3.4.6.2.	Existing acceptable, if visually apparent.
A45	3.4.6.3.	Existing acceptable.
A46	3.4.6.4.	Existing acceptable.
A47	3.4.6.5.(2) to (11)	Existing acceptable.
A48	3.4.6.6.(2), (4) and (5)	Existing acceptable.
A49	3.4.6.7.(1)	Existing acceptable.
A50	3.4.6.8.	Existing acceptable.
A51	3.4.6.9.	Existing acceptable.
A52	3.4.6.11.(1) to (3) and (5)	Existing acceptable.
A53	3.4.6.12.	Existing acceptable in *public heritage buildings* or a change in *occupancy* with no increase in *occupant load*.
Column 1	2	3

Table 11.5.1.1.A. (Cont'd)
Compliance Alternatives for Assembly Occupancies
Forming Part of Article 11.5.1.1.

	C.A. Number	Division B Requirements	*Compliance Alternative*
r11.1	A54	3.4.6.16.(2) and (3)	Existing functionally operable panic hardware acceptable.
	A55	3.4.7.2.	*Combustible* fire escapes which are protected from fire in accordance with Sentence 3.2.3.14.(2) are permitted or may be reconstructed or recreated (as in the case of a *heritage building*).
	A56	3.5.1.	Existing acceptable.
	A57	3.6.2.1.(7)	Existing *fire separation* of not less than 30 min is acceptable.
	A58	3.6.2.2.	Existing acceptable where explosion-resistant *construction* or venting is provided.
	A59	3.6.2.6.	Existing acceptable.
	A60	3.6.2.7.(1)	2 h *fire separation* acceptable.
	A61	3.6.3.1.(1) to (5)	45 min *fire separation* acceptable.
	A62	3.6.3.3.(1) to (5) and (8)	Existing acceptable.
	A63	3.6.3.3.(9)	1 h acceptable if *sprinklered*.
	A64	3.6.3.3.(10)	Existing acceptable.
	A65	3.6.3.4.	Existing acceptable.
	A66	3.6.4.	Existing acceptable.
	A67	3.7.1.3.(3)	2.1 m is acceptable.
	A68	3.7.2.1.(3)	The minimum glass areas may be reduced by 50%.
	A69	3.7.4.	Where the *occupant load* is increased by more than 15% above the capacity of the existing facilities, facilities to be added to accommodate the increase.
r4	A70	3.8.1.2.	Existing accessible entrance acceptable. (See *C.A.* A74) Existing curb ramp conforming to Sentence 3.8.3.2.(3) is acceptable. Existing principal entrance acceptable, provided at least one *barrier-free* entrance is available.
	A71	3.8.1.3.(1)	Existing unobstructed width of 920 mm minimum is acceptable.
	A72	3.8.1.3.(4)	Existing unobstructed space not less than 1 500 mm in width and 1 500 mm in length located not more than 30 m apart is acceptable.
r4	A72.1	3.8.3.2.(3)(b)	Existing curb ramp acceptable, provided width not less than 1 200 mm.
	A73	3.8.3.3.(1)	Existing doorway acceptable, provided not less than 810 mm wide.
r4	A73.1	3.8.3.3.(11)(a)	Existing distance acceptable, provided not less than 1 200 mm plus the width of any door that swings into the space in the path of travel.
	A74	3.8.3.4.(1)(a)	Existing ramp acceptable, provided not less than 870 mm between handrails.
r4	A75	3.8.3.8.(5)	Existing grab bar is acceptable.
r4	A75.1	3.8.3.12.	Existing universal washroom acceptable.
	Column 1	2	3

Table 11.5.1.1.A. (Cont'd)
Compliance Alternatives for Assembly Occupancies
Forming Part of Article 11.5.1.1.

	C.A. Number	Division B Requirements	*Compliance Alternative*
r11.1	A76	3.8.3.13.(2)(g)	Existing grab bar is acceptable.
r11.1	A76.1	3.8.3.16.	Existing drinking fountain conforming to Clauses 3.8.3.16.(2)(a) and (b) acceptable.
r4	A76.2	3.11.3.1.(9)	Existing clear width acceptable, provided not less than 900 mm.
r4	A76.3	3.11.3.1.(14)	Existing painted line acceptable.
	A77	4.1.8.	The requirements under this Subsection do not apply.
	A78	6.2.2.1.(2)	Required outdoor air rates may be provided by mechanical, natural or combination of natural and mechanical means.
	A79	8.2.1.4.	Existing clearances acceptable where a *sewage system* is replaced with another *sewage system* within the same class and the capacity of the replacement *sewage system* does not exceed the capacity of the existing *sewage system*.
	A80	8.2.1.4.	Existing clearances are acceptable where a replacement *sewage system* requires lesser clearances than those required in Part 8 for the existing *sewage system.*
	Column 1	2	3

r1 **Table 11.5.1.1.B.**
Compliance Alternatives for Care, Care and Treatment or Detention Occupancies
Forming Part of Article 11.5.1.1.

r11.1

C.A. Number	Division B Requirements	*Compliance Alternative*
B1	3.1.5.2. to 3.1.5.4.; 3.1.5.6.	Existing acceptable.
B2	3.1.5.7. to 3.1.5.10.	Except for exposed foamed plastics, existing acceptable.
B3	3.1.5.15. to 3.1.5.17.; 3.1.5.21.; 3.1.5.23.	Existing acceptable.
B4	3.1.7.1.	*Fire-resistance ratings* may also be used where they are based on: 1. HUD Rehabilitation Guidelines, "Guideline on Fire Ratings of Archaic Materials and Assemblies". 2. DBR Technical Paper No. 194, "Fire Endurance of Protected Steel Columns and Beams". 3. DBR Technical Paper No. 207, "Fire Endurance of Unit Masonry Walls". 4. DBR Technical Paper No. 222, "Fire Endurance of Light-Framed and Miscellaneous Assemblies".
B5	3.1.7.5.(3)	Existing assemblies required to be of *noncombustible construction* may be supported by *combustible construction* having at least the same *fire-resistance rating* as that supported.
B6	3.1.8.5.(2)	(a) Existing functional and sound doors in existing *buildings* that are either hollow metal or kalamein and containing wired glass at least 6 mm thick and conforming to Sentence 3.1.8.14.(2) are permitted in lieu of doors not required to exceed 45 min, (b) all existing functional and sound hollow metal or kalamein doors which carry existing 1.5 h labels are acceptable in lieu of current 1.5 h labels and may contain wired glass panels not exceeding 0.0645 m², at least 6 mm thick and conforming to Sentence 3.1.8.14.(2), and (c) every fire door, window assembly or glass block used as a *closure* in a required *fire separation* shall be installed in conformance with good engineering practice.
B7	3.1.8.7., 3.1.8.8. and 3.1.8.9.	*Fire dampers* or *fire stop flaps* are not required to be installed in existing ducts at penetrations of existing *fire separations*.
B8	3.1.8.10.(1)	For existing unlabelled doors in existing *buildings*, at least 45 mm solid core wood or metal clad are acceptable.
B9	3.1.8.11.(1)	Existing functionally operable self-closing devices acceptable, including devices with "pause" hardware.
B10	3.1.8.12.(1) and (2)	Between patient or inmate rooms, and corridors, existing "pause" type self-closing devices may be used as hold-open devices where functionally operable.
B11	3.1.8.13.	Existing functionally operable latching devices, excluding draw bolts, are acceptable.
B12	3.1.8.14.(1) and (2)	Except in zone or *exit fire separations* not required to be greater than 1 h, existing wired glass installations are acceptable provided they are set in steel or metal clad frames.
B13	3.1.8.14.(3)	Existing glass block acceptable.
B14	3.1.8.15. to 3.1.8.17.	Existing acceptable.
B15	3.1.9.5.(1) and (2)	Existing openings in existing ceiling membranes to remain. Existing openings may be moved to another location in the same ceiling provided the aggregate area of openings does not increase and are not cumulative, and the existing opening is blocked up to provide the same rating as the ceiling assembly.
Column 1	2	3

r1 **Table 11.5.1.1.B. (Cont'd)**
Compliance Alternatives for Care, Care and Treatment or Detention Occupancies
Forming Part of Article 11.5.1.1.

r11.1

C.A. Number	Division B Requirements	*Compliance Alternative*
B16	3.1.11.	Where the concealed space is being materially altered, provide smoke or heat detection in that space in lieu of *fire blocks* and tie into fire alarm system.
B17	3.1.14.; 3.1.15.	Existing roof assemblies and roof coverings acceptable.
B18	3.2.3.	Existing windows. (a) Existing windows in walls may be relocated to another part of the wall, provided the existing opening is blocked up to provide the same fire rating for the wall, and the projection of the new opening, at a right angle to the property line onto another *building*, lies no closer than 300 mm from a window in such other *building*, where the "opposite" window is less than 2 400 mm from the opposite new opening, and (b) except relocation of units, to be restricted to the same *fire compartment* and shall conform to the requirements of Article 3.2.3.14. or 9.10.12.3. where applicable, or (c) where a *building* does not satisfy the requirements of Subsection 3.2.3. for the amount of openings facing a yard or space that does not have sufficient *limiting distance*, such existing openings are allowed to be relocated provided: (i) such openings are not increased in size and they are protected with wired glass in steel frames conforming to Sentence 3.1.8.14.(2), or (ii) the *building* is *sprinklered*.
B19	3.2.3.6.(3)	Existing roof soffit projections acceptable.
B20	3.2.4.	(a) Existing fire alarm system may remain except that Article 3.2.4.5. does not apply where the fire safety plan (as described in the Fire Code made under the *Fire Protection and Prevention Act, 1997*) for the *building* addresses the intent of Subsection 3.2.4. (i.e. "stage" system, electrical supervision, detection as required, Fire Department connection and emergency power supply), and (b) extension of an existing system must ensure continuity and compatibility, and integrity of the system.
B21	3.2.4.9.(2)(e)	Does not apply to existing installations in *buildings*.
B22	3.2.4.10.(5)(c)	Does not apply to existing installations in *buildings*.
B23	3.2.5.1.; 3.2.5.2.	Existing access to an existing *occupancy* acceptable. Where the existing *building* is changed to a "B" *occupancy*, existing access are acceptable.
B24	3.2.5.3.(1)	Existing acceptable, except where a change in *occupancy* occurs to a "B1" or "B2" *occupancy*.
B25	3.2.5.3.(2)	Existing acceptable.
B26	3.2.5.4. to 3.2.5.6.	Existing access route to existing *occupancy* is acceptable if the *building* is *sprinklered*. Where existing *building* is changed to a "B" *occupancy*, access route shall be provided.
B27	3.2.5.7.; 3.2.5.18.	Does not apply except where a change in *occupancy* occurs to a "B1" or "B2" *occupancy*, where occupants are not normally evacuated from the *building*.
Column 1	2	3

r1 **Table 11.5.1.1.B. (Cont'd)**
Compliance Alternatives for Care, Care and Treatment or Detention Occupancies
Forming Part of Article 11.5.1.1.

r11.1

C.A. Number	Division B Requirements	*Compliance Alternative*
B28	3.2.5.13.	Existing sprinkler systems in existing *buildings* that do not conform to NFPA 13 may be altered, added to, or extended from the existing system without complying with NFPA 13, provided the system is operational and adequate with respect to coverage, water supply and controls, and provided the system is evaluated by a qualified designer.
B29	3.2.9.	Does not apply except where a change in *occupancy* occurs to a Group B *occupancy*, where occupants are not normally evacuated from the *building*.
B30	3.3.1.9.	Existing width of *public corridors* of not less than 914 mm is acceptable, except as provided in Sentence 3.3.3.3.(2).
B31	3.3.1.10.; 3.3.1.11.	Existing door swings may remain in *heritage buildings*, existing or being restored, with no change in *major occupancy* and with *occupant load* no greater than 100.
B32	3.3.1.12.	Existing doors acceptable.
B33	3.3.1.15.	Existing acceptable.
B34	3.3.1.16.	Existing non-conforming capacities of *access to exits* are acceptable, provided that the excessive capacity is no greater than 15% and, (a) corridor *fire separations* are rated to Code plus early warning system provided, or (b) there are sprinklers, plus *smoke alarms* in *suites*.
B35	3.3.1.17.	Existing acceptable.
B36	3.3.1.18.	Existing stained, etched, bevelled, leaded or figured glass acceptable.
B37	3.3.3.3.(1)	Existing dead end corridors acceptable with 30 min *fire separation* of corridor plus sprinklering of *floor area*, provided the *occupant load* is not greater than 10 persons and travel distance not greater than 6 m plus corridor width to "*exit* choice" point.
B38	3.3.3.7.	45 min *fire separation* acceptable.
B39	3.3.5.4.(1); 3.3.5.7.(3)	Need not comply where a gasketed door and self closer are provided in the existing *fire separation*.
B40	3.4.1.8.	Existing stained, etched, bevelled, leaded or figured glass acceptable.
B41	3.4.2.5.(1)	Existing travel distance acceptable where *floor area* is *sprinklered* and provided *fire separations* comply with Part 3.
B42	3.4.3.2.(7)	Existing acceptable provided there is no change in *occupancy* to a "B2" or "B3".
B43	3.4.3.4.	Existing acceptable.
B44	3.4.3.5.	Existing headroom clearance of not less than 1 980 mm is acceptable.
B45	3.4.5.1.(2) and (9)	Existing illuminated legible *exit* signs are acceptable.
B46	3.4.6.2.	Existing acceptable, if visually apparent.
B47	3.4.6.3.(1)	Existing acceptable with rise no greater than 3.7 m.
B48	3.4.6.4.(1)	Existing acceptable provided there is no change in *occupancy* to a "B2" or "B3".
B49	3.4.6.4.(2) to (4)	Existing acceptable.
B50	3.4.6.5.(2) to (11)	Existing acceptable.
Column 1	2	3

r1 **Table 11.5.1.1.B. (Cont'd)**
Compliance Alternatives for Care, Care and Treatment or Detention Occupancies
Forming Part of Article 11.5.1.1.

	C.A. Number	Division B Requirements	*Compliance Alternative*
	B51	3.4.6.6.(2) to (5)	Existing acceptable.
	B52	3.4.6.7.(1)	Existing acceptable.
	B53	3.4.6.8.	Existing acceptable.
	B54	3.4.6.9.	Existing acceptable where there is no change in *major occupancy* or increase in *occupant load* greater than 15%.
r11.1	B55	3.4.6.11.(1) to (3) and (5)	Existing acceptable.
	B56	3.4.6.12.	Existing acceptable in *public heritage buildings*.
	B57	3.4.6.16.(2) and (3)	Existing functionally operable panic hardware acceptable.
r11.1	B58	3.4.6.18.(4)(b)	Existing access to existing *occupancy* is acceptable. Where the existing *building* is changed to a "B" *occupancy*, existing access is acceptable.
	B59	3.4.7.2.	*Combustible* fire escapes which are protected from fire in accordance with Sentence 3.2.3.14.(2) are permitted or may be reconstructed or recreated (as in the case of a *heritage building*). Where serving non-ambulatory persons, minimum width shall be 1 100 mm.
	B60	3.5.1.	Existing acceptable, except where *building* is classified under Subsection 3.2.6.
	B61	3.6.2.1.(7)	45 min *fire separation* acceptable.
	B62	3.6.2.6.	Existing acceptable.
	B63	3.6.2.7.(1)	2 h *fire separation* acceptable.
	B64	3.6.3.1.(1) to (5)	45 min *fire separation* acceptable.
	B65	3.6.3.3.(1), (3), (4)(a), (5) and (10)	Existing acceptable.
	B66	3.6.3.3.(2)(a)	45 min *fire separation* acceptable.
	B67	3.6.4.	Existing acceptable, except where a change in *occupancy* occurs to a Group B *occupancy*.
	B68	3.7.1.3.(1)	Existing acceptable.
	B69	3.7.2.1.(2)	The minimum glass areas may be reduced by 50%.
	B70	3.7.4.	Where the *occupant load* is increased by more than 15% above the capacity of the existing facilities, facilities to be added to accommodate the increase.
r4	B71	3.8.1.2.	Existing accessible entrance acceptable. (See *C.A.* B75) Existing curb ramp conforming to Sentence 3.8.3.2.(3) is acceptable. Existing principal entrance acceptable, provided at least one *barrier-free* entrance is available.
	B72	3.8.1.3.(1)	Existing unobstructed width of 920 mm minimum is acceptable.
	Column 1	2	3

r1 **Table 11.5.1.1.B.**
Compliance Alternatives for Care, Care and Treatment or Detention Occupancies
Forming Part of Article 11.5.1.1.

r11.1	*C.A.* Number	Division B Requirements	*Compliance Alternative*
	B73	3.8.1.3.(4)	Existing unobstructed space not less than 1 500 mm in width and 1 500 mm in length located not more than 30 m apart is acceptable.
r4	B73.1	3.8.3.2.(3)(b)	Existing curb ramp acceptable, provided width not less than 1 200 mm.
	B74	3.8.3.3.(1)	Existing doorway acceptable, provided not less than 810 mm wide.
r4	B74.1	3.8.3.3.(11)(a)	Existing distance acceptable, provided not less than 1 200 mm plus the width of any door that swings into the space in the path of travel.
	B75	3.8.3.4.(1)(a)	Existing ramp acceptable, provided not less than 870 mm between handrails.
r4	B76	3.8.3.8.(5)	Existing grab bar is acceptable.
r4	B76.1	3.8.3.12.	Existing universal washroom acceptable.
r11.1	B77	3.8.3.13.(2)(g)	Existing grab bar is acceptable.
r4	B77.1	3.8.3.16.	Existing drinking fountain conforming to Clauses 3.8.3.16.(2)(a) and (b) acceptable.
r4	B77.2	3.11.3.1.(9)	Existing clear width acceptable, provided not less than 900 mm.
r4	B77.3	3.11.3.1.(14)	Existing painted line acceptable.
	B78	4.1.8.	The requirements under this Subsection do not apply.
	B79	6.2.2.1.(2)	Required outdoor air rates may be provided by mechanical, natural or combination of natural and mechanical means.
	B80	8.2.1.4.	Existing clearances acceptable where a *sewage system* is replaced with another *sewage system* within the same class and the capacity of the replacement *sewage system* does not exceed the capacity of the existing *sewage system*.
	B81	8.2.1.4.	Existing clearances are acceptable where a replacement *sewage system* requires lesser clearances than those required in Part 8 for the existing *sewage system.*
	Column 1	2	3

Table 11.5.1.1.C.
Compliance Alternatives for Residential Occupancies
Forming Part of Article 11.5.1.1.

	C.A. Number	Division B Requirements	*Compliance Alternative*
	C1	3.1.4.7.	Existing *heavy timber construction* acceptable where *construction* is within 90% of member sizes listed in Part 3.
	C2	3.1.5.2. to 3.1.5.4.; 3.1.5.6.	Existing acceptable.
	C3	3.1.5.7. to 3.1.5.10.	Except for exposed foamed plastics, existing acceptable. To match existing, materials may be added from on or off site.
	C4	3.1.5.14. to 3.1.5.17.; 3.1.5.21.; 3.1.5.23.	Existing acceptable.
	C5	3.1.7.1.	*Fire-resistance ratings* may also be used where they are based on: 1. HUD Rehabilitation Guidelines, "Guideline on Fire Ratings of Archaic Materials and Assemblies". 2. DBR Technical Paper No. 194, "Fire Endurance of Protected Steel Columns and Beams". 3. DBR Technical Paper No. 207, "Fire Endurance of Unit Masonry Walls". 4. DBR Technical Paper No. 222, "Fire Endurance of Light-Framed and Miscellaneous Assemblies".
	C6	3.1.7.5.(3)	Existing assemblies required to be of *noncombustible construction* may be supported by *combustible construction* having at least the same *fire-resistance rating* as that supported.
	C7	3.1.8.1.(2); 3.1.8.6.(1) and (2)	Existing functional *closures* are acceptable and may be relocated within the same existing *fire separation*.
	C8	3.1.8.5.(2)	(a) Existing functional and sound doors in existing *buildings* that are either hollow metal or kalamein and containing wired glass at least 6 mm thick and conforming to Sentence 3.1.8.14.(2) are permitted in lieu of doors not required to exceed 45 min, (b) all existing functional and sound hollow metal or kalamein doors which carry existing 1.5 h labels are acceptable in lieu of current 1.5 h labels and may contain wired glass panels not exceeding 0.0645 m², at least 6 mm thick and conforming to Sentence 3.1.8.14.(2), and (c) every fire door, window assembly or glass block used as a *closure* in a required *fire separation* shall be installed in conformance with good engineering practice.
r11.1	C9	3.1.8.7., 3.1.8.8. and 3.1.8.9.	Except for *hotels*, *fire dampers* or *fire stop flaps* are not required to be installed in existing ducts at penetrations of existing *fire separations*.
	C10	3.1.8.10.(1)	For existing unlabeled doors in existing *buildings*, at least 45 mm solid core wood or metal clad are acceptable. Except for *residential occupancies*, existing closure rating of 20 min will not be required where the entire *floor area* is *sprinklered*.
r6	C10.1	3.1.8.12.(1) and (2)	In *retirement homes*, between a *suite* and a *public corridor*, existing 'pause' type self-closing devices may be used as hold-open devices where functionally operable.
	C11	3.1.8.13.	Existing functionally operable latching devices, excluding draw bolts, are acceptable.
	C12	3.1.8.14.	Existing transoms or sidelights located in *fire separations* not required to be greater than 1 h may be retained if wired glass, at least 6 mm thick, is securely fixed to a wood frame of at least 50 mm thickness with steel stops. Operable transoms shall be fixed closed.
	C13	3.1.8.15. to 3.1.8.17.	Existing acceptable.
	Column 1	2	3

Table 11.5.1.1.C. (Cont'd)
Compliance Alternatives for Residential Occupancies
Forming Part of Article 11.5.1.1.

r11.1	*C.A.* Number	Division B Requirements	*Compliance Alternative*
	C14	3.1.11.	Where the concealed space is being materially altered, provide smoke or heat detection in that space in lieu of *fire blocks* and tie into fire alarm system.
r6	C15	3.2.2.17.(1)(b) and (c)	Except for *retirement homes*, existing sprinkler systems in 1 *storey buildings* need not comply.
	C16	3.2.3.	Existing windows. (a) Existing windows in walls may be relocated to another part of the wall, provided the existing opening is blocked up to provide the same fire rating for the wall, and the projection of the new opening, at a right angle to the property line onto another *building*, lies not closer than 300 mm from a window in such other *building*, where the "opposite" window is less than 2 400 mm from the opposite new opening, and (b) except relocation of units, shall be restricted to the same *fire compartment* and shall conform to the requirements of Article 3.2.3.14. or 9.10.12.3. where applicable, or (c) where a *building* does not satisfy the requirements of Subsection 3.2.3. for the amount of openings facing a yard or space that does not have sufficient *limiting distance*, such existing openings are allowed to be relocated provided: (i) such openings are not increased in size and they are protected with wired glass in steel frames conforming to Sentence 3.1.8.14.(2), or (ii) the *building* is *sprinklered.*
	C17	3.2.3.6.(3)	Existing roof soffit projections acceptable.
	C18	3.2.4.	(a) Existing fire alarm system may remain except that Article 3.2.4.5. does not apply where the fire safety plan (as described in the Fire Code made under the *Fire Protection and Prevention Act, 1997*) for the *building* addresses the intent of Subsection 3.2.4. (i.e. "stage" system, electrical supervision, detection as required, Fire Department connection, and emergency power supply), and (b) extension of an existing system must ensure continuity and compatibility, and integrity of the system.
	C19	3.2.4.9.(2)(e)	Does not apply to existing installations in *buildings*.
	C20	3.2.4.10.(5)(c)	Does not apply to existing installations in *buildings*.
r6	C21	3.2.4.22.	Except for *retirement homes*, such *smoke alarms* may be battery operated.
	C22	3.2.5.1.; 3.2.5.2.	Existing acceptable.
	C23	3.2.5.3.(1)	Existing access acceptable.
	C24	3.2.5.3.(2)	Existing acceptable.
	C25	3.2.5.4. to 3.2.5.6.	(a) For *buildings* 6 *storeys* and less, existing access to existing *occupancy* is acceptable, and (b) where existing *building* is changed to a "C" *occupancy*, an access route shall be provided, or the existing access is acceptable provided the *building* is *sprinklered*.
	C26	3.2.5.7.	Existing water supply and hydrants are acceptable in *buildings* up to 6 *storeys* in *building height*.
	Column 1	2	3

Table 11.5.1.1.C. (Cont'd)
Compliance Alternatives for Residential Occupancies
Forming Part of Article 11.5.1.1.

r11.1

C.A. Number	Division B Requirements	*Compliance Alternative*
C27	3.2.5.13.	Existing sprinkler systems in existing *buildings* that do not conform to NFPA 13 may be altered, added to, or extended from the existing system without complying with NFPA 13, provided the system is operational and adequate with respect to coverage, water supply and controls, and provided the system is evaluated by a qualified designer.
C28	3.2.9.	Does not apply to *buildings* 4 *storeys* and less. For existing *buildings* over 4 *storeys* in *building height*, existing standpipe and hose systems water supply is acceptable provided it can deliver a minimum flow rate of 265 L/min for 30 min at 345 kPa (gauge) at the two highest and most remote hose valves, with not less than 132 L/min from each of the two simultaneously.
C29	3.3.1.4.(1); 3.3.4.2.(1)	30 min is acceptable to separate corridors or *exits* in *buildings* not exceeding 6 *storeys* in *building height*, except that 45 min is required for *exits* in *buildings* exceeding 3 *storeys* in *building height*. For *buildings* exceeding 6 *storeys* in *building height*, 30 min is acceptable where *smoke detectors* are installed in corridors, except 1 h is required in *exits*. 30 min is acceptable to separate *public corridors*, *exits* or *suites* in *hotels*, provided *fire detectors* are installed in every room in a *suite* and in every room not located in a *suite*, other than corridors, washrooms, closets in *suites*, saunas, refrigerated areas and swimming pools.
C30	3.3.1.5.(1)(c); Tables 3.3.1.5.A. and 3.3.1.5.B.	In Column 2, maximum area of room or *suite* to be unlimited.
C31	3.3.1.9.	Existing width of *public corridors* of not less than 914 mm is acceptable.
C32	3.3.1.10.; 3.3.1.11.	Existing door swings may remain in *heritage buildings*, existing or being restored, with no change in *major occupancy* and with *occupant load* no greater than 100.
C33	3.3.1.12.	Existing doors acceptable, provided not less than 600 mm wide.
C34	3.3.1.15.	Existing curved or spiral stairs acceptable.
C35	3.3.1.16.	Existing non-conforming capacities of *access to exits* are acceptable, provided that the excessive capacity is no greater than 15% and, (a) corridor *fire separations* are rated to Code plus early warning system provided, or (b) there are sprinklers, plus *smoke alarms* in *suites*.
C36	3.3.1.17.	Does not apply to *heritage buildings*.
C37	3.3.1.18.	Existing stained, etched, bevelled, leaded or figured glass acceptable.
C38	3.3.4.2.(3)(b)(i) 3.3.4.2.(3)(b)(ii), (iii) 3.3.4.2.(3)(b)(iv)	30 min *fire separation* acceptable. 45 min *fire separation* acceptable. 1.5 h *fire separation* acceptable.
C39	3.3.4.4.(4) and (5)	For *buildings* 6 *storeys* and less, doorway from *dwelling unit* will be permitted to open directly into *exit* stairway or interior corridor served by a single *exit* if a fire alarm system complying with Subsection 3.2.4. is installed and the *dwelling unit* has a second and separate *means of egress*.
C40	3.3.5.4.(1) and 3.3.5.7.(3)	Need not comply where a gasketed door and self closer are provided in the existing *fire separation*.
Column 1	2	3

Table 11.5.1.1.C. (Cont'd)
Compliance Alternatives for Residential Occupancies
Forming Part of Article 11.5.1.1.

	C.A. Number	Division B Requirements	*Compliance Alternative*
r6	C41	3.4.1.4.	Except for *hotels* and *retirement homes*, the following types of *exits* may also be used for *buildings* not over 6 *storeys* in *building height*: (a) connected balconies, which connect across *firewalls*, or connect to another *exit*, or with access to ground level, (b) areas of refuge where fire service rescue is possible and that comply with Measure L of Sentences (4) to (10), (18) and Clauses (20)(a), (b) and (d) in MMAH Supplementary Standard SB-4, "Measures for Fire Safety in High Buildings".
	C42	3.4.1.8.	Existing stained, etched, bevelled, leaded or figured glass acceptable.
	C43	3.4.2.5.(1)	Existing travel distance acceptable where *floor area* is *sprinklered* and provided *fire separations* comply with Part 3.
	C44	3.4.3.2.(7)	Existing width of *exits* acceptable provided the *occupant load* is not more than 15% above the *exit* capacity.
	C45	3.4.3.4.	Except for *heritage buildings*, existing acceptable, provided not less than 800 mm.
	C46	3.4.3.5.	Existing headroom clearance of not less than 1 980 mm is acceptable.
	C47	3.4.4.1.(1)	Except for *exits*, no rating required where *floor areas* are *sprinklered*.
r11.1	C48	3.4.4.1.	*Fire separations* of *exits* permitted in *buildings*: (a) 30 min, up to 3 *storeys* in *building height,* (b) 45 min, in *hotels* up to 3 *storeys* in *building height,* (c) 45 min, up to 6 *storeys* in *building height,* (d) 1 h, over 6 *storeys* in *building height*.
	C49	3.4.4.4.(8)	Existing washrooms opening directly into an *exit* stairwell shall be separated from the *exit* stairwell by a 45 min *closure*.
	C50	3.4.5.1.(2) and (9)	Existing illuminated legible *exit* signs are acceptable.
	C51	3.4.6.1.	Existing acceptable.
	C52	3.4.6.2.	Existing acceptable, if visually apparent.
	C53	3.4.6.3.(1)	Existing acceptable with rise no greater than 3.7 m.
	C54	3.4.6.4.(1)	Existing acceptable.
	C55	3.4.6.4.(2) and (3)	Existing acceptable.
	C56	3.4.6.5.(2) and (11)	Existing acceptable.
	C57	3.4.6.6.(2) and (4)	Existing acceptable.
	C58	3.4.6.7.(1)	Existing acceptable.
	C59	3.4.6.8.	Existing acceptable.
r6	C60	3.4.6.9.	(a) Except for *retirement homes*, existing acceptable. (b) For *retirement homes*, existing acceptable provided there is no change in *major occupancy* or increase in *occupant load* greater than 15%.
	C61	3.4.6.10.(2) to (6)	Existing acceptable.
	Column 1	2	3

Table 11.5.1.1.C. (Cont'd)
Compliance Alternatives for Residential Occupancies
Forming Part of Article 11.5.1.1.

	C.A. Number	Division B Requirements	*Compliance Alternative*
r11.1	C62	3.4.6.11.(1), (1.1) and (2)	Existing acceptable.
r11.1	C63	3.4.6.12.	Existing acceptable in *heritage buildings* provided the *occupant load* is not more than 60.
	C64	3.4.6.16.(1) to (3)	Existing functionally operable panic hardware acceptable.
r6	C65	3.4.7.2.	Except for *retirement homes, combustible* fire escapes which are protected from fire in accordance with Sentence 3.2.3.13.(2) are permitted or may be reconstructed or recreated (as in the case of a *heritage building*).
	C66	3.5.1.	Existing acceptable except where *building* is classified under Subsection 3.2.6.
	C67	3.6.2.1.(7)	45 min *fire separation* acceptable.
	C68	3.6.2.2.	Existing acceptable where explosion-resistant *construction* or venting is provided.
	C69	3.6.2.6.	Existing acceptable.
	C70	3.6.2.7.(1)	2 h *fire separation* acceptable.
	C71	3.6.3.1.(1) to (5)	45 min *fire separation* acceptable up to 6 *storeys*.
	C72	3.6.3.3.(2)	Where 2 h *fire separation* is required,1 h is acceptable. Except for linen discharge rooms where 1 h *fire separation* is required, 45 min is acceptable.
	C73	3.6.3.3.(4) and (5)	Existing sizes acceptable.
	C74	3.6.3.3.(9)	Where 2 h *fire separation* is required,1 h is acceptable.
r6	C75	3.6.4.2.	Except for *retirement homes*, ceiling *fire separation* need not have a *fire-resistance rating* where sprinklering, subject to *C.A.* C27, of *fire compartments* on both sides of vertical *fire separation* is provided and where such *fire separation* is not required to exceed 1 h.
	C76	3.6.4.3.(1)	Existing to meet *flame-spread rating* of 25 or to be *sprinklered*.
	C77	3.6.4.4. to 3.6.4.6.	Existing access acceptable.
	C78	3.7.1.1.(2)	Minimum room height shall be not less than 1 950 mm over the required floor area and any location that would normally be used as a *means of egress*.
	C79	3.7.2.1.	(a) Where windows are not used as *means of egress* and where they do not conflict with ventilation requirements, the minimum glass areas as shown in Table 9.7.2.3. may be reduced by 50%, or (b) an existing room converted to an interior room, created by an addition, shall not require a window, provided there is an opening in a dividing wall occupying not less than 30% of the separating plane to an adjoining room, where the adjoining room has a minimum of 5% window area of the combined floor areas, and provided the required ventilation for the combined room is maintained.
	C80	3.7.4.	Where the *occupant load* is increased by more than 15% above the capacity of the existing facilities, facilities to be added to accommodate the increase.
	Column 1	2	3

Table 11.5.1.1.C. (Cont'd)
Compliance Alternatives for Residential Occupancies
Forming Part of Article 11.5.1.1.

	C.A. Number	Division B Requirements	*Compliance Alternative*
r11.1 r4	C81	3.8.1.2.	Existing accessible entrance acceptable. (See *C.A.* C85) Existing curb ramp conforming to Sentence 3.8.3.2.(3) is acceptable. Existing principal entrance acceptable, provided at least one *barrier-free* entrance is available.
	C82	3.8.1.3.(1)	Existing unobstructed width of 920 mm minimum is acceptable.
	C83	3.8.1.3.(4)	Existing unobstructed space not less than 1 500 mm in width and 1 500 mm in length located not more than 30 m apart is acceptable.
r4	C83.1	3.8.3.2.(3)(b)	Existing curb ramp acceptable, provided width not less than 1 200 mm.
	C84	3.8.3.3.(1)	Existing doorway acceptable, provided not less than 810 mm wide.
r4	C84.1	3.8.3.3.(11)(a)	Existing distance acceptable, provided not less than 1 200 mm plus the width of any door that swings into the space in the path of travel.
	C85	3.8.3.4.(1)(a)	Existing ramp acceptable, provided not less than 870 mm between handrails.
r4	C86	3.8.3.8.(5)	Existing grab bar is acceptable.
r4	C86.1	3.8.3.12.	Existing universal washroom acceptable.
r11.1	C87	3.8.3.13.(2)(g)	Existing grab bar is acceptable.
r4	C87.1	3.8.3.16.	Existing drinking fountain conforming to Clauses 3.8.3.16.(2)(a) and (b) acceptable.
r4	C87.2	3.11.3.1.(9)	Existing clear width acceptable, provided not less than 900 mm.
r4	C87.3	3.11.3.1.(14)	Existing painted line acceptable.
	C88	4.1.8.	The requirements under this Subsection do not apply.
	C89	6.2.2.1.(2)	Required outdoor air rates may be provided by mechanical, natural or combination of natural and mechanical means.
	C90	6.2.3.2.; 6.2.3.8.; 6.2.3.18; 6.2.3.19.	Existing acceptable.
	C91	6.2.3.9.(1)	In a *building* containing not more than four *dwelling units* or residential *suites*, the existing heating or *air-conditioning* system may be altered to serve more than one *dwelling unit* or *suite*, provided *smoke alarms* are installed in each *dwelling unit* or *suite* and provided *a smoke detector* is installed in the supply or return air duct system serving the entire *building* which would turn off the fuel supply and electrical power to the heating system upon activation of such detector.
	C92	6.2.3.12.	Existing openings, grilles and diffusers acceptable.
	C93	6.2.4.2.(1); 6.2.4.3.(1) to (3), (5), (11) and (12)	Existing acceptable.
	C94	6.2.4.3.(10)	Where the duct system is being altered, lesser amounts and extent of insulation will be permitted.
	Column 1	2	3

Table 11.5.1.1.C. (Cont'd)
Compliance Alternatives for Residential Occupancies
Forming Part of Article 11.5.1.1.

	C.A. Number	Division B Requirements	*Compliance Alternative*
r11.1	C95	6.2.4.7.(10)	In a *building* containing not more than four *dwelling units* or residential *suites*, the existing heating or *air-conditioning* system may be altered to serve more than one *dwelling unit* or *suite*, provided *smoke alarms* are installed in each *dwelling unit* or *suite* and provided a *smoke detector* is installed in the supply or return air duct system serving the entire *building* which would turn off the fuel supply and electrical power to the heating system upon activation of such detector.
	C96	6.2.9.2.	Existing acceptable.
	C97	6.2.12.3.(1)	Carbon monoxide alarms may be battery operated or plugged into an electrical outlet.
	C98	6.3.1.	Existing acceptable, provided products of combustion are safely vented.
	C99	8.2.1.4.	Existing clearances acceptable where a *sewage system* is replaced with another *sewage system* within the same class and the capacity of the replacement *sewage system* does not exceed the capacity of the existing *sewage system*.
	C100	8.2.1.4.	Existing clearances are acceptable where a replacement *sewage system* requires lesser clearances than those required in Part 8 for the existing *sewage system.*
	C101	9.3.2.1.	Sound used lumber may be acceptable for reuse without a grade stamp provided that: (a) visual examination shows no excessive weakening by holes, notches, nail splits or other damage, (b) where the grade or species is unknown, the minimum grade shall apply for span table use, and (c) lumber has not been subjected to termite infestation.
r6	C102	9.5.3.1.	In a *house*, (a) minimum room height shall not be less than 1 950 mm over the required floor area and in any location that would normally be used as a *means of egress*, or (b) minimum room height shall not be less than 2 030 mm over at least 50% of the required floor area, provided that any part of the floor having a clear height of less than 1 400 mm shall not be considered in computing the required floor area.
	C103	9.5.11.1.	Doors may be lesser heights to suit ceiling heights.
	C104	9.5.11.2.	Existing acceptable, provided not less than 600 mm.
	C105	9.6.1.2.(2) and (3); 9.6.1.4.(1) and (2)	Existing doors and sidelights being reused or relocated need not conform if identified or protected.
	C106	9.6.1.4.(3)	Existing acceptable, if marked to indicate their existence and position.
	C107	9.7.2.3.	(a) Where windows are not used as a *means of egress* and where they do not conflict with ventilation requirements, the minimum glass areas as shown in Table 9.7.2.3. may be reduced by 50%, and (b) an existing room converted to an interior room, created by an addition, shall not require a window, provided there is an opening in a dividing wall occupying not less than 30% of the separating plane to an adjoining room, where the adjoining room has a minimum of 5% window area of the combined floor areas, and provided the required ventilation for the combined room is maintained.
	Column 1	2	3

Table 11.5.1.1.C. (Cont'd)
Compliance Alternatives for Residential Occupancies
Forming Part of Article 11.5.1.1.

r11.1

C.A. Number	Division B Requirements	*Compliance Alternative*
C108	9.7	Existing acceptable.
C109	9.8.1. to 9.8.4.	Replacement or extension of existing stair systems shall be exempt from the provisions of these Subsections, except that they shall have: (a) a minimum width between wall faces of 700 mm, and (b) a minimum clear height over tread nosing or landing of 1 800 mm.
C110	9.8.4.3.	Existing curved or spiral stairs are acceptable.
C111	9.8.4.5.	Where a stair complies with Subsection 9.8.4., an extension to a stair may contain two sets of winders provided that they are separated by at least three treads or a landing.
C112	9.8.5.1.(2)	Existing ramps acceptable, where practical.
C113	9.8.7.	Existing handrails acceptable, unless considered unsafe by *chief building official*.
C114	9.8.8.	Existing *guards* acceptable, unless considered unsafe by *chief building official*.
C115	9.8.9.6.(4)	Existing acceptable.
C116	9.9.2.1.(1) to (3)	Except for *hotels*, the following types of *exits* may also be used: (a) connected balconies, which connect across *firewalls*, or connect to another *exit*, or with access to grade, (b) areas of refuge approved by the *chief building official*, where fire service rescue is possible, or (c) *combustible* or *noncombustible* exterior stairways or fire escapes which are protected in accordance with Sentence 3.2.3.13.(2). These may be reconstructed or recreated (as in the case of a *heritage building*).
C117	9.9.2.1.(4)	Except for *hotels*, existing acceptable.
C118	9.9.3.2.	(a) In a *building* containing not more than four *dwelling units*, the width of every *exit* facility may be as the existing, but not less than 800 mm, or (b) in a *building* containing more than four *dwelling units*, the width of every *exit* facility may be as the existing, but not less than 900 mm.
C119	9.9.3.3.	(a) In a *building* containing not more than four *dwelling units*, the minimum width of a *public corridor* may be 800 mm, or (b) in a *building* containing more than four *dwelling units*, the minimum width of a *public corridor* may be 900 mm.
C120	9.9.3.4.	Existing clear height of not less than 1 950 mm is acceptable.
C121	9.9.4.2.	Except as permitted in *C.A.* C136, in a *building* containing not more than four *dwelling units* or *suites*, one *exit* need not be separated from the remainder of the *building* at the *first storey* where there are one or more other *exits* complying with *C.A.* C122.
C122	9.9.4.2.(1) and (2)	30 min *fire separation* acceptable.
C123	9.9.5.4.	Existing acceptable.
C124	9.9.5.8.	Existing acceptable provided minimum 45 min *fire separation* and where explosion-resistant *construction* or venting is provided.
C125	9.9.5.9.	Existing acceptable, provided that the enclosure has a 45 min *fire-resistance rating*.
Column 1	2	3

Table 11.5.1.1.C. (Cont'd)
Compliance Alternatives for Residential Occupancies
Forming Part of Article 11.5.1.1.

	C.A. Number	Division B Requirements	*Compliance Alternative*
	C126	9.9.6.1.	Except for *hotels*, existing acceptable.
	C127	9.9.6.2.	Existing clear opening height of not less than 1 950 mm is acceptable.
	C128	9.9.6.3.	Existing door widths are acceptable, provided *exit* widths conform to *C.A.* C118.
	C129	9.9.6.5.	Existing door swings acceptable. Existing acceptable in *public heritage buildings*, where approved by *chief building official*.
	C130	9.9.6.6.(1)	Where *exit* doors open onto a landing, they shall not extend beyond the face of the first riser.
	C131	9.9.6.8.	Existing functionally operable passage or panic hardware acceptable.
	C132	9.9.7.4.(1)(a)	Maximum area of existing room or *suite* does not apply.
r6	C133	9.9.7.5.	Except as provided in *C.A.* C136, in a *house*, the Code requirement applies.
	C134	9.9.8.2.(1)	Existing travel distance acceptable where *floor area* is *sprinklered* and provided *fire separations* comply with Part 9.
	C135	9.9.8.5.	In a *building* containing not more than four *dwelling units* or *suites*, existing glazed solid wood doors to lobby may remain in lieu of new 20 minute doors, provided the *fire separations* for the floor above or below are provided as per *C.A.* C147, and a second *means of egress* from the *dwelling units* complies with the Code requirements.
r6	C136	9.9.9	In a *house*, *exit* requirements are acceptable if at least one of the following conditions exists: (a) a door, including a sliding door, that opens directly to the exterior from a *dwelling unit*, serves only that *dwelling unit* and has reasonable access to ground level, and the *dwelling units* are equipped with *smoke alarms* installed in conformance with Subsection 9.10.19., (b) an *exit* that is accessible to more than one *dwelling unit* and provides the only *means of egress* from each *dwelling unit*, provided that the *means of egress* is separated from the remainder of the *building* and common areas by a *fire separation* having a 30 min *fire-resistance rating* and provided further that the required *access to exit* from any *dwelling unit* cannot be through another *dwelling unit*, *service room* or other *occupancy*, and both *dwelling units* and common areas are provided with *smoke alarms* that are installed in conformance with Subsection 9.10.19. and are interconnected, or (c) access to an *exit* from one *dwelling unit* which leads through another *dwelling unit* where, (i) an additional means of escape is provided through a window that conforms to the following: (A) the sill height is not more than 1 000 mm above or below adjacent ground level, (B) the window can be opened from the inside without the use of tools, (C) the window has an individual unobstructed open portion having a minimum area of 0.38 m² with no dimension less than 460 mm,
	Column 1	2	3

Table 11.5.1.1.C. (Cont'd)
Compliance Alternatives for Residential Occupancies
Forming Part of Article 11.5.1.1.

	C.A. Number	Division B Requirements	*Compliance Alternative*
r11.1	C136 (Cont'd)	9.9.9.	(D) the sill height does not exceed 900 mm above the floor or fixed steps, (E) where the window opens into a window well, a clearance of not less than 1 000 mm shall be provided in front of the window, and (F) *smoke alarms* are installed in every *dwelling unit* and in common areas in conformance with Subsection 9.10.19. and are interconnected, (ii) an additional means of escape is provided through a window that conforms to the following: (A) the window is a casement window not less than 1 060 mm high, 560 mm wide, with a sill height not more than 900 mm above the inside floor, (B) the sill height of the window is not more than 5 m above adjacent ground level, and (C) *smoke alarms* are installed in every *dwelling unit* and in common areas in conformance with Subsection 9.10.19. and are interconnected, or (iii) the *building* is *sprinklered* and the *dwelling units* are equipped with *smoke alarms* installed in conformance with Subsection 9.10.19.
r6	C137	9.9.10.1.	In a *house*, existing acceptable, where there is direct access to the exterior.
r6	C138	9.9.11.	In a *house*, the requirements under this Subsection do not apply.
	C139	9.9.11.3.	Existing illuminated legible signs are acceptable for *exit* signs, if approved by *chief building official*.
r6	C140	9.9.12.	In a *house*, the requirements under this Subsection apply only where the condition described in (b) of *C.A.* C136 exists.
	C141	9.10.1.1.	Assemblies required to be of *noncombustible construction* may be supported by *combustible construction* having at least the same *fire-resistance rating* as that supported.
	C142	9.10.1.3.(8) to (10)	Existing installations acceptable subject to *C.A.*'s C26, C27 and C28.
	C143	9.10.3.	*Fire-resistance ratings* may also be used where they are based on: 1. HUD Rehabilitation Guidelines, "Guideline on Fire Ratings of Archaic Materials and Assemblies". 2. DBR Technical Paper No. 194, "Fire Endurance of Protected Steel Columns and Beams". 3. DBR Technical Paper No. 207, "Fire Endurance of Unit Masonry Walls". 4. DBR Technical Paper No. 222, "Fire Endurance of Light-Framed and Miscellaneous Assemblies".
	C144	9.10.5.1.	(a) Existing openings in existing wall or ceiling membranes to remain. (b) Existing openings may be moved to another location in the same wall or ceiling, provided the aggregate area of openings does not increase and are not cumulative, and the existing opening is blocked up to provide the same rating as the existing wall or ceiling assembly.
	C145	9.10.6.2.	Existing *heavy timber construction* acceptable where *construction* is within 90% of member sizes listed in Part 3.
	C146	9.10.7.	Existing acceptable for *heritage buildings*, subject to approval of *chief building official*.
	Column 1	2	3

Table 11.5.1.1.C. (Cont'd)
Compliance Alternatives for Residential Occupancies
Forming Part of Article 11.5.1.1.

r11.1	*C.A.* Number	Division B Requirements	*Compliance Alternative*
r6	C147	9.10.8.1.; 9.10.8.3.; 9.10.8.8.	(a) Except as provided in (b) and (c), 30 min rating is acceptable.. (b) In a *house*, 15 min horizontal *fire separation* is acceptable where, (i) *smoke alarms* are installed in every *dwelling unit* and in common areas in conformance with Subsection 9.10.19., and (ii) *smoke alarms* are interconnected. (c) In a *house*, the *fire-resistance rating* of the *fire separation* is waived where the *building* is *sprinklered*.
	C148	9.10.9.7.; 9.10.9.9.	Existing acceptable in existing *fire separations*.
r3	C149	9.10.9.10.(1)	Ceiling *fire separation* need not have a *fire-resistance rating* where sprinklering, subject to *C.A.* C27, of *fire compartments* on both sides of vertical *fire separation* is provided and where such *fire separation* is not required to exceed 1 h.
	C150	9.10.9.11.(1)	Except for *hotels*, 30 min *fire separation* acceptable.
	C151	9.10.9.11.(2)	In lieu of the 2 h *fire separation*, sprinklers may be used in the *mercantile occupancy* or *medium hazard industrial occupancy*, with a 1 h *fire separation*.
r6	C152	9.10.9.14.(1) and (3); 9.10.9.15.(1)	(a) Except as provided in (b) and (c), 30 min *fire separation* is acceptable. (b) In a *house*, 15 min horizontal *fire separation* is acceptable where, (i) *smoke alarms* are installed in every *dwelling unit* and in common areas in conformance with Subsection 9.10.19., and (ii) *smoke alarms* are interconnected. (c) In a *house*, the *fire-resistance rating* of the *fire separation* is waived where the *building* is *sprinklered*.
r6	C153	9.10.10.3.	(a) Except as provided in (b) and (c) and in Articles 9.10.10.5. and 9.10.10.6., 30 min *fire separation* is acceptable. (b) In a *house*, the *fire-resistance rating* of the vertical *fire separation* is waived where, (i) *smoke alarms* are installed in every *dwelling unit* and in common areas in conformance with Subsection 9.10.19., and (ii) *smoke alarms* are interconnected. (c) In a *house*, the *fire-resistance rating* of the vertical *fire separation* is waived where *service rooms* are *sprinklered*.
r6	C154	9.10.11.2.(1)	In a *house*, a *party wall* with 1 h *fire-resistance rating* is acceptable.
	C155	9.10.13.1.	Existing functional *closures* are acceptable subject to *C.A.*'s C8 and C156.
r6	C156	9.10.13.2.(1)	In a *house*, existing unlabelled doors at least 45 mm solid core wood or metal clad are acceptable. For existing *closures*, ratings of 20 min will not be required where the entire *floor area* is *sprinklered*.
	C157	9.10.13.2.(1)	In a *building* containing not more than four *dwelling units* or *suites*, existing glazed solid wood doors to corridors may remain in lieu of new 20 min doors, provided they are not located in a dead end corridor.
	C158	9.10.13.3.	Existing acceptable provided that wood door frames are secured with hinge screws going through frame into the stud.
	Column 1	2	3

Table 11.5.1.1.C. (Cont'd)
Compliance Alternatives for Residential Occupancies
Forming Part of Article 11.5.1.1.

r11.1	*C.A.* Number	Division B Requirements	*Compliance Alternative*
	C159	9.10.13.5.	Existing wired glass acceptable. Existing transoms or sidelights located in required *fire separations* may be retained if wired glass, at least 6 mm thick, is securely fixed to a wood frame of at least 50 mm thickness with steel stops. Operable transoms shall be fixed closed.
	C160	9.10.13.6.	Existing steel door frames acceptable.
	C161	9.10.13.7.	Existing glass block acceptable.
	C162	9.10.13.8.	Existing sizes acceptable.
	C163	9.10.13.9.	Existing operable latches acceptable.
	C164	9.10.13.10.(1)	Existing functionally operable self-closing devices acceptable.
	C165	9.10.13.11.	Existing operable self-releasing electromagnetic hold-open device acceptable, and except for *hotels*, fusible link hold-open devices acceptable.
	C166	9.10.13.12.	Existing swings acceptable.
	C167	9.10.13.13.(1)	Except as permitted in *C.A.* C168, in a *building* containing not more than four *dwelling units*, the existing heating or *air-conditioning* system may be altered to serve more than one *dwelling unit*, provided *smoke alarms* are installed in each *dwelling unit* and provided *a smoke detector is* installed in the supply or return air duct system serving the entire *building* which would turn off the fuel supply and electrical power to the heating system upon activation of such detector.
r6	C168	9.10.13.13.(1)	In a *house*, existing acceptable.
	C169	9.10.13.14.; 9.10.5.1.	Except as permitted in *C.A.* C170, in a *building* containing not more than four *dwelling units*, the existing heating or *air-conditioning* system may be altered to serve more than one *dwelling unit*, provided *smoke alarms* are installed in each *dwelling unit* and provided *a smoke detector is* installed in the supply or return air duct system serving the entire *building* which would turn off the fuel supply and electrical power to the heating system upon activation of such detector.
r6	C170	9.10.13.14.; 9.10.5.1.	In a *house*, existing acceptable.
	C171	9.10.14.2.(2) and (3); 9.10.14.4.(2); 9.10.15.2.(2) and (3); 9.10.15.4.(4)	Where an addition to an existing residential *building* has its *exposing building face* further distant from the line than the existing *exposing building face* and the *limiting distance* is at least 1 200 mm, the total area of allowable *unprotected openings* may be determined under Sentence 9.10.14.2.(2) or 9.10.15.2.(2) for the combined new and existing *exposing building faces* and, (a) where the existing *exposing building face* has no *unprotected openings*, or the existing *unprotected openings* are to be filled in, the total allowable area of *unprotected openings* may be installed in the new *exposing building face*, or (b) where the existing *unprotected openings* are to remain, (i) their area shall be deducted from the total allowable area of *unprotected openings*, and the balance may be installed in the new *exposing building face*, and (ii) Sentences 9.10.14.2.(3) and 9.10.14.4.(2) or Sentences 9.10.15.2.(3) and 9.10.15.4.(4) apply only to the new *exposing building face.*
	Column 1	2	3

Table 11.5.1.1.C. (Cont'd)
Compliance Alternatives for Residential Occupancies
Forming Part of Article 11.5.1.1.

r11.1

C.A. Number	Division B Requirements	*Compliance Alternative*
C172	9.10.14.4.; 9.10.15.4.	Existing windows. (a) Existing windows in walls may be relocated to another part of the wall, provided the existing opening is blocked up to provide the same fire rating for the wall, and the projection of the new opening, at a right angle to the property line onto another *building*, lies no closer than 300 mm from a window in such other *building*, where the "opposite" window is less than 2 400 mm from the opposite new opening, and (b) except relocation of units, to be restricted to the same *fire compartment* and shall conform to the requirements of Article 3.2.3.14. or 9.10.12.3. where applicable, or (c) where a *building* does not satisfy the requirements of Subsection 3.2.3. for the amount of openings facing a yard or space that does not have sufficient *limiting distance*, such existing openings are allowed to be relocated provided: (i) such openings are not increased in size and they are protected with wired glass in steel frames conforming to Sentence 3.1.8.14.(2), or (ii) the *building* is *sprinklered*.
C173	9.10.16.2.(1)	Where balloon framing is exposed during renovation, *fire blocks* shall be provided.
C174	9.10.18.	(a) Subject to approval by the *chief building official*, existing fire alarm system may remain where the fire safety plan (as described in the Fire Code made under the *Fire Protection and Prevention Act, 1997*) for the *building* addresses the intent of Subsection 3.2.4. (i.e. "stage" system, electrical supervision, detection as required, Fire Department connection, and emergency power supply), and (b) extension of an existing system must ensure continuity and compatibility, and integrity of the system.
C175	9.10.19.4.	*Smoke alarms* may be battery operated.
C176	9.10.20.	Existing access acceptable.
C177	9.14.2.1.(2)	Existing acceptable.
C178	9.18.2.	Existing access acceptable.
C179	9.18.3.	Existing vents and ventilation acceptable.
C180	9.19.	Existing acceptable.
C181	9.20.2.2.	Used masonry may be reused for patching and filling openings to match adjacent work. Used interior brick may not be used for exterior applications.
C182	9.20.3.	Archaic mortars may be used to match existing jointing.
C183	9.20.4.1.	Sound jointing techniques may be employed to match existing archaic joints.
C184	9.20.12.1.	Corbelling may be constructed to match existing or original details, provided that it is structurally adequate for the proposed use.
C185	9.21.	Existing acceptable, provided the products of combustion are safely vented and provided no fire hazard is created.
C186	9.22.1. to 9.22.7.	Sound period materials, designs and techniques may be employed in recreated fireplaces, provided no fire hazard is created. Existing need not comply with Article 9.22.1.4.
Column 1	2	3

Table 11.5.1.1.C. (Cont'd)
Compliance Alternatives for Residential Occupancies
Forming Part of Article 11.5.1.1.

	C.A. Number	Division B Requirements	*Compliance Alternative*
	C187	9.23.	Existing acceptable.
	C188	9.24.	Existing acceptable.
	C189	9.25.	A *vapour barrier* may consist of paint or other coating with specified perm rating such as two coats of leafing aluminum pigmented paint.
	C190	9.26.	Existing acceptable, except when removing and replacing shingles, comply with the eave protection requirements of Subsection 9.26.5.
	C191	9.27.	Existing acceptable.
	C192	9.28.	All replacement or recreation of existing stucco may be compatible with the existing materials and application.
	C193	9.29.4.	Existing acceptable. All replacement or recreation of existing plaster may be compatible with the existing materials and application.
r6	C194	9.32.	In a *house*, rooms or spaces to be ventilated by natural means in accordance with Subsection 9.32.2. or by providing adequate mechanical ventilation.
	C195	9.33.1.1.	In a *building* containing not more than four *dwelling units*, the existing heating or *air-conditioning* system may be altered to serve more than one *dwelling unit,* provided *smoke alarms* are installed in each *dwelling unit* and provided *a smoke detector* is installed in the supply or return air duct system serving the entire *building* which would turn off the fuel supply and electrical power to the heating system upon activation of such detector.
	C196	9.33.1.2.	Sound, used or antique *appliances* are acceptable, provided that: (a) visual examination shows no excessive weakening by corrosion or other damage, (b) no structural parts are missing, (c) no cracks are present in the components intended to support the *appliance* or enclose the fire, and (d) loading and ash removal door latches and hinges hold the door closed.
	C197	9.33.4.3.(1)	Carbon monoxide alarms may be battery operated or plugged into an electrical outlet.
	C198	9.37.	Sound used materials shall be acceptable for reuse, subject to the following limitations: (a) visual examination shows no excessive weakening by holes, notches, nail splits or other damage, and (b) logs have not been subjected to termite infestation.
r6	C199	12.2.1.1.(3)	(a) Where the framing systems are being altered to match the existing framing, lesser amounts and extent of insulation and *vapour barrier* is acceptable. (b) Existing acceptable for Article 2.1.1.9. of MMA Supplementary Standard SB-12, "Energy Efficiency for Housing". (c) Existing previously occupied log houses that are dismantled and reconstructed are exempt from Article 2.1.1.5. of MMA Supplementary Standard SB-12, "Energy Efficiency for Housing".
	Column 1	2	3

Table 11.5.1.1.D/E.
Compliance Alternatives for Business/Mercantile Occupancies
Forming Part of Article 11.5.1.1.

C.A. Number	Division B Requirements	*Compliance Alternative*
DE1	3.1.4.7.	Existing *heavy timber construction* acceptable where *construction* is within 90% of member sizes listed in Part 3.
DE2	3.1.5.2. to 3.1.5.4.; 3.1.5.6.	Existing acceptable.
DE3	3.1.5.7. to 3.1.5.10.	Except for exposed foamed plastics, existing acceptable. To match existing, materials may be added from on or off site.
DE4	3.1.5.15. to 3.1.5.17.; 3.1.5.21.; 3.1.4.23.	Existing acceptable.
DE5	3.1.7.1.	*Fire-resistance ratings* may also be used where they are based on: 1. HUD Rehabilitation Guidelines, "Guideline on Fire Ratings of Archaic Materials and Assemblies". 2. DBR Technical Paper No. 194, "Fire Endurance of Protected Steel Columns and Beams". 3. DBR Technical Paper No. 207, "Fire Endurance of Unit Masonry Walls". 4. DBR Technical Paper No. 222, "Fire Endurance of Light-Framed and Miscellaneous Assemblies".
DE6	3.1.7.5.(3)	Existing assemblies required to be of *noncombustible construction* may be supported by *combustible construction* having at least the same *fire-resistance rating* as that supported.
DE7	3.1.8.1.(2); 3.1.8.6.	Existing functional *closures* are acceptable and may be relocated within the same existing *fire separation*.
DE8	3.1.8.5.(2)	(a) Existing functional and sound doors in existing *buildings* that are either hollow metal or kalamein and containing wired glass at least 6 mm thick and conforming to Sentence 3.1.8.14.(2) are permitted in lieu of doors not required to exceed 45 min, (b) all existing functional and sound hollow doors which carry existing 1.5 h labels are acceptable in lieu of current 1.5 h labels and may contain wired glass panels not exceeding 0.0645 m², at least 6 mm thick and conforming to Sentence 3.1.8.14.(2), and (c) every fire door, window assembly or glass block used as a *closure* in a required *fire separation* shall be installed in conformance with good engineering practice.
r11.1 DE9	3.1.8.7., 3.1.8.8. and 3.1.8.9.	*Fire dampers* or *fire stop flaps* are not required to be installed in existing ducts at penetrations of existing *fire separations*.
DE10	3.1.8.10.(1)	For existing unlabelled doors in existing *buildings*, at least 45 mm solid core wood or metal clad are acceptable.
DE11	3.1.8.13.	Existing functionally operable latching devices, excluding draw bolts, are acceptable.
DE12	3.1.8.14.	Existing transoms or sidelights located in required *fire separations* may be retained if wired glass, at least 6 mm thick, is securely fixed to a wood frame of at least 50 mm thickness with steel stops. Operable transoms shall be fixed closed.
DE13	3.1.8.15. to 3.1.8.17.	Existing acceptable.
DE14	3.1.11.	Where the concealed space is being materially altered, smoke or heat detection in that space in lieu of *fire blocks* and tied into fire alarm system is acceptable.
DE15	3.2.2.17.(1)(b) and (c)	Existing sprinkler systems in 1 *storey buildings* need not comply.
Column 1	2	3

Table 11.5.1.1.D/E. (Cont'd)
Compliance Alternatives for Business/Mercantile Occupancies
Forming Part of Article 11.5.1.1.

r11.1

C.A. Number	Division B Requirements	*Compliance Alternative*
DE16	3.2.3.	Existing windows. (a) Existing windows in walls may be relocated to another part of the wall, provided the existing opening is blocked up to provide the same fire rating for the wall, and the projection of the new opening, at a right angle to the property line onto another *building*, lies not closer than 300 mm from a window in such other *building*, where the "opposite" window is less than 2 400 mm from the opposite new opening, and (b) except relocation of units, shall be restricted to the same *fire compartment* and shall conform to the requirements of Article 3.2.3.14. or 9.10.12.3. where applicable, or (c) where a *building* does not satisfy the requirements of Subsection 3.2.3. for the amount of openings facing a yard or space that does not have sufficient *limiting distance*, such existing openings are allowed to be relocated provided: (i) such openings are not increased in size and they are protected with wired glass in steel frames conforming to Sentence 3.1.8.14.(2), or (ii) the *building* is *sprinklered.*
DE17	3.2.3.6.(3)	Existing roof soffit projections acceptable.
DE18	3.2.3.17.	Need not comply for "E" *occupancy*.
DE19	3.2.4.	(a) Existing fire alarm system may remain except that Article 3.2.4.5. does not apply where the fire safety plan (as described in the Fire Code made under the *Fire Protection and Prevention Act, 1997*) for the *building* addresses the intent of Subsection 3.2.4. (i.e. "stage" system, electrical supervision, detection as required, Fire Department connection, and emergency power supply), and (b) extension of an existing system must ensure continuity and compatibility, and integrity of the system.
DE20	3.2.4.9.(2)(e)	Does not apply to existing installations in *buildings*.
DE21	3.2.4.10.(5)(c)	Does not apply to existing installations in *buildings*.
DE22	3.2.5.1.; 3.2.5.2.	Existing acceptable.
DE23	3.2.5.3.	Existing access acceptable.
DE24	3.2.5.4. to 3.2.5.6.	Existing acceptable provided the *building* is *sprinklered*.
DE25	3.2.5.7.	Does not apply, except where a change in *major occupancy* occurs from a lesser *hazard index*.
DE26	3.2.5.13.	Existing sprinkler systems in existing *buildings* that do not conform to NFPA 13 may be altered, added to, or extended from the existing system without complying with NFPA 13, provided the system is operational and adequate with respect to coverage, water supply and controls, and provided the system is evaluated by a qualified designer.
DE27	3.2.9.	Does not apply to *buildings* 6 *storeys* and less. Does not apply to *sprinklered buildings*.
DE28	3.3.1.5.(1)(c); Tables 3.3.1.5.A. and 3.3.1.5.B.	In Column 2, maximum area of room or *suite* to be unlimited.
Column 1	2	3

Table 11.5.1.1.D/E. (Cont'd)
Compliance Alternatives for Business/Mercantile Occupancies
Forming Part of Article 11.5.1.1.

	C.A. Number	Division B Requirements	*Compliance Alternative*
	DE29	3.3.1.9.(1)	Existing width of *public corridors* of not less than 914 mm is acceptable.
	DE30	3.3.1.10.; 3.3.1.11.	Existing door swings may remain in *heritage buildings*, existing or being restored, with no change in *major occupancy* and with *occupant load* no greater than 100.
	DE31	3.3.1.12.	Existing doors acceptable, provided not less than 600 mm wide.
	DE32	3.3.1.15.	Existing curved or spiral stairs acceptable.
	DE33	3.3.1.16.	Existing non-conforming capacities of *access to exits* are acceptable, provided that: (a) the increase in *occupant load* is not greater than 15%, (b) the corridor *fire separations* are rated to Code, and (c) early warning systems are provided, or (d) there are sprinklers, plus *smoke alarms* in *suites*.
	DE34	3.3.1.17.	Does not apply to *heritage buildings*.
	DE35	3.3.1.18.	Existing stained, etched, bevelled, leaded or figured glass acceptable.
	DE36	3.3.5.4.; 3.3.5.7.(3)	Need not comply where a gasketed door and self closer are provided in the existing *fire separation*.
	DE37	3.4.1.4.	The following types of *exits* may also be used for *buildings* not over 6 *storeys* in *building height*: (a) connected balconies, which connect across *firewalls*, or connect to another *exit*, or with access to grade, (b) areas of refuge where fire service rescue is possible and that comply with Measure L of Sentences (4) to (10), (18), and Clauses (20)(a), (b) and (d) in MMAH Supplementary Standard SB-4, “Measures for Fire Safety in High Buildings”.
	DE38	3.4.1.8.	Existing stained, etched, bevelled, leaded or figured glass acceptable.
	DE39	3.4.2.5.(1)	Existing travel distance acceptable where *floor area* is *sprinklered*.
	DE40	3.4.3.2.(7)	Existing width of *exits* acceptable provided the *occupant load* is not more than 15% above the *exit* capacity.
	DE41	3.4.3.4.	Existing acceptable.
	DE42	3.4.3.5.	Existing headroom clearance of not less than 1 980 mm is acceptable.
r11.1	DE43	3.4.4.1.	*Fire separations* of *exits* permitted in *buildings*: (a) 30 min, up to 3 *storeys* in *building height*, (b) 45 min, up to 6 *storeys* in *building height*, (c) 1 h, over 6 *storeys* in *building height*.
	DE44	3.4.4.4.(8)	Existing washrooms opening directly into *exit* stairwell shall be separated from *exit* stairwell by a 45 min *closure*.
	DE45	3.4.5.1.(2) and (9)	Existing illuminated legible *exit* signs are acceptable.
	DE46	3.4.6.1.	Existing acceptable.
	DE47	3.4.6.2.	Existing acceptable, if visually apparent.
	DE48	3.4.6.3.(1)	Existing acceptable with rise no greater than 3.7 m.
	Column 1	2	3

Table 11.5.1.1.D/E. (Cont'd)
Compliance Alternatives for Business/Mercantile Occupancies
Forming Part of Article 11.5.1.1.

	C.A. Number	Division B Requirements	*Compliance Alternative*
	DE49	3.4.6.4.(1)	Existing acceptable.
	DE50	3.4.6.4.(2) and (3)	Existing acceptable.
	DE51	3.4.6.5.(2) to (11)	Existing acceptable.
	DE52	3.4.6.6.(1) to (5)	Existing acceptable.
	DE53	3.4.6.7.(1)	Existing acceptable.
	DE54	3.4.6.8.	Existing acceptable.
	DE55	3.4.6.9.	Existing acceptable.
	DE56	3.4.6.10.(2) to (6)	Existing acceptable.
r11.1	DE57	3.4.6.11.(1), (1.1) and (2)	Existing acceptable.
	DE58	3.4.6.12.	Existing acceptable in *public heritage buildings* or a change in *occupancy* with no increase in *occupant load*.
	DE59	3.4.6.13.	Existing acceptable.
	DE60	3.4.6.14.	Existing acceptable.
	DE61	3.4.6.16.	Existing functionally operable panic hardware acceptable.
	DE62	3.4.7.2.	*Combustible* fire escapes which are protected from fire in accordance with Sentence 3.2.3.13.(2) are permitted or may be reconstructed or recreated (as in the case of a *heritage building*).
	DE63	3.5.1.	Existing acceptable except where *building* is classified under Subsection 3.2.6.
	DE64	3.6.2.1.(7)	Existing *fire separation* of not less than 30 min is acceptable
	DE65	3.6.2.2.	Existing acceptable where explosion-resistant *construction* or venting is provided.
	DE66	3.6.2.6.	Existing acceptable.
	DE67	3.6.2.7.(1)	2 h *fire separation* acceptable.
	DE68	3.6.3.1.(1) to (5)	45 min *fire separation* acceptable up to 6 *storeys*.
	DE69	3.6.3.3.	(a) Where 2 h *fire separation* is required, 1 h is acceptable. (b) Where 1 h *fire separation* is required, 45 min is acceptable. (c) Existing need not comply with Sentence 3.6.3.3.(5).
r3	DE70	3.6.4.2.	Ceiling *fire separation* need not have a *fire-resistance rating* where sprinklering, subject to *C.A.* DE27, of *fire compartments* on both sides of vertical *fire separation* is provided and where such *fire separation* is not required to exceed 1 h.
	DE71	3.6.4.3.(1)	Existing to meet *flame-spread rating* of 25 or to be *sprinklered*.
	DE72	3.6.4.4. to 3.6.4.6.	Existing access acceptable.
	DE73	3.7.4.	Where the *occupant load* is increased by more than 15% above the capacity of the existing facilities, facilities to be added to accommodate the increase.
r4	DE74	3.8.1.2.	Existing accessible entrance acceptable. (See *C.A.* DE78) Existing curb ramp conforming to Sentence 3.8.3.2.(3) is acceptable. Existing principal entrance acceptable, provided at least one *barrier-free* entrance is available.
	Column 1	2	3

Table 11.5.1.1.D/E. (Cont'd)
Compliance Alternatives for Business/Mercantile Occupancies
Forming Part of Article 11.5.1.1.

	C.A. Number	Division B Requirements	*Compliance Alternative*
	DE75	3.8.1.3.(1)	Existing unobstructed width of 920 mm minimum is acceptable.
	DE76	3.8.1.3.(4)	Existing unobstructed space not less than 1 500 mm in width and 1 500 mm in length located not more than 30 m apart is acceptable.
r4	DE76.1	3.8.3.2.(3)(b)	Existing curb ramp acceptable, provided width not less than 1 200 mm.
	DE77	3.8.3.3.(1)	Existing doorway acceptable, provided not less than 810 mm wide.
r4	DE77.1	3.8.3.3.(11)(a)	Existing distance acceptable, provided not less than 1 200 mm plus the width of any door that swings into the space in the path of travel.
	DE78	3.8.3.4.(1)(a)	Existing ramp acceptable, provided not less than 870 mm between handrails.
r4	DE79	3.8.3.8.(5)	Existing grab bar is acceptable.
r4	DE79.1	3.8.3.12.	Existing universal washroom acceptable.
r11.1	DE80	3.8.3.13.(2)(g)	Existing grab bar is acceptable.
r4	DE80.1	3.8.3.16.	Existing drinking fountain conforming to Clauses 3.8.3.16.(2)(a) and (b) acceptable.
	DE81	4.1.8.	The requirements under this Subsection do not apply.
	DE82	6.2.2.1.(2)	Required outdoor air rates may be provided by mechanical, natural or combination of natural and mechanical means.
	DE83	6.2.3.2.; 6.2.3.9.; 6.2.3.18; 6.2.3.19.	Existing acceptable.
	DE84	6.2.3.8.(18)	Existing acceptable.
	DE85	6.2.3.12.	Existing openings, grilles and diffusers acceptable, subject to approval of *chief building official*.
	DE86	8.2.1.4.	Existing clearances acceptable where a *sewage system* is replaced with another *sewage system* within the same class and the capacity of the replacement *sewage system* does not exceed the capacity of the existing *sewage system*.
	DE87	8.2.1.4.	Existing clearances are acceptable where a replacement *sewage system* requires lesser clearances than those required in Part 8 for the existing *sewage system.*
	DE88	9.3.2.1.	Sound used lumber may be acceptable for reuse without a grade stamp provided that: (a) visual examination shows no excessive weakening by holes, notches, nail splits or other damage, (b) where the grade or species is unknown, the minimum grade shall apply for span table use, and (c) lumber has not been subjected to termite infestation.
	DE89	9.5.11.2.	Existing acceptable, provided not less than 600 mm.
	DE90	9.6.1.2.(2) and (3); 9.6.1.4.(1) and (2)	Existing doors and sidelights being reused or relocated need not conform if identified or protected.
	DE91	9.6.1.4.(3) and (4); 9.8.8.1.(7) and (9)	Existing acceptable.
	DE92	9.7.	Existing acceptable.
	Column 1	2	3

Table 11.5.1.1.D/E. (Cont'd)
Compliance Alternatives for Business/Mercantile Occupancies
Forming Part of Article 11.5.1.1.

r11.1

C.A. Number	Division B Requirements	*Compliance Alternative*
DE93	9.8.1. to 9.8.4.	Replacement or extension of existing stair systems shall be exempt from the provisions of these Subsections, except that they shall have: (a) a minimum width between wall faces of 700 mm, and (b) a minimum clear height over tread nosing or landing of 1 800 mm.
DE94	9.8.3.2.	Existing acceptable.
DE95	9.8.4.3.	Existing curved or spiral stairs acceptable.
DE96	9.8.5.1.(2)	Existing ramps acceptable, where practical.
DE97	9.8.7.	Existing handrails acceptable, unless considered unsafe by *chief building official*.
DE98	9.8.8.	Existing *guards* acceptable, unless considered unsafe by *chief building official*.
DE99	9.9.1.1.	Existing acceptable.
DE100	9.9.2.1.(1) to (3)	The following types of *exits* may also be used: (a) connected balconies, which connect across *firewalls*, or connect to another *exit*, or with access to grade, (b) areas of refuge approved by the *chief building official*, where fire service rescue is possible, or (c) *combustible* or *noncombustible* exterior stairways or fire escapes which are protected in accordance with Sentence 3.2.3.13.(2). These may be reconstructed or recreated (as in the case of a *heritage building*).
DE101	9.9.2.1.(4)	Existing acceptable.
DE102	9.9.3.2.	Existing width of *exits* acceptable.
DE103	9.9.3.3.	Existing width of *public corridors* of not less than 965 mm is acceptable.
DE104	9.9.3.4.	Existing clear height of not less than 1 950 mm is acceptable.
DE105	9.9.4.2.	30 min *fire separation* acceptable.
DE106	9.9.5.4.; 9.9.5.5.	Existing acceptable.
DE107	9.9.5.8.	Existing acceptable provided minimum 45 min *fire separation* and where explosion-resistant *construction* or venting is provided.
DE108	9.9.5.9.	Existing acceptable, provided that the enclosure has a 45 min *fire-resistance rating*.
DE109	9.9.6.1.	Existing acceptable.
DE110	9.9.6.2.	Existing clear opening height of not less than 1 950 mm is acceptable.
DE111	9.9.6.3.	Existing door widths are acceptable, provided *exit* widths comply with *C.A.* DE103.
DE112	9.9.6.5.	Existing door swings are acceptable. Existing acceptable in *public heritage buildings*, where approved by *chief building official*.
DE113	9.9.6.6.(1)	Where *exit* doors open onto a landing, they shall not extend beyond the face of the first riser.
DE114	9.9.6.8.	Existing functionally operable passage or panic hardware acceptable.
Column 1	2	3

Table 11.5.1.1.D/E. (Cont'd)
Compliance Alternatives for Business/Mercantile Occupancies
Forming Part of Article 11.5.1.1.

r11.1

C.A. Number	Division B Requirements	*Compliance Alternative*
DE115	9.9.7.4.	Maximum area of existing room or *suite* to be unlimited.
DE116	9.9.8.2.(1)	Existing travel distance acceptable where *floor area* is *sprinklered* and provided *fire separations* comply with Part 9.
DE117	9.9.11.3.	Existing illuminated legible signs are acceptable for *exit* signs, if approved by *chief building official*.
DE118	9.10.1.1.	Assemblies required to be of *noncombustible construction* may be supported by *combustible construction* having at least the same *fire-resistance rating* as that supported.
DE119	9.10.1.3.(8) to (10)	Existing installations acceptable subject to *C.A.*'s DE26 and DE27.
DE120	9.10.3.	*Fire-resistance ratings* may also be used where they are based on: 1. HUD Rehabilitation Guidelines, "Guideline on Fire Ratings of Archaic Materials and Assemblies". 2. DBR Technical Paper No. 194, "Fire Endurance of Protected Steel Columns and Beams". 3. DBR Technical Paper No. 207, "Fire Endurance of Unit Masonry Walls". 4. DBR Technical Paper No. 222, "Fire Endurance of Light-Framed and Miscellaneous Assemblies".
DE121	9.10.5.1.	(a) Existing openings in existing wall or ceiling membranes to remain. (b) Existing openings may be moved to another location in the same wall or ceiling, provided the aggregate area of openings does not increase and are not cumulative, and the existing opening is blocked up to provide the same rating as the existing wall or ceiling assembly.
DE122	9.10.6.2.	Existing *heavy timber construction* acceptable where *construction* is within 90% of the member sizes listed in Part 3.
DE123	9.10.7.	Existing acceptable for *heritage buildings*, subject to approval of *chief building official*.
DE124	9.10.8.1.	Existing 30 min rating acceptable.
DE125	9.10.8.2.	Existing sprinkler systems complying with *C.A.* DE27 and Sentence 3.2.2.17.(1) are acceptable.
DE126	9.10.8.3.	Existing acceptable, subject to approval of the *chief building official*.
DE127	9.10.8.8.	30 min rating acceptable.
DE128	9.10.9.7.; 9.10.9.9.	Existing acceptable in existing *fire separations*.
DE129	9.10.9.10.(1)	Ceiling *fire separation* need not be fire-resistance rated where sprinklering of *fire compartments* on both sides of vertical *fire separation* is provided and where such *fire separation* is not required to exceed 1 h.
DE130	9.10.9.11.(2)	In lieu of the 2 h *fire separation*, sprinklers may be used in the *mercantile occupancy* with a 1 h *fire separation*.
DE131	9.10.9.13.	30 min *fire separation* acceptable.
DE132	9.10.9.15.(1)	30 min *fire separation* acceptable.
DE133	9.10.9.15.(3)	Need not comply for *mercantile occupancy*.
DE134	9.10.10.3.(1)	45 min *fire separation* acceptable.
Column 1	2	3

Table 11.5.1.1.D/E. (Cont'd)
Compliance Alternatives for Business/Mercantile Occupancies
Forming Part of Article 11.5.1.1.

r11.1

C.A. Number	Division B Requirements	*Compliance Alternative*
DE135	9.10.13.1.	Existing functional *closures* are acceptable subject to *C.A.* DE8.
DE136	9.10.13.2.	Existing acceptable.
DE137	9.10.13.3.	Existing acceptable, provided that wood door frames are secured with hinge screws going through frame into the stud.
DE138	9.10.13.5.	Existing acceptable. Existing transoms or sidelights located in required *fire separations* may be retained if wired glass, at least 6 mm thick, is securely fixed to a wood frame of at least 50 mm thickness with steel stops. Operable transoms shall be fixed closed.
DE139	9.10.13.6.	Existing steel door frames acceptable.
DE140	9.10.13.7.	Existing glass block acceptable.
DE141	9.10.13.8.	Existing sizes acceptable.
DE142	9.10.13.9.	Existing operable latches acceptable.
DE143	9.10.13.10.(1)	Existing functionally operable self-closing devices acceptable.
DE144	9.10.13.10.(2)	Existing functionally operable self-closing devices acceptable in "E" *occupancy*.
DE145	9.10.13.11.	Existing operable self-releasing electromagnetic and fusible link hold-open devices acceptable.
DE146	9.10.13.12.	Existing swings acceptable.
DE147	9.10.14.4.	Existing windows. (a) Existing windows in walls may be relocated to another part of the wall, provided the existing opening is blocked up to provide the same fire rating for the wall, and the projection of the new opening, at a right angle to the property line onto another *building*, lies no closer than 300 mm from a window in such other *building*, where the "opposite" window is less than 2 400 mm from the opposite new opening, and (b) except relocation of units, to be restricted to the same *fire compartment* and shall conform to the requirements of Article 3.2.3.14. or 9.10.12.3. where applicable, or (c) where a *building* does not satisfy the requirements of Subsection 3.2.3. for the amount of openings facing a yard or space that does not have sufficient *limiting distance*, such existing openings are allowed to be relocated provided: (i) such openings are not increased in size and they are protected with wired glass in steel frames conforming to Sentence 3.1.8.14.(2), or (ii) the *building* is *sprinklered*.
DE148	9.10.16.2.(1)	Where balloon framing is exposed during renovation, *fire blocks* shall be provided.
DE149	9.10.18.	(a) Subject to approval by the *chief building official*, existing fire alarm system may remain where the fire safety plan (as described in the Fire Code made under the *Fire Protection and Prevention Act, 1997*) for the *building* addresses the intent of 3.2.4. (i.e. "stage' system, electrical supervision, detection as required, Fire Department connection, and emergency power supply), and (b) extension of an existing system must ensure continuity and compatibility, and integrity of the system.
Column 1	2	3

Table 11.5.1.1.D/E. (Cont'd)
Compliance Alternatives for Business/Mercantile Occupancies
Forming Part of Article 11.5.1.1.

r11.1

C.A. Number	Division B Requirements	*Compliance Alternative*
DE150	9.10.20.	Existing access acceptable.
DE151	9.18.2.	Existing access acceptable.
DE152	9.18.3.	Existing vents and ventilation acceptable.
DE153	9.19.	Existing acceptable.
DE154	9.20.2.2.	Used masonry may be reused for patching and filling openings to match adjacent work. Used interior brick may not be used for exterior applications.
DE155	9.20.3.	Archaic mortars may be used to match existing jointing.
DE156	9.20.4.1.	Sound jointing techniques may be employed to match existing archaic joints.
DE157	9.20.12.1.	Corbelling may be constructed to match existing or original details, provided that it is structurally adequate for the proposed use.
DE158	9.21.	Existing acceptable, provided the products of combustion are safely vented and provided no fire hazard is created.
DE159	9.22.1. to 9.22.7.	Sound period materials, designs and techniques may be employed in recreated fireplaces, provided no fire hazard is created. Existing need not comply with Article 9.22.1.4.
DE160	9.23.	Existing acceptable.
DE161	9.24.	Existing acceptable.
DE162	9.26.	Existing acceptable, except when removing and replacing shingles, comply with eave protection requirements in Subsection 9.26.5.
DE163	9.27.	Existing acceptable.
DE164	9.28.	All replacement or recreation of existing stucco may be compatible with the existing materials and application.
DE165	9.29.4.	Existing acceptable. All replacement or recreation of existing plaster may be compatible with the existing materials and application.
DE166	9.33.1.2.	Sound, used or antique *appliances* are acceptable, provided that: (a) visual examination shows no excessive weakening by corrosion or other damage, (b) no structural parts are missing, (c) no cracks are present in the components intended to support the *appliance* or enclose the fire, and (d) loading and ash removal door latches and hinges hold the door closed.
DE167	9.37.	Sound used materials shall be acceptable for reuse, subject to the following limitations: (a) visual examination shows no excessive weakening by holes, notches, nail splits or other damage, and (b) logs have not been subjected to termite infestation.
Column 1	2	3

Table 11.5.1.1.F.
Compliance Alternatives for Industrial Occupancies
Forming Part of Article 11.5.1.1.

r11.1	*C.A.* Number	Division B Requirements	*Compliance Alternative*
	F1	3.1.4.7.	Existing *heavy timber construction* acceptable where *construction* is within 90% of member sizes listed in Part 3.
	F2	3.1.5.2. to 3.1.5.4.; 3.1.5.6.	Existing acceptable.
	F3	3.1.5.7. to 3.1.5.10.	Except for exposed foamed plastics, existing acceptable for "F2" and "F3" *occupancies*. To match existing, materials may be added from on or off site.
	F4	3.1.5.15. to 3.1.5.17.; 3.1.5.21.; 3.1.5.23.	Existing acceptable.
	F5	3.1.7.1.	*Fire-resistance ratings* may also be used where they are based on: 1. HUD Rehabilitation Guidelines, "Guideline on Fire Ratings of Archaic Materials and Assemblies". 2. DBR Technical Paper No. 194, "Fire Endurance of Protected Steel Columns and Beams". 3. DBR Technical Paper No. 207, "Fire Endurance of Unit Masonry Walls". 4. DBR Technical Paper No. 222, "Fire Endurance of Light-Framed and Miscellaneous Assemblies".
	F6	3.1.7.5.(3)	Existing assemblies required to be of *noncombustible construction* may be supported by *combustible construction* having at least the same *fire-resistance rating* as that supported.
	F7	3.1.8.1.(2); 3.1.8.6.	Existing functional *closures* are acceptable and may be relocated within the same existing *fire separation*.
	F8	3.1.8.5.(2)	(a) Existing functional and sound doors in existing *buildings* that are either hollow metal or kalamein and containing wired glass at least 6 mm thick and conforming to Sentence 3.1.8.14.(2) are permitted in lieu of doors not required to exceed 45 min, (b) all existing functional and sound hollow metal or kalamein doors which carry existing 1.5 h labels are acceptable in lieu of current 1.5 h labels and may contain wired glass panels not exceeding 0.0645 m², at least 6 mm thick and conforming to Sentence 3.1.8.14.(2), and (c) every fire door, window assembly or glass block used as a *closure* in a required *fire separation* shall be installed in conformance with good engineering practice.
r11.1	F9	3.1.8.7., 3.1.8.8. and 3.1.8.9.	*Fire dampers* or *fire stop flaps* are not required to be installed in existing ducts at penetrations of existing *fire separations*.
	F10	3.1.8.10.(1)	For existing unlabelled doors in existing *buildings*, at least 45 mm solid core wood or metal clad are acceptable.
	F11	3.1.8.11.(1)	Existing functionally operable devices acceptable for "F2" and "F3" *occupancies*.
	F12	3.1.8.13.	Existing functionally operable latching devices, excluding draw bolts, are acceptable.
	F13	3.1.8.14.	Existing transoms or sidelights located in required *fire separations* may be retained if wired glass, at least 6 mm thick, is securely fixed to a wood frame of at least 50 mm thickness with steel stops. Operable transoms shall be fixed closed.
	F14	3.1.8.15. to 3.1.8.17.	Existing acceptable.
	F15	3.1.11.	Where the concealed space is being materially altered, smoke or heat detection in that space in lieu of *fire blocks* and tied into fire alarm system is acceptable.
	Column 1	2	3

Table 11.5.1.1.F. (Cont'd)
Compliance Alternatives for Industrial Occupancies
Forming Part of Article 11.5.1.1.

r11.1

C.A. Number	Division B Requirements	*Compliance Alternative*
F16	3.2.2.17.(1)(b) and (c)	Existing sprinkler systems in 1 *storey buildings* need not comply.
F17	3.2.3.	Existing need not comply with Article 3.2.3.18. for "F2" *occupancy*. Existing windows. (a) Existing windows in walls may be relocated to another part of the wall, provided the existing opening is blocked up to provide the same fire rating for the wall, and the projection of the new opening, at a right angle to the property line onto another *building*, lies not closer than 300 mm from a window in such other *building*, where the "opposite" window is less than 2 400 mm from the opposite new opening, and (b) except relocation of units, shall be restricted to the same *fire compartment* and shall conform to the requirements of Article 3.2.3.14. or 9.10.12.3. where applicable, or (c) where a *building* does not satisfy the requirements of Subsection 3.2.3. for the amount of openings facing a yard or space that does not have sufficient *limiting distance*, such existing openings are allowed to be relocated provided: (i) such openings are not increased in size and they are protected with wired glass in steel frames conforming to Sentence 3.1.8.14.(2), or (ii) the *building* is *sprinklered.*
F18	3.2.3.6.(3)	Existing roof soffit projections acceptable.
F19	3.2.3.17.	Need not comply for "F2" *occupancy*.
F20	3.2.4.	(a) Existing fire alarm system may remain except that Article 3.2.4.5. does not apply where the fire safety plan (as described in the Fire Code made under the *Fire Protection and Prevention Act, 1997*) for the *building* addresses the intent of Subsection 3.2.4. (i.e. "stage" system, electrical supervision, detection as required, Fire Department connection, and emergency power supply), and (b) extension of an existing system must ensure continuity and compatibility, and integrity of the system.
F21	3.2.4.9.(2)(e)	Does not apply to existing installations in *buildings*.
F22	3.2.4.10.(5)(c)	Does not apply to existing installations in *buildings*.
F23	3.2.5.1; 3.2.5.2.	Existing acceptable.
F24	3.2.5.3.	Existing access acceptable.
F25	3.2.5.4. to 3.2.5.6.	Existing acceptable provided the *building* is *sprinklered*.
F26	3.2.5.7.	Does not apply, except where a change in *major occupancy* occurs from a lesser *hazard index*.
F27	3.2.5.13.	Existing sprinkler systems in existing *buildings* that do not conform to NFPA 13 may be altered, added to, or extended from the existing system without complying with NFPA 13, provided the system is operational and adequate with respect to coverage, water supply and controls, and provided the system is evaluated by a qualified designer.
F28	3.2.9.	Does not apply to *buildings* 6 *storeys* and less of "F2" and "F3" *occupancies*. Does not apply to *sprinklered buildings*.
Column 1	2	3

Table 11.5.1.1.F. (Cont'd)
Compliance Alternatives for Industrial Occupancies
Forming Part of Article 11.5.1.1.

C.A. Number	Division B Requirements	*Compliance Alternative*
F29	3.3.1.4.(1)	30 min is acceptable to separate *public corridors* or *exits* in *buildings* not exceeding 6 *storeys* in *building height*, except that 45 min is required for *exits* in *buildings* exceeding 3 *storeys* in *building height*. Except for *exits*, no rating required where *floor areas* are *sprinklered*.
F30	3.3.1.5.(1)(c); Tables 3.3.1.5.A. and 3.3.1.5.B.	For "F2" and "F3" *occupancies* in Column 2, maximum area of room or *suite* to be unlimited.
F31	3.3.1.9.	Existing width of *public corridors* of not less than 914 mm is acceptable.
F32	3.3.1.9.(13) and (14)	Need not comply where connected balcony or area of refuge is provided in compliance with *C.A.* F39.
F33	3.3.1.10.; 3.3.1.11.	Existing door swings may remain in *heritage buildings*, existing or being restored, with no change in *major occupancy* and with *occupant load* no greater than 100.
F34	3.3.1.12.	Existing doors acceptable, provided not less than 600 mm wide.
F35	3.3.1.15.	Existing curved or spiral stairs acceptable.
F36	3.3.1.18.	Existing stained, etched, bevelled, leaded or figured glass acceptable.
F37	3.3.5.4.(2), (3) and (5)	Existing acceptable.
F38	3.3.5.6.; 3.3.5.7.	Need not comply where a gasketed door and self closer are provided in the existing *fire separation*.
F39	3.4.1.4.	For "F2" and "F3" *occupancies*, the following types of *exits* may also be used for *buildings* not over 6 *storeys* in *building height*: (a) connected balconies, which connect across *firewalls*, or connect to another *exit*, or with access to grade, (b) areas of refuge where fire service rescue is possible and that comply with Measure L in Sentences (4) to (10), (18) and Clauses (20)(a), (b) and (d) in MMAH Supplementary Standard SB-4, "Measures for Fire Safety in High Buildings".
F40	3.4.1.8.	Existing stained, etched, bevelled, leaded or figured glass acceptable.
F41	3.4.2.5.(1)	For "F2" and "F3" *occupancies*, existing travel distance acceptable where the *floor area* is *sprinklered*.
F42	3.4.3.2.(7)	For "F2" and "F3" *occupancies*, existing width of *exits* acceptable provided the *occupant load* is not more than 15% above the *exit* capacity.
F43	3.4.3.4.	Existing acceptable.
F44	3.4.3.5.	Existing headroom clearance of not less than 1 980 mm is acceptable.
F45	3.4.4.1.	*Fire separations* of *exits* permitted in *buildings*: (a) 30 min, up to 3 *storeys* in *building height*, (b) 45 min, up to 6 *storeys* in *building height*, (c) 1 h, over 6 *storeys* in *building height*.
F46	3.4.4.4.(8)	Existing washrooms opening directly into *exit* stairwell shall be separated from *exit* stairwell by 45 min *closure*.
F47	3.4.5.1.(2) and (9)	Existing illuminated legible *exit* signs are acceptable.
F48	3.4.6.1.	Existing acceptable.
Column 1	2	3

Table 11.5.1.1.F. (Cont'd)
Compliance Alternatives for Industrial Occupancies
Forming Part of Article 11.5.1.1.

	C.A. Number	Division B Requirements	*Compliance Alternative*
	F49	3.4.6.2.	Existing acceptable, if visually apparent.
	F50	3.4.6.3.(1)	Existing acceptable with rise no greater than 3.7 m.
	F51	3.4.6.4.(1)	Existing acceptable.
	F52	3.4.6.4.(2) and (3)	Existing acceptable.
	F53	3.4.6.5.(2) to (11)	Existing acceptable.
	F54	3.4.6.6.(1) to (5)	Existing acceptable.
	F55	3.4.6.7.(1)	Existing acceptable.
	F56	3.4.6.8.	Existing acceptable.
	F57	3.4.6.9.	Existing acceptable.
	F58	3.4.6.10.(2) to (6)	Existing acceptable.
r11.1	F59	3.4.6.11.(1), (1.1) and (2)	Existing acceptable.
	F60	3.4.6.12.	For “F2” and “F3” *occupancies*, existing acceptable in *public heritage buildings* or a change in *occupancy* with no increase in *occupant load*.
	F61	3.4.6.13.; 3.4.6.14.	Existing acceptable.
	F62	3.4.6.16.	Existing functionally operable panic hardware acceptable.
	F63	3.4.7.2.	*Combustible* fire escapes which are protected from fire in accordance with Sentence 3.2.3.13.(2) are permitted or may be reconstructed or recreated (as in the case of a *heritage building*).
	F64	3.5.1.	Existing acceptable, except where *building* classified under Subsection 3.2.6. and except where existing elevators are “open” type.
	F65	3.6.2.1.(7)	45 min *fire separation* acceptable.
	F66	3.6.2.2.	Existing acceptable where explosion-resistant *construction* or venting is provided.
	F67	3.6.2.6.	Existing acceptable.
	F68	3.6.2.7.(1)	2 h *fire separation* acceptable.
	F69	3.6.3.1.(1) to (5)	45 min *fire separation* acceptable up to 6 *storeys*.
	F70	3.6.3.3.	(a) Where 2 h *fire separation* is required, 1 h is acceptable. (b) Where 1 h *fire separation* is required, 45 min is acceptable. (c) Existing need not comply with Sentences 3.6.3.3.(4) and (5).
	F71	3.6.4.2.	Ceiling *fire separation* need not be fire-resistance rated where sprinklering, subject to *C.A.* F27, of *fire compartments* on both sides of vertical *fire separation* is provided and where such *fire separation* is not required to exceed 1 h.
	F72	3.6.4.3.(1)	Existing to meet *flame-spread rating* of 25 or to be *sprinklered*.
	F73	3.6.4.4. to 3.6.4.6.	Existing access acceptable.
	F74	3.7.4.	Where the *occupant load* is increased by more than 15% above the capacity of the existing facilities, facilities to be added to accommodate the increase.
	Column 1	2	3

Table 11.5.1.1.F. (Cont'd)
Compliance Alternatives for Industrial Occupancies
Forming Part of Article 11.5.1.1.

	C.A. Number	Division B Requirements	*Compliance Alternative*
r11.1 r4	F75	3.8.1.2.	Existing accessible entrance acceptable. (See *C.A.* F79) Existing curb ramp conforming to Sentence 3.8.3.2.(3) is acceptable. Existing principal entrance acceptable, provided at least one *barrier-free* entrance is available.
	F76	3.8.1.3.(1)	Existing unobstructed width of 920 mm minimum is acceptable.
	F77	3.8.1.3.(4)	Existing unobstructed space not less than 1 500 mm in width and 1 500 mm in length located not more than 30 m apart is acceptable.
r4	F77.1	3.8.3.2.(3)(b)	Existing curb ramp acceptable, provided width not less than 1 200 mm.
	F78	3.8.3.3.(1)	Existing doorway acceptable, provided not less than 810 mm wide.
r4	F78.1	3.8.3.3.(11)(a)	Existing distance acceptable, provided not less than 1 200 mm plus the width of any door that swings into the space in the path of travel.
	F79	3.8.3.4.(1)(a)	Existing ramp acceptable, provided not less than 870 mm between handrails.
r4	F80	3.8.3.8.(5)	Existing grab bar is acceptable.
r4	F80.1	3.8.3.12.	Existing universal washroom acceptable.
r11.1	F81	3.8.3.13.(2)(g)	Existing grab bar is acceptable.
r4	F81.1	3.8.3.16.	Existing drinking fountain conforming to Clauses 3.8.3.16.(2)(a) and (b) acceptable.
	F82	4.1.8.	The requirements under this Subsection do not apply.
	F83	6.2.2.3.(1), (3) and (4)	*Storage garages* with a total capacity of fewer than 20 motor vehicles need not have mechanical ventilating systems if the downward slope of the floor to the outside door is 1 in 120 and the garage floor is above outside ground level.
	F84	6.2.3.2.; 6.2.3.9.; 6.2.3.18; 6.2.3.19.	Existing acceptable for “F2” and “F3” *occupancies*.
	F85	6.2.3.12.	Existing openings, grilles and diffusers acceptable.
	F86	6.2.9.2.	Existing acceptable for “F2” and “F3” *occupancies*.
	F87	8.2.1.4.	Existing clearances acceptable where a *sewage system* is replaced with another *sewage system* within the same class and the capacity of the replacement *sewage system* does not exceed the capacity of the existing *sewage system*.
	F88	8.2.1.4.	Existing clearances are acceptable where a replacement *sewage system* requires lesser clearances than those required in Part 8 for the existing *sewage system.*
	F89	9.3.2.1.	Sound used lumber is acceptable for reuse without a grade stamp provided that: (a) visual examination shows no excessive weakening by holes, notches, nail splits or other damage, (b) where the grade or species is unknown, the minimum grade shall apply for span table use, and (c) lumber has not been subjected to termite infestation.
	F90	9.5.11.2.	Existing acceptable, provided not less than 600 mm.
	F91	9.6.1.2.(2) and (3); 9.6.1.4.(1) and (2)	Existing doors and sidelights being reused or relocated need not conform if identified or protected.
	F92	9.6.1.4.(3) and (4); 9.8.8.1.(7) and (9)	Existing barriers acceptable.
	Column 1	2	3

Table 11.5.1.1.F. (Cont'd)
Compliance Alternatives for Industrial Occupancies
Forming Part of Article 11.5.1.1.

r11.1

C.A. Number	Division B Requirements	*Compliance Alternative*
F93	9.7.	Existing acceptable.
F94	9.8.1. to 9.8.4.	Replacement or extension of existing stair systems shall be exempt from the provisions of these Articles, except that they shall have: (a) a minimum width between wall faces of 700 mm, and (b) a minimum clear height over tread nosing or landing of 1 800 mm.
F95	9.8.4.3.	Existing curved or spiral stairs acceptable.
F96	9.8.5.1.(2)	Existing ramps acceptable, where practical.
F97	9.8.7.	Existing handrails acceptable, unless considered unsafe by *chief building official*.
F98	9.8.8.	Existing *guards* acceptable, unless considered unsafe by *chief building official*.
F99	9.8.9.6.(4)	Existing acceptable.
F100	9.9.1.1.	Existing acceptable.
F101	9.9.2.1.(1) to (3)	The following types of *exits* may also be used: (a) connected balconies, which connect across *firewalls*, or connect to another *exit*, or with access to grade, (b) areas of refuge approved by the *chief building official*, where fire service rescue is possible, or (c) *combustible* or *noncombustible* exterior stairways or fire escapes which are protected in accordance with Sentence 3.2.3.13.(2). These may be reconstructed or recreated (as in the case of a *heritage building*).
F102	9.9.2.1.(4)	Existing acceptable.
F103	9.9.3.2.	Existing width of *exits* acceptable.
F104	9.9.3.3.	Existing width of *public corridors* of not less than 965 mm is acceptable.
F105	9.9.3.4.	Existing clear height of not less than 1 950 mm is acceptable.
F106	9.9.4.2.	30 min *fire separation* acceptable.
F107	9.9.5.4.	Existing acceptable.
F108	9.9.5.8.	Existing acceptable provided minimum 45 min *fire separation* and where explosion-resistant *construction* or venting is provided.
F109	9.9.5.9.	Existing acceptable, provided that the enclosure has a 45 min *fire-resistance rating*.
F110	9.9.6.3.	Existing door widths are acceptable, provided *exit* widths comply with *C.A.* F104.
F111	9.9.6.5.	Existing door swings acceptable. Existing acceptable in *public heritage buildings*, where approved by *chief building official*.
F112	9.9.6.6.(1)	Where *exit* doors open onto a landing, such doors shall not extend beyond the face of the first riser.
F113	9.9.6.8.	Existing functionally operable passage or panic hardware acceptable.
F114	9.9.7.4.	Maximum area of existing room or *suite* does not apply.
Column 1	2	3

Table 11.5.1.1.F. (Cont'd)
Compliance Alternatives for Industrial Occupancies
Forming Part of Article 11.5.1.1.

r11.1

C.A. Number	Division B Requirements	*Compliance Alternative*
F115	9.9.8.2.(1)	Existing travel distance acceptable where *floor area* is *sprinklered* and provided *fire separations* comply with Part 9.
F116	9.9.11.3.	Existing illuminated legible signs are acceptable for *exit* signs, if approved by *chief building official*.
F117	9.10.1.1.	Assemblies required to be of *noncombustible construction* may be supported by *combustible construction* having at least the same *fire-resistance rating* as that supported.
F118	9.10.1.3.(8) to (10)	Existing acceptable subject to *C.A.*'s F27 and F28.
F119	9.10.3.	*Fire-resistance ratings* may also be used where they are based on: 1. HUD Rehabilitation Guidelines, "Guideline on Fire Ratings of Archaic Materials and Assemblies". 2. DBR Technical Paper No. 194, "Fire Endurance of Protected Steel Columns and Beams". 3. DBR Technical Paper No. 207, "Fire Endurance of Unit Masonry Walls". 4. DBR Technical Paper No. 222. Fire Endurance of Light-Framed and Miscellaneous Assemblies".
F120	9.10.5.1.	Existing openings in existing wall or ceiling membranes to remain. Existing openings may be moved to another location in the same wall or ceiling, provided the aggregate area of openings does not increase and are not cumulative, and the existing opening is blocked up to provide the same rating as the existing wall or ceiling assembly.
F121	9.10.6.2.	Existing *heavy timber construction* acceptable where *construction* is within 90% of the member sizes listed in Part 3.
F122	9.10.7.	Existing acceptable for *heritage buildings*, subject to approval of *chief building official*.
F123	9.10.8.1.	Existing 30 min rating acceptable.
F124	9.10.8.2.	Existing sprinkler systems complying with *C.A.* F27 and Sentence 3.2.2.17.(1) are acceptable.
F125	9.10.8.3.	Existing acceptable, subject to approval of *chief building official*.
F126	9.10.8.8.	30 min rating acceptable.
F127	9.10.9.7.; 9.10.9.9.	Existing acceptable in existing *fire separations*.
F128	9.10.9.10.(1)	Ceiling *fire separation* need not be *fire-resistance rated* where sprinklering of *fire compartments* on both sides of vertical *fire separation* is provided and where such *fire separation* is not required to exceed 1 h.
F129	9.10.9.11.(2)	In lieu of the 2 h *fire separation*, sprinklers may be used in the *medium hazard industrial occupancy* with a 1 h *fire separation*.
F130	9.10.9.13.; 9.10.9.15.(1)	30 min *fire separation* acceptable.
F131	9.10.10.3.(1)	45 min *fire separation* acceptable.
F132	9.10.13.1.	Existing functional *closures* are acceptable subject to *C.A.* F8.
Column 1	2	3

Table 11.5.1.1.F. (Cont'd)
Compliance Alternatives for Industrial Occupancies
Forming Part of Article 11.5.1.1.

r11.1

C.A. Number	Division B Requirements	*Compliance Alternative*
F133	9.10.13.2.	Existing acceptable.
F134	9.10.13.3.	Existing acceptable, provided that wood door frames are secured with hinge screws going through frame into the stud.
F135	9.10.13.5.	Existing wired glass acceptable. Existing transoms or sidelights located in required *fire separations* may be retained if wired glass, at least 6 mm thick, is securely fixed to a wood frame of at least 50 mm thickness with steel stops. Operable transoms shall be fixed closed.
F136	9.10.13.6.	Existing steel door frames acceptable.
F137	9.10.13.7.	Existing glass block acceptable.
F138	9.10.13.8.	Existing sizes acceptable.
F139	9.10.13.9.	Existing operable latches acceptable.
F140	9.10.13.10.(1)	Existing functionally operable self-closing devices acceptable.
F141	9.10.13.11.	Existing operable self-releasing electromagnetic and fusible link hold-open devices acceptable.
F142	9.10.13.12.	Existing swings acceptable.
F143	9.10.14.4.	Existing windows. (a) Existing windows in walls may be relocated to another part of the wall, provided the existing opening is blocked up to provide the same fire rating for the wall, and the projection of the new opening, at a right angle to the property line onto another *building*, lies no closer than 300 mm from a window in such other *building*, where the "opposite" window is less than 2 400 mm from the opposite new opening, and (b) except relocation of units, to be restricted to the same *fire compartment* and shall conform to the requirements of Article 3.2.3.14. or 9.10.12.3. where applicable, or (c) where a *building* does not satisfy the requirements of Subsection 3.2.3. for the amount of openings facing a yard or space that does not have sufficient *limiting distance*, such existing openings are allowed to be relocated provided: (i) such openings are not increased in size and they are protected with wired glass in steel frames conforming to Sentence 3.1.8.14.(2), or (ii) the *building* is *sprinklered*.
F144	9.10.16.2.(1)	Where balloon framing is exposed during renovation, *fire blocks* shall be provided.
F145	9.10.18.	(a) Subject to approval by the *chief building official*, existing fire alarm system may remain where the fire safety plan (as described in the Fire Code made under the *Fire Protection and Prevention Act, 1997*) for the *building* addresses the intent of Subsection 3.2.4. (i.e. "stage" system, electrical supervision, detection as required, Fire Department connection, and emergency power supply), and (b) extension of an existing system must ensure continuity and compatibility, and integrity of the system.
Column 1	2	3

Table 11.5.1.1.F. (Cont'd)
Compliance Alternatives for Industrial Occupancies
Forming Part of Article 11.5.1.1.

r11.1

C.A. Number	Division B Requirements	*Compliance Alternative*
F146	9.10.20.	Existing access acceptable.
F147	9.18.2.	Existing access acceptable.
F148	9.18.3.	Existing vents and ventilation acceptable.
F149	9.19.2.1.	Existing access acceptable.
F150	9.20.2.2.	Used masonry may be reused for patching and filling openings to match adjacent work. Used interior brick may not be used for exterior applications.
F151	9.20.3.	Archaic mortars may be used to match existing jointing.
F152	9.20.4.1.	Sound jointing techniques may be employed to match existing archaic joints.
F153	9.20.12.1.	Corbelling may be constructed to match existing or original details, provided that it is structurally adequate for the proposed use.
F154	9.21.	Existing acceptable, provided the products of combustion are safely vented and provided no fire hazard is created.
F155	9.22.1. to 9.22.7.	Sound period materials, designs and techniques may be employed in recreated fireplaces provided no fire hazard is created. Existing need not comply with Article 9.22.1.4.
F156	9.23.	Existing acceptable.
F157	9.24.	Existing acceptable.
F158	9.26.	Existing acceptable.
F159	9.27.	Existing acceptable.
F160	9.28.	All replacement or recreation of existing stucco may be compatible with the existing materials and application.
F161	9.29.4.	Existing acceptable. All replacement or recreation of existing plaster may be compatible with the existing materials and application.
F162	9.33.1.2.	Sound, used or antique *appliances* are acceptable, provided that: (a) visual examination shows no excessive weakening by corrosion or other damage, (b) no structural parts are missing, (c) no cracks are present in the components intended to support the appliance or enclose the fire, and (d) loading and ash removal door latches and hinges hold the door closed.
F163	9.37.	Sound used materials shall be acceptable for reuse, subject to the following limitations: (a) visual examination shows no excessive weakening by holes, notches, nail splits or other damage, and (b) logs have not been subjected to termite infestation.
Column 1	2	3

12.2.4. Motion Sensors

12.2.4.1. Motion Sensors

(1) Lighting installed to provide the minimum illumination levels required by this Code may be controlled by motion sensors except where the lighting,
(a) is installed in an *exit*,
(b) is installed in a corridor serving patients or residents in a Group B, Division 2 or Division 3 *occupancy*, or
(c) is required to conform to Sentence 3.2.7.1.(6).

(2) Where motion sensors are used to control minimum lighting in a *public corridor* or corridor providing *access to exit* for the public, the motion sensors shall be installed with switch controllers equipped for fail-safe operation and illumination timers set for a minimum 15-minute duration.

(3) A motion sensor shall not be used to control emergency lighting.

Section 12.3. Energy Efficiency for Buildings of Residential Occupancy Within the Scope of Part 9

12.3.1. General

12.3.1.1. Application

r3 **(1)** This Section applies to the energy efficiency of a *building* or part of a *building* of *residential occupancy* that is within the scope of Part 9 and is intended for occupancy on a continuing basis during the winter months.

12.3.1.2. Windows and Sliding Glass Doors

(1) The energy rating and the overall coefficient of heat transfer required for windows and sliding glass doors shall be determined in conformance with,
r11.1 (a) CSA A440.2, "Fenestration Energy Performance", or
(b) NFRC 100, "Procedure for Determining Fenestration Product U-factors" and NFRC 200, "Procedure for Determining Fenestration Product Solar Heat Gain Coefficient and Visible Transmittance at Normal Incidence".

r6 12.3.1.3. Temperature Control in Houses and Dwelling Units

(1) Except as provided in Sentence (3) and except where space heating energy is provided by a solid fuel-burning *appliance* or a ground source heat pump,
(a) where a *house* contains two *dwelling units* and each *dwelling unit* is served by a separate heating system, the indoor air temperature in each *dwelling unit* shall be controlled by at least one programmable thermostatic control device located in the *dwelling unit*,
(b) where a *house* contains one *dwelling unit* or contains two *dwelling units* and both *dwelling units* are served by one heating system, the indoor air temperature in the *house* shall be controlled by at least one programmable thermostatic control device located in the *house*, and
(c) the indoor air temperature in an individual *dwelling unit* in a *building* other than a *house* shall be controlled by at least one programmable thermostatic control device located in the *dwelling unit*.

(2) The programmable thermostatic control device required in Sentence (1) shall,
(a) allow the setting of different air temperatures for at least,
  (i) four time periods per day, and
  (ii) two different day-types per week,
(b) include a manual override, and
(c) allow the setting of the air temperature to,
  (i) 13°C or lower in heating mode, and
  (ii) 29°C or higher in cooling mode, where *air-conditioning* is provided.

(3) A manual thermostatic control device is permitted if it,
(a) controls a heating or cooling system where the heating or cooling capacity is not more than 2 kW, or
(b) serves an individual room or space.

12.3.1.4. Hot Water Piping Insulation

(1) Hot water pipes that are vertically connected to a hot water storage tank shall have heat traps on both inlet and outlet piping as close as practical to the tank, except where the tank,
(a) has an integral heat trap, or
(b) serves a recirculating system.

(2) The first 2.5 m of hot water outlet piping of a hot water storage tank serving a non-recirculating system shall be insulated to provide a thermal resistance of not less than RSI 0.62.

(3) The inlet pipe of a hot water storage tank between the heat trap and the tank serving a non-recirculating system shall be insulated to provide a thermal resistance of not less than RSI 0.62.

r6 12.3.1.5. Residential Furnaces

(1) A furnace serving a *house* or an individual *dwelling unit* shall be equipped with a brushless direct current motor. (See Appendix A.)

r6 12.3.1.6. Energy Supply for Kitchen and Laundry Facilities

(1) In order to supply energy to cooking appliances and clothes dryers, every kitchen and laundry space shall be provided with,
(a) an electrical outlet,
(b) a natural gas line, or
(c) a propane line.

Section 12.4. Water Efficiency

12.4.1. General

12.4.1.1. Plumbing Systems

(1) All *buildings* shall conform to the water efficiency requirements of Subsection 7.6.4.

Section 2.3. Building Materials Evaluation Commission

2.3.1. Application Fee

2.3.1.1. Application Fee

r5 **(1)** The fee on an application to the Building Materials Evaluation Commission is,
(a) $5,000, for 2015,
(b) $7,000, for 2016,
(c) $9,000, for 2017, and
(d) $11,000, for 2018 and subsequent calendar years.

Section 2.4. Rulings and Interpretations

r2 2.4.1. Minister's Rulings — Innovative Materials, Systems or Building Designs

r2 2.4.1.1. Designated Materials Evaluation Bodies

(1) The following body is designated as a materials evaluation body for the purposes of clause 29(1)(a) of the Act: Canadian Construction Materials Centre of the National Research Council of Canada.

r2 2.4.1.2. Fee

(1) The fee on a request for a ruling under clause 29(1)(a) of the Act is,
(a) $560, for 2014, and
(b) the amount determined in accordance with Sentences (2) and (3) rounded to the nearest dollar, for 2015 and subsequent calendar years.

(2) On and after January 1, 2015, the fee for a calendar year is the fee for the previous calendar year adjusted by the percentage change from year to year in the Consumer Price Index for Ontario (All-Items) as reported monthly by Statistics Canada under the authority of the *Statistics Act* (Canada), averaged over the 12-month period that ends on March 31 of the previous calendar year, rounded to the first decimal point.

(3) Despite Sentence (2), if the percentage change results in a negative amount, the fee for a calendar year shall remain at the same level as the previous calendar year.

r2 2.4.2. Minister's Rulings — Alternative Materials, Systems or Building Designs

2.4.2.1. Criteria

(1) Sentence (2) sets out criteria to be followed by the *Minister* when making a ruling under clause 29(1)(c) of the Act to approve the use of an alternative material, system or *building* design.

(2) The *Minister's* approval of the use of an alternative material, system or *building* design referred to in Sentence (1) may be granted only if the approval is consistent with,

(a) a decision of the Building Code Commission in respect of a dispute described in clause 24(1)(a) of the Act,

(b) an approval of the use of the material, system or *building* design in the whole of another province or territory in accordance with the law of that province or territory, or

r11.1 (c) a revision of the CCBFC NRCC 56190, "National Building Code of Canada", or the CCBFC NRCC 56193, "National Plumbing Code of Canada", that has been approved by the Canadian Commission on Building and Fire Codes.

2.4.3. Interpretations By Minister

2.4.3.1. Interpretations By Minister

(1) Every interpretation issued by the *Minister* under section 28.1 of the Act shall be made available to the public,

(a) by posting the interpretation on the *Building Code website*, and

(b) by providing a written copy of the interpretation on receipt of a request for it.

Part 4

e5 Transition, Amendments, Revocation and Commencement

4.1. Transition Rule

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Part 4

Transition, Amendments, Revocation and Commencement

Section 4.1. Transition Rule

4.1.1. Transition, January 2014

4.1.1.1. Transition Rule

r3 **(1)** Subject to Sentence (2), Ontario Regulation 350/06 (Building Code) made under the Act, as it read on December 31, 2013, is deemed to continue in force with respect to *construction* for which a permit has been applied for before January 1, 2014.

(2) Sentence (1) does not apply unless the *construction* is commenced within six months after the permit is issued.

r3 4.1.2. Transition, January 2015

4.1.2.1. Transition Rule

(1) Subject to Sentence (2), this Regulation, as it read on December 31, 2014, is deemed to continue in force with respect to *construction* for which a permit has been applied for before January 1, 2015.

(2) Sentence (1) does not apply unless the *construction* is commenced within six months after the permit is issued.

r3 4.1.3. Transition, January 2017

4.1.3.1. Transition Rule

r5 **(1)** Subject to Sentence (2), Item 337 (MMAH Supplementary Standard SB-5, "Approved Sewage Treatment Units") of Table 1.3.1.2. and Sentence 8.6.2.2.(5) of Division B of this Regulation, as they read on December 31, 2016, are deemed to continue in force with respect to *construction* for which a permit has been applied for before January 1, 2017.

(2) Sentence (1) does not apply unless the *construction* is commenced within six months after the permit is issued.

r6 4.1.4. Transition, July 2017

4.1.4.1. Transition Rule

(1) Subject to Sentence (2), this Regulation, as it read on June 30, 2017, is deemed to continue in force with respect to *construction* for which a permit has been applied for before July 1, 2017.

(2) Sentence (1) does not apply unless the *construction* is commenced within six months after the permit is issued.

r6.1 ## 4.1.5. Transition, January 2018

4.1.5.1. Transition Rule

(1) Subject to Sentence (2), this Regulation, as it read on December 31, 2017, is deemed to continue in force with respect to *construction* for which a permit has been applied for before January 1, 2018.

(2) Sentence (1) does not apply unless the *construction* is commenced within six months after the permit is issued.

r11.1 ## 4.1.6. Transition, January 2020

4.1.6.1. Transition Rule

(1) Subject to Sentence (2), this Regulation, as it read on December 31, 2019, is deemed to continue in force with respect to *construction* for which a permit has been applied for before January 1, 2020.

(2) Sentence (1) does not apply unless the *construction* is commenced within six months after the permit is issued.

r11.1 ## 4.1.7. Transition, January 2022

4.1.7.1. Transition Rule

(1) Subject to Sentence (2), this Regulation, as it read on December 31, 2021, is deemed to continue in force with respect to *construction* for which a permit has been applied for before January 1, 2022.

(2) Sentence (1) does not apply unless the *construction* is commenced within six months after the permit is issued.

e5 # Section 4.2. Omitted

(Provides for Amendments to this Regulation). O. Reg. 332/12, Section 4.2.

e5 # Section 4.3. Omitted

(Revokes Other Regulations). O. Reg. 332/12, Section 4.3.

e5 # Section 4.4. Omitted

(Provides for Coming into Force of Provisions of this Regulation). O. Reg. 332/12, Section 4.4.

Explanatory Material for Division B

A-1.1.2.1.(2) Winter Design Temperatures.

The 2.5 percent values referenced in Sentence 1.1.2.1.(2) are the least restrictive temperatures that can be used. If a designer chooses to use the 1 percent values shown in MMAH Supplementary Standard SB-1, they would be in excess of the Code minimums and would be considered acceptable.

A-1.3.2.1. Abbreviations of Proper Names.

The following table provides contact information for organizations referenced in this Code:

Name	Address	Contact
ACGIH	American Conference of Governmental Industrial Hygienists 1330 Kemper Meadow Drive Cincinnati, Ohio 45240 USA	ph: 513-742-2020 fax: 513-742-3355 web site: www.acgih.org
AISI	American Iron and Steel Institute 25 Massachusetts Ave., NW Suite 800 Washington, DC 20001 USA	ph: 202-452-7100 fax: 202-452-1039 web site: www.steel.org
ANSI	American National Standards Institute 25 West 43rd Street, 4th Floor New York, New York 10036 USA	ph: 212-642-4900 fax: 212-398-0023 web site: www.ansi.org
APHA	American Public Health Association 800 I Street, NW Washington, DC 20001 USA	ph: 202-777-2742 fax: 202-777-2534 web site: www.apha.org
a10.1 ASCE	American Society of Civil Engineers 1801 Alexander Bell Drive Reston, VA 20191 USA	ph: 800-584-2723 web site: www.asce.org
ASHRAE	American Society of Heating, Refrigerating and Air-Conditioning Engineers 1791 Tullie Circle, N.E. Atlanta, Georgia 30329 USA	ph: 404-636-8400 800-527-4723 fax: 404-321-5478 web site: www.ashrae.org
ASME	The American Society of Mechanical Engineers Three Park Avenue New York, New York 10016-5990 USA	ph: 800-843-2763 fax: 973-882-1717 web site: www.asme.org
ASPE	American Society of Plumbing Engineers 6400 Shafer Court, Suite 350 Rosemont, Illinois 60018 USA	ph: 847-296-0002 fax: 847-296-2963 web site: www.aspe.org
ASSE	American Society of Sanitary Engineering 901 Canterbury Suite A Westlake, Ohio 44145 USA	ph: 440-835-3040 fax: 440-835-3488 web site: www.asse-plumbing.org
ASTM	American Society for Testing and Materials 100 Barr Harbor Drive PO Box C700 West Conshohocken, Pennsylvania 19428-2959 USA	ph: 610-832-9585 fax: 610-832-9555 web site: www.astm.org
AWS	American Welding Society 8669 NW 36th Street, Suite 130 Doral, Florida 33166 USA	ph: 800-443-9353 fax: 305- 443-5647 web site: www.aws.org

Name	Address	Contact
AWWA	American Water Works Association 6666 W. Quincy Ave. Denver, Colorado 80235 USA	ph: 303-794-7711; 800-926-7337 fax: 303-347-0804 web site: www.awwa.org
BCMOHS	British Columbia Ministry of Health Population Health and Wellness, Health Protection 1515 Blanshard Street, 4th Floor Victoria, British Columbia V8W 3C8	ph: (250) 952-1469 fax: (250) 952-1713 web site: http://www.health.gov.bc.ca
BNQ	Bureau de Normalisation du Québec 333, rue Franquet Québec, Québec G1P 4C7	ph: 418-652-2238 800-386-5114 fax: 418-652-2292 web site: www.bnq.qc.ca
CCBFC	Canadian Commission on Building and Fire Codes National Research Council Canada Building M-23A 1200 Montreal Road Ottawa, Ontario K1A 0R6	ph: 613-993-9960 fax: 613-952-4040 web site: www.nationalcodes.ca
CGSB	Canadian General Standards Board 11 Laurier Street Gatineau, Quebec K1A 1G6	ph: 819-956-0425 800-665-2472 fax: 819-956-5740 web site: www.pwgsc.gc.ca/cgsb
CSA	Canadian Standards Association 5060 Spectrum Way, Suite 100 Mississauga, Ontario L4W 5N6	ph: 416-747-4044 800-463-6727 fax: 416-747-2510 web site: www.csa.ca
CWC	Canadian Wood Council 99 Bank Street, Suite 400 Ottawa, Ontario K1P 6B9	ph: 613-747-5544 800-463-5091 fax: 613-747-6264 web site: www.cwc.ca
DBR	Institute for Research in Construction National Research Council Canada Building M-23A 1200 Montreal Road Ottawa, Ontario K1A 0R6 *The Division of Building Research (DBR) is now known as the Institute for Research in Construction.*	ph: 613-993-9960 fax: 613-952-4040 web site: www.nationalcodes.ca
EPA	Environmental Protection Agency Ariel Rios Building 1200 Pennsylvania Avenue, N.W. Washington, DC 20460 USA	ph: (202) 272-0167 web site: www.epa.gov
FINA	Fédération Internationale de Natation Avenue de l'Avant-Poste No 4 CH-1005 Lausanne, Switzerland	ph: (+41-21) 310-47-10 fax: (+41-21) 312-66-10 web site: www.fina.org
a10.1 GRHC	Green Roofs for Healthy Cities 406 King Street East Toronto, Ontario M5A 1L4	ph. 416-971-4494 web site: www.greenroofs.org
HC	Health Canada Address Locator 0900C2 Ottawa, Ontario K1A 0K9	ph: 866-225-0709 fax: 613-941-5366 web site: www.hc-sc.gc.ca

	Name	Address	Contact
	HI	Hydronics Institute Division of GAMA 35 Russo Place P.O. Box 218 Berkeley Heights, New Jersey 07922 USA *The Hydronics Institute was formally merged into GAMA in 2004.*	ph: 866-408-3831 908-464-8200 fax: 908-464-7818 web site: www.gamanet.org
a10.1	HPVA	Hardwood Plywood & Veneer Association (Now Decorative Hardwoods Association) 42777 Trade West Dr Sterling, VA 20166 USA	ph: 703-435-2900 fax: 703-435-2573 web site: decorativehardwoods.org
	HRAI	Heating, Refrigerating and Air-Conditioning Institute of Canada 2800 Skymark Avenue Building 1, Suite 201 Mississauga, Ontario L4W 5A6	ph: 905-602-4700 800-267-2231 fax: 905-602-1197 web site: www.hrai.ca
	HVI	Home Ventilating Institute 1000 N. Rand Rd. Suite 214 Wauconda, Illinois 60084 USA	ph: 847-526-2010 fax: 847-526-3993 web site: www.hvi.org
a5	IAPMO	International Association of Plumbing and Mechanical Officials 4755 E. Philadelphia St. Ontario, California 91761 USA	ph: 909-472-4100 fax: 909-472-4150 web site: iampo.org
	IESNA	Illuminating Engineering Society of North America 120 Wall Street, Floor 17 New York, New York 10005-4001 USA	ph: 212-248-5000 fax: 212-248-5017 web site: www.iesna.org
	ISO	International Organization for Standardization ISO Central Secretariat 1, ch. de la Voie-Creuse CP 56 CH-1211 Geneva 20, Switzerland	ph: 41-22-749-01-11 fax: 41-22-733-34-30 web site: www.iso.org
	HUD	U.S. Department of Housing and Urban Development *HUD established HUD USER as the primary source of US government technical housing publications.* HUD USER P.O. Box 23268 Washington, DC 20026-3268 USA	ph: 202-708-3178 800-245-2691 fax: 202-708-9981 web site: www.huduser.org
a8	MMA (now MMAH)	Ontario Ministry of Municipal Affairs (Ontario Ministry of Municipal Affairs and Housing) 777 Bay Street, 17th Floor Toronto, Ontario M5G 2E5	ph: 416-585-7041 fax: 416-585-6470 web site: www.ontario.ca/buildingcode
a8	MOE (now MECP)	Ontario Ministry of the Environment (Ontario Ministry of the Environment and Climate Change) (Ontario Ministry of the Environment, Conservation and Parks) 135 St Clair Avenue West Toronto, Ontario M4V 1P5	ph: 416-325-4000 fax: 416-314-6713 web site: www.ontario.ca/ministry-environment-conservation-parks
	NFPA	National Fire Protection Association 1 Batterymarch Park Quincy, Massachusetts 02169-7471 USA	617-770-3000 fax: 617-770-0700 web site: www.nfpa.org
a10.1	NFRC	National Fenestration Rating Council 6305 Ivy Lane, Suite 140 Greenbelt, MD 20770, USA	ph: 301-589-1776 fax: 301-589-3884 web site: www.nfrc.org

Name	Address	Contact
NLGA	National Lumber Grades Authority #302 -960 Quayside Drive, New Westminster, British Columbia V3M 6G2	ph: 604-524-2393 fax: 604-524-2893 web site: www.nlga.org
NRCan	Natural Resources Canada Office of Energy Efficiency 580 Booth St., 18th Floor Ottawa, Ontario K1A 0E4	ph: 613-995-2943 800-387-2000 web site: www.nrcan-rncan.gc.ca
NSF	NSF International P.O. Box 130140 789 N. Dixboro Road Ann Arbor, Michigan 48113-0140 USA	ph: 734-769-8010 fax: 734-769-0109 web site: www.nsf.org
a10.1 SEI	See ASCE	
SMACNA	Sheet Metal and Air Conditioning Contractors National Association Inc. 4201 Lafayette Center Drive Chantilly, Virginia 20151-1219 USA	ph: 703-803-2980 fax: 703-803-3732 web site: www.smacna.org
a10.1 SPRI	Single Ply Roofing Industry 465 Waverley Oaks Road Suite 421 Waltham, MA 02452	ph: 781-647-7026 fax: 781-647-7222 web site: www.spri.org
TC	Transport Canada 330 Sparks Street Ottawa, Ontario K1A 0N5	ph: 613-990-2309 866-995-9737 fax: 613-954-4731 web site: www.tc.gc.ca
TPIC	Truss Plate Institute of Canada c/o Jager Metal Products, #220 6223 2nd Street East, Calgary, Alberta T2H 1J5 *The TPIC, "Truss Design Procedures and Specifications for Light Metal Plate Connected Wood Trusses" is available on-line at: the TPIC web site at: www.tpic.ca.*	web site: www.tpic.ca.
UL	Underwriters Laboratories Inc. 333 Pfingsten Road Northbrook, Illinois 60062-2096 USA	ph: 847-272-8800 web site: www.ul.com
ULC	Underwriters' Laboratories of Canada 7 Underwriters Road Toronto, Ontario M1R 3A9	ph: 866-937-3852 fax: 416-757-8727 web site: www.ulc.ca
USDA	United States Department of Agriculture 1400 Independence Ave., S.W. Washington, DC 20250 USA	web site: www.usda.gov
WEF	Water Environment Federation 601 Wythe Street Alexandria, Virginia 22314-1994 USA	ph: 800-666-0206 fax: 703-684-2492 web site: www.wef.org
a9 WT	Waterfront Toronto 20 Bay Street, Suite 1310 Toronto, Ontario M5J 2N8	ph: 416-214-1344 fax: 416-244-4591 web site: info@waterfrontoronto.ca

Group B, Division 2
- Facilities for people with developmental disabilities
- Homes for the aged
- Hospitals
- Infirmaries
- Long term care
- Nursing homes
- Psychiatric hospitals without detention quarters
- Reformatories without detention quarters
- Sanatoria without detention quarters

Group B, Division 3 (See also Sentence 3.1.2.5.(1).)
- Children's custodial homes
- Convalescent homes
- Group homes for people with developmental disabilities
- Residential care facilities
- Sanatoria without detention quarters

Group C
- Apartments
- Boarding houses
- Camps for housing workers
- Clubs, residential
- Colleges, residential
- Convents
- Dormitories
- Group homes
- Halfway houses, drug and alcohol treatment
- Hostels
- Hotels
- Houses
- Lodging houses
- Monasteries
- Motels
- Open and semi-secure detention for youth
- Recreational camps
- Rooming houses
- Schools, residential
- Shelters for homeless
- Shelters for women

Group D
- Banks
- Barber and hairdressing shops
- Beauty parlours
- Dental offices
- Dry cleaning establishments, self-service, not using flammable or explosive solvents or cleaners
- Laundries, self-service
- Medical offices
- Offices
- Police stations without detention quarters
- Radio stations
- Small tool and appliance rental and service establishments

Group E
- Department stores
- Exhibition halls
- Markets
- Restaurants with an occupant load not more than 30 persons consuming food and drink
- Shops
- Stores
- Supermarkets

Group F, Division 1
- Bulk plants for flammable liquids
- Bulk storage warehouses for hazardous substances
- Cereal mills
- Chemical manufacturing or processing plants
- Distilleries
- Dry cleaning plants using flammable or explosive solvents or cleaners
- Feed mills
- Flour mills
- Grain elevators
- Lacquer factories
- Paint, varnish and pyroxylin product factories
- Rubber processing plants
- Spray painting operations

Group F, Division 2
- Aircraft hangars
- Cold storage plants
- Dry cleaning establishments not using flammable or explosive solvents or cleaners
- Electrical substations
- Freight depots
- Helicopter landing areas on roofs
- Laboratories
- Laundries, except self-service
- Planing mills
- Printing plants
- Repair garages
- Self-service storage buildings
- Service stations
- Storage rooms
- Television studios not admitting a viewing audience
- Tire storage
- Warehouses
- Woodworking factories

Group F, Division 3
- Creameries
- Laboratories
- Power plants
- Storage garages, including open air parking garages
- Storage rooms
- Warehouses

A-3.1.3.2.(3) Food Premises.

This requirement is intended to apply to facilities where food is being prepared, stored, processed or served, such as restaurants, commercial kitchens, cafeterias, camps, milk plants and bakeries.

a10.1 A-3.1.4.1.(1) Combustible Construction and Materials Permitted.

The permission to use combustible construction or combustible materials stated in Articles 3.1.4.1., 3.1.5.5., 3.1.5.12., and 3.1.5.12A. does not waive the requirements regarding construction type and cladding stated in Article 3.2.3.7.

a10.1 A-3.1.4.2. Protection of Penetrations.

Where foamed plastics are required to be protected from adjacent spaces within a building, the protection should be continuous so as to cover the foamed plastics so they are not exposed to the interior of the building. However, minor penetrations of the protective covering by small electrical and mechanical components, such as electrical outlets and fixtures, sprinkler piping, and mechanical vents, are acceptable because the penetrant and associated fittings and seals will prevent the small amount of foamed plastic surrounding the penetration from being exposed to the interior of the building.

Foamed plastics that are penetrated by larger components or assemblies, such as windows, are unlikely to be exposed to the interior of the building as they are protected by associated framing and finishes and/or the installation of a closure.

Small amounts of foamed plastics, such as air sealants used between major components of exterior wall construction, are not required to be protected (see Sentence 3.1.5.2.(1)).

Penetrations of a fire separation or of a membrane forming part of an assembly required to have a fire-resistance rating are nevertheless required to be provided with a fire stop in accordance with Subsection 3.1.9.

A-3.1.4.2.(1)(c) Thermal Barrier in Combustible Construction.

Any thermal barrier that is accepted under the requirements of Sentence 3.1.5.12.(2) for noncombustible construction is also acceptable for combustible construction.

a10.1 A-3.1.4.2.(1) Concealed Space.

The term “concealed space” includes any space that is not visibly apparent and that is provided with an opening to allow access for repair and periodic inspections.

a10.1 A-3.1.4.2.(3) & A-3.1.5.5A.(3) Walk-in Coolers and Freezers.

Sentences 3.1.4.2.(3) and 3.1.5.5A.(3) are intended to apply to walk-in coolers and freezers that are constructed as stand-alone structures within a building.

A-3.1.4.3. Wire and Cable Equivalence.

Electrical wires and cables that conform to the requirements of Sentence 3.1.5.18.(1) are deemed to satisfy the requirements of Sentence 3.1.4.3.(1).

A-3.1.4.3.(1)(b)(i) Raceway Definition.

The term raceway is defined in Ontario Electrical Safety Code and includes both rigid and flexible conduit.

A-3.1.5.4.(1) Skylight Spacing.

The minimum spacing dimensions for skylight assemblies are based on the distance that flame must travel along a flat ceiling surface. If ceilings have projecting beams or other features that would increase the distance the flame would have to travel along the surface, the distances specified may be measured accordingly.

A-3.1.5.5.(1) Combustible Elements.

These requirements allow for exterior wall assemblies incorporating combustible elements on buildings of noncombustible construction. Since the tested assemblies must be representative of actual construction, the performance of the entire assembly is assessed with regard to its ability to resist flame propagation up the outside of a building. The thermal barrier protection limits the impact of an interior fire on the wall assembly.

These requirements, in combination, thus allow for wall assemblies containing both combustible cladding elements and non-loadbearing combustible framing members. These wall assemblies can be used as infill or panel type walls between structural elements, or attached directly to a loadbearing noncombustible structural system. These requirements, however, do not waive others specifically intended for the protection of combustible insulation in buildings of noncombustible construction.

These requirements are predicated upon the assumption that the manufacturing process and field installation procedure are both carried out under an independent quality assurance program designed to confirm that the product and its application are consistent with the system as tested.

a10.1 A-3.1.5.5.(1)(b)(i) Flame-Spread Distance.

The maximum flame-spread distance referred to in Subclause 3.1.5.5.(1)(b)(i) means the distance between the top of the opening and the highest observable instance of flaming along the wall assembly; thus, intermittent flaming to a height of 5 m above the opening is acceptable.

a10.1 A-3.1.5.5.(1)(b)(ii) Heat Flux Measurement.

The heat flux to the assembly referred to in Subclause 3.1.5.5.(1)(b)(ii) is the maximum one-minute averaged heat flux measured by transducers located 3.5 m above the top of the opening. The intent of this criterion is to limit the spread of fire on the wall assembly to a height of 3.5 m above the opening.

Fire tests have shown that flame does not spread on the exterior surface of a wall assembly where the heat flux is less than 35 kW/m^2 above the opening.

e7 A-3.1.5.12A.(2)(e) Foamed Plastic Insulation Protection.

The standard fire exposure temperature in CAN/ULC-S101, "Fire Endurance Tests of Building Construction and Materials", is the same as in CAN/ULC-S124, "Test for the Evaluation of Protective Coverings for Foamed Plastic". A thermal barrier that, when tested in conformance with CAN/ULC-S101, "Fire Endurance Tests of Building Construction and Materials", will not exceed an average temperature rise of 140°C on its unexposed face after a period of 10 min satisfies this requirement.

A-3.1.5.18.(1) Wire and Cable Flammability.

In regulating the flammability characteristics of optical fibre cables and electrical wires and cables installed in a building, it is intended that the requirements of this Sentence and of other similar Sentences in the Code apply to wires and cables that are essentially a part of the distribution systems for power or communications. These distribution systems will normally include branch circuits that terminate at an outlet box in the space to be served and, at that location, cable terminators or plugs for individual items of equipment will be plugged in.

A-3.1.8.1.(1)(b) Barrier to Control Smoke Spread.

Although a fire separation is not always required to have a fire-resistance rating, the fire separation should act as a barrier to the spread of smoke and fire until some response is initiated.

When choosing products for the fire stopping, the physical characteristics of the material used at the joints as well as the nature of the assembly and its potential movement should be taken into consideration.

If the fire-resistance rating of a fire separation is waived on the basis of the presence of an automatic sprinkler system, it is intended that the fire separation will be constructed so that it will remain in place and act as a barrier against the spread of smoke for a period of time until the sprinklers have actuated and controlled the fire.

A-3.1.8.1.(2) Installation of Closures.

Although there is no explicit performance statement in the Code that means of egress should be free of smoke, it is the intent that during the period when occupants are using a means of egress to evacuate from a floor area, the smoke contamination should not reach levels that would inhibit movement to the exit. This is particularly critical for persons with disabilities, who may not move at the same rate as other persons and who could be more susceptible to the effects of smoke contamination. NFPA 80, "Fire Doors and Other Opening Protectives", requires that a fire door protecting a means of egress be designed to minimize the possibility of smoke passing through the opening.

Although self-closing devices are not required for all doors in a fire separation (see Article 3.1.8.11.), it is assumed that in a fire situation every door in a fire separation is closed. Article 3.3.3.5. prohibits grilles and similar openings for certain fire separations in hospitals and long term care homes.

Although fire dampers that release on the fusion of a fusible link will help to control the spread of fire, a substantial quantity of smoke could have passed through the opening before that event. They are frequently located below the upper levels of a room and so the release of the fusible link of the fire damper that protects an opening will be delayed until the temperature at the level of the opening becomes high enough to fuse the link.

Similar concern has to be considered for other closure devices that are permitted to remain open on fusible links, and their location should be restricted in accordance with NFPA 80, "Fire Doors and Other Opening Protectives", and this Code, except where their installation in another location will not allow the products of combustion to spread into means of egress.

A-3.1.8.3.(4) Fire Separation Continuity.

The continuity of a fire separation where it abuts against another fire separation, a floor, a ceiling or an exterior wall assembly is maintained by filling all gaps at the juncture of the assemblies with a material that will ensure the integrity of the fire separation at that location.

a10.1 **A-3.1.8.9.(3) Combination Smoke/Fire Dampers.**

A combination smoke/fire damper may be used in lieu of a fire damper to meet the requirement of Sentence 3.1.8.9.(2).

A-3.1.8.9.(5) Fire Damper Access.

It is intended that an access door be provided in the duct and, if the duct is enclosed with an architectural finish, that a second access door be provided through that finish.

A-3.1.8.16.(1) Wired Glass and Glass Block.

The permission to include wired glass and glass block in doors and fire separations between an exit and the adjacent floor area does not permit the inclusion of those items in fire separations between exits and other parts of the building that are not included in the floor area. Examples include other exit facilities and vertical service spaces, including those used for building services and elevator hoistways.

A-3.1.8.17.(1) Fire-Protection Rating for Doors.

The provisions in Articles 3.1.8.15. to 3.1.8.17. do not waive a requirement for a door to have a fire-protection rating. To achieve this rating in a door test, it may be necessary to limit the area of glass in the door. If this area is less than the area limits of Article 3.1.8.16., it is the governing criterion. Conversely, if the area limits of Article 3.1.8.16. are less than the area required to achieve a fire-protection rating, then the area limits of this Article govern.

A-3.1.9. Penetrations.

In the application of Subsection 3.1.9., a building service is considered to penetrate an assembly if it passes into or through the assembly. In some situations a service item enters an assembly through a membrane at one location, runs within the assembly, and then leaves the assembly through a membrane at another location.

The term “membrane penetration” usually designates an opening made through one side (wall, floor or ceiling membrane) of an assembly, whereas the term “through-penetration” designates an opening that passes through an entire assembly. Fire stopping of membrane penetrations involves installing a material, device or assembly to resist for a prescribed time period the passage of flame and heat through the openings in a protective membrane caused by cables, cable trays, conduit, tubing, pipes or similar items. Fire stopping of a though-penetration involves installing an assembly of specific materials or products that are designed, tested and fire-resistance rated to resist for a prescribed period of time the spread of fire through penetrations.

Products for fire stopping within a barrier are required to address movement of the assembly and to control smoke spread; as such, the flexibility of the material used at the flexible joints as well as the nature of the assembly and its potential movement must be taken into consideration.

A-3.1.9.1.(1)(b) Tightly Fitted.

The intention behind the use of the term “tightly fitted” is to reinforce that there are to be no gaps between the building service or other penetrating item and the membrane or assembly it penetrates. A typical means of fire stopping for a service or other penetration through a concrete slab or wall is “cast in place” concrete.

A-3.1.9.2.(1) Penetration of Fire Separations by Electrical Boxes.

The provisions dealing with outlet boxes assume size, quantities and concentrations of partial depth penetrations that would not significantly affect the fire resistance of the assembly, including the temperature rise on the unexposed side of a wall. Sentence 3.1.9.2.(1) is not intended to allow large electrical distribution and control boxes to be recessed into an assembly required to have a fire-resistance rating unless they were incorporated in the assembly at the time of testing.

Electrical boxes used as junction boxes, for lighting fixtures and communication cable should be treated in a similar manner.

a10.1 A-3.1.9.3A. Outlet Boxes.

For the purposes of Article 3.1.9.3A., outlet boxes include, but are not limited to, electrical boxes, junction boxes, high and low voltage outlets, switches, enclosures for electrical equipment, laundry boxes, and shower diverters.

A-3.1.9.4.(1) Combustible Piping Penetrations.

The use of combustible pipe for sprinkler systems, water supply, drains or other services is governed by other requirements in Part 3. This Article regulates the use of combustible piping through penetrations of fire separations or a membrane that forms part of an assembly that is required to have a fire-resistance rating. Where permitted by this Article, combustible pipe may penetrate a fire separation or a membrane that forms part of an assembly that is required to have a fire resistance rating.

A-3.1.10.2.(4) Firewall Construction.

Inherent in the use of a firewall is the intent that this specialized wall construction provide the required fire-resistance rating while also being designed to resist physical damage - arising out of normal use - that would compromise the rating of the assembly. Traditionally, this has been accomplished by prescribing the use of noncombustible materials, which was, in fact, restricted to concrete or masonry. Sentences 3.1.10.2.(3) and (4) are intended to retain both of the characteristics of firewalls, while permitting greater flexibility in the use of materials and designs. The fire-resistance rating and damage protection attributes of a firewall may be provided by a single fire- and damage-resistant material such as concrete or masonry, by a fire- and damage-resistant membrane on a structural frame, or by separate components - one that provides the fire-resistance rating and another one that protects the firewall against damage.

If the firewall is composed of separate components, the fire-resistance rating of the fire-resistive component needs to be determined for this assembly on its own. In addition, if the damage protection component is physically attached to the fire-resistive component (for example, as a sacrificial layer), then, for the purposes of determining the overall performance of the assembly, it is also necessary to determine through testing whether failure of the damage protection component during a fire affects the performance of the fire-resistive component.

a10.1 A-3.1.11.5.(1) Fire Blocks in Combustible Construction.

Combustible construction referred to in Sentence 3.1.11.5.(1) includes all types of construction that do not comply with the requirements for noncombustible construction. All of the elements within the concealed space can be combustible, unless required to be of noncombustible materials (e.g., certain categories of pipework and ducts). However, the value of the flame-spread rating of the combustible materials determines the permitted extent of the concealed space between fire blocks. The materials to be considered should include all construction materials regulated by this Code, including the framing and building services that are located in the concealed space. When designing fire blocking, consideration should be given to avoid restricting venting capabilities within concealed spaces. (See also Note A-5.6.2.1.)

a10.1 A-3.1.11.5.(3) Fire Blocks in Concealed Spaces.

To reduce the risk of fire spread in combustible concealed spaces within the types of buildings referred to in Sentence 3.1.11.5.(3), fire blocking is required regardless of whether the horizontal concealed space is protected by sprinklers or not, unless the space is filled with noncombustible insulation so that any air gap at the top of the insulation is very small. See also Note A-3.1.11.5.(1) for roof venting.

A 5- or 6-storey building constructed in accordance with Article 3.2.2.50. and buildings constructed in accordance with Article 3.2.2.58. are required to be sprinklered in accordance with NFPA 13, "Installation of Sprinkler Systems" (see Article 3.2.5.12.). NFPA 13 generally requires sprinklering of any concealed spaces of combustible construction or where large amounts of combustibles are present. However, NFPA 13 allows combustible concealed spaces to be unsprinklered in certain cases, including where concealed spaces are filled almost entirely with noncombustible insulation, where spaces contain only materials with a low flame-spread rating, and where limited access or the size of the space makes it impractical to install sprinklers. For certain types of construction in unsprinklered combustible concealed spaces, NFPA 13 mandates fire blocking beyond the minimum specified in Sentence 3.1.11.5.(3).

A-3.1.11.7.(6) Integrity of Fire Blocks.

Sentence 3.1.11.7.(6) together with Article 3.1.9.1., is intended to ensure that the integrity of fire blocks in maintained at areas where they are penetrated. This requirement is satisfied by the use of generic fire stops such as mineral wool, gypsum plaster or Portland cement mortar, as well as rated fire stops.

A-3.1.13.2.(2) Folding Partition.

Folding partitions used to divide a space into separate rooms are not considered as doors for the purposes of this Sentence.

A-3.1.15.1.(1) Roof Covering.

The tests described in CAN/ULC-S107 are intended to measure the relative fire-performance of roof coverings when exposed to a fire originating from sources outside the building. When metal deck or a similar noncombustible rigid roof surface is directly exposed to the exterior (a covering material on its exterior surface has not been provided), the requirements of this Sentence need not apply.

a10 A-3.1.21.1. Reserved.

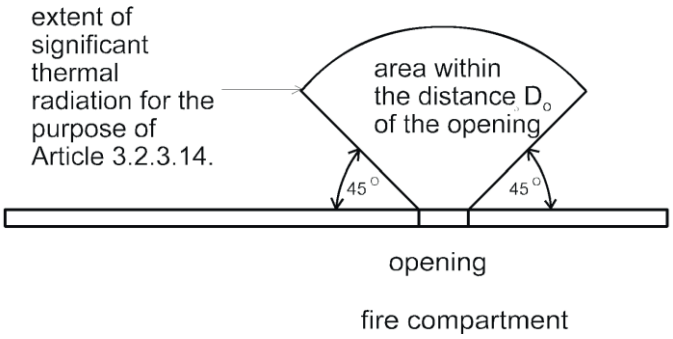


Figure A-3.2.3.14.D.
Thermal Radiation

Sentence 3.2.3.14.(2) requires the portion of an exterior wall (containing an unprotected opening) of any other fire compartment that falls within the shaded area of the Figure above to have a fire-resistance rating.

Figure A-3.2.3.14.E. illustrates the application of Sentence 3.2.3.14.(2) where the exterior walls of 2 fire compartments contain unprotected openings and the planes of the openings meet at 90°.

In order to apply Sentence 3.2.3.14.(2), the fire-resistance rating of each of the exterior walls exposed to significant thermal radiation at all angles of less than 135° within the distance, D_o, from the opening in the opposite wall must be investigated. In the example shown in Figure A-3.2.3.14.E., the effect of Opening A on the exterior wall of Fire Compartment "B" must be investigated as follows.

In this example, a portion of the exterior wall of Fire Compartment "B" happens to fall within the distance, D_o, and within the angle, θ less than 135°. However, only that part of the wall which is shown shaded is required to have a fire-resistance rating.

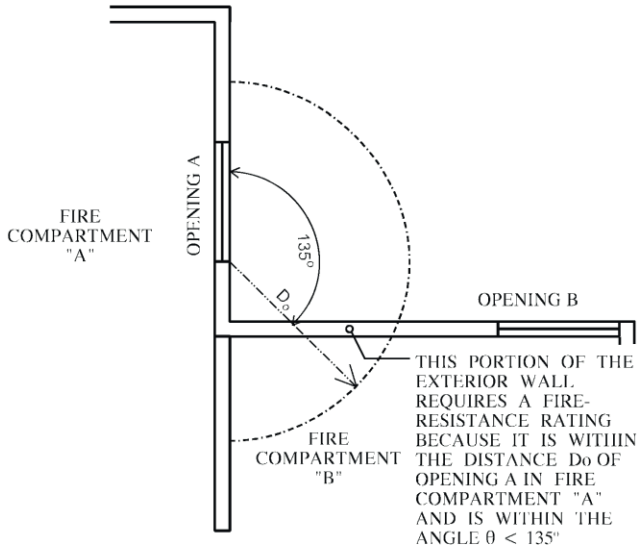


Figure A-3.2.3.14.E.
Thermal Radiation

A-3.2.4. Fire Alarm System.

The term "fire alarm system" used in this Subsection applies to fire alarm systems with or without voice communication capability.

A-3.2.4.4.(1) Single Stage Fire Alarm System.

This requirement, in combination with Article 3.2.4.23., is intended to allow for the provision of voice communication capability as an integral part of a single stage fire alarm system.

A-3.2.4.4.(2) Two Stage Fire Alarm System.

This requirement, in combination with Article 3.2.4.23., is intended to allow for the provision of voice communication capability as an integral part of a 2 stage fire alarm system.

A-3.2.4.4.(2)(c) Fire Alarm Alert Signal.

In a 2 stage fire alarm system described in Sentence 3.2.4.4.(2), the alert signal may be transmitted to audible signal devices in designated locations or to audible signal devices throughout the building. If actuated, the second stage alarm signal in a 2 stage fire alarm system may sound throughout all zones in the building. All manual station key switches would typically initiate the alarm signal.

Sentence 3.2.4.4.(2) also allows the implementation of a "zoned 2-stage" sequence of operation, whereby the alarm signal sounds in the zone of key switch actuation (and perhaps in the adjacent zones, which may be the storey above and the storey below) and the alert signal sounds throughout the rest of the building. This sequencing would be created automatically by the fire alarm control unit.

The key or special device referred to in Clause 3.2.4.4.(2)(c) should be immediately available to all persons on duty who have been given authority to sound an alarm signal.

A-3.2.4.7.(2) Access to Silencing Switches.

This requirement is intended to prevent unauthorized access to silencing switches. The satisfactory operation of a fire alarm system to alert the occupants of a building to an emergency is predicated on the assumption that the alarm signal will be silenced only after responsible staff have verified that no emergency exists.

a10.1 A-3.2.4.8.(4) Design and Installation of Fire Department Notification.

In some jurisdictions, the fire department may utilize, or have available, a municipal fire alarm system intended for receiving notification by means of a direct connection. If used, it is expected that these systems and installations conform to the requirements of Sentence (4) so as to achieve and provide a uniform and reliable level of service. It is also intended that a proprietary central station as well as a fire brigade used by a large corporation, university campus or similar site comply with Sentence (4).

CAN/ULC-S561, "Installation and Services for Fire Signal Receiving Centres and Systems" which is referenced in Sentence 3.2.4.8.(4), and CAN/ULCS524, "Installation of Fire Alarm Systems" which is referenced in Sentence 3.2.4.5.(1), go hand-in-hand: conformity to CAN/ULC-S561 entails conformity with the fire alarm system components required in that standard, which include the fire alarm transmitter (signal transmitting unit), the interconnections, and the communication path.

A-3.2.4.8.(5)(b) Emergency Telephone Number.

In many municipalities an emergency telephone number, for example 911, is used for all emergency services and it is preferable to post that number.

A-3.2.4.9.(2) Fire Alarm Zones.

Alarm initiating devices referred to in this Sentence include fire detectors, waterflow switches and manual pull stations. If a room or space in a building extends through more than one storey of the building, as in the case of multi-level dwelling units and machinery rooms, judgment must be exercised in the zoning and annunciation of the fire detectors in that room or space. In general, the lowest storey on which access is provided into the room or space should be indicated on the annunciator to

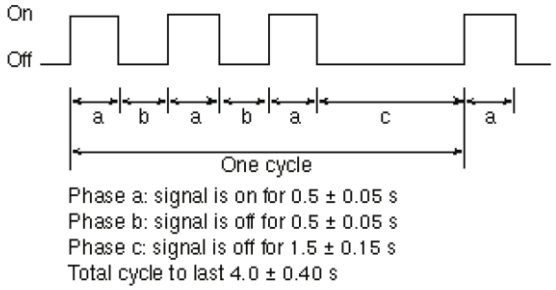


Figure A-3.2.4.20.(2).A.
Temporal Pattern for Fire Alarm Signal

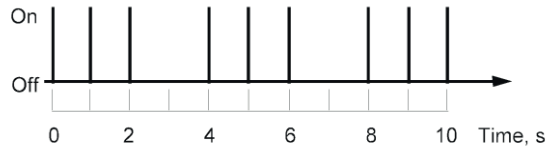


Figure A-3.2.4.20.(2).B.
Temporal Pattern Imposed on a Single Stroke Bell or Chime

Note:

(1) The on phase represents the time that the striker mechanism is actuated. The sound produced by the bell or chime will continue at a level that decreases until the striker mechanism is re-actuated.

A-3.2.4.20.(3) Audibility of Alarm Systems.

It is very difficult to specify exactly what types of sound patterns are considered to be "significantly different" from one another. The intent is to ensure that there is a noticeable or measurable difference between the alert signals and the alarm signals such that it reduces the possibility of confusion.

A-3.2.4.20.(5) Residential Sound Level.

In a building in which corridors or hallways serve more than one suite or dwelling unit, there will be situations in which an audible signal device cannot be placed in the corridor or hallway to alert persons sleeping in suites and dwelling units, because the sound level in the vicinity of the device would exceed that permitted by Sentence 3.2.4.20.(4).

In these situations it will be necessary to supplement the building fire alarm system with an audible signal device in the suite or dwelling unit. These devices could be piezoelectric devices similar to the sounding units in many smoke alarms, subject to the device emitting the appropriate temporal pattern required by Sentence 3.2.4.20.(2).

The sound pressure level required in this Sentence should be measured when the suite is unfurnished and unoccupied.

A-3.2.4.20.(9) Disconnect Device for Dwelling Units.

In order to minimize the annoyance caused by false and unwanted alarms, the disconnect is intended to permit a person to silence the local audible device within the dwelling unit. At that time the person would be aware of sounds from devices in common spaces and could plan appropriate action.

A-3.2.4.20.(10) Signal Circuits.

Clause 3.2.4.20.(10)(a) permits Class A wiring, or Class B wiring with signal circuit isolators located outside of the suites, to serve audible signal devices within residential suites. Clause 3.2.4.20.(10)(b) permits a separate signal circuit to serve each suite without the need for signal circuit isolators or Class A wiring. Open circuits and Class A and Class B wiring circuits are terms defined in CAN/ULC-S524, "Installation of Fire Alarm Systems."

A-3.2.4.20.(13) Separate Signal Circuits.

Sentence 3.2.4.20.(10) in combination with Sentence 3.2.4.20.(11) require separate audible signal circuits for dwelling units. It allows the designer the option to wire the audible signal devices in a dwelling unit on an individual circuit that serves each suite only or to wire the audible signal devices in a common circuit that serves the dwelling units within the floor area and is separate from the circuit that serves the audible devices outside the dwelling unit. Compliance with either of the above two options would meet the intent of a separate circuit required in Sentence 3.2.4.20.(13).

A-3.2.4.21.(1) Visual Alarm Pattern.

CAN/ULC-S526, "Visible Signal Devices for Fire Alarm Systems Including Accessories", published by Underwriters' Laboratories of Canada, applies to visual signalling units. This document is referenced by the most recent standard for the installation of fire alarm systems and would automatically apply. Visual signalling devices with the same temporal pattern as required for audible devices are available from some sources and they should become available in Canada. Not all units that comply with the ULC standard will have sufficient power to adequately cover large areas; care will have to be taken to specify units with adequate power when large spaces are being designed.

A-3.2.4.21.(2) Visual Signal.

If staff located in each zone or compartment can see each sleeping room door, visual signals could be located above each door. If staff cannot see every door, it is intended that the visual signals be provided at the location where the staff are normally in attendance.

A-3.2.4.22.(5) Smoke Alarm Installation.

Ontario's Electrical Safety Code permits a smoke alarm to be installed on most residential circuits that carry lighting outlets and receptacles. It is the intent of the Building Code that any other item on a circuit with a smoke alarm should be unlikely to be overloaded and trip the breaker with a resultant loss of power that is not sufficiently annoying for the breaker to be restored to the on position. It is considered that an interior bathroom light or a kitchen light fulfills this intent, but that circuits restricted to receptacles do not fulfill this intent.

A-3.2.4.22.(7) Smoke Detectors in Lieu of Smoke Alarms.

It is intended that the smoke detector in this application will function as per the requirements of a smoke alarm; specifically, it will be a localized alarm to the suite. The advantage of this type of installation is that the detector would be monitored by the fire alarm panel, which would provide notification to the supervisory personnel and be inspected as per CAN/ULC-S524, "Installation of Fire Alarm Systems." It is not intended that smoke detectors used in lieu of smoke alarms will activate the fire alarm panel to send a signal to the fire department.

a3 A-3.2.4.22.(13) Smoke Alarms with a Visual Signalling Component.

Smoke alarms with a visual signaling component can alert people who are deaf, deafened or hard of hearing to the presence of smoke in the dwelling just as the alarm sound provides an alert to people with no or low vision or who are sighted. The visual signal provides an extra level of safety alerts to building residents.

a10.1 A-3.2.4.23.(1)(b) Voice Messages.

The concept of intelligibility expressed in Clause 3.2.4.23.(1)(b) is intended to mean that a person with average hearing and cognitive abilities is able to understand the messages that are transmitted into the space occupied by the person. There is no absolute measure to predetermine the effect of loudspeakers and it maybe necessary, once the building has been furnished and occupied, to increase to the number of loudspeakers to improve the quality of the messages.

The intelligibility of the message depends on the speech level, the background level, and the reverberation time of the space. ISO 7731, "Ergonomics - Danger Signals for Public and Work Areas - Auditory Danger Signals", addresses audibility. The standard suggests that an A-weighted sound level at least 15 dBA above the ambient is required for audibility, but allows for more precise calculations using octave or ⅓ octave band frequencies to tailor the alarm signal for particular ambient noise conditions. Design of the alarm system is limited to ensuring that all areas receive an adequately loud alarm signal.

If a public address system is to be used to convey instructions during an emergency, then the requirements of the system are less straightforward. In general, however, a larger number of speakers operating at lower sound levels would be required.

Additional guidance on how to design and evaluate the intelligibility of a communication system can be found in the following documents

- IEC 60268-16, Sound System Equipment — Part 16: Objective Rating of Speech Intelligibility by Speech Transmission Index
- ISO 7240-19, Fire Detection and Alarm Systems — Part 19: Design, Installation, "Commissioning and Service of Sound Systems for Emergency Purposes"
- NEMA SB 50, "Emergency Communications Audio Intelligibility Applications Guide"
- Annex D of NFPA 72, "National Fire Alarm and Signaling Code".

A-3.2.5.4.(1) Fire Department Access for Detention Buildings.

Buildings of Group B, Division 1 used for housing persons who are under restraint include security measures that would prevent normal access by local fire departments. These security measures include fencing around the building site, exterior walls without openings or openings which are either very small or fitted with bars, and doors that are equipped with security hardware that would prevent easy entry. These buildings would have firefighting equipment installed and the staff would be trained to handle any small incipient fires. It is expected that appropriate fire safety planning would be undertaken in conjunction with local fire departments in order that special emergencies could be handled in a cooperative manner.

A-3.2.5.6.(1) Fire Department Access Route.

The design and construction of fire department access routes involves the consideration of many variables, some of which are specified in the requirements in the Building Code. All these variables should be considered in relation to the type and size of fire department vehicles available in the municipality or area where the building will be constructed. It is appropriate, therefore, that the local fire department be consulted prior to the design and construction of access routes.

A-3.2.5.7. Water Supply.

This Article requires that an adequate water supply for firefighting is to be provided for every building. However, farm buildings of low human occupancy under the National Farm Building Code of Canada 1995 are exempted. The water supply requirements for interior fire suppression systems such as sprinkler systems and standpipe and hose systems are contained in other standards, for example, NFPA Standard 13, "Installation of Sprinkler Systems", and NFPA Standard 14, "Installation of Standpipe and Hose Systems". This Appendix note focuses only on water supplies that are considered essential to firefighting by fire department or other trained personnel using fire hoses.

Minimum requirements for water supply for firefighting are relevant mainly to building sites not serviced by municipal water supply systems. For building sites serviced by municipal water supply systems where the water supply duration is not a concern, water supply flow rates at minimum pressures would be the main focus of this Appendix note. However, where municipal water supply capacities are limited, it would be necessary for buildings to have on-site supplemental water supply.

An adequate water supply for firefighting should be an immediately available and accessible water supply with sufficient volume and/or flow to enable fire department personnel using fire hoses to control fire growth until the building is safely evacuated, prevent the fire from spreading to adjacent buildings, limit environmental impact of the fire, and provide a limited measure of property protection.

The sources of water supply for firefighting purposes may be natural or man-made. Natural sources may include ponds, lakes, rivers, streams, bays, creeks, springs, artesian wells, and irrigation canals. Man-made sources may include aboveground tanks, elevated gravity tanks, cisterns, swimming pools, wells, reservoirs, aqueducts, tankers, and hydrants served by a public or private water system. It is imperative that such sources of water be accessible to fire department equipment under all climate conditions.

The available water supply would allow arriving fire department personnel to use the water at their discretion when entering a burning building with hose lines. During the search and evacuation operation, hose streams may be needed for fire suppression to limit fire spread. The duration of the water supply should be sufficient to allow complete search and evacuation of the building. Once the search and rescue operations are complete, additional water may be required for exposure protection or fire suppression to limit property damage.

Fire departments serving remote or rural areas often have to respond to a fire with a transportable water supply of sufficient volume for approximately 5 to 10 minutes when using one or two 38 mm hose lines. This would provide minimal hose streams allowing immediate search and rescue operations in small buildings with simple layouts but limited fire suppression capabilities, especially if a fire is already well-established.

For larger more complex buildings, an on-site water supply for firefighting would be needed to provide an extended duration of hose stream use by the fire department to allow search and evacuation of the building, exposure protection and fire suppression. The volume of this on-site water supply would be dependent on the building size, construction, occupancy, exposure and environmental impact potential, and should be sufficient to allow at least 30 minutes of fire department hose stream use.

The recommendations of this Appendix note are predicated on prompt response by a well equipped fire department using modern firefighting techniques, and buildings being evacuated in accordance with established building fire safety plans and fire department pre-fire plans. For buildings constructed in areas where fire department response is not expected at all or in a reasonable time, sprinkler protection should be considered to ensure safe evacuation.

Elementary and secondary schools usually have a record of well established and practiced fire safety plans which would allow complete evacuations within 4 minutes. Because of this and the inherent high level of supervision in these buildings, a reduction of the water supply for firefighting may be considered. It is suggested that the level of reduction should be determined by the local enforcement authority based on the resources and response time of the fire department, and the size and complexity of the buildings.

When designing open, unheated reservoirs as sources of fire protection water, a 600 mm ice depth allowance should be included in the water volume calculations, except where local winter temperature conditions result in a greater ice depth (as typically found on local lakes or ponds). As well, make-up water supplies should be provided to maintain the design volumes, taking into account volume loss due to evaporation during drought periods.

1. Buildings not Requiring an On-Site Water Supply
   (a) A building would not require an on-site water supply for firefighting if the building satisfies the criteria set out in Item 1(b) or Item 1(c) provided that:
      (i) the building is serviced by a municipal water supply system that satisfies Item 3(b), or
a6 (ii) the fire department can respond with a transportable water supply of sufficient quantity to allow them to conduct an effective search and evacuation of the building, determined on the basis of other guidelines or standards (such as, NFPA 1142, "Standard on Water Supplies for Suburban and Rural Fire Fighting").
   (b) A building would not require an on-site water supply for firefighting where all of the following criteria are met:
      (i) the building area is 200 m^2 or less,
      (ii) the building height is 2 storeys or less,
      (iii) the building does not contain a care or detention occupancy,
      (iv) the building does not require a sprinkler system or a standpipe and hose system,
      (v) the limiting distance from the property line is at least 13 m if the building contains a high hazard industrial occupancy, and
      (vi) the building constitutes no significant environmental contamination potential due to fire.
   (c) A building that exceeds 200 m^2 in building area or 2 storeys in building height and that contains a low hazard industrial occupancy may not require an on-site water supply for firefighting if the combustible loading in the building is insignificant (such as that found in cement plants, steel stock storage sheds, etc.), as determined by the chief building official.

2. Sprinklered Buildings
For sprinklered buildings, water supply additional to that required by the sprinkler systems should be provided for firefighting using fire hoses in accordance with the hose stream demands and water supply durations for different hazard classifications as specified in NFPA 13, "Installation of Sprinkler Systems".

3. Buildings Requiring On-Site Water Supply
(a) Except for sprinklered buildings and as required by Items 3(c) and 3(e), buildings should have a supply of water available for firefighting purposes not less than the quantity derived from the following formula:

$$Q = K \bullet V \bullet S_{tot}$$

where

Q = minimum supply of water in litres

K = water supply coefficient from Table 1

V = total building volume in cubic metres

S_{tot} = total of spatial coefficient values from property line exposures on all sides as obtained from the formula:

$$S_{tot} = 1.0 + [S_{side1} + S_{side2} + S_{side3} + \text{... etc.})]$$

where

S_{side} values are established from Figure 1, as modified by Items 3(d) and 3(f), and

S_{tot} need not exceed 2.0.

(b) Water supply flow rates should not be less than that specified in Table 2. Where the water supply is from a municipal or industrial water supply system, the required flow rate should be available at a minimum pressure of 140 kPa.
(c) The water supply as required in Item 3(a) should not be less than that needed to provide the minimum flow rate specified in Table 2 for a minimum duration of 30 minutes.
(d) Where a masonry wall with a minimum fire-resistance rating of 2 h, and no unprotected openings is provided as an exterior wall, the spatial coefficient (S_{side}) for this side of the building may be considered equal to 0. This masonry wall should be provided with a minimum 150 mm parapet. Firewalls that divide a structure into two or more buildings may be given similar consideration when evaluating the exposure of the buildings to each other.
(e) In elementary or secondary schools, the water supply determined in accordance with Items 3(a) and 3(b) may be reduced. The level of reduction to be applied would be at the discretion of the local enforcement authority, and should not exceed 30 percent.
(f) The spatial coefficient S_{side} may be considered equal to 0 when the exposed building is on the same property and is less than 10 m^2 in building area.

4. Additions to Existing Buildings
(a) Except as permitted in Items 4(b) and 4(c), additions to existing buildings should be provided with a water supply for firefighting as required in Items 3(a) to 3(e). Although under Part 11, Renovation, the required water supply is to be based only on the building volume of the addition, it is recommended that the entire building volume of the expanded facility be used to ensure complete evacuation and safety of all the occupants.
(b) Buildings with new additions falling within any one of the following criteria would not require an additional water supply for firefighting where:
(i) the expanded building complies with all the requirements of Item 1(a),
(ii) the new addition does not exceed 100 m^2 in building area, or
(iii) the new addition exceeds 100 m^2 but does not exceed 400 m^2 in building area, contains an assembly, business and personal services, mercantile or low hazard industrial occupancy, is of noncombustible construction, does not result in a significant increase in exposure to other existing buildings, has no combustible storage or process, and is separated from the existing building by a fire separation with a fire-resistance rating of at least 1 h.
(c) Where a firewall is provided between the new addition and the existing building, the water supply for firefighting may be determined in accordance with Items 1(a) and 3(a), using only the building volume of the new addition.

Table 1					
Water Supply Coefficient - K					
Type of Construction	Classification by Group or Division in Accordance with Table 3.1.2.1. of the Building Code				
	A-2 B-1 B-2 B-3 C D	A-4 F-3	A-1 A-3	E F-2	F-1
Building is of noncombustible construction with fire separations and fire-resistance ratings provided in accordance with Subsection 3.2.2., including loadbearing walls, columns and arches.	10	12	14	17	23
Building is of noncombustible construction or of heavy timber construction conforming to Article 3.1.4.6. Floor assemblies are fire separations but with no fire-resistance rating. Roof assemblies, mezzanines, loadbearing walls, columns and arches do not have a fire-resistance rating.	16	19	22	27	37
Building is of combustible construction with fire separations and fire-resistance ratings provided in accordance with Subsection 3.2.2., including loadbearing walls, columns and arches. Noncombustible construction may be used in lieu of fire-resistance rating where permitted in Subsection 3.2.2.	18	22	25	31	41
Building is of combustible construction. Floor assemblies are fire separations but with no fire-resistance rating. Roof assemblies, mezzanines, loadbearing walls, columns and arches do not have a fire-resistance rating.	23	28	32	39	53
Column 1	2	3	4	5	6

Table 2	
Part 3 Buildings under the Building Code	Required Minimum Water Supply Flow Rate, L/min
One-storey building with building area not exceeding 600 m²	1 800
All other buildings	2 700 (if Q ≤ 108 000 L)(1) 3 600 (if Q > 108 000 L and ≤ 135 000 L)(1) 4 500 (if Q > 135 000 L and ≤ 162 000 L)(1) 5 400 (if Q > 162 000 L and ≤ 190 000 L)(1) 6 300 (if Q > 190 000 L and ≤ 270 000 L)(1) 9 000 (if Q > 270 000 L)(1)

Notes to Table 2:
(1) $Q = KVS_{tot}$ as referenced in Paragraph 3(a)

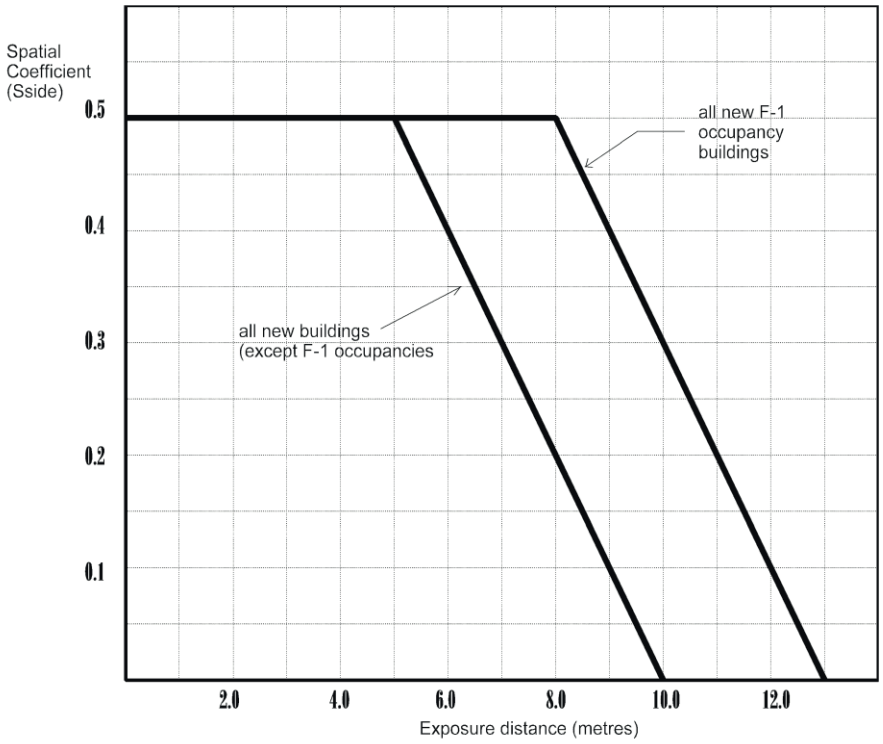


Figure 1
Spatial Coefficient vs Exposure Distance

Further clarification of intent and sample problems and solutions are contained in the "Fire Protection Water Supply Guideline for Part 3 in the Ontario Building Code". This guideline may be obtained through the Office of the Fire Marshal's web site at: "www.ofm.gov.on.ca"

A-3.2.5.13.(1) Sprinkler System Design.

In NFPA 13, "Installation of Sprinkler Systems", reference is made to other NFPA standards which contain additional sprinkler design criteria. These criteria apply to industrial occupancies with high fire loads, including warehouses with high piled storage, and industrial occupancies intended for the use, manufacture or storage of highly flammable materials. Therefore, while only NFPA 13 is called up directly by Sentence 3.2.5.13.(1), the additional criteria in the other NFPA standards are included automatically.

In some NFPA standards, certain aspects of sprinkler protection are dependent on the fire-resistance rating of the vertical structural members. In these cases, the sprinkler system design options can be affected by the fire-resistance rating of these elements. For example, in buildings used for the storage of rubber tires, sprinklers directed at the sides of a column are required if the column does not have the required fire-resistance rating.

Other NFPA standards may require that certain occupancies be sprinklered in conformance with NFPA 13, as in the case of some garages. These requirements do not supersede the requirements in the Building Code. An occupancy is required to be sprinklered only when this is specified in the Building Code, but when it is so required, it must be sprinklered in conformance with NFPA 13 and its referenced standards.

a10.1 Additionally, while Part 4 contains seismic force provisions that apply to the design of sprinklers, NFPA 13 contains other structural requirements for sprinklers that are also required to be met.

a10.1 A-3.2.5.13.(2) Sprinklering of Residential Buildings Above a Storage Garage Considered as a Separate Building.

For the purpose of determining whether NFPA 13R, "Installation of Sprinkler Systems in Residential Occupancies up to and including Four Stories in Height", applies to a residential building constructed over a storage garage, it is not intended that a storage garage constructed as a separate building in accordance with Article 3.2.1.2. be considered as a storey when determining the building height of the residential building. Similarly, this would not preclude the use of NFPA 13D, "Installation of Sprinkler Systems in One- and Two-Family Dwellings and Manufactured Homes", for any one- or two-family home constructed above such a storage garage.

A-3.2.5.13.(6) Sprinklering of Roof Assembly.

Sprinkler protection for roof assemblies in lieu of fire resistance is based on the assumption that the sprinklers will protect the roof assembly from the effects of fire in spaces below the roof. If a ceiling membrane is provided, the sprinklers would have to be located below the membrane in order to react quickly to the fire. In certain instances, however, sprinklers may be required within the concealed spaces as well as below the membrane. NFPA 13, "Installation of Sprinkler Systems", requires sprinklers in certain concealed spaces.

According to NFPA 13 and 13R, rooms and closets within a dwelling unit in a sprinklered building, including those in the storey immediately below the roof assembly do not require sprinklers. However, the Building Code requires sprinkler protection within all rooms and closets immediately below the roof so as to control any fire that might start in that space and thereby limit the probability of the fire spreading into the roof assembly.

Moreover, NFPA 13D, "Installation of Sprinkler Systems in One- and Two-Family Dwellings and Manufactured Homes," also allows the omission of sprinklers in such rooms and closets under certain circumstances, provided the building is sprinklered in conformance with this standard. In this case, the Building Code concurs with the provisions of the NFPA 13D standard.

a10.1 A-3.2.5.13.(7) Balconies and Decks.

The intent of this provision is to suppress or control a fire originating from a balcony or deck which could spread to the balcony above, roof assembly or other parts of the building. It is not intended to apply to a roof top deck or uppermost balcony where there are no parts of the building above.

e3 A-3.2.5.13.(8) Sprinkler Rating.

The requirements of this Sentence can be met by using sprinklers with a rating of 79°C to 107°C.

A-3.2.5.14.(1) Hazard Classification for Sprinkler Selection.

The reference to light hazard occupancies is based on the descriptions of these occupancies given in NFPA 13, "Installation of Sprinkler Systems" and is intended only for use in the design of sprinkler systems. These descriptions should not be confused with the occupancy classifications in the Building Code.

In NFPA 13 a light hazard occupancy is one in which the quantity or combustibility of contents is low and fires with relatively low rates of heat release are expected. Typical buildings or parts of buildings include: churches; clubs; eaves and overhangs, if of combustible construction with no combustibles beneath; educational buildings; hospitals; institutional buildings; libraries, except very large stack rooms; museums; long term care or convalescent homes; offices, including data processing rooms; residential buildings; restaurant seating areas; theatres and auditoria, excluding stages and proscenia; and unused attics.

Although NFPA 13R, "Installation of Sprinkler Systems in Residential Occupancies up to and Including Four Stories in Height", and NFPA 13D, "Installation of Sprinkler Systems in One- and Two-Family Dwellings and Mobile Homes", as referenced by NFPA 13, are concerned with specific types of residential occupancy, namely apartment buildings up to four storeys, one and two family dwellings, and mobile homes, for the purpose of acceptance of combustible sprinkler piping these occupancies are considered to be included in the category of residential buildings under light hazard occupancies.

A-3.2.5.19.(1) Fire Pumps.

In order to ensure an adequate water supply, it may be necessary to install a fire pump for a building that has either a standpipe system or an automatic sprinkler system installed. Reference to NFPA 20, "Installation of Stationary Pumps for Fire Protection", provides the necessary guidance to designers.

A-3.2.6. High Buildings.

It is assumed that buildings regulated by Subsection 3.2.6. will be in an area served by a fire department capable of an early response and that all firefighting and rescue situations will be under the direct control of the officer-in-charge of the fire department responding to the emergency.

Measures that relate to limiting or controlling the movement of smoke caused by a building fire are described in the Supplementary Standard SB-4. Adoption of one of these measures is considered to be an acceptable means of complying with the requirements of this Subsection.

A-3.2.6.4.(6)(a) Elevator Recall.

Automatic emergency recall actuation that is dependent on the operation of 2 smoke detectors in the elevator lobby meets the intent of this requirement. Such an arrangement may reduce the frequency of nuisance recalls.

A-3.2.7.4.(1) Emergency Power Reliability.

In some areas power outages are frequent and may be of long duration. These local conditions should be taken into account in determining the type of system for supplying emergency power for lighting. This should be studied at the planning stage of a building project in conjunction with the local fire safety and building officials.

A-3.2.7.6.(1) Emergency Power for Hospitals.

CSA-Z32, "Electrical Safety and Essential Electrical Systems in Health Care Facilities", contains requirements for three classes of health care facilities - Class A, Class B and Class C. The intent of Article 3.2.7.6. is to apply specific requirements for emergency equipment for Class A facilities, which are designated as hospitals by the enforcement authority and where patients are accommodated on the basis of medical need and are provided with continuing medical care and supporting diagnostic and therapeutic services.

A-3.2.7.8.(3) Emergency Power Duration.

The times indicated in this Sentence are the durations for which emergency power must be available for a building under fire emergency conditions. Additional fuel for generators or additional battery capacity is required to handle normal testing of the equipment. If the operation of emergency generators or batteries is intended for other than fire emergency conditions, such as power failures, fuel supplies or battery capacity must be increased to compensate for that use.

A-3.2.7.9.(1) Emergency Power Reliability.

In some areas power outages are frequent and may be of long duration. These local conditions should be taken into account in determining the type of system for supplying emergency power for building services. This should be studied at the planning stage of a building project in conjunction with the local fire safety and building officials.

a10.1 A-3.2.7.10.(2)(a) and (3)(a) Protection of Electrical Conductors.

It is important to understand that electrical conductors are part of a system that includes—among other components—raceways, conduits, splices, couplings, vertical supports, grounds and pulling lubricants. When selecting electrical conductors to provide a circuit integrity rating, it is therefore important to understand how they will be installed and to know if the fire performance of the system as a whole was tested.

A-3.2.7.10.(5)(b) Electrical Conductors in the Same Room.

If the distribution panel and the equipment it serves are within the same room, only the electrical conductors leading up to the distribution panel need to be protected. It is assumed that the distribution panel and the equipment it serves are within sufficient proximity to each other such that a fire in the same area of origin would affect both.

A-3.2.7.10.(7) Fire Alarm Branch Circuits.

In order to ensure continuos operation of the fire alarm and voice communication system in a high-rise building for a sufficient duration of time to control and direct the evacuation of building occupants, a level of protection is required by Sentence 3.2.7.10.(2) for those electrical conductors interconnecting the major elements of the fire alarm system. Sentence 3.2.7.10.(7) permits the protection of electrical conductors to be waived for portions connecting a transponder or fault isolation device to the fire alarm input devices (fire detectors, manual stations, etc.) or a voice communication transponder to a fire alarm audible signalling device, provided all circuits or portions of the circuits are contained within the same storey.

A-3.2.8.2.(3) Special Protection of Opening.

In manufacturing operations involving the use of conveyor systems to transport material through fire separations, it may not be possible to use standard closure devices. NFPA 80, "Fire Doors and Other Opening Protectives", includes appendix information concerning protection of openings through vertical fire separations. NFPA 13, "Installation of Sprinkler Systems", includes methods of protecting openings through floor assemblies, however, it is assumed by that standard that the remainder of the building would be sprinklered. Combinations of methods may be required to ensure that the level of safety inherent in the requirements of the Code is maintained.

A-3.2.8.2.(6) Waiver of Occupancy Separation Continuity.

The typical application of this Sentence is to buildings with a mixture of occupancies that are randomly located throughout the building. Examples include shopping centres, podia of large commercial and business complexes, and recreational buildings that are combined with mercantile and business operations. A shopping mall with two interconnected storeys is an example that is frequently encountered in many jurisdictions. The permission to breach the floor assembly between the storeys does not override requirements for separation of specific suites or occupancies. For instance, although storage garages are Group F, Division 3 occupancies, the requirement in Article 3.3.5.6. for the storage garage to be separated from other occupancies by a fire separation with at least a 1.5 h fire-resistance rating must be observed. In a similar manner, a theatre or cinema (Group A, Division 1 occupancy) must be separated from other occupancies in accordance with Sentence 3.3.2.2.(1) and seats in an arena type building (Group A, Division 3) must be separated from space below in accordance with Sentence 3.3.2.2.(3).

A-3.2.8.3.(2)(b) Area of Ellipse.

The area of an ellipse, whose semiaxes are a and b, is equal to "$\pi \cdot ab$", where $\pi = 3.14$.

A-3.2.8.4.(6) Area of Safety.

The objective of this Sentence is to provide an area of temporary safety in the exit stair shafts for those occupants of the interconnected floor space. This requirement is considered to be met where 0.3 m^2 per person is provided in the stair shaft between the floor level served and floor level immediately beneath it.

A-3.2.8.8.(1)(b) Smoke Detector Location.

In the design and installation of the smoke detection system, it is essential that consideration be given to all features which could have a bearing on the location and sensitivity of the detectors, including such pertinent physical configurations as ceiling height, sloped ceilings, diffusion from air conditioning and ventilating currents and the location of any obstructions or baffles that might interfere with the proper operation of the system.

A-3.2.9.2.(4)(c) Fire Department Pumping Equipment.

Availability of appropriate pumping equipment from the local fire department or, in the case of industrial plants or complexes, from their fire brigade, is considered sufficient to meet the intent of this requirement.

a10.1 A-3.2.10.1.(1) Testing of Fire Protection and Life Safety Systems.

Building owners should verify that fire protection and life safety systems and their components (i.e. fire alarm systems, sprinklers, standpipes, smoke control, ventilation, pressurization, door hold-open devices, elevator recalls, smoke and fire shutters and dampers, emergency power, emergency lighting, fire pumps, generators, etc.) , including their interconnections with other building systems, are functioning according to the intent of their design . CAN/ULC-S1001, "Integrated Systems Testing of Fire Protection and Life Safety Systems" provides the methodology for verifying and documenting that

interconnections between building systems satisfy the intent of their design and that systems function as intended by the Code.

Clause 6.1.5. of CAN/ULC-S1001 allows the Integrated Testing Coordinator to accept documented evidence of any tests that have been performed on a system as part of its acceptance testing for the purpose of demonstrating compliance with the integrated testing requirements of that standard, so as to avoid duplication of work.

A-3.3. Safety Within Floor Area.

Section 3.3. regulates safety within floor areas including rooms or other spaces within a building, with the exception of service rooms and service spaces that are regulated by Section 3.6. The requirements are grouped according to the occupancy of the floor area, room or space. The occupancy of these floor areas and other spaces is not necessarily the major occupancy for which the building is classified.

Life safety for the occupants of any floor area depends in the first instance on the use or occupancy of that floor area. The risks to the occupants occur in the early stages of a fire. These special life risks differ from one occupancy to another and, consequently, must be regulated differently. Section 3.3. regulates risks within floor areas, and these requirements apply regardless of the major occupancy of the building that contains them. For example, an assembly room must comply with the requirements for assembly occupancy whether it is contained in an office building, hospital, hotel, theatre, industrial building or other major occupancy.

a10.1 A-3.3.1.2.(1) Hazardous Substances.

The term “hazardous substances” refers to dangerous goods that are regulated by TC SOR/2008-34, “Transportation of Dangerous Goods Regulations (TDGR)” or that are classified as “controlled products” under the “Workplace Hazardous Materials Information System (WHMIS)” established to meet the requirements of HC SOR/2015-17 “Hazardous Products Regulations”. It also refers to materials and products that are not regulated by the TDGR or WHMIS, but that pose a fire or explosion hazard due to their own properties or because of the manner in which they are stored, handled or used. These include combustible products, rubber tires, combustible fibres, combustible dusts, products producing flammable vapours or gases, etc.

A-3.3.1.2.(2) Cooking Equipment Ventilation.

Cooking equipment manufactured for use in dwelling units and other residential suites is often installed in buildings used for assembly and care or detention purposes. It is not obvious from the Building Code requirements or those of NFPA 96, “Ventilation Control and Fire Protection of Commercial Cooking Operations”, whether a ventilation and grease removal system is required in all assembly, care or detention uses. If the equipment is to be used in a manner that will produce grease-laden vapours that are substantially more than would be produced in a normal household environment, then it would be appropriate to apply the requirements of NFPA 96. If the equipment is used primarily for reheating food prepared elsewhere or is used occasionally for demonstration or educational purposes, there would be no expectation of applying the requirements of NFPA 96. In all cases the circumstances should be reviewed with the enforcement authority.

A-3.3.1.4.(1) Occupancy in Corridor.

Since the Building Code regulates new construction, alterations and changes of occupancy, kiosks in public corridors are required to be constructed on the same basis as the remainder of the building. This means that the construction of kiosks and similar structures must take into consideration all the requirements which apply to the remainder of the building, including structural fire protection, construction type, finish materials, egress widths and sprinkler installations.

A-3.3.1.7.(1) Temporary Refuge for Persons with Disabilities.

These measures are intended to provide temporary refuge for persons with disabilities. It is acknowledged, however, that the measures cannot provide absolute safety for all occupants in the fire area. It may, therefore, be necessary to develop special arrangements in the fire safety plan to evacuate persons with disabilities from these areas.

The protected elevator referred to in Clause 3.3.1.7.(1)(a) is intended to be used by firefighters as a means for evacuating persons with disabilities. It is not intended that this elevator be used by persons with disabilities as a means of egress without the assistance of firefighters.

If an estimate is to be made of the number of persons with disabilities in a floor area who can be accommodated in each zone in Clause 3.3.1.7.(1)(b), this estimate may be based on Table 3.8.2.1., which is used to determine the minimum number of spaces to be provided for wheelchair occupants in fixed seating areas. If more precise information is available, it should be used for sizing the zones.

a10.1 **A-3.3.1.7.(1)(b) Zones.**

The floor area on either side of a horizontal exit conforming to Article 3.4.6.10. may be considered as a zone in applying the requirements of Article 3.3.1.7.

A-3.3.1.9.(4) Obstruction in Corridor.

The sweep of a cane used by a person with vision loss normally detects obstructions that are within 680 mm of the floor. Any obstruction above this height would not normally be detected and can, therefore, create a hazard if it projects more than 100 mm into the path of travel.

A-3.3.1.11.(3) Movable Partitions.

Should an emergency situation arise outside of normal working hours but when occupants are still in the space, they could be left without a clear way out. This could occur during inventory or after closing time when all occupants have not yet left, but staff close the door to prevent other persons from entering. In many small tenant areas, the movable partitions (store fronts) provide the only way out. There should always be a second way out or a swinging door within or adjacent to the sliding partitions.

A-3.3.1.12.(4) Door Hardware.

The permission to have additional door releasing devices is intended to allow the use of a security chain, night latch or dead bolt to supplement the normal door latching device. These are permitted for dwelling units and locations where guests in a hotel require additional security. The height of these items is also governed by the maximum height stipulated in Sentence 3.3.1.12.(5) to ensure that they can be operated by persons with physical disabilities. This additional hardware should not require appreciable dexterity by the user and the general requirements on the ability to operate the device without the use of keys, special tools or specialized knowledge still apply.

A-3.3.1.12.(6) Controlled Egress Doors.

It is intended that Sentence 3.3.1.12.(6) apply to doors used at the perimeter of a contained use area or an impeded egress zone. If the contained use area consists of a single room, the requirements would apply to that room. In the case of individual cells within a contained use area, exterior keyed locks could be used on the cell doors consistent with the fire safety plan and continuous supervision by staff who can release the doors in an emergency.

A-3.3.1.22.(1) Obstructions in Means of Egress.

Obstructions including posts, counters or turnstiles should not be located in a manner that would restrict the width of a normal means of egress from a floor area or part of a floor area unless an alternative means of egress is provided adjacent to and plainly visible from the restricted means of egress.

A-3.3.2.3.(2) Tablet Arms.

Although it is intended that the motion to raise the tablet arm be essentially a single fluid motion, it is acceptable that the motion be a compound motion of raising the tablet arm and including an articulation to allow the tablet to fall back alongside the arm rest.

A-3.3.3.1.(1) Safety in a Care or Detention Occupancy.

Fire safety for patients and residents in sleeping room areas in care or detention occupancies is predicated on the ability of staff to carry out at all times essential life safety functions in accordance with the fire safety plan.

A-3.3.3.4.(1) Doorway Width.

The 1 050 mm minimum clear width of doorways accounts for door stops and, thus, is intended to allow for the use of 1 100 mm doors.

A-3.3.3.5.(1) Hospitals and Long-Term Care Homes.

The basis for the requirements in this Article is that staff will be in attendance at all times on the same storey, either in each fire compartment or in a fire compartment immediately adjacent.

A long-term care home is intended to include skilled nursing facilities, intermediate care facilities and some homes for the aged. Occupants of long-term care homes are assumed to be, for the most part, non-ambulatory. The use of physical restraints and tranquilizing drugs which may render occupants immobile are also factors which should be considered.

Although the age of patients by itself is not sufficient justification for a floor area to be included in a long-term care home occupancy, it should be recognized that many homes for the aged are in fact long-term care homes. The factor that determines whether or not a home for the aged is a long-term care home and, therefore, a care and treatment occupancy, is whether or not continuous nursing care is required for the occupants. Where continuous nursing care and treatment is not provided for the occupants, a home for the aged may be classified as either a care occupancy or a residential occupancy. If no care is provided to the residents, a home for the aged would normally be classified as a residential occupancy.

A-3.3.3.5.(10) Intercommunicating Rooms.

Rooms that are interconnected can include more than one sleeping room, together with ensuite toilet rooms, shower rooms, and storage closets used for the storage of personal items of the persons occupying the sleeping rooms. It is not intended that storage rooms for other purposes be included within the group of interconnected rooms.

A-3.3.4.4.(1) Landing in Egress Stairway.

A landing level used in an egress stairway from a dwelling unit is not considered to be a storey of that dwelling unit if the landing is used only for pedestrian travel purposes.

A-3.3.4.5.(1) Automatic Locking Prohibited.

Doors that must be manually reset to lock them when they are opened from the inside meet the intent of this requirement.

a2.1 A-3.3.4.9.(1) Stud Wall Reinforcement.

If the bathroom layout does not provide a wall beside the water closet, the reinforcing for future installation of a grab bar would only be required in the wall behind the water closet.

A-3.3.5.4. Electrical Wiring and Appliances.

Sources of ignition, such as electrical wiring and appliances, can set off an explosion if exposed to gases or vapours such as those that can be released in a repair or storage garage. The Ontario Electrical Safety Code contains provisions requiring either shielded wiring installations adjacent to certain garages or an air-tight curb separating the garage from adjacent spaces.

A-3.3.6.1.(1) Design of Hazardous Areas.

Subsection 3.3.6. applies to the storage of products, whether raw or waste materials, goods in process, or finished goods.

This Subsection does not deal with products or materials that are directly supplied to appliances, equipment or apparatus through piping, hose, etc. For example, gas cylinders that are mounted on propane barbeques are not covered by Subsection 3.3.6. since they are considered to be “in use” as opposed to “in storage”.

The design requirements contained in Subsection 3.3.6. reflect some, but not all design requirements contained in Division B of the Fire Code as it relates to the design of hazardous areas. Designers are advised to refer to the Fire Code for any other design requirements that may apply to their circumstances.

a10.1 A-3.3.6.2.(2) Storage of Reactive Materials.

Reactive materials include various classes of unstable or reactive dangerous goods, such as flammable solids, pyrophoric materials, oxidizers, corrosives, water-reactive substances and organic peroxides.

In general, it is unsafe to store highly reactive oxidizers close to liquids with low flash points, combustible products or chemically incompatible products. Quantities of oxidizers or other dangerously reactive materials should therefore be limited and the storage area should be constructed of noncombustible materials, should be kept cool and ventilated, and should not impede egress.

In some cases, depending on the quantity and nature of the oxidizing agent, normal fire protection measures (e.g. sprinklers, fire hose and extinguishers) are ineffective due to the self-yielding of oxygen by the oxidizing agent.

When containers of highly reactive oxidizers become damaged or are exposed to excessive heat, humidity or contamination (e.g. sawdust, petroleum products, or other chemicals), a very violent fire or explosion can result.

The following oxidizing substances, among others, are known to supply oxygen: organic and inorganic peroxides; pool chemicals (e.g. calcium hypochlorite, sodium dichloroisocyanurate); oxides; permanganates; perrhenates; chlorates; perchlorates; persulfates; organic and inorganic nitrates; bromates; iodates; periodates; perselenates; chromates, dichromates; ozone; perborates.

When containers of dangerously reactive materials become damaged or are exposed to water or humidity, a flammable gas (such as hydrogen, ammonia or methane) or a toxic gas (such as hydrogen chloride, hydrogen bromide or phosphine) can be released.

The following dangerously reactive materials, among others, are known to release a flammable gas in reaction to contact with water or humidity: alkali metals (e.g. sodium, potassium, cesium); reactive metals (e.g. zinc, aluminum, magnesium); metallic hydride (e.g. sodium borohydride, germanium tetrahydride, calcium hydride).

The following dangerously reactive materials, among others, are known to release a toxic gas in reaction to contact with water or humidity: organic and inorganic chloride (e.g. phosphorus trichloride, phosphorus oxide trichloride, acetyl chloride); organic and inorganic bromide (e.g. phosphorus tribromide, aluminum tribromide, acetyl bromide).

A-3.3.6.4.(2) Explosion Venting in Hazardous Locations.

When a flammable mixture of air and vapour/gas/dust is ignited and causes an explosion, the exothermic reaction results in the rapid expansion of heated gases and the corresponding pressure waves travel through the mixture at sonic or supersonic velocities. The pressures developed by an explosion very rapidly reach levels that most building structures and equipment cannot withstand unless specifically designed to do so. Explosion venting consists of devices designed to open at a predetermined pressure to relieve internal pressure build-up inside a room or enclosure, hence limiting the structural and mechanical damage.

The major parameters to be considered in designing an explosion venting system for a building are:

- the physical and chemical properties of the flammable air mixture, such as the particle size or the droplet diameter, the moisture content, the minimum ignition temperature and the explosive concentration, the burning velocity or explosion classification, the maximum explosion pressure and the rate of pressure rise,
- the concentration and dispersion of the flammable mixture in the room,
- the turbulence and physical obstructions in the room,
- the size and shape of the room, the type of construction and its ability to withstand internal pressures, and
- the type, size and location of relief panels, which should be designed to reduce the possibility of injury to people in the immediate vicinity of the panels.

A-3.3.6.5.(1) Measurement of Tire Storage Volume.

The volume of tires in a storage area can be determined by measuring to the nearest 0.1 m the length, width, and height of the piles or racks intended to contain the tires. In racks, the top shelf is assumed to be loaded to a maximum possible height, while observing required clearances between structural elements and sprinklers.

A-3.3.6.6.(1) Products Stored with Ammonium Nitrate.

Copper and its alloys should not be used where they can come into contact with ammonium nitrate. The presence of copper represents the single greatest hazard with respect to the accidental detonation of ammonium nitrate during a fire.

Steel and wood can be protected with special coatings such as sodium silicate, epoxy, or polyvinyl chloride.

Asphalt and similar hydrocarbon-based roof coverings should not be used. Stored ammonium nitrate may become sensitized during a fire if such roof coverings melt and leak into the interior of the building, causing burning droplets to fall on the stored product.

A-3.4.1.6.(2) Sleeping Area.

Areas serving patients' or residents' sleeping rooms include sleeping areas and areas where patients or residents are taken for treatment.

A-3.4.2.3.(1) Least Distance Between Exits.

The least distance measurement does not apply to each combination of exits on a multi-exit storey. It only applies to at least 2 of the required exits from that storey.

A-3.4.3.2.(7) Door Width.

The clear width values of exit doorways in Clauses 3.4.3.2.(7)(f) and (g) account for door stops and are intended to allow for the use of 1 100 mm doors in Clause 3.4.3.2.(7)(f) and 810 mm doors in Clause 3.4.3.2.(7)(g).

A-3.4.3.4. and 3.4.3.5. Clear Height and Width of Exits.

Clear height is intended to be measured from a line tangent to the nosings extended to the underside of the lowest element above the walking surface, over the clear width of the exit (see Figure A-3.4.3.4.) Examples of low elements above the walking surface include light fixtures, sprinkler heads and pipes.

Clear width is intended to be measured from a line tangent to the horizontal protrusions such as handrails.

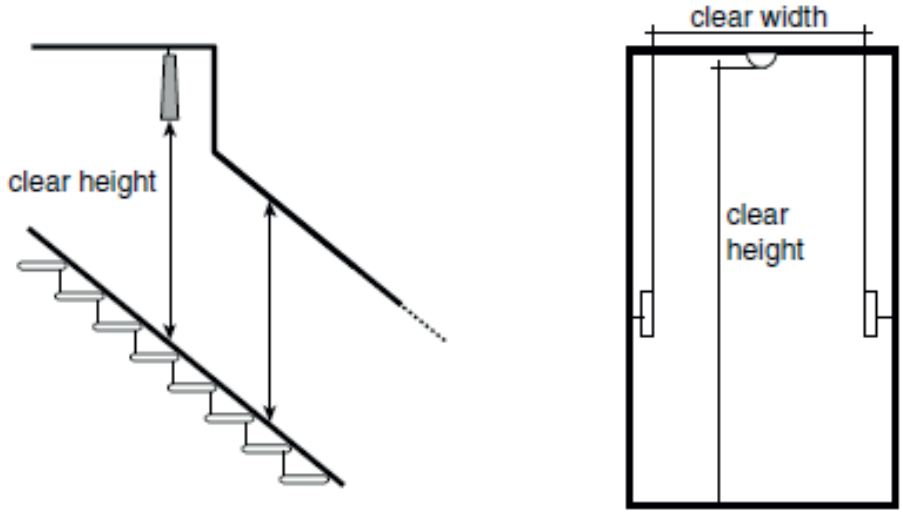


Figure A-3.4.3.4.
Measuring Clear Height

A-3.4.4.2.(2)(e) Requirements for Lobby.

If an exit is permitted to lead through a lobby, the lobby must provide a level of protection approaching that of the exit. As well as meeting the width and height requirements for exits, the lobby must be separated from the remainder of the building by a fire separation having a fire-resistance rating at least equal to that required for the exit, unless one of the exceptions in this Clause is applied.

A-3.4.5.1.(2)(c) Graphic Symbols for Exit Signs.

ISO 7010, "Graphic symbols - Safety colours and safety signs - Safety signs used in workplaces and public areas", identifies the recognized symbols for use at required exits. Examples are provided in Figures 3.4.5.1.(2)(c)(i) and 3.4.5.1.(2)(c)(iii).



Figure A- 3.4.5.1.(2)(c)(i)
Emergency Exit Left Symbol (E001) from ISO 7010

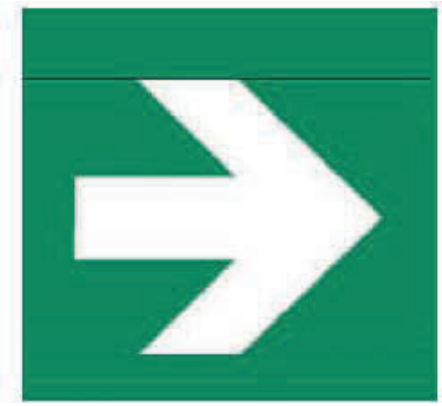


Figure A- 3.4.5.1.(2)(c)(iii)
Emergency Exit Directional Arrow (E005) from ISO 7010

A-3.4.5.1.(5) Photoluminescent Exit Signs.

An external lighting source is required to properly charge photoluminescent signs. These types of signs must be lit in conformance with the charging requirements stated in CAN/ULC-S572, "Photoluminescent and Self-Luminous Exit Signs and Path Marking Systems".

A-3.4.5.2.(2) Stairwell Signs.

Past experience indicates that some persons attempt to exit at the roof level of a building in the event of an emergency. Rescue from the roof of a building more than six storeys high is rarely possible from the exterior of a building. In order to avoid instances of persons getting trapped by smoke at the top of a stairwell that has no access to a roof, signs are required within the stairwell (at least one sign immediately above the highest normally occupied floor level) to indicate that the stairwell does not provide an exit at the roof level. The sign should consist of a graphic and text to indicate that there is no exit to the roof.

A-3.4.6. Application to Means of Egress.

The requirements in Subsection 3.4.6. apply to interior and exterior exits, as well as to ramps, stairways and passageways used by the public as access to exit. The treads, risers, landings, handrails and guards for the latter access to exit facilities must thus be provided in conformance with the appropriate requirements for exit facilities.

a3 **A-3.4.6.1.(2) Surface Finish of Ramps and Stairs.**

A tactile attention indicator strip signals a warning to people with no or low vision that they are approaching a change in level. The strip is set back from the leading edge of the stair to provide sufficient warning of the change in level in advance.

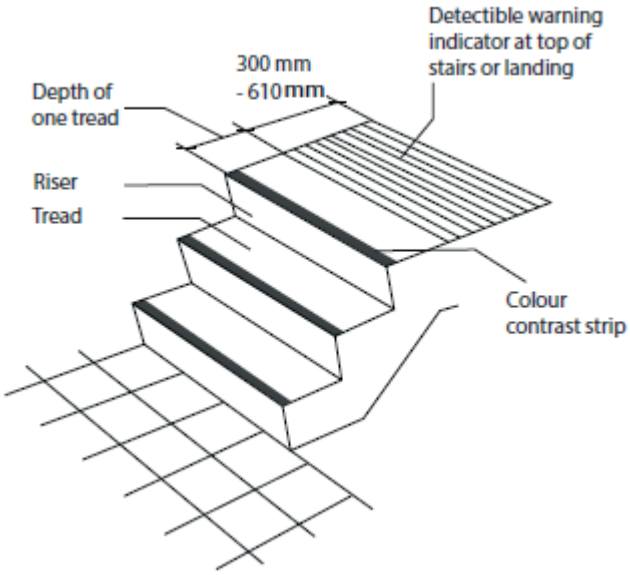


Figure A-3.4.6.1.(2)
Tactile Indicator at Stairs and Ramps

A-3.4.6.5.(3) Continuity of Handrail.

Persons with vision loss rely on handrails to guide them on stairways. A continuous handrail will assist them in negotiating stairs at changes in direction. The extended handrail is useful to persons with physical disabilities to steady themselves before using the stairs. Handrails should, however, return to the wall, floor or post, so as not to constitute a hazard to persons with vision loss.

A-3.4.6.8.(5) Stair Tolerances.

The term “shall not differ significantly” assumes normal construction tolerances.

A-3.4.6.10.(5) Door Swing.

Although it is required that the door on the right hand side of a pair of doors shall swing in the direction of travel through the exit, the direction of swing of the door on the left side will depend on the function of the horizontal exit. If the horizontal exit provides for movement from one building to the adjacent building but does not require movement in the reverse direction, both doors must swing in the direction of travel to the adjacent building. If the design is based upon both buildings providing complementary movement in either direction, then the doors must swing in opposite directions. Location of a required exit sign directly above a door that swings in the direction of travel is deemed to meet the intent of Clause 3.4.6.10.(5)(b).

A-3.4.6.11.(3) Exit Concealment.

Hangings or draperies placed over exit doors may conceal or obscure them.

A-3.4.6.16.(1) Fastening Device.

Turnpieces of a type which must be rotated through an angle of more than 90° before releasing a locking bolt are not considered to be readily openable. The release of a locking bolt should allow the door to open without having to operate other devices on the door.

A-3.4.6.16.(4) Electromagnetic Locks.

Electromagnetic locks are intended for use where there is a need for security additional to that provided by traditional exit hardware. They are not intended for indiscriminate use as alternative locking devices.

The design of these devices requires evaluation to ensure that their operation will be fail-safe in allowing exiting in the event of foreseeable emergencies.

If more than one locking device is used in a building, it is expected that one switch will release and reset all devices simultaneously. If more than one such switch is provided in a building, at least one switch must be installed in the annunciator panel located at the main entrance of the building or, in the case of a building within the scope of Subsection 3.2.6., in the central alarm and control facility for easy access of fire department personnel.

Most importantly, electromagnetic locks are not to be used where panic hardware must be installed. This will ensure that a large number of occupants can exit a building quickly in emergency situations created by either fire or non-fire conditions. It will also ensure that occupants in buildings containing highly hazardous substances can exit quickly unimpeded in an emergency.

In care and treatment facilities, such as hospitals and long term care homes, and residential care facilities, however, because the occupant load is relatively low and the level of staff supervision is generally high, electromagnetic devices may be installed on exit doors at the bottom of exit stairways where panic hardware is required by code to maintain security where necessary.

When installed on doors in fire separations, electromagnetic locking devices must used in conjunction with positive latching devices designed to hold the doors in the closed position since these locks do not incorporate latches and are released in an emergency. In a fire, keeping doors in fire separations closed is essential to control the spread of fire and smoke.

To enable exiting without delay (especially important in non-fire emergency situation), a manual pull station must be installed in close proximity to the door equipped with an electromagnetic locking device. The operation of this manual pull station will immediately release the electromagnetic locking device and, at the same time, activate the building fire alarm system.

Precautionary measures should be in place to ensure that by-pass switches would be deactivated at the completion of each fire alarm testing. An audible and a visual signal at the annunciator panel and at the monitory station should provide such assurance.

A-3.4.6.19.(1)(d) Colour Contrast.

The identification of floor and other signs intended to facilitate orientation for visually-impaired persons should offer maximum colour contrast to be effective. For this reason, it is recommended that white on black or black on white be used, as this combination produces the best legibility. It is also recommended that the sign surfaces be processed to prevent glare.

A-3.5.4.1.(1) Elevator Car Dimensions.

In some circumstances, it is necessary to maintain a patient on a stretcher in the prone position during transit to a hospital or to treatment facilities. Inclining the stretcher to load it into an elevator could be fatal or at the very least detrimental to the patient's health. Many ambulance services use a 2 010 mm long by 610 mm wide mobile patient stretcher. As well as space for the stretcher in the elevator, there should be sufficient additional space for at least two attendants who may also be providing treatment during transit. Common elevator units that can satisfy this requirement include:

- a 1 134 kg elevator car with minimum interior dimensions of 2 032 mm wide and 1 295 mm deep with a right or left hand access door. The minimum access door width is 1 067 mm and it must be on the 2 032 mm side of the car.
- a 1 134 kg elevator car with minimum interior dimensions of 2 032 mm deep and 1 295 mm wide with a minimum 915 mm wide access door located on the 1 295 mm side.

A-3.6.2.1.(1) Location of Fuel-Fired Appliances.

Sentence 3.6.2.1.(1) requires that fuel-fired appliances be located in service rooms. It does not allow for their installation in service spaces.

A-3.6.2.5.(1) Combustible Refuse Storage.

Storage of refuse consisting of combustible materials including waste paper, cardboard and plastic, and noncombustible materials such as glass and metallic containers can be accumulated in these rooms for the purpose of recycling. This storage is allowed in consideration of a less stringent collection schedule when compared to that of garbage or refuse, which is collected regularly.

A-3.6.3.1.(1) Vertical Service Spaces.

Sentence 3.6.3.1.(1) does not prohibit the internal subdivision of a vertical service space to allow different building services to be installed in physically separated spaces unless other requirements apply (see, for example, Article 3.2.7.10.). Fire separation requirements apply to the perimeter of the group of service spaces. Article 3.6.3.3. has special requirements for linen chutes and refuse chutes.

a10.1 A-3.6.3.5. Grease Duct Enclosures.

NFPA 96, "Ventilation Control and Fire Protection of Commercial Cooking Operations", presents two options for enclosing grease ducts for commercial cooking equipment: the first option is to use continuous fire-rated building component assemblies to enclose the ducts and the second one consists of installing proprietary, fire-rated, field- applied or factory-built grease duct assemblies in accordance with the manufacturer's instructions. These types of enclosure assemblies are evaluated for their resistance to fire and their ability to protect adjacent combustibles through reduced clearances. Although NFPA 96 references other standards that deal with grease duct assemblies, Sentence 3.6.3.5.(2) requires that CAN/ULC-S144, "Fire Resistance Test – Grease Duct Assemblies", be used to determine the fire-resistance rating of factory-built and field-applied grease duct assemblies.

A-3.6.4.2.(2) Ceiling Membrane Rating.

In construction assemblies that utilize membrane ceiling protection and have been assigned a fire-resistance rating on the basis of a fire test, the membrane is only one of the elements that contribute to the performance of the assembly and does not in itself provide the protection implied by the rating. For the fire-resistance rating of membrane materials used in this form of construction, reference should be made to the results of fire tests which have been conducted to specifically evaluate the performance of this element.

A-3.7.2.1.(1) Window Area Limit.

Part 9 requirements for windows cover a number of subjects, however, this Article refers only to the area limits.

A-3.7.4.2.(1) Sanitary Facilities.

It is assumed that if the sanitary facilities are provided on every storey, the occupant load for the determination of the number of fixtures would be the anticipated occupant load of that storey. If the washrooms are provided in a central location, the number of fixtures should then be based on the total anticipated occupant load for the areas that are served by that washroom.

a2.1 A-3.7.4.2.(8) Plumbing Fixtures for Small, Low Occupancy Uses.

For small restaurants, retail and other small assembly uses with low occupancy loads, the number of washrooms provided may be reduced, where permitted, to provide some flexibility for space planning provided at least one universal washroom is provided in compliance with Sentence 3.8.3.12.(6) and one single washroom is provided and neither washroom is signed for gender.

A-3.7.4.13.(1) Washrooms for Public Use.

The definition of public use clarifies that facilities for public use must have unrestricted access. Since a washroom in a hotel room is restricted for the use of the hotel guest only, it is an example of a washroom that would be exempt from requiring a floor drain. Also, the definition of private use includes a washroom in a hotel suite.

a3 A-3.7.4.15.(1) Clearances for Water Closets.

The minimum clearance in front of a water closet is intended to be measured from the front edge of the seat to:

- the nearest point of the wall or cubicle enclosure,
- another fixture, or
- the washroom door or stall door when the door is in the closed position.

A-3.7.5.3.(1) Shielding of X-Ray Equipment.

Every installation of an x-ray machine or x-ray equipment used for the exposure of persons shall be shielded with a primary and a secondary protective barrier to protect any person who could be exposed to radiation. This protection is required for

- x-ray workers
- persons other than patients undergoing an application of therapeutic or diagnostic x-rays
- persons in adjacent buildings
- persons located outdoors of buildings containing x-ray equipment.

These protective barriers should be designed and installed to comply with requirements of The Healing Arts Radiation Protection Act. Applications for approval for these installations should be addressed to the Ministry of Health and Long-Term Care.

Similarly, every installation of an x-ray machine or x-ray equipment for industrial or veterinary applications shall be shielded with a primary and a secondary protective barrier to protect any person who could be exposed to radiation. This protection is required for

- x-ray workers,
- persons other than x-ray workers,
- persons in adjacent buildings, and
- persons located outdoors of buildings containing x-ray equipment.

The protective barriers should be designed and installed to comply with requirements of The Occupational Health and Safety Act. Applications for approval for these installations should be addressed to the Ministry of Health and Long-Term Care.

a2.1 A-3.8. Barrier-Free Design Assumptions.

This Section contains minimum provisions to accommodate a person using a typical manual wheelchair or other manual mobility assistance devices such as walking aids, including canes, crutches, braces and artificial limbs. The Code also includes provisions to address needs of people with sensory disabilities.

a2.1 A-3.8.1.1.(1)(b) Industrial Occupancies.

Industrial buildings often pose a greater risk to their occupants due to the presence of significant quantities of dangerous materials or the use of hazardous processes. For example, plants which are classified as Group F, Division 2 or 3, may store and use toxic or highly flammable substances in significant quantities, or house processes which involve very high temperatures and which may have a high degree of automation. In some facilities, particularly in primary industries such as forestry and metallurgy, the construction normally used and the operations carried out within the space can make compliance with the requirements of Section 3.8. impractical. It is therefore intended that these requirements be applied with discretion in buildings of Group F, Division 2 or 3 major occupancy. However, where industrial buildings contain subsidiary occupancies, such as offices or showrooms, it is reasonable to require that accessibility be provided in these spaces.

a2.1 A-3.8.1.1.(1)(d) Camps for Temporary and Emergency Workers.

The exemption of camps for housing of workers from barrier-free design requirements is intended to exempt accommodations for seasonal workers such as agricultural workers or emergency workers such as firefighters working in remote areas.

a2.1 A-3.8.1.2. Barrier-Free Entrances.

A barrier-free path of travel should be provided from the sidewalk or roadway and parking areas to a barrier-free building entrance. This route should be located so that persons with disabilities do not have to pass behind parked cars. The number of barrier-free entrances to a building must be not less than the minimum number required in Table 3.8.1.2. in order to provide more general and equitable access to the building and should include the principal entrance. For the purpose of determining the number of entrances to a building, several adjacent doors in a bank of doors are considered to be a single entrance. The principal entrance to the building is the entrance that is normally used by the public or the building occupants.

a10.1 A-3.8.1.3.(2) Surfaces in a Barrier-Free Path of Travel.

Floor finishes, including walk-off matts and carpet, should be selected, installed and securely fixed to provide a firm and stable surface so that persons using wheelchairs, walkers or other mobility aids can easily travel over them without tripping or expending undue energy. Other than very high-density, short-pile carpeting, most carpeting does not meet these criteria.

Furthermore, where the path of travel is exposed to intense light conditions, such as daylight or directional lighting, a low-glare or matte floor surface should be selected as glare from floor surfaces can bother all users and be particularly problematic for individuals with a vision impairment. For the same reasons, heavily patterned flooring should also be avoided.

a2.1 A-3.8.1.3.(4) Unobstructed Space.

The 1800 mm by 1800 mm space spaced every 30 m provides a layby area where two wheelchairs can pass.

a2.1 A-3.8.1.3.(5) and (6)(b) Reduced Headroom.

Wherever an overhead obstruction occurs within or adjacent to a barrier-free path of travel such as the underside of a stairway or escalator or a building structural element, a cane-detectable barrier will provide an effective warning to people with no or low vision that headroom is reduced and the path is obstructed to prevent them from moving toward the obstruction.

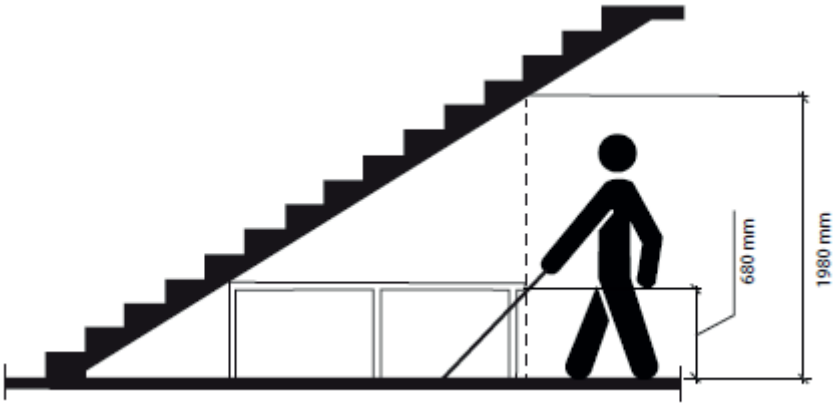


Figure A-3.8.1.3.(5) and (6)(b)
Reduced Headroom

A-3.8.1.4.(1) Access to Storeys Served by Escalators and Moving Walks.

In some buildings, escalators and inclined moving walks are installed to provide transportation from one floor level to another floor level so as to increase the capacity to move large numbers of persons. Some buildings located on a sloping site are accessible from street level on more than one storey and an escalator or inclined moving walk is provided for internal movement from floor to floor. In both these situations, a person with a physical disability must be provided with an equally convenient means of moving between the same floor levels within the building. A wheelchair user should not be required to travel outside the building in order to gain access to another level. This can be accomplished by providing an elevator or a platform-equipped passenger-elevating device.

a2.1 A-3.8.1.5.(1) Controls.

Building controls that are intended to be operated by the occupants include thermostats, light switches, intercoms and other controls for building use and comfort. It is not intended to include those controls that are secured for use by building operations, maintenance and management personnel.

Light switches, intercoms and similar devices located within a barrier-free path of travel should be located between 900 mm and 1100 mm above the finished floor. Thermostats should be mounted at 1200 mm on centre above the finished floor for the optimal operation.

a2.1 A-3.8.2.1.(1) Access to Rooms and Facilities.

If barrier-free access is required into suites or rooms in Subsection 3.8.2., it is intended that access be provided, with some exceptions identified in Sentence 3.8.2.1.(3), throughout each room or suite. Some examples of where barrier-free access is required are as follows:

- within rooms or areas that serve the public or are designated for use by visitors, including areas in assembly occupancies with fixed seats, display areas and merchandising departments,
- within rooms or areas for student use in assembly occupancies,
- within general work areas, including office areas,
- within general use or general service areas, including shared laundry areas in residential occupancies, recreational areas, cafeterias, lounge rooms, lunch rooms and infirmaries,
- within sleeping rooms in hospitals and long term care homes,
- (if installed), into at least one passenger elevator or elevating device conforming to Article 3.8.3.5.,
- into washrooms described in Article 3.8.2.3.,
- to any facility required by this Section to be designed to accommodate persons with physical disabilities,
- onto every balcony provided in conformance with Sentence 3.3.1.7.(2),
- to service counters used by the general public (examples include ticket counters, refreshment stands, drinking fountains, cafeteria counters, checkout counters and bank service counters)
- into 10% of hotel suites, (not more than 20 suites required), and
- within 15% of residential suites in an apartment building from the suite entrance door into at least one bedroom and bathroom at the same level as the suite entrance.

a2.1 A-3.8.2.1.(1)(b) and (c) Rooftop Amenity Spaces.

External rooftop areas of buildings that are designed for use as amenity spaces for building occupants must be made accessible to people with disabilities. This includes rooftop terraces, patios and barbecue facilities and requires that a barrier-free path of travel be provided from the floor area to the rooftop amenity space. Exterior roof spaces that are only accessed for the purpose of building and equipment maintenance and operations are not required to be barrier-free accessible and will continue to be exempt from barrier-free design requirements under Clause 3.8.2.1.(3)(f).

a2.1 A-3.8.2.1.(2) Portions of Floor Areas not Required to be Barrier-Free.

The permission to waive a barrier-free path of travel for wheelchair access to certain specified areas of a building is not intended to waive accessibility requirements for persons with physical disabilities who do not require special provision for access to raised or sunken levels. The concept of providing similar amenities and facilities applies, among other things, to food, beverage, and entertainment facilities within restaurants, and to window areas providing a view of an exterior attraction. Availability of specific spaces depends on reservation policy and the sequence in which patrons arrive at a restaurant or other facility, and therefore is beyond the scope of this Code.

Accessibility "within" a floor area is intended to mean that in general all normally occupied spaces are to be accessible, except where essential obstructions in the work area would make a barrier-free path of travel hazardous. Examples of excluded floor areas could include small raised office areas in retail and industrial premises, storage platforms in industrial occupancies, repair garages and areas within commercial kitchens.

Where a floor area does not require a barrier-free path of travel, certain barrier-free design provisions of Section 3.8. will still be applicable. These requirements can provide greater accessibility for persons with limited mobility who do not use wheelchairs or for those with sensory disabilities. People using walking aids, service animals or those with hearing and vision loss may still be able to climb stairs or use escalators. Accessibility features such as wider door openings, lever door handles and larger washroom stalls can also assist other building users.

The applicable requirements include:

- 3.8.1.3.(6) – Headroom and walking surfaces
- 3.8.2.3.(6) – Non-barrier-free washrooms
- 3.8.3.1.(6) – Accessibility signs
- 3.8.3.3.(19) – Doors, door hardware and vision panels
- 3.8.3.8.(10) – Ambulatory water closet stalls
- 3.8.3.10.(5) – Urinals
- 3.8.3.11.(5) – Lavatories
- 3.8.3.15.(5) – Counters for telephones
- 3.8.3.16.(4) – Drinking fountains

a2.1 A-3.8.2.1.(2)(b) Exemptions from Barrier-Free Path of Travel for Small Buildings.

Some small buildings are restricted in building area by lot size, including small infill properties between existing buildings. In those cases, it may not be feasible to require an elevator for the building.

a2.1 A-3.8.2.1.(3) Exemptions for Service Facilities.

The concept of wheelchair accessibility does not extend to building service facilities. Nor does it extend to all floor levels within a storey, e.g., mezzanines not served by an elevator. Mezzanines that are accessible by an elevator are not excluded.

a2.1 A-3.8.2.1.(4) Designated Wheelchair Spaces and Adaptable Seating.

Spaces designated for wheelchair use, and for adaptable seating, should be distributed in various locations throughout the venue in order to provide a choice of seating location for patrons. Seating spaces should be located adjacent to a barrier-free access aisle or an open space to facilitate ease of manoeuvring a wheelchair into position or to facilitate a side transfer to a fixed adaptable seat.

a2.1 A-3.8.2.1.(5) Number of Apartments Required to be Barrier-Free.

The intent behind Sentence 3.8.2.1.(5) is that, in calculating the 15% of apartments in a multi-unit apartment building required to be barrier-free, the 15% of units is determined based on whole numbers as indicated in the examples set out in Table A-3.8.2.1.(5) and not based on fractions of units.

Table A-3.8.2.1.(5)
Minimum Number of Apartments Required to be Barrier-Free

Number of Apartments	Minimum Number of Barrier-Free Apartments
1 to 6	0
7 to 13	1
14 to 19	2
20 to 26	3
27 to 33	4
34 to 39	5
Column 1	2

a2.1 A-3.8.2.1.(5)(a) and (b) Access to Bedrooms and Bathrooms in Apartments.

This requirement ensures that a person using a wheelchair can enter a bedroom and a bathroom within 15% of apartment suites and 10% of hotel and motel suites. A barrier-free path of travel and clearances on the latch side of the doors to the designated bedroom and bathroom must be provided.

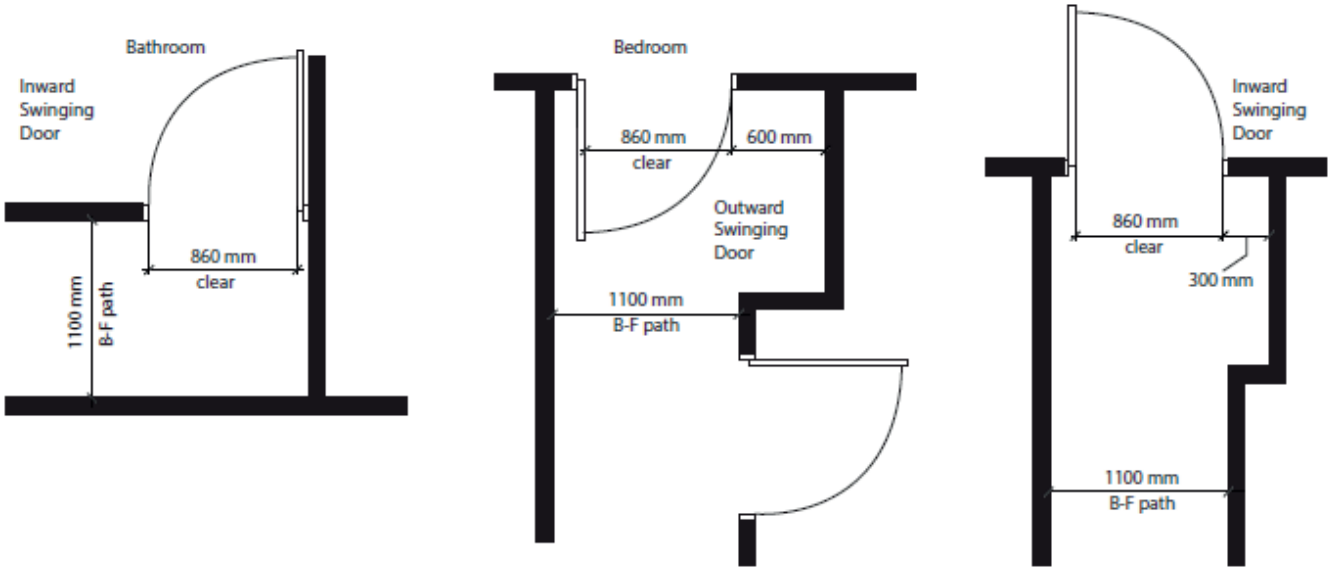


Figure A-3.8.2.1.(5)(a) and (b)
Access to One Bedroom and One Bathroom in 15% of Apartments

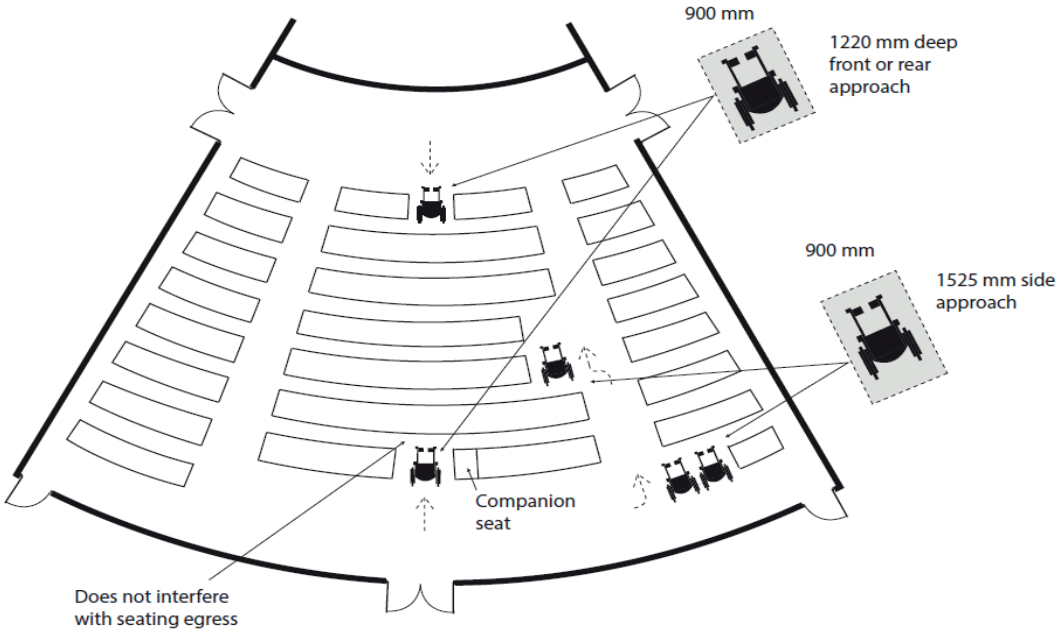


Figure A-3.8.3.6.(1)(c)
Accessible Seating Spaces

A-3.8.3.7.(1) Assistive Listening Devices.

Wireless sound transmission systems, such as FM, infrared or magnetic induction loop, improve sound reception for the hard of hearing by providing amplification which can be adjusted by each user while blocking out unwanted background noise. These systems transmit a signal that is picked up by special receivers available for use by people with a hearing impairment, whether or not they use a hearing aid. Neither system interferes with the listening enjoyment of others.

The transmitter can be jacked into an existing P.A. system amplifier or used independently with microphones. The induction loop system requires users to sit in the area circumscribed by the loop; though installation of the loop is relatively simple, the installer should be knowledgeable about these systems if proper functioning is to be achieved. FM or infrared systems can be designed to broadcast signals which cover the entire room and, thus do not restrict seating to any one area. Figures 3.8.3.7.A and 3.8.3.7.B show the general configuration of FM and infrared systems. Although portable systems (FM in particular) are available, these are best suited to small audiences. Generally, the systems installed in church halls, auditoria, theatres and similar places of assembly are not easily portable, as they are installed in a fixed location by a sound technician and form an integral part of the P.A. system of the room or building.

Hard wired systems (where a jack is provided at a particular seat) will not meet this requirement unless adequate provisions are made to accommodate persons with hearing aids. In choosing the most appropriate system, a number of factors must be taken into account including cost, installation and maintenance, suitability to the audience, ease of operation and the need for privacy. Information on designers and suppliers of these systems may be obtained from such organizations as the Canadian Hearing Society.

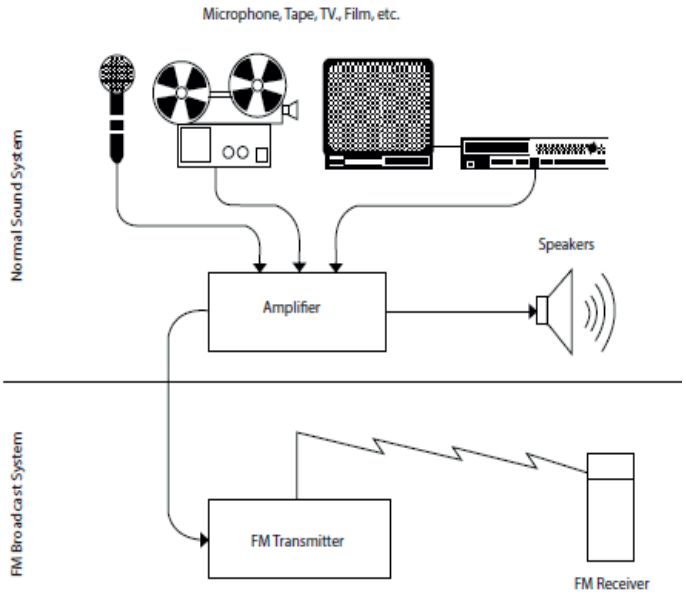


Figure A-3.8.3.7.(1)A
FM Sound Transmission System

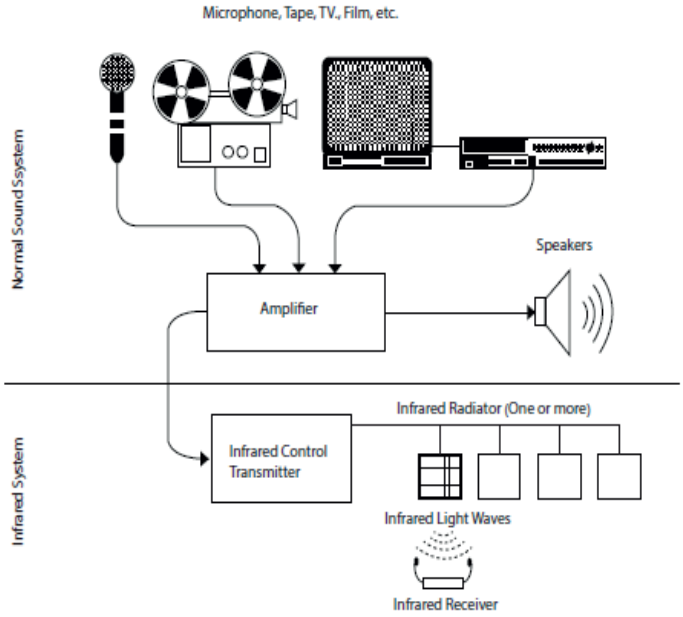


Figure A-3.8.3.7.(1)B
Infrared Sound Transmission System

a2.1 A-3.8.3.8.(1)(a) Water Closet Stalls.

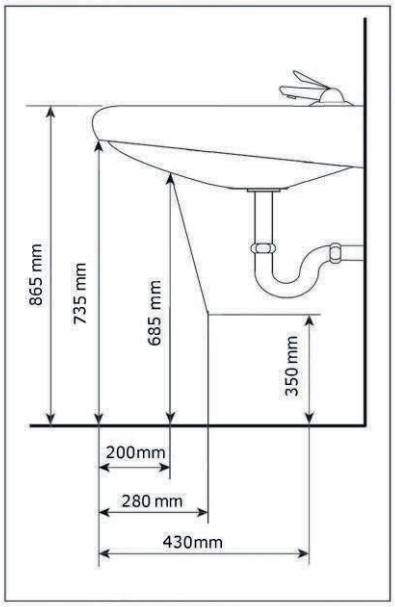
The wheelchair turning circle within the stall may not overlap space of an inward swinging door or the area below plumbing fixtures.

a10.1 A-3.8.3.8.(1)(c)(iii) Water Closet Stalls.

Doors to water closet stalls for persons with disabilities should swing outward and preferably against a side wall.

a10.1 A-3.8.3.8.(1)(c)(v) Washroom Stall Door Pulls.

The purpose of the door pull mounted on both sides of the stall door is to assist those with limited arm strength to open and close the door. The pull should be located close to the latch side on both the inside and outside surfaces of the door. Pulls mounted close to the latch side require less strength to pull the door open or closed than a pull located close to the hinge side. The door pull should consist of a D-shaped handle mounted horizontally. The centrelines are the lines drawn through the long axis and the short axis of the handle. In the horizontal position, the centerline of the short or transverse axis must be located at between 200 mm and 300 mm from the latch side of the door, and the long or longitudinal axis must be located between 900 mm and 1 100 mm from the floor.



a10.1 **Figure A-3.8.3.11.(1)(c)**
Clearances Beneath a Lavatory

a2.1 A-3.8.3.11.(1)(d) Pipe Protection.

The pipes referred to in Clause 3.8.3.11.(1)(d) include both supply and waste pipes. The hazard can be prevented by insulating the pipes, by locating the pipes in enclosures, or avoided by limiting the temperature of the hot water to a maximum of 43°C.

a2.1 A-3.8.3.11.(1)(f) Clear Space at Lavatory.

The clear space required for the wheelchair user to pull into the fountain may overlap with an adjacent barrier-free path of travel but should not prevent other building users from passing when the barrier-free lavatory is in use.

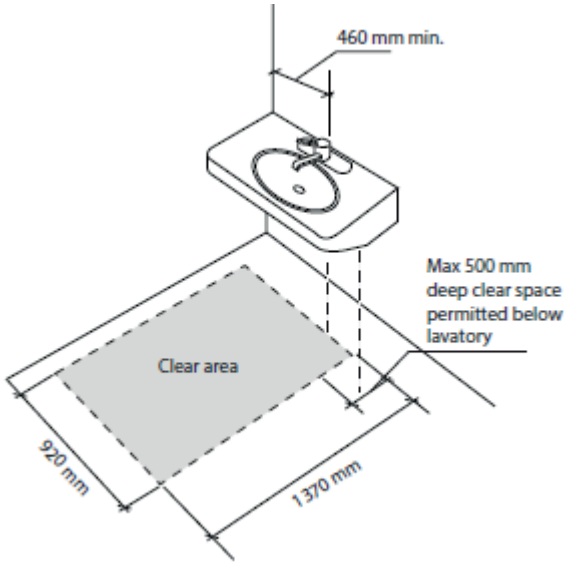


Figure A-3.8.3.11.(1)(f)
Clear Space at Lavatory

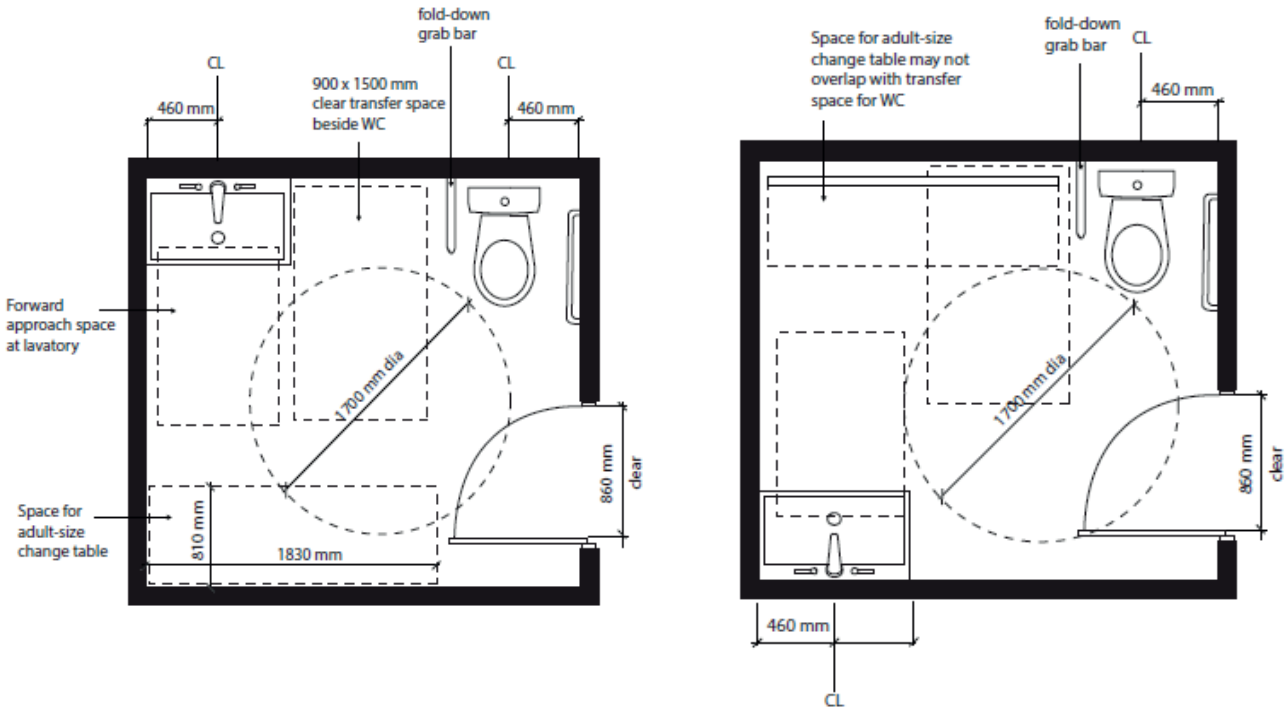
a2.1 A-3.8.3.12.(1)(d) Transfer Space.

The transfer space beside a water closet or the approach space at a lavatory must be a clear space with no obstruction or potential obstruction of the space from adjacent elements such as a fold-down change table, or other fixture. The exception to this would be a fold-down grab bar where provided. If a fold down change table is not returned to the folded up position after use, the next user of the space should not be inconvenienced from using the water closet or lavatory due to the transfer or approach spaces being blocked.

a3 A-3.8.3.12.(1) and (3) Universal Washroom.

Unobstructed areas in front of the lavatory, in front of the water closet and on one side of the water closet are necessary for manoeuverability of a wheelchair. The door swing may overlap the turning circle within the universal washroom as long as there is sufficient space for a wheelchair user to manoeuver to clear the door and close the door from a front approach position.

The space for an adult size change table may encroach upon the 1700 mm turning circle only where the change table is movable and is not permanently fixed or stored within the washroom. In that case the table, such as a hospital gurney is brought into the washroom when needed and removed after use. A permanently fixed table may not be appropriate for certain building occupancies due to operational and maintenance considerations.



Acceptable Universal Washroom

Unacceptable Universal Washroom

Figure A-3.8.3.12.(1) and (3)
Universal Washroom

a2.1 A-3.8.3.12.(2) Emergency Call System.

The purpose of the emergency call system is to notify other building occupants that a person using the universal washroom requires assistance. The visual signal and alarm should be different from the building fire and smoke alarms and visual signals, where installed, as this call system is for personal, not building, emergencies.

a3 The emergency call button is intended to provide a local visual signal outside of the washroom to alert others that someone in the washroom needs assistance. It is not required to be linked to a central monitoring station. Where central monitoring is not provided, such as in the case of a small building or a standalone washroom in a park, an additional sign informing the washroom users that there is no central monitoring may be appropriate.

a2.1 A-3.8.3.12.(6) Universal Washrooms for Small Buildings.

The permission for a smaller universal washroom to be provided in small buildings recognizes the limited space available for construction of service and amenity spaces while still balancing available space with the needs of people with disabilities.

a2.1 A-3.8.3.13.(1) Minimum Number of Barrier-Free Showers.

The intent of the requirement for one or more barrier-free showers in a group of showers is to address the increased demand for accessible facilities in publicly accessible buildings such as arenas, community recreation centres and private health and fitness facilities where the accessible shower stall is located in the same room as non-accessible showers. It is not the intent of the Code to require single shower stalls or single private use showers that are part of a private office suite to be barrier-free accessible.

A-3.8.3.13.(2)(b) Clear Space at Entrances to Showers.

The clear space at the entrance to a shower may be encroached upon by fixtures such as a wall hung sink which does not interfere with the leg rests of the wheelchair. However, this sink could restrict movement for persons who need to make a lateral transfer if it were installed at the seat end of the shower.

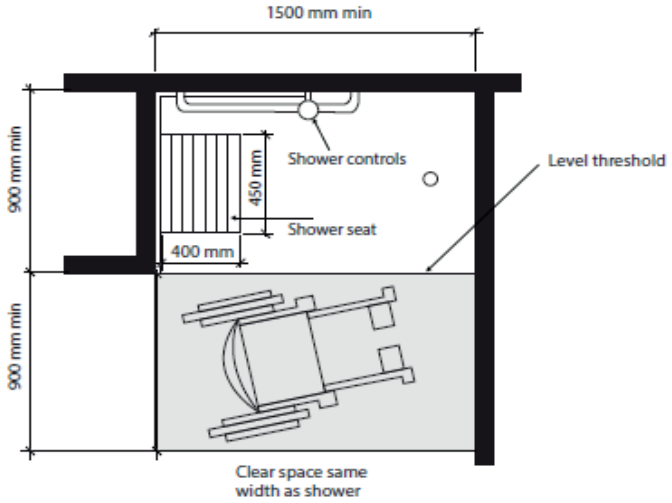


Figure A-3.8.3.13.(2)(b)
Shower Design

a11.1 A-3.8.3.13.(2)(f) and (g) Shower Seat and Grab Bars.

Only one grab bar is required, to be installed on the wall next to the seat; a grab bar behind the seat prevents the user from leaning against the wall, while one located on the wall opposite the seat cannot be reached from the seated position.

The use of two straight grab bars installed at a 90° angle to one another is not acceptable. The Code requires a continuous L-shaped grab bar. The seat itself may be used in conjunction with the bar for transfer. If design flexibility is required, fold away grab bars may be used as an alternative.

a3 A grab bar installed within a barrier-free shower stall on the same wall as the shower controls should have 900 mm long horizontal and vertical components.

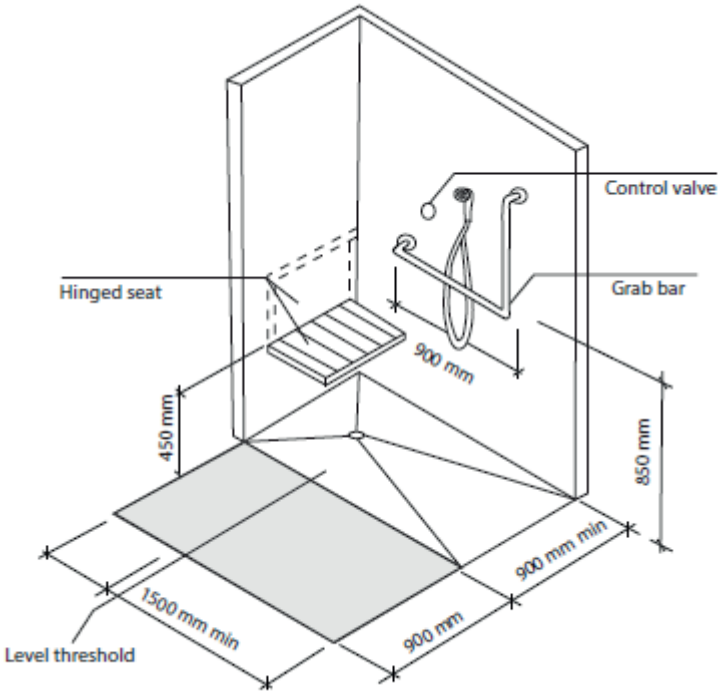


Figure A-3.8.3.13.(2)(e) and (f)
Accessible Shower

a2.1 A-3.8.3.13.(4) Showers and Bathtubs.

The grab bars and their mounting position must facilitate getting in and out of the bathtub from a seated or standing position, as appropriate, to limit the need for twisting the body.

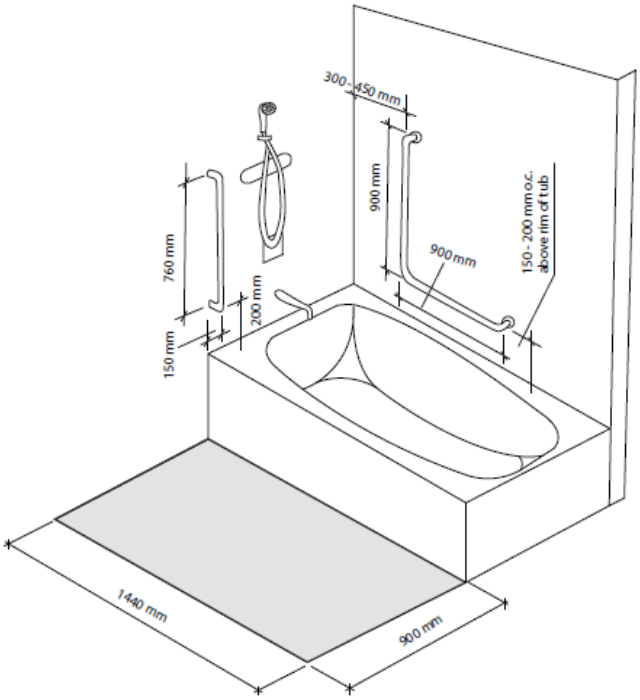


Figure A-3.8.3.13.(4)
Accessible Bathtub

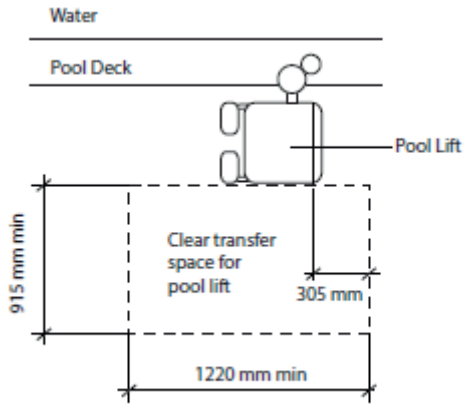


Figure A-3.11.3.3.(4)
Transfer Space at Pool Lift

a2.1 A-3.12.3.2.(3) and (4) Transfer Wall at Public Spa.

A transfer wall design can be accommodated where the spa is raised above the pool deck enabling a wheelchair user to make a horizontal transfer from the wheelchair seat to the top surface of the transfer wall and directly accessing the water on the other side of the wall.

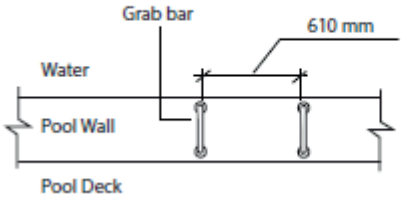


Figure A-3.12.3.2.(3)A
Transfer Wall with Two Grab Bars

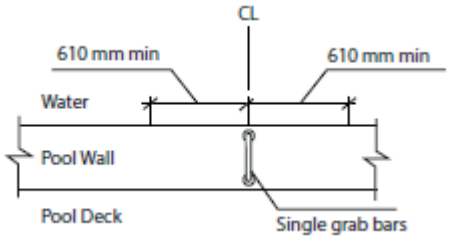


Figure A-3.12.3.2.(3)B
Transfer Wall with One Grab Bar

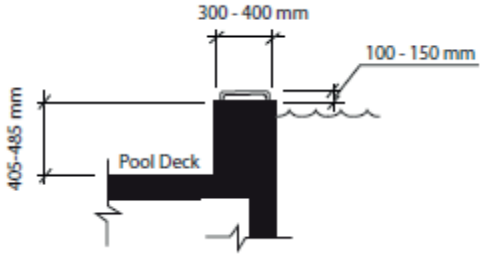


Figure A-3.12.3.2.(3)C
Section at Spa Transfer Wall

A-3.14. Tents and Air-Supported Structures.

The requirements in this Subsection are intended to be limited to certain types of structure. For instance, the word "tent" as used in the Code is intended to refer to a temporary shelter which is used at an open air event such as a fair or an exhibition. A tent will normally be constructed of a fabric held up by poles and attached to the ground by ties. The requirements for tents, however, are not intended to be applied to fabric structures located on buildings.

The term "air-supported structure", as used in the Code, refers to an envelope which is held up by air pressure alone and which is erected on the ground or on a building. The structure will usually require ballast or a positive anchorage system around the entire perimeter to secure it to the ground or building structure.

A-3.16.1.7.(7) Exits and Means of Egress from Shelf and Rack Storage Systems.

The fundamental principle of providing sufficient exits and means of egress from a shelf and rack storage system is to have the occupants reach an open public thoroughfare, a separate building, or an exterior open space protected from fire exposure from the building and having an access to an open public thoroughfare before the environment in the building becomes life threatening.

In addition to the time-based egress calculation, the professional engineer or architect undertaking the time-based egress analysis, must also undertake a detailed fire dynamics evaluation of the occupancy to determine when critical life threatening levels are reached. Temperature, toxic conditions and psycho-physiological characteristics of the occupants will play an important roll in the analysis.

e7 **A-4.1.1.3.(1) Structural Integrity.**

The requirements of Part 4, including the CSA design standards, generally provide a satisfactory level of structural integrity. Additional considerations may, however, be required for building systems made of components of different materials, whose interconnection is not covered by existing CSA design standards, buildings outside the scope of existing CSA design standards, and buildings exposed to severe accidental loads such as vehicle impact or explosion. Further guidance can be found in the Commentary entitled "Structural Integrity" in the *2015 Structural Commentaries (User's Guide – NBC 2015: Part 4 of Division B)*.

e7 A-4.1.1.3.(2) Serviceability.

Information on serviceability can be found in the Commentary entitled "Deflection and Vibration Criteria for Serviceability and Fatigue Limit States" in the *2015 Structural Commentaries (User's Guide – NBC 2015: Part 4 of Division B)*.

A-4.1.1.4.(2) Structural Equivalents.

Sentence 4.1.1.4.(2) provides for the use of design methods not specified in Part 4, including full-scale testing and model analogues. This provision is usually used to permit the acceptance of newer and innovative structures or to permit the acceptance of model tests such as those used to determine structural behaviour, or snow or wind loads. Sentence 4.1.1.4.(2) specifically requires that the level of safety and performance be at least equivalent to that provided by design to Part 4 and requires that loads and designs conform to Section 4.1.

Sentence 4.1.1.4.(2) and the provision for alternative solutions stated in Clause 1.2.1.1.(1)(b) of Division A are not intended to allow structural design using design standards other than those listed in Part 4. The acceptance of structures that have been designed to other design standards would require the designer to prove to the appropriate authority that the structure provides the level of safety and performance required by Clause 1.2.1.1.(l)(b) of Division A. The equivalence of safety and performance can only be established by analyzing the structure for the loads and load factors set out in Section 4.1. and by demonstrating that the structure at least meets the requirements of the design standards listed in Sections 4.3. and 4.4.

e7 A-4.1.2.1. Loads and Effects.

Information on the definitions can be found in the Commentary entitled "Limit States Design" in the *2015 Structural Commentaries (User's Guide – NBC 2015: Part 4 of Division B)*.

e7 A-4.1.2.1.(1) Temperature Changes.

Information on effects due to temperature changes can be found in the Commentary entitled "Effects of Deformations in Building Components" in the *2015 Structural Commentaries (User's Guide – NBC 2015: Part 4 of Division B)*.

A.4.1.2.1.(3) Major Occupancies.

In a building containing more than one major occupancy and classified in more than one Importance Category, the classification of each independent structural system shall be the same as for any part of the building that is dependent on that structural system and for the highest usage group according to Table 4.1.2.1.

A-Table 4.1.2.1.B. Importance Categories for Buildings.

Low Importance Category Buildings

Low human-occupancy farm buildings are defined in the National Farm Building Code of Canada 1995 as having an occupant load of 1 person or less per 40 m^2 of floor area. Minor storage buildings include only those storage buildings that represent a low direct or indirect hazard to human life in the event of structural failure, either because people are unlikely to be affected by structural failure, or because structural failure causing damage to materials or equipment does not present a direct threat to human life.

Buildings Containing Hazardous Materials

The following buildings contain sufficient quantities of toxic, explosive or other hazardous substances to be classified in the High Importance Category of use and occupancy:

- petrochemical facilities,
- fuel storage facilities (other than those required for post-disaster use), and
- manufacturing or storage facilities for dangerous goods.

The following types of buildings may be classified in the Normal Importance Category: buildings that are equipped with secondary containment of toxic, explosive or other hazardous substances, including but not limited to, double-wall tanks, dikes of sufficient size to contain a spill, or other means to contain a spill or a blast within the property boundary of the facility and prevent the release of harmful quantities of contaminants to the air, sod, groundwater, surface water or atmosphere, as the case may be.

e7 ## A-4.1.3. Limit States Design.

Information on limit states design can be found in the Commentary entitled "Limit States Design" in the *2015 Structural Commentaries (User's Guide – NBC 2015: Part 4 of Division B)*.

A-4.1.3.2.(2) Load Combinations.

Load Combination Equations

e7 The load combinations in Tables 4.1.3.2.A. and 4.1.3.2.B. apply to most situations for loadbearing building structures. Guidance on special situations such as load combinations for fire resistance and building envelopes is given in the Commentary entitled "Limit States Design" in the *2015 Structural Commentaries (User's Guide – NBC 2015: Part 4 of Division B)*.

Load Cases and Crane Load Effects

The load combinations in Table 4.1.3.2.A. are to be evaluated for structures with crane load effects for the scenario where the crane loads are zero, and for structures without crane loads. The load combinations in Table 4.1.3.2.B. are to be evaluated for structures with crane loads for the scenario where the crane load effects are other than zero.

Crane Loads

e7 Crane-supporting structures that have cranes in multiple parallel bays should be designed for the maximum vertical crane load with the cranes positioned for the most critical effect in conjunction with a lateral load with each crane in turn positioned for the most critical effect. For load combinations that include crane loads, additional guidance can be found in CISC/ICCA 2013, "Crane-Supporting Steel Structures: Design Guide."

A-4.1.3.2.(4) Effects of Lateral Earth Pressure, H, Pre-Stress, P, and Imposed Deformation, T, in Design Calculations.

Effects of Lateral Earth Pressure, H, in Design Calculations

e7 For common building structures below ground level, such as walls, columns and frames, 1.5 H is added to load combinations 2 to 4. For cantilever retaining wall structures, see the Commentary entitled "Limit States Design" in the *2015 Structural Commentaries (User's Guide – NBC 2015: Part 4 of Division B)*.

Effects of Pre-Stress, P, and Imposed Deformation, T, in Design Calculations

e7 For structures and building envelopes designed in accordance with the requirements specified in the standards listed in Section 4.3., with the exception of Clauses 8 and 18 of CSA A23.3, P and T need not be included in the load combinations of Table 4.1.3.2. For structures not within the scope of the standards listed in Section 4.3., including building envelopes, P and T must be taken into account in the design calculations. For recommended load combinations including T, see the Commentary entitled "Limit States Design" in the *2015 Structural Commentaries (User's Guide – NBC 2015: Part 4 of Division B)*.

e7 ## A-4.1.3.2.(5) Overturning, Uplift or Sliding.

Information on overturning, uplift and sliding can be found in the Commentary entitled "Limit States Design" in the *2015 Structural Commentaries (User's Guide – NBC 2015: Part 4 of Division B)*.

e7 ## A-4.1.3.3.(1) Failure Due to Fatigue.

Failure due to fatigue of building structures referred to in Section 4.3. and designed for serviceability in accordance with Article 4.1.3.6. is, in general, unlikely except for girders supporting heavily used cranes, on which Article 4.1.5.11. provides guidance.

e7 A-4.1.3.3.(2) Vibration Effects.

Guidance on vibration effects can be found in the Commentary entitled "Deflection and Vibration Criteria for Serviceability and Fatigue Limit States" in the *2015 Structural Commentaries (User's Guide – NBC 2015: Part 4 of Division B)*.

e7 A-4.1.3.4.(1) Loads and Load Combinations for Serviceability.

The loads and load combinations for serviceability depend on the serviceability limit states and on the properties of the structural materials. Information on loads and load combinations for the serviceability limit states, other than those controlled by deflection, can be found in the Commentary entitled "Deflection and Vibration Criteria for Serviceability and Fatigue Limit States" in the *2015 Structural Commentaries (User's Guide – NBC 2015: Part 4 of Division B)*.

e7 A-4.1.3.5.(1) Deflections.

Serviceability criteria for deflections that cause damage to non-structural building components can be found in the standards listed in Section 4.3. Information on deflections can be found in the Commentary entitled "Deflection and Vibration Criteria for Serviceability and Fatigue Limit States" in the *2015 Structural Commentaries (User's Guide – NBC 2015: Part 4 of Division B)*. Information on loads and load combinations for calculating deflection can be found in the Commentary entitled "Limit States Design" in the *2015 Structural Commentaries (User's Guide – NBC 2015: Part 4 of Division B)*.

e7 A-4.1.3.5.(3) Lateral Deflection of Buildings.

The limitation of 1/500 drift per storey may be exceeded if it can be established that the drift as calculated will not result in damage to non-structural elements. Information on lateral deflection can be found in the Commentary entitled "Wind Load and Effects" in the *2015 Structural Commentaries (User's Guide – NBC 2015: Part 4 of Division B)*.

e7 A-4.1.3.6.(1) Floor Vibration.

Information on floor vibration can be found in the Commentary entitled "Deflection and Vibration Criteria for Serviceability and Fatigue Limit States" in the User's Guide - NBC 2010, Structural Commentaries (Part 4 of Division B). Information on loads and load combinations for the calculation of vibration can be found in the Commentary entitled "Limit States Design" in the *2015 Structural Commentaries (User's Guide – NBC 2015: Part 4 of Division B)*.

e7 A-4.1.3.6.(2) Dynamic Analyses of Floor Vibrations.

Information on a dynamic analysis of floor vibrations from rhythmic activities can be found in the Commentary entitled "Deflection and Vibration Criteria for Serviceability and Fatigue Limit States" in the *2015 Structural Commentaries (User's Guide – NBC 2015: Part 4 of Division B)*.

e7 A-4.1.3.6.(3) Lateral Vibration Under Wind Load.

Information on lateral vibrations and accelerations under dynamic wind loads can be found in the Commentary entitled "Wind Load and Effects" in the *2015 Structural Commentaries (User's Guide – NBC 2015: Part 4 of Division B)*.

A-4.1.4.1.(6) Counteracting Dead Load Due to Soil.

Examples of structures that traditionally employ the dead load of soil to resist loadings are pylon signs, tower structures, retaining walls, and deadmen, which resist wind uplift and overturning in light structures.

A-4.1.5.1.(1) Loads Due to Use of Floors and Roofs.

In many areas of buildings, such as equipment areas, service rooms, factories, storage areas, warehouses, museums, and office filing areas, live loads due to their intended use may exceed the minimum specified loads listed in Table 4.1.5.3. In these instances, the probable live load shall be calculated and used as the specified live load for the design of that particular area.

A-Table 4.1.5.3. Considerations for Live Loads.

Arenas, Grandstands and Stadia

The designer should give special consideration to the effects of vibration.

Attics - Limited Accessibility

Attic live loading is not required when the ceiling below the attic consists of removable panels that permit access to the ceiling space without loading the ceiling supporting members. Attic live loading is not required in any area of the attic where the least dimension of the attic space is less than 500 mm.

Corridors, Aisles and Rows of Seats

The spaces between rows of seats are typically designed for the loads of the occupancy they serve. Rows typically discharge into aisles that are designed for the loads used for the rows of seats. Corridors have a minimum width 1 100 mm and may serve as collectors for aisles; they are therefore part of the exit system and are required to be designed for a minimum live load of 4.8 kPa.

Floor Areas That Could Be Used As Viewing Areas

Some interior balconies, mezzanines, corridors, lobbies and aisles that are not intended to be used by an assembly of people as viewing areas are sometimes used as such; consequently, they are subject to loadings much higher than those for the occupancies they serve. Floor areas that may be subject to such higher loads must, therefore, be designed for a loading of 4.8 kPa.

Lecture Halls and Classrooms

For the purpose of applying the requirements of Table 4.1.5.3., lecture halls with fixed seats are similar to theatres in configuration (the seats may have a writing tablet affixed to one arm). Classrooms are typically furnished with full-sized desks having separate or integrated seats.

Minimum Roof Live Load

Articles 4.1.5.3. and 4.1.5.10. stipulate a minimum uniform roof live load of 1.0 kPa and a minimum concentrated live load of 1.3 kN. These live loads are "use and occupancy loads" intended to provide for maintenance loadings: they are not reduced as a function of area or as a function of the roof slope due to their variability in distribution and location.

Vehicle Loads

A special study should be undertaken to determine the distributed loads to be used for the design of floors and areas used by vehicles exceeding 9 000 kg gross weight and of driveways and sidewalks over areaways and basements. Where appropriate, the designer should refer to CAN/CSA-S6, "Canadian Highway Bridge Design Code".

A-4.1.5.5. Loads on Exterior Areas.

In Article 4.1.5.5., "accessible" refers to the lack of a physical barrier that prevents or restricts access by vehicles or persons to the site in the context of the specific use.

e7 A-4.1.5.8. Tributary Area.

Information on tributary area can be found in the Commentary entitled "Live Loads" in the *2015 Structural Commentaries (User's Guide – NBC 2015: Part 4 of Division B)*.

A-Table 4.1.5.9. Loads Due to Concentrations.

Special study is required to determine concentrated loads for the design of floors and areas used by vehicles exceeding 9 000 kg gross weight, and of driveways and sidewalks over areaways and basements. Where appropriate, the designer should refer to CAN/CSA-S6, "Canadian Highway Bridge Design Code".

A-4.1.5.11. Crane-Supporting Structures.

Guidance on crane-supporting structures can be found in CSA S16, "Design of Steel Structures".

A.4.1.5.14. and 4.1.5.15.(1) Design of Guards.

In the design of guards, due consideration should be given to the durability of the members and their connections.

e7 ### A.4.1.5.17. Loads on Firewalls.

Information on loads on firewalls can be found in the Commentary entitled "Structural Integrity of Firewalls" in the *2015 Structural Commentaries (User's Guide – NBC 2015: Part 4 of Division B)*.

e7 ### A-4.1.6.2. Coefficients for Snow Loads on Roofs.

Information on coefficients for snow loads on roofs can be found in the Commentary entitled "Snow Loads" in the *2015 Structural Commentaries (User's Guide – NBC 2015: Part 4 of Division B)*.

a10.1 ### A-4.1.6.2.(2) Basic Roof Snow Load Factor, C_b.

Figure A-4.1.6.2.(2) shows the basic roof snow load, C_b, plotted against $I_c C_w^2$.

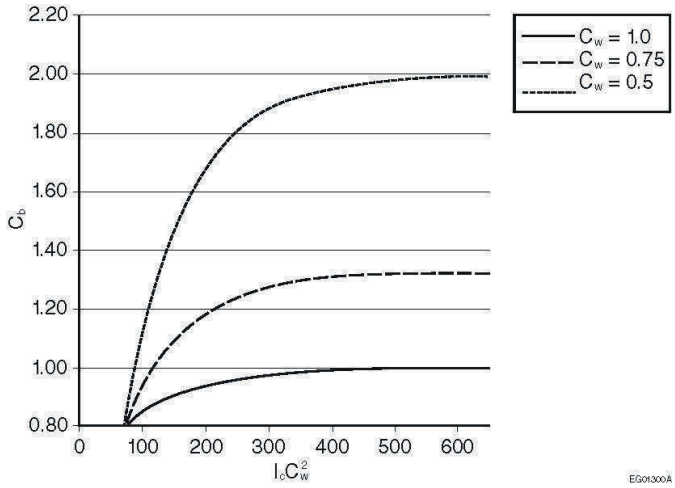


Figure A-4.1.6.2.(2)
Basic Roof Snow Load Factor, C_b

e7 ### A-4.1.6.3.(2) Full and Partial Loading under Snow Loads.

Information on full and partial snow loading on roofs can be found in the Commentary entitled "Snow Loads" in the *2015 Structural Commentaries (User's Guide – NBC 2015: Part 4 of Division B)*.

e7 ### A-4.1.6.4.(1) Rain Loads.

Information on rain loads can be found in the Commentary entitled "Rain Loads" in the *2015 Structural Commentaries (User's Guide – NBC 2015: Part 4 of Division B)*.

A-4.1.6.4.(3) Flow Control Drains.

Part 7 contains requirements regarding the use of flow control roof drains. The designer must ensure that the building complies with both Part 4 and Part 7.

a10.1 A-4.1.6.7.(1) Roof Projections.

Elevator, air-conditioning and fan housings, small penthouses and wide chimneys are examples of roof projections.

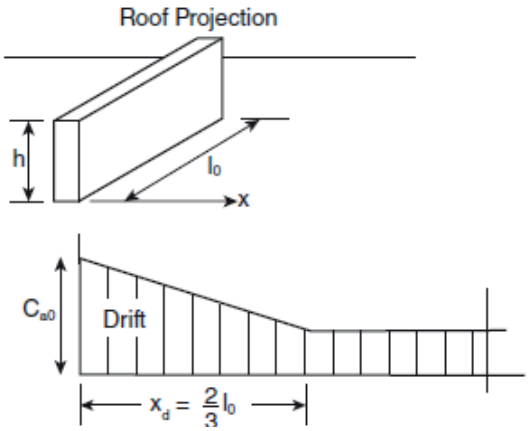
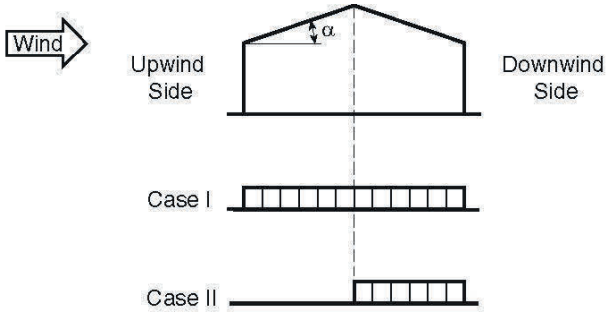


Figure A-4.1.6.7.(1)
Roof Projections

a10.1 A-4.1.6.7.(2) Values of C_a for Small Roof Projections.

Calculating C_a in accordance with Article 4.1.6.5. rather than Sentence 4.1.6.7.(1) results in lower values for small projections.

a10.1 A-4.1.6.9. Load Cases for Gable Roofs.



Load Case	Roof Slope, α	Factors			
		C_w	C_s	C_a on upwind side	C_a on downwind side
I	$0° \le \alpha \le 90°$	(2)	f(α)(3)	1.0	1.0
II(1)	$15° < \alpha \le 20°$ $20° < \alpha \le 90°$	1.0 1.0	f(α)(3)	0.0 0.0	0.25 + α/20 1.25

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Figure A-4.1.6.9.
Load Cases for Gable Roofs

Notes to Figure A-4.1.6.9.:

(1) Case II loading does not apply to gable roofs with slopes of 15° or less, to single-sloped (shed) roofs, or to flat roofs.
(2) The value of C_w for load case I is as prescribed in Sentences 4.1.6.2.(3) and (4).
(3) Varies as a function of slope, α, as defined in Sentences 4.1.6.2.(5) and (6).

a10.1 A-4.1.7.1.(6) Computational Fluid Dynamics (CFD).

It is not currently possible to verify the reliability and accuracy of CFD and no standards address it; as such, this method is not permitted to be used to determine specified wind loads.

e7 A-4.1.7.2. Natural Frequency.

Information on calculating the natural frequency of a building can be found in the Commentary entitled "Wind Load and Effects" in the *2015 Structural Commentaries (User's Guide – NBC 2015: Part 4 of Division B)*.

a10.1 A-4.1.7.3.(5)(c) Procedure for Calculating Intermediate C_e.

Information on calculating intermediate values of C_e between two exposures can be found in the Commentary entitled "Wind Load and Effects" in the *2015 Structural Commentaries (User's Guide – NBC 2015: Part 4 of Division B)*.

a10.1 A-4.1.7.3.(10) Internal Gust Factor, C_{qi}.

The effect of building envelope flexibility can be included in the calculation of C_{gi}. See the Commentary entitled "Wind Load and Effects" in the *2015 Structural Commentaries (User's Guide – NBC 2015: Part 4 of Division B)*.

a10.1 A-4.1.7.5.(2) and (3) Pressure Coefficients for Main Structural System on Rectangular Buildings.

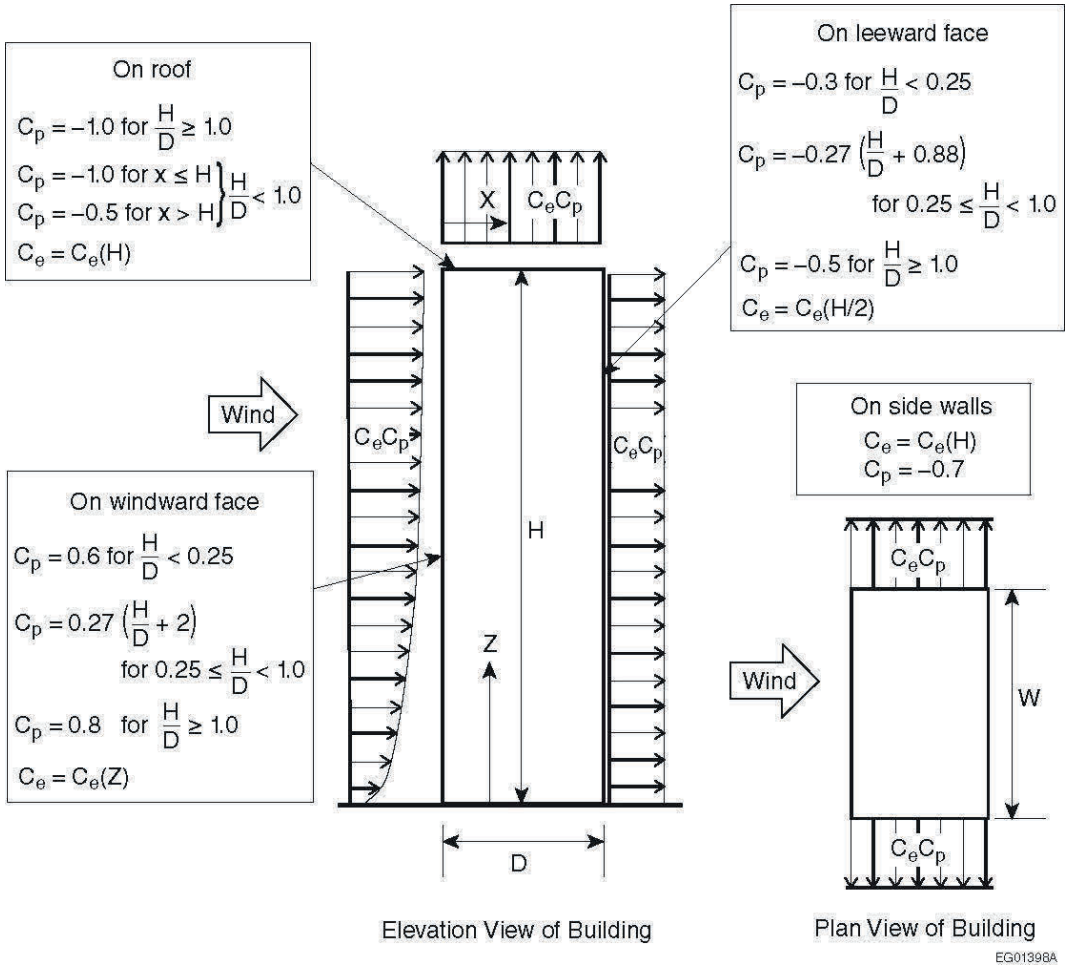


Figure A-4.1.7.5.(2) and (3)
Values of C_P for Main Structural System on Rectangular Buildings

a10.1 A-4.1.7.5.(4) Pressure Coefficients for Roof and Wall Claddings and Secondary Structural Supports of Cladding on Rectangular Buildings.

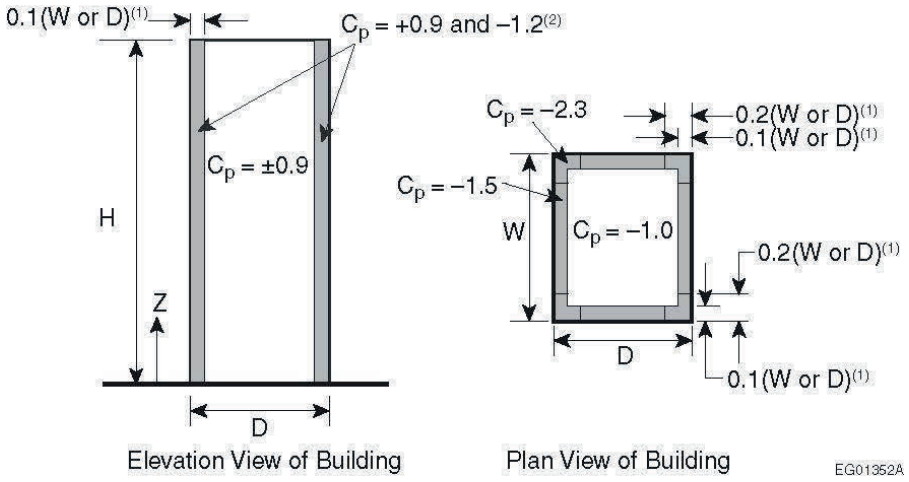


Figure A-4.1.7.5.(4)
Values of C_p for Roof and Wall Claddings and Secondary Structural Supports of Cladding on Rectangular Buildings

Notes to Figure A-4.1.7.5.(4):
(1) The larger of W or D is to be used.
(2) Where vertical ribs deeper than 1 m are present on the walls, the dimensions 0.1D and 0.1W must be changed to 0.2D and 0.2W and the negative value of C_p must be changed from –1.2 to –1.4.

a10.1 A-4.1.7.8.(2) and (3) Exposure Factor for Dynamic Procedure.

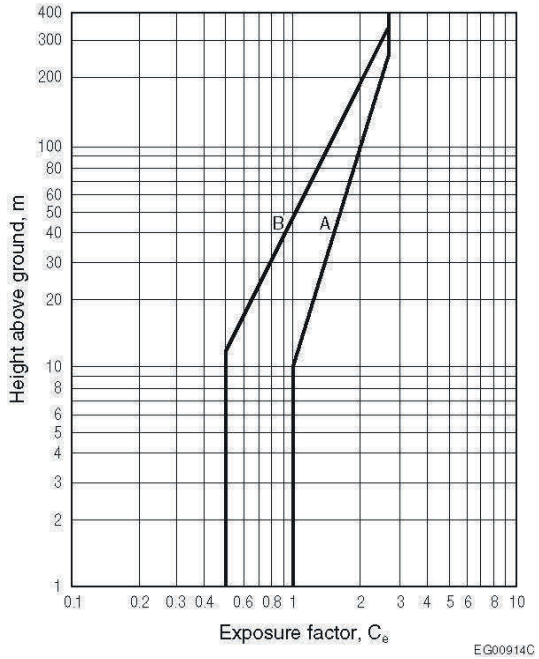


Figure A-4.1.7.8.(2) and (3)
Exposure Factor, C_e, for Dynamic Procedure

Notes to Figure A-4.1.7.8.(2) and (3):
(1) Curve A represents C_e for open terrain, as defined in Clause 4.1.7.3.(5)(a).
(2) Curve B represents C_e for rough terrain, as defined in Clause 4.1.7.3.(5)(b).

a10.1 A-4.1.7.8.(4) Peak Factor, Size Reduction Factor and Gust Energy Ratio.

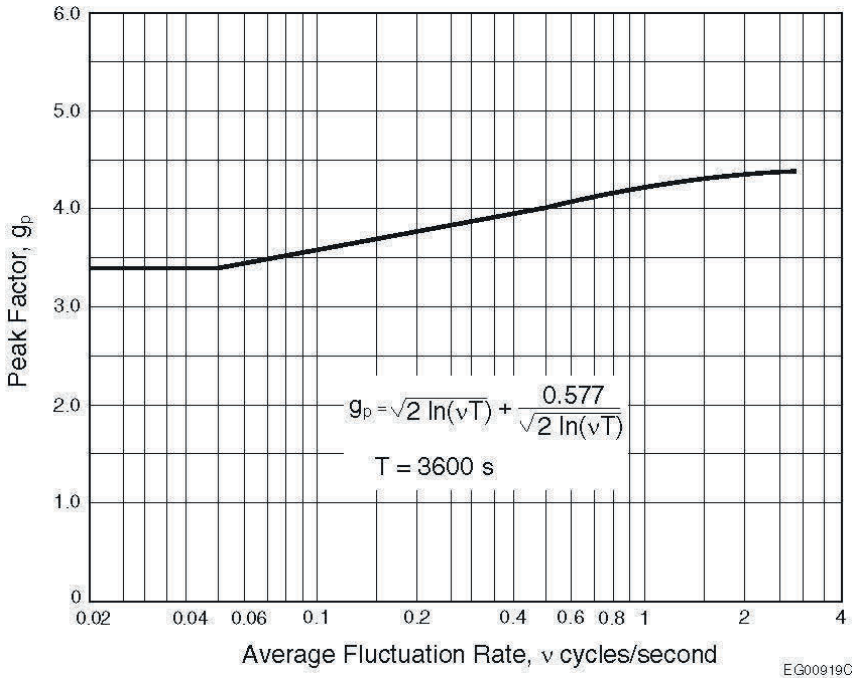


Figure A-4.1.7.8.(4)
Peak Factor, g_p

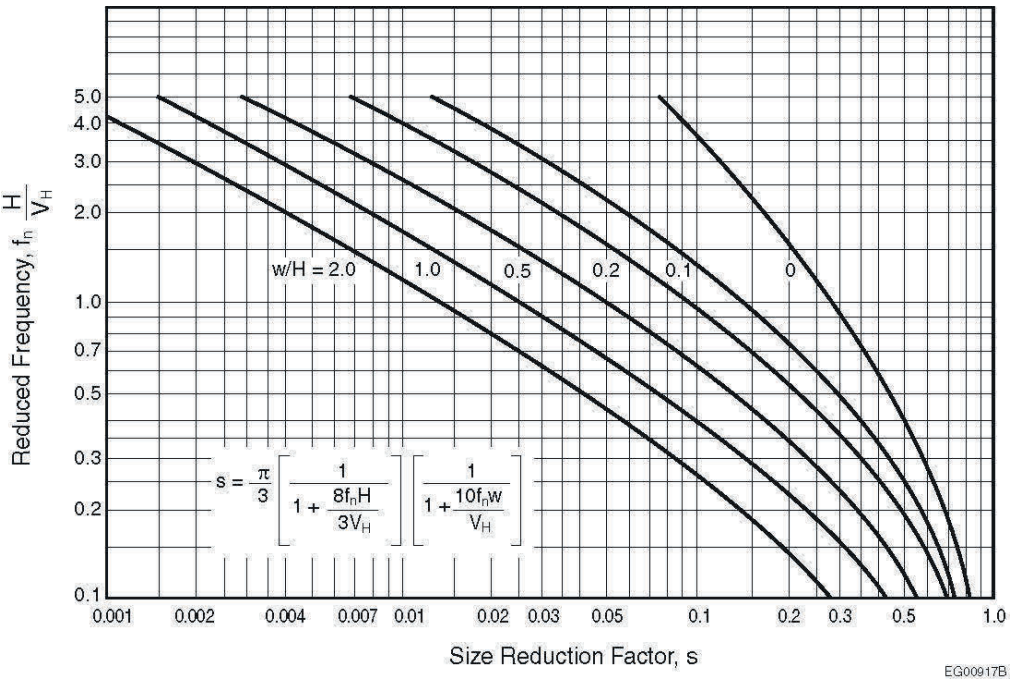


Figure A-4.1.7.8.(4)-B
Size Reduction Factor, s

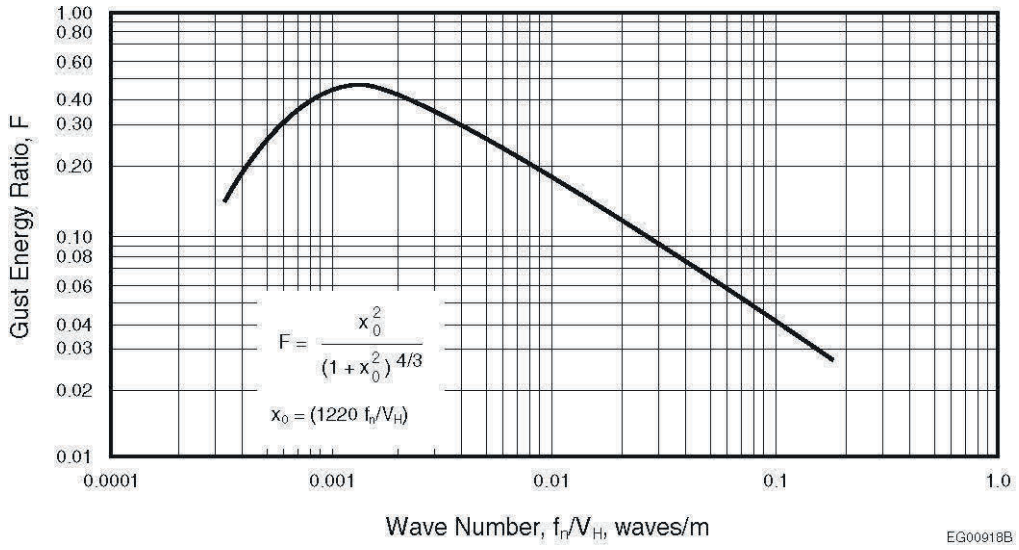


Figure A-4.1.7.8.(4)-C
Gust Energy Ratio, F

a10.1 A-4.1.7.9.(1) Full and Partial Wind Loading.

Information on full and partial loading under wind loads can be found in the Commentary entitled "Wind Load and Effects" in the *2015 Structural Commentaries (User's Guide – NBC 2015: Part 4 of Division B)*.

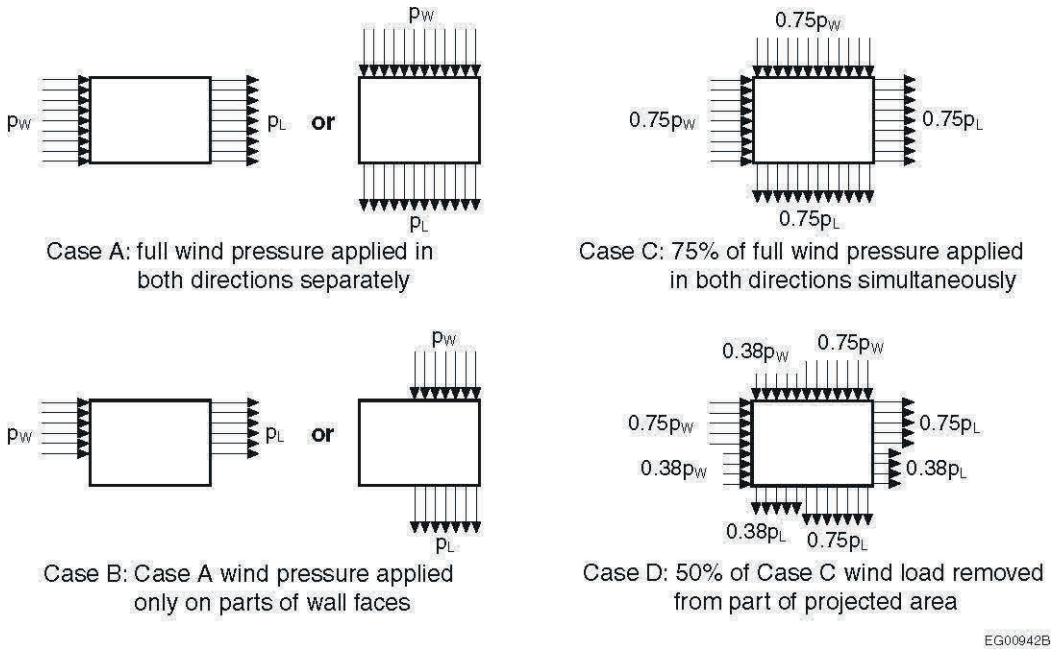


Figure A-4.1.7.9.(1)
Full and Partial Wind Loads

a10.1 A-4.1.7.11. Exterior Ornamentations, Equipment and Appendages.

Appendages may increase the overall forces in the design of the building structure and need to be accounted for.

e7 A-4.1.8.2.(1) Notation.

Definition of e_x

Information on the calculation of torsional moments can be found in the Commentary entitled "Design for Seismic Effects" in the *2015 Structural Commentaries (User's Guide – NBC 2015: Part 4 of Division B).)*.

Definition of W

Information on the definition of dead load, W, can be found in the Commentary entitled "Design for Seismic Effects" in the *2015 Structural Commentaries (User's Guide – NBC 2015: Part 4 of Division B)*.

e7 A-4.1.8.3.(4) General Design of the SFRS.

Information on the general design requirements for the SFRS can be found in the Commentary entitled "Design for Seismic Effects" in the *2015 Structural Commentaries (User's Guide – NBC 2015: Part 4 of Division B)*.

e7 A-4.1.8.3.(6) General Design of Stiff Elements.

Information on the general design requirements for stiff elements can be found in the Commentary entitled "Design for Seismic Effects" in the *2015 Structural Commentaries (User's Guide – NBC 2015: Part 4 of Division B)*.

e7 A-4.1.8.3.(7)(b) and (c) Stiffness Imparted to the Structure from Elements Not Part of the SFRS.

Information on stiffness imparted to the structure from elements not part of the SFRS can be found in the Commentary entitled "Design for Seismic Effects" in the *2015 Structural Commentaries (User's Guide – NBC 2015: Part 4 of Division B)*.

e7 A-4.1.8.3.(8) Structural Modelling.

Information on structural modelling can be found in the Commentary entitled "Design for Seismic Effects" in the *2015 Structural Commentaries (User's Guide – NBC 2015: Part 4 of Division B)*.

e7 A-4.1.8.4.(3) and Table 4.1.8.4.A. Site Class.

Information on Site Class can be found in the Commentary entitled "Design for Seismic Effects" in the *2015 Structural Commentaries (User's Guide – NBC 2015: Part 4 of Division B)*.

e7 A-Table 4.1.8.5. Serviceability Limit States for Earthquake.

Information on serviceability limit states for earthquake can be found in the Commentary entitled "Design for Seismic Effects" in the *2015 Structural Commentaries (User's Guide – NBC 2015: Part 4 of Division B)*.

a10.1 A-Table 4.1.8.6. Structural Irregularities.

Information on structural irregularities can be found in the Commentary entitled "Design for Seismic Effects" in the *2015 Structural Commentaries (User's Guide – NBC 2015: Part 4 of Division B)*.

Gravity-Induced Lateral Demand – Type 9 Irregularity

Uncoupled concrete and masonry shear walls where a large fraction of the overturning resistance is provided by axial compression, rather than through yielding of the longitudinal reinforcement, are less susceptible to amplified displacements due to gravity-induced lateral demands because the axial loads have a self-centering effect on the shear walls. Walls that are stronger than the foundation and other systems such as coupled walls, braced frames and moment frames are more susceptible to amplified displacements due to gravity-induced lateral demands. A lower limit on α is thus specified for such systems. Further information on the impacts of gravity-induced lateral demands on the seismic response of buildings can be found in the Commentary entitled "Design for Seismic Effects" in the *2015 Structural Commentaries (User's Guide – NBC 2015: Part 4 of Division B)*.

e7 A-4.1.8.7.(1) Dynamic Analysis Procedures.

Information on dynamic analysis procedures can be found in the Commentary entitled "Design for Seismic Effects" in the *2015 Structural Commentaries (User's Guide – NBC 2015: Part 4 of Division B)*.

a10.1 A-Table 4.1.8.9. Industrial-Type Steel Structures.

Guidance on the height limits, system restrictions and additional analysis and design requirements for steel SFRSs in industrial-type structures, intended essentially to support equipment, tanks or an industrial process, can be found in Annex M "Seismic Design of Industrial Steel Structures" of CSA S16, "Design of Steel Structures".

e7 A-4.1.8.9.(4) Vertical Variations in R_dR_o.

Information on vertical variations in R_dR_o can be found in the Commentary entitled "Design for Seismic Effects" in the *2015 Structural Commentaries (User's Guide – NBC 2015: Part 4 of Division B)*.

e7 A-4.1.8.9.(5) R_dR_o and Equivalent Systems.

Information on the R_dR_o, of equivalent systems can be found in the Commentary entitled "Design for Seismic Effects" in the *2015 Structural Commentaries (User's Guide – NBC 2015: Part 4 of Division B)*.

a10.1 A-4.1.8.10.(4) Mid-Rise Timber SFRS.

Information on structural irregularities in mid-rise wood construction and on how to determine the number of storeys for application in Sentence 4.1.8.10.(4) can be found in the Commentary entitled "Design for Seismic Effects" in the *2015 Structural Commentaries (User's Guide – NBC 2015: Part 4 of Division B)*.

a10.1 A-4.1.8.10.(5) Gravity-Induced Lateral Demand – Type 9 Irregularity.

Structural systems that include components such as inclined columns or horizontal floor cantilevers can induce lateral force demands on the SFRS under gravity loads. Buildings with such gravity-induced lateral demands on the SFRS are more likely to experience severe damage during strong ground shaking due to their tendency to drift only in one direction, leading to large residual displacements or instability. To determine if a building is susceptible to amplification of displacements due to gravity-induced lateral demands, the lateral resistance of the yielding mechanism to resist earthquake forces alone, Q_y, must be compared with the gravity-induced lateral demand, Q_G, at the same location. The force component selected for this comparison depends on the yielding mechanism for the SFRS. For example, for a coupled wall, the overturning moment resistance at the level of the expected plastic hinges should be compared with overturning moment demand (at the same level) due to gravity loads alone; whereas for a steel braced-frame, the storey shear at the critical level of the yielding system should be compared with the storey shear demand (at the same level) due to the gravity loads alone. If the gravity-induced lateral demands exceed the limits prescribed in Sentence 4.1.8.10.(7), amplifications in seismic displacements due to gravity-induced lateral demands can only be identified through nonlinear dynamic analyses using models which adequately represent the hysteretic behaviour of the SFRS. Further information on the impacts of gravity-induced lateral demands on the seismic response of buildings can be found in the Commentary entitled "Design for Seismic Effects" in the *2015 Structural Commentaries (User's Guide – NBC 2015: Part 4 of Division B)*.

a10.1 A-4.1.8.10.(7) Gravity-Induced Lateral Demand – Non-Linear Dynamic Analysis.

Information on non-linear dynamic analysis can be found in the Commentary entitled "Design for Seismic Effects" in the *2015 Structural Commentaries (User's Guide – NBC 2015: Part 4 of Division B)*.

e7 A-4.1.8.11.(3) Determination of the Fundamental Period, T_a.

Information on the determination of the fundamental period, T_a, can be found in the Commentary entitled "Design for Seismic Effects" in the *2015 Structural Commentaries (User's Guide – NBC 2015: Part 4 of Division B)*.

e7 A-4.1.8.12.(1)(a) Linear Dynamic Analysis.

Information on Linear Dynamic Analysis can be found in the Commentary entitled "Design for Seismic Effects" in the *2015 Structural Commentaries (User's Guide – NBC 2015: Part 4 of Division B)*.

e7 A-4.1.8.12.(1)(b) Nonlinear Dynamic Analysis.

Information on Nonlinear Dynamic Analysis can be found in the Commentary entitled "Design for Seismic Effects" in the *2015 Structural Commentaries (User's Guide – NBC 2015: Part 4 of Division B)*.

e7 A-4.1.8.12.(3) Ground Motion Histories.

Information on ground motion histories can be found in the Commentary entitled "Design for Seismic Effects" in *2015 Structural Commentaries (User's Guide – NBC 2015: Part 4 of Division B)*.

e7 A-4.1.8.12.(4)(a) Accidental Torsional Moments.

Information on accidental torsional moments can be found in the Commentary entitled "Design for Seismic Effects" in the *2015 Structural Commentaries (User's Guide – NBC 2015: Part 4 of Division B)*.

e7 A-4.1.8.13.(4) Deflections and Sway Effects.

Information on deflections and sway effects can be found in the Commentary entitled "Design for Seismic Effects" in the *2015 Structural Commentaries (User's Guide – NBC 2015: Part 4 of Division B)*.

e7 A-4.1.8.15.(1) Diaphragms and their Connections.

Information on diaphragms and their connections can be found in the Commentary entitled "Design for Seismic Effects" in the *2015 Structural Commentaries (User's Guide – NBC 2015: Part 4 of Division B)*.

e7 A-4.1.8.15.(3) Ductile Diaphragms

Information on the design of struts, collectors, chords and connections for ductile diaphragms can be found in the Commentary entitled "Design for Seismic Effects" in the *2015 Structural Commentaries (User's Guide – NBC 2015: Part 4 of Division B)*.

a10.1 A-4.1.8.15.(4) Influence of Dynamic Diaphragm In-Plane Response.

Clause 4.1.8.15.(4)(a)

In lieu of carrying out a special study as stated in Subclause 4.1.8.15.(4)(a)(iii), the anticipated total deformation demand on the vertical elements of the SFRS, including inelastic deformations, may be taken as equal to $R_oR_d(\Delta B + \Delta D) - R_o\Delta D$, i.e., the difference between the total storey drift including inelastic deformation effects and diaphragm deformations, $R_oR_d(\Delta B + \Delta D)$, and the diaphragm deformation under R_o times the seismic load, where R_o may be replaced by the actual overstrength of the SFRS vertical elements. The design engineer must verify that the SFRS vertical elements have sufficient deformation capacity to accommodate the computed deformation demand. If the vertical elements of the SFRS do not have sufficient deformation capacity, the design forces for the vertical elements of the SFRS must be magnified by $R_d(1 + \Delta D/\Delta B)/(R_d + \Delta D/\Delta B)$. The calculation of the magnified design forces is iterative as the $\Delta D/\Delta B$ ratio may change when using higher design forces for the vertical elements of the SFRS. Reducing the $\Delta D/\Delta B$ ratio by increasing the stiffness of the roof diaphragm relative to that of the vertical elements of the SFRS may be considered to reduce the deformation demand on the vertical elements of the SFRS. Additional information can be found in the Commentary entitled "Design for Seismic Effects" in the *2015 Structural Commentaries (User's Guide – NBC 2015: Part 4 of Division B)*.

Clause 4.1.8.15.(4)(b)

The dynamic response of the diaphragm with the vertical elements of the SFRS under seismic excitation involves several modes of vibration that affect both the amplitude and distribution of in-plane shears and bending moments in the roof diaphragm. The shape of the fundamental mode of vibration resembles the deflected shape of the diaphragm/vertical SFRS elements under a distributed lateral load while higher modes involve increasing numbers of zero crossings of the deflected shapes along the length of the diaphragm, similar to the modes of a simply supported beam with distributed mass. Shears and bending moments therefore deviate from the values obtained from the equivalent static force procedure essentially due to higher mode response. Modal contributions to shears and bending moments in the diaphragms can be obtained from a Linear Dynamic Analysis. The contribution from the higher modes is generally more pronounced when the $\Delta D/\Delta B$ ratio, the period in the first mode, or the ratio $S_a(0.2)/S_a(2.0)$ is increased. It also increases when the SFRS is designed with a higher R_d factor as inelastic deformations of the vertical elements of the SFRS attenuate the first mode response. Methods to take into

account the inelastic higher mode effects on in-plane diaphragm shears and moments are discussed in the Commentary entitled "Design for Seismic Effects" in the *2015 Structural Commentaries (User's Guide – NBC 2015: Part 4 of Division B)*.

e7 A-4.1.8.15.(5) Discontinuities.

Information on elements supporting discontinuities can be found in the Commentary entitled "Design for Seismic Effects" in the *2015 Structural Commentaries (User's Guide – NBC 2015: Part 4 of Division B)*.

e7 A-4.1.8.15.(6) Vertical Variations in R_dR_o.

Information on elements of the SFRS below the variation in R_dR_o can be found in the Commentary entitled "Design for Seismic Effects" in the *2015 Structural Commentaries (User's Guide – NBC 2015: Part 4 of Division B)*.

e7 A-4.1.8.15.(7) Concurrent Yielding.

Information on the effects of concurrent yielding of elements can be found in the Commentary entitled "Design for Seismic Effects" in the *2015 Structural Commentaries (User's Guide – NBC 2015: Part 4 of Division B)*.

e7 A-4.1.8.15.(8) Design Force in Elements.

Information on the design force in elements can be found in the Commentary entitled "Design for Seismic Effects" in the *2015 Structural Commentaries (User's Guide – NBC 2015: Part 4 of Division B)*.

a10.1 A-4.1.8.16.(1) Foundation Movement.

The bearing stress distribution in soil or rock that is used to determine the factored overturning resistance of the foundation influences the rotation of the foundation, which occurs due to the forces applied by the SFRS. Generally, all foundations will rotate on soil or rock. In particular, footings (a type of foundation unit) often undergo uplift at one end, and if the factored bearing stress at the other end is only over a short length, then the uplift and rotation of the footing can be significant. CSA A23.3, "Design of Concrete Structures", contains design requirements for footings that rotate and uplift; see also the Commentary entitled "Design for Seismic Effects" in the *2015 Structural Commentaries (User's Guide – NBC 2015: Part 4 of Division B)* for guidance and methods to account for foundation movement.

a10.1 A-4.1.8.16.(2) Actual Lateral Load Capacity of the SFRS.

The actual lateral load capacity of the SFRS includes the effects of member overstrengths similar to those used to determine the R_o factors. The applicable CSA design standards include requirements on calculating the overstrengths and capacities, which may be based on the members' nominal or probable resistance. The actual capacities are larger than the factored loads and factored resistances and, in many cases, can be significantly larger. Note that the foundations designed to develop the capacity of the SFRS will undergo movements and Sentence 4.1.8.16.(1) still applies.

a10.1 A-4.1.8.16.(4) Overturning Resistance of the Foundation.

For the special case where the foundation is a footing, and where it and the attached SFRS are not constrained against rotation, it is permitted, with certain limitations, to size the footing to have a factored overturning resistance less than the overturning capacity of the supported SFRS. This approach results in a smaller footing, increased footing rotations, increased drifts in the structure, and increased soil stresses, all of which are over and above those associated with footings sized to have a factored overturning resistance equal to or greater than the overturning capacity of the SFRS. The footing itself must have a factored resistance capable of developing the required soil or rock reactions. An example of a footing and SFRS that are not constrained against rotation is an SFRS on a footing near the ground surface such that it can rotate freely and is attached to a gravity-load-resisting system (non-SFRS) that is laterally flexible and provides little lateral resistance. For this case, the SFRS is usually analyzed on its own and the resulting displacements are imposed on the non-SFRS elements in order to assess the effects on them. Cases where the footing and SFRS are attached to a system that has significant lateral stiffness require careful analysis and engineering judgement, or the footing can be capacity-designed.

Limiting the overturning moment on the foundation and the R_dR_o value provides some control on the increase in lateral displacement, drift and stress in the soil or rock. Cases that exceed these limits require special study.

For the common case where the SFRS and/or the footing are constrained in some way against rotation, the footing's factored resistance must be equal to or greater than the capacity of the supported SFRS. An example of an SFRS constrained against freely rotating with the footing is an SFRS attached to adjacent foundation walls by below-grade diaphragms. Examples of footings constrained against free rotation are footings that use soil anchors to resist overturning, footings on piles, and raft foundations. Note that Sentence 4.1.8.16.(1) still applies.

See CSA A23.3, "Design of Concrete Structures," and the Commentary entitled "Design for Seismic Effects" in the *2015 Structural Commentaries (User's Guide – NBC 2015: Part 4 of Division B)*.

e7 A-4.1.8.16.(6)(a) Interconnection of Foundation Elements.

Information on the interconnection of piles or pile caps, drilled piers, and caissons can be found in the Commentary entitled "Design for Seismic Effects" in the *2015 Structural Commentaries (User's Guide – NBC 2015: Part 4 of Division B)*.

e7 A-4.1.8.16.(7) Earthquake Lateral Pressures from Backfill or Natural Ground.

Information on methods of computing the seismic lateral pressures from backfill or natural ground can be found in the Commentary entitled "Design for Seismic Effects" in the *2015 Structural Commentaries (User's Guide – NBC 2015: Part 4 of Division B)*.

e7 A-4.1.8.16.(8)(a) Cyclic Inelastic Behaviour of Foundation Elements.

Information on the cyclic inelastic behaviour of piles or pile caps, drilled piers, and caissons can be found in the Commentary entitled "Design for Seismic Effects" in the *2015 Structural Commentaries (User's Guide – NBC 2015: Part 4 of Division B)*.

e7 A-4.1.8.16.(9) Alternative Foundation Ties.

Alternative methods of tying foundations together, such as a properly reinforced floor slab capable of resisting the required tension and compression forces, may be used. Passive soil pressure against buried pile caps may not be used to resist these forces.

e7 A-4.1.8.16.(10) Liquefaction.

Information on liquefaction can be found in the Commentary entitled "Design for Seismic Effects" in the *User's Guide - 2015 Structural Commentaries (User's Guide – NBC 2015: Part 4 of Division B)*.

e7 A-4.1.8.17.(1) Slope Stability.

Information on slope stability can be found in the Commentary entitled "Design for Seismic Effects" in the *2015 Structural Commentaries (User's Guide – NBC 2015: Part 4 of Division B)*.

e7 A-4.1.8.18. Elements of Structures, Non-Structural Components and Equipment.

Information on the requirements of Article 4.1.8.18. can be found in the Commentary entitled "Design for Seismic Effects" in the *2015 Structural Commentaries (User's Guide – NBC 2015: Part 4 of Division B)*.

a10.1 A-Table 4.1.8.18. Non-Structural Components and Equipment.

The failure or detachment of non-structural components and equipment during an earthquake can present a major threat to life safety. The design requirements presented in Article 4.1.8.18. are intended to ensure that such components and their connections to the building will retain their integrity during strong ground shaking. Guidelines for the seismic risk reduction of such components are given in CSA S832, "Seismic Risk Reduction of Operational and Functional Components (OFCs) of Buildings".

a10.1 A-4.1.8.18.(13) Storage Racks.

Free-standing steel pallet storage racks contain only materials typically loaded by forklift. They are designed to store loaded pallets, however in some cases, the stored material does not sit on a pallet. There is no occupancy within the racks. Information on racks can be found in the Commentary entitled "Design for Seismic Effects" in the *2015 Structural Commentaries (User's Guide – NBC 2015: Part 4 of Division B)*.

a10.1 A-4.1.8.18.(14) and (15) Glass Fallout and Failure.

Information on glass fallout and testing for glass fallout can be found in AAMA 501.6, "Recommended Dynamic Test Method For Determining The Seismic Drift Causing Glass Fallout From A Wall System". Every surface other than inaccessible areas or areas where occupancy is prevented or access is prevented should be considered a "walking surface". Additional information can be found in ASCE/SEI 7, "Minimum Design Loads for Buildings and Other Structures", in FEMA P-750, "NEHRP Recommended Seismic Provisions for New Buildings and Other Structures", and FEMA 450-1, "NEHRP Recommended Provisions for Seismic Regulations for New Buildings and Other Structures", and related commentaries, and in the Commentary entitled "Design for Seismic Effects" in the *2015 Structural Commentaries (User's Guide – NBC 2015: Part 4 of Division B)*.

a10.1 A-4.1.8.19.(2) Design Review.

It is strongly recommended that a design review of the seismically isolated structure and its isolation system be carried out by an independent team of professional engineers and geoscientists experienced in seismic analysis methods and the theory and application of seismic isolation. The design review should include, but not be limited to, the following:

(a) site-specific spectra,
(b) ground motion time histories,
(c) modeling and analyses,
(d) testing program and results, and
(e) final design of all structural framing elements and isolation system components.

a10.1 A-4.1.8.19.(3)(a) Non-Linear Dynamic Analysis.

Three-dimensional non-linear dynamic analysis is a complex process requiring special expertise. Guidance on non-linear dynamic analysis can be found in the Commentary entitled "Design for Seismic Effects" in the *2015 Structural Commentaries (User's Guide – NBC 2015: Part 4 of Division B)*.

a10.1 A-4.1.8.19.(4) and A-4.1.8.21.(5) Ground Motion Time Histories.

Ground motion time histories and the horizontal and vertical components shall be appropriately selected and scaled according to accepted practice. Further information on ground motion time histories can be found in the Commentary entitled "Design for Seismic Effects" in the *2015 Structural Commentaries (User's Guide – NBC 2015: Part 4 of Division B)*.

a10.1 A-4.1.8.21.(2) Design Review.

It is strongly recommended that a design review of the structure and the supplementary energy dissipation system be carried out by an independent team of professional engineers and geoscientists experienced in seismic analysis methods and the theory and application of supplementary energy dissipation. The design review should include, but not be limited to, the following:

(a) ground motion time histories,
(b) modeling and analyses,
(c) testing program and results, and
(d) final design of all structural framing elements and supplemental energy dissipation system components.

a10.1 A-4.1.8.21.(4)(a) Non-Linear Dynamic Analysis.

Three-dimensional non-linear dynamic analysis is a complex process requiring special expertise. Guidance on non-linear dynamic analysis can be found in the Commentary entitled "Design for Seismic Effects" in the *2015 Structural Commentaries (User's Guide – NBC 2015: Part 4 of Division B)*.

A-4.2.2.1.(1) Subsurface Investigation.

Where acceptable information on subsurface conditions already exists, the investigation may not require further physical subsurface exploration or testing.

A-4.2.4.1.(1) Innovative Designs.

It is important that innovative approaches to foundation design be carried out by a person especially qualified in the specific method applied and that the design provide a level of safety and performance at least equivalent to that provided for or implicit in the design carried out by the methods referred to in Part 4. Provision must be made for monitoring the subsequent performance of such structures so that the long-term sufficiency of the design can be evaluated.

e7 A-4.2.4.1.(3) Ultimate Limit States for Foundations.

Information on ultimate limit states for foundations, including terminology and resistance factors, can be found in the Commentary entitled "Foundations" in the *2015 Structural Commentaries (User's Guide – NBC 2015: Part 4 of Division B)*.

e7 A-4.2.4.1.(5) Design of Foundations for Differential Movements.

Information on the design of foundations for differential movements can be found in the Commentary entitled "Foundations" in the *2015 Structural Commentaries (User's Guide – NBC 2015: Part 4 of Division B)*.

A-4.2.4.4.(1) Depth of Foundations.

When adfreezing has occurred and subsequent freezing results in soil expansion beneath this area, the resulting uplift effect is sometimes referred to as frost jacking.

A heated building that is insulated to prevent heat loss through the foundation walls should be considered as an unheated structure unless the effect of the insulation is taken into account in determining the maximum depth of frost penetration.

e7 A-4.2.5.1.(1) Excavations.

Information on excavations can be found in the Commentary entitled "Foundations" in the *2015 Structural Commentaries (User's Guide – NBC 2015: Part 4 of Division B)*.

e7 A-4.2.6.1.(1) Shallow Foundations.

Information on shallow foundations can be found in the Commentary entitled "Foundations" in the *2015 Structural Commentaries (User's Guide – NBC 2015: Part 4 of Division B)*.

A-4.2.7.1.(1) Deep Foundation Units.

A deep foundation unit can be pre-manufactured or cast-in-place; it can be driven, jacked, jetted, screwed, bored or excavated; it can be of wood, concrete or steel or a combination thereof.

e7 A-4.2.7.2.(1) Deep Foundations.

Information on deep foundations can be found in the Commentary entitled "Foundations" in the *2015 Structural Commentaries (User's Guide – NBC 2015: Part 4 of Division B)*.

A-4.2.7.2.(2) Load Testing of Piles.

ASTM D1143, "Piles Under Static Axial Compressive Load", defines routine load test procedures that have been extensively used.

A-4.3.3.1.(1) Precast Concrete.

CAN/CSA-A23.3, "Design of Concrete Structures", requires precast concrete members to conform to CSA A23.4, "Precast Concrete - Materials and Construction".

A-4.3.4.1.(1) Welded Construction.

Qualification for fabricators and erectors of welded construction is found in Clause 24.3 of CSA S16, "Design of Steel Structures".

A-4.3.4.2.(1) Cold-Formed Stainless Steel Members.

There is currently no Canadian standard for the design of cold-formed stainless steel structural members. As an interim measure, design may be carried out using the limit states design provisions of ASCE/SEI 8, "Design of Cold Formed Stainless Steel Structural Members", except that load factors, load combinations and load combination factors shall be in accordance with Subsection 4.1.3.

A-4.3.4.3.(1) Steel Building Systems.

A steel building system is defined in Section 3 of CAN/CSA-A660, "Certification of Manufacturers of Steel Building Systems".

a10.1 A-4.3.6.1.(1) Design Basis for Glass.

The load factors in Tables 4.1.3.2.A. and 4.1.3.2.B. must be applied to the adjusted wind load before designing in accordance with the referenced standard. Additional information is given in the Commentary entitled "Wind Load and Effects" in the *2015 Structural Commentaries (User's Guide – NBC 2015: Part 4 of Division B)*.

a10.1 A-4.4.2.1.(1) Design Basis for Parking Structures and Repair Garages.

See the Commentary entitled "Live Loads" in the *2015 Structural Commentaries (User's Guide – NBC 2015: Part 4 of Division B)*.

A-5 Environmental Separation.

The requirements provided in Part 5 pertain to the separation of environmentally dissimilar spaces. Most obvious is the need to separate indoor conditioned spaces from unconditioned spaces, the outdoors or the ground. There are also cases where separation is needed between interior spaces which are intended to provide different environments. (See also Appendix Notes A-5.1.1.1.(1) and A-5.1.2.1.(1).)

A-5.1.1.1.(1) Scope.

Part 5 provides explicit requirements related to the transfer of heat, air, moisture and sound in various forms. Control of the ingress of radon and other soil gases is addressed by the requirements related to air leakage.

A-5.1.2.1.(1) Application.

Subsection 1.1.2. of Division A specifies that Part 5 applies to all buildings except those within the scope of Part 9 or the scope of the National Farm Building Code of Canada. Because of their intended use, many buildings need only provide a limited degree of separation from the outdoor environment, the ground, or between interior spaces. The provisions in Part 5 are written to allow exemptions for these buildings.

Part 5 applies to building elements that separate dissimilar environments and to site conditions that may affect environmental loading on the building envelope.

The provisions address

- the design and construction, or selection, of building components, such as windows and doors,
- the design and construction of building assemblies, such as walls, floors and roofs,
- the design and construction of the interfaces between the above-mentioned elements, and
- the design or selection, and installation, of site materials, components and assemblies, such as backfill and drainage, and grading.

Part 5 applies not only to building elements that separate indoor space from outdoor space, but also to those elements that separate indoor space from the ground and that separate adjacent indoor spaces having significantly different environments. Indoor spaces that require separation include interior conditioned spaces adjacent to indoor unconditioned spaces, and adjacent interior conditioned spaces that are intended to provide different environments. An extreme example of the last would be a wall that separates an indoor ice rink from a swimming pool.

Some building elements are exposed to exterior environmental loads but do not separate dissimilar environments. Solid guards on exterior walkways are one example. Such elements are subject to the application of Part 5.

A-5.1.4.1. Application of Structural Design to Other Building Elements.

Part 4, as currently written, applies primarily to buildings as a whole and to structural members. Requirements defining structural loads and design to accommodate or resist those loads, however, apply not only to buildings as a whole and components that are traditionally recognized as structural members, but also apply to other elements of the building that are subject to structural loading. This is addressed to some extent in Part 4 by the requirements that pertain, for example, to wind loads on cladding. A range of structural loads and effects, as defined in Subsection 4.1.2., may be imposed on non-loadbearing elements such as backing walls, roofing, interior partitions and their connections. These must generally be addressed using the same load determination and structural design procedures as used for structural members.

Responsibility for the structural design of buildings as a whole and their structural members is commonly assigned to the designer of record. The application of Part 4 reflects this, and as such, "non-structural" elements are not explicitly identified in the Part 4 provisions. Rather, the application of Part 4 to these elements is specified in cross-references from other Parts of the Code, e.g. Part 5, which recognizes the fact that the structural design of these elements is often carried out by designers other than the designer of record.

e7 Part 4 applies to the design of the connections of building services to address earthquake loads (See Article 4.1.8.18.).

a10.1 A-5.1.4.1.(1.1) Materials, Components and Assemblies with Multiple Functions.

Where materials, components or assemblies are used to fulfill multiple functions, the designer may have to take into account their function with regard to structural loads, heat transfer, air leakage, vapour diffusion, and protection from precipitation, surface and ground water, and sound transmission. Materials should be selected taking into account the environmental loads to which they will be subjected, their physical and chemical characteristics, and their installation. Design and construction details should satisfy all intended functions and ensure continuity within and between assemblies, without adversely impacting adjacent materials, components or assemblies. The designer should also anticipate unintended consequences when materials that may fulfill multiple functions are used. For example, building membranes consisting of modified bitumen compounds, which are commonly used to control both water ingress and air leakage, also typically have low vapour transmission characteristics. Similarly, extruded polystyrene boards, which are used as thermal insulation, may also act as a component of an air barrier assembly, thus requiring wind loads to be considered.

An increasing number of manufactured systems are being used to serve more than one (and sometimes all) of the functions of an environmental separator: examples include pre-engineered building systems, exterior insulation finish systems, insulated metal panel systems, windows, other fenestration assemblies, and insulated precast concrete wall panels. These systems consist of combinations of pre-manufactured and/or site-built components, which are supposed to be assembled in a prescribed manner.

Ensuring compliance with one Section of Part 5 may impact compliance with other Sections of Part 5: for example, air barriers that are integral to some systems may also act as vapour barriers and impact condensation control. By extension, ensuring compliance with the requirements of Part 5 may impact compliance with other Parts of the Building Code: for example, increasing the thickness of the insulation to improve an assembly's thermal performance may impact its compliance with Part 3 with regard to fire resistance.

Compliance with a standard listed in Section 5.10. does not ensure that a system is appropriate for the intended application. The designer should consider all relevant criteria, beyond the standard tests, when selecting an appropriate product for a project.

A-5.1.4.1.(4) Past Performance as Basis for Compliance with Respect to Structural Loads.

As discussed in Appendix Note A-5.1.4.1., a range of structural loads and effects can be imposed on materials, components and assemblies in environmental separators and assemblies exposed to the exterior. In many instances, compliance with Sentence 5.1.4.1.(1) for structural loads must be determined based on the loads and calculation methods described in Part 4 as specified in Sentence 5.1.4.1.(2) and the referenced Subsection 5.2.2., e.g. for cladding. In practice, compliance for some materials, components or assemblies of environmental separators and assemblies exposed to the exterior is determined by relying on provisions governing the use of alternative solutions (such as Clause 1.2.1.1.(l)(b) of Division A).

For some very common building elements and installations, however, there is a very large body of evidence of proven performance over a long period of time. In these cases, imposing the degree of analysis, or documentation of performance, required by Part 4 or Section 2.1. of Division C would be unnecessary and onerous. Clause 5.1.4.1.(4)(b) is intended to address these particular cases. Because these common building elements and assemblies are so widely accepted throughout the industry and the body of evidence is so substantial (though not necessarily documented in an organized fashion), detailed analysis or documentation is unnecessary.

Whether compliance of a particular material, component or assembly may be determined based on past performance depends not only on the type of material, component or assembly, but also on its intended function, the particular loads to which it will be subject and the magnitude of those loads. Because the possible number of combinations and permutations is astronomical, only guidelines can be provided as to when past performance is a reasonable basis for determining compliance.

In determining compliance based on past performance, the period of past performance considered should be a substantial number of years. For example, 30 years is often used to do life-cycle cost analysis of the viability of investments in building improvements. This period is more than long enough for most deficiencies to show up. There should be no question as to the structural adequacy of a material, component or assembly that has been successfully used in a given application for such a period.

The determination of compliance may be based on past performance only where the function of the material, component or assembly is identical to that of the materials, components or assemblies used as a reference, and where the expected loads do not exceed those imposed on the reference materials, components or assemblies. For example, the acceptance of gypsum board, and its fastening, to serve as part of the backing wall supporting cladding cannot be based on the performance of gypsum board that has served only as an interior finish.

The determination of compliance may be based on past performance only where the properties of the material, component or assembly are identical or superior to those of the materials, components or assemblies used as a reference. For example, where a component of a certain gauge of a particular metal has provided acceptable performance, the same component made of the same metal or a stronger one would be acceptable.

Compliance with respect to various loads may be determined individually. A particular material may have to be designed to Part 4 to establish acceptable resistance to wind or earthquake loads, for example, but past performance may be adequate to determine that the material and normal fastening will support the material's dead load and will resist loads imposed by thermal and moisture-related expansion and contraction.

Past performance is a reasonable basis for determining compliance for lighter materials, components or assemblies not subject to wind load; for example, semi-rigid thermal insulation installed in wall assemblies where other materials, components or assemblies are installed to resist air pressure loads.

Past performance is an appropriate basis for determining compliance for some smaller elements that will be subject to wind loads but are continually supported or fastened behind elements that are designed for wind loads, for example, standard flashing over wall penetrations.

It should be noted that this particular approach to demonstrating compliance pertains only to the resistance or accommodation of structural loads described in Part 4. The resistance or accommodation of environmental loads, resistance to deterioration, and material compatibility must still be addressed in accordance with Part 5.

a10.1 A.5.1.4.1.(5)(b) and (c) Accommodating Movement.

It is well understood that the deflection of the backing assembly in a wall can have significant effects on the performance of the cladding. For example, CSA S304, "Design of Masonry Structures", specifies the maximum deflection criteria for backing assemblies to masonry veneer. Clauses 5.1.4.1.(5)(b) and (c) are written in very general terms in recognition of the fact that not only can the deflection of cladding affect the performance of the backing assembly, but that the excessive deflection of any element has the potential to adversely affect the performance of any adjacent element. Similarly, inter-storey drift has the potential to adversely affect the performance of components and assemblies of environmental separators. CSA O86, "Engineering Design in Wood", specifies a method for calculating building movement due to changes in moisture content. The effects of movement should be avoided or accommodated.

a10.1 A-5.1.4.2. Deterioration.

Environmental loads that must be considered include but are not limited to: sound, light and other types of radiation, temperature, moisture, air pressure, acids and alkalis.

Mechanisms of deterioration include:

- structural (impact, air pressure)
- hygrothermal (freeze-thaw, differential movement due to thermal expansion and contraction, ice lensing)
- electrochemical (oxidation, electrolytic action, galvanic action, solar deterioration)
- biochemical (biological attack, intrusion by insects and rodents).

Information on the effects of deformations in building elements can be found in the Commentary entitled "Effects of Deformations in Building Components" in the *2015 Structural Commentaries (User's Guide – NBC 2015: Part 4 of Division B)*.

Resistance to deterioration may be determined based on field performance, accelerated testing or compliance with guidelines provided by evaluation agencies recognized by the authority having jurisdiction. Guidance can be found in CSA S478, "Guideline on Durability in Buildings".

Building components should be designed with some understanding of the length of time over which they will effectively perform their intended function. Actual service life will depend on the materials used and the environment to which they are exposed. The design should take into consideration these factors, the particular function of the component and the implications of premature failure, the ease of access for maintenance, repair or replacement, and the cost of repair or replacement.

Many buildings are designed such that access for maintenance, repair or replacement is not possible without damaging – or seriously risking damaging – other building elements. This can become a considerable deterrent to proper maintenance thus compromising the performance of the subject materials, components and assemblies, or other elements of the building. In cases where it is known or expected that maintenance, repair or replacement is likely to be required for certain elements before such time as the building undergoes a major retrofit, special consideration should be given to providing easy access to those elements. Anchorage points for maintenance personnel should be considered during the design of multi-storey buildings, including those of wood-frame construction, as adding them post-construction can be difficult.

Where the use of a building or space, or the services for a building or space, are changed significantly, an assessment of the impact of the changes on the environmental separators should be conducted to preclude premature failures that could create hazardous conditions.

A-5.2.1.1.(3) Soil Temperatures.

In theory, soil temperatures are needed to determine the conformance of a design to the requirements related to heat transfer and vapour diffusion. In practice, standard construction in a particular area may have proven to perform quite adequately and detailed calculations of soil temperature are unnecessary. (See also Sentence 5.2.1.3.(2).)

A-5.2.1.2.(1) Interior Environmental Loads.

The interior environmental conditions required depend on the intended use of the spaces in the building as defined in the building program. Spaces in different types of buildings and different spaces within a single building may impose different loads on the separators between interior and exterior spaces and between adjacent interior spaces. The separators must be designed to withstand the expected loads.

A-5.2.2.1.(2)(c) Determination of Structural Loads and Effects.

For the design of post-disaster buildings, the effects of earthquake loads on the ability of materials, components and assemblies and their interfaces to resist or accommodate environmental loads must be taken into account. For such buildings, seismic effects must be taken into account in the design for environmental separation, as these buildings are required to have an adequate degree of functionality after the seismic event to meet their intended function (see Article 4.1.8.13. for deflections and drift limits for post-disaster buildings). For all other buildings, damage to building components during seismic events is anticipated and these buildings are not intended to be functional after the event.

a10.1 However, it is important to note that earthquake effects must be taken into account in the seismic design of all building materials, components and assemblies and their interfaces covered by Article 4.1.8.18. to address life safety and the structural protection of buildings.

A-5.2.2.2. Resistance to Wind and Other Air Pressure Loads.

The wind load provisions apply to roofing and other materials subject to wind-uplift loads.

e7 Note that, although Article 5.2.2.2. is specifically concerned with wind loads and directly references only two Sentences from Part 4, Sentence 5.2.2.1.(1) references all of Part 4 and would invoke Article 4.1.7.10. for example, that is concerned with air pressure loads on interior walls and partitions.

a10.1 A-5.2.2.2.(4) Membrane Roofing Systems.

Wind loads for membrane roofing systems must be calculated in accordance with Part 4. The tested uplift resistance and factored load should satisfy the requirements of the Commentary entitled “Limit States Design” in the *2015 Structural Commentaries (User’s Guide – NBC 2015: Part 4 of Division B)*.

The test method described in CAN/CSA-A123.21, “Dynamic Wind Uplift Resistance of Membrane-Roofing Systems”, applies only to membrane roofing systems whose components’ resistance to wind uplift is achieved by fasteners or adhesives. It does not apply to roofing systems that use ballasts, such as gravel or pavers, to secure the membrane against wind uplift.

In the case of membrane roofing systems in which the waterproof membrane is attached to the structural deck using mechanical fasteners, the wind-induced forces and the roofing system’s response are time- and space-dependent and, thus, dynamic in nature. Further information on the design and evaluation of such systems can be found in “A Guide for the Wind Design of Mechanically Attached Flexible Membrane Roofs”, published by NRC.

The wind uplift resistance obtained from the test method in CAN/CSA-A123.21 is limited to configurations with specific fastener or adhesive patterns. To extrapolate the test data to non-tested configurations, refer to ANSI/SPRI WD-1, "Wind Design Standard Practice for Roofing Assemblies", for a rational calculation procedure. However, in using this extrapolation procedure, wind loads should be calculated in accordance with the NBC. NRC's guide for wind design referenced above provides further guidance and examples of wind load calculations.

A-5.3. Heat Transfer.

In addressing issues related to health and safety, Section 5.3. calls up levels of thermal resistance needed to minimize condensation on or within environmental separators, and to ensure thermal conditions appropriate for the building use. Part 12 specifies levels of thermal resistance required for energy efficiency or calls up energy performance levels, which relate to levels of thermal resistance. Where Part 5 calls for levels of thermal resistance higher than those required by Part 12, the requirements of Part 5 take precedence.

A-5.3.1.1. Required Resistance to Heat Transfer.

The control of heat flow is required wherever there is an intended temperature difference across the building assembly. The use of the term "intended" is important since, whenever interior space is separated from exterior space, temperature differences will occur.

The interior of an unheated warehouse, for example, will often be at a different temperature from the exterior due to solar radiation, radiation from the building to the night sky and the time lag in temperature change due to the thermal mass of the building and its contents. If this temperature difference is not "intended," no special consideration need be given to the control of heat flow.

If the warehouse is heated or cooled, thus making the temperature difference "intended," some consideration would have to be given to the control of heat flow.

It should be noted, however, that in many cases, such as with adjacent interior spaces, there will be an intended temperature difference but the difference will not be great. In these cases, the provisions to control heat flow may be little or no more than would be provided by any standard interior separator. That is, materials typically used in the construction of partitions may provide the separation needed to meet the requirements of Section 5.3. without adding what are generally considered to be "insulating" materials.

a10.1 A-5.3.1.2. Material and Component Properties and Condensation.

Total prevention of condensation is generally unnecessary and its achievement is rarely a certainty at design conditions. Part 5, therefore, requires that condensation be minimized. The occurrence of condensation should be sufficiently rare, or the quantities accumulated should be sufficiently small and dry rapidly enough, to avoid material deterioration and the growth of mould and fungi.

The Harmonized North American Fenestration Standard, AAMA/WDMA/CSA 101/I.S.2/A440, "NAFS – North American Fenestration Standard/Specification for Windows, Doors, and Skylights", identifies procedures to determine the condensation resistance and thermal transmittance of windows, doors and skylights though testing for condensation resistance is presented as optional in the standard. As such, a fenestration product that meets the standard's requirements on air leakage, water penetration, uniform load and other performance requirements may not meet the condensation resistance performance level needed for a given application.

Only the physical test procedure presented in CSA A440.2, "Fenestration Energy Performance", can be used to establish the temperature index (I) value, which denotes condensation resistance performance evaluation criteria. It is recommended that designers specify I values for a given application to minimize the potential for condensation. Further guidance on the selection of the correct I value is provided in CSA A440.3, "User Guide to CSA A440.2-14, Fenestration Energy Performance".

The scope of AAMA/WDMA/CSA 101/I.S.2/A440, which is referenced in Subsection 5.10.2., includes skylights and tubular daylighting devices (TDD). Where skylights and TDDs pass through unconditioned space, their wells and shafts may become the environmental separator and would therefore have to comply with the requirements of Part 5.

A-5.3.1.2.(1) Use of Thermal Insulation or Mechanical Systems for Environmental Control.

The level of thermal resistance required to avoid condensation on the warm side of an assembly or within an assembly (at the vapour barrier) and to permit the maintenance of indoor conditions appropriate for the occupancy depends on:

- the occupancy
- the exterior design air temperature
- the interior design air temperature and relative humidity
- the capacity of the heating system, and
- the means of delivering heat.

e7 To control condensation on the interior surface of an exterior wall, for example, the interior surface must not fall below the dew point of the interior air. If, for instance, the interior air is 20°C and 35% RH, the dew point will be 4°C. If the interior air is 20°C and 55% RH, the dew point will be 11°C.

Exterior design temperatures are low in Ontario; for example, -20°C in Toronto, and -35°C in Geraldton. In these cases, maintaining temperatures inboard of the vapour barrier above the dew point requires insulation.

In addition to controlling condensation, interior surface temperatures must be warm enough to avoid occupant discomfort due to excessive heat loss by radiation. Depending on the occupancy of the subject spaces, this may require the installation of insulation even where it is not needed to control condensation.

A-5.3.1.3.(2) Position of Materials Providing Thermal Resistance.

For a material providing thermal resistance to be effective, it must not be short-circuited by convective airflow through or around the material. The material must therefore be either the component of the air barrier system providing principal resistance to air leakage, or installed in full and continuous contact with a continuous low air permeance component.

A-5.4.1.1. Resistance to Air Leakage.

An air barrier system in above-grade building components and assemblies separating conditioned space from the exterior will reduce the likelihood of condensation due to air leakage, discomfort from drafts, the infiltration of dust and other pollutants, and interference in the performance of building services, such as HVAC and plumbing.

These problems can all lead to serious health or safety hazards.

Currently, the most obvious and significant problems are due to moisture-related material deterioration, such as rot and corrosion, which can lead to the failure of component connections. The infiltration of dust and other pollutants can lead to a wide range of health problems. Where the separator is subject to high moisture levels, the pollutants may include fungus spores. Interference with the performance of building services can lead to unhealthy conditions and potentially hazardous conditions during the heating season in many regions of the province.

There are few buildings intended for human occupancy where the interior space is conditioned but where an air barrier system is not required. Some industrial buildings, for example, may be exempt. This would depend, however, on the particular levels of interior conditioning provided, ventilation levels, protection provided for the workers, and the tolerance of the building's construction to the accumulation of condensation and potential precipitation ingress.

Some industrial buildings are provided with only limited conditioning, for example radiant heating, and ventilation levels are sufficient to reduce relative humidity to a level at which condensation will not accumulate to a degree that is problematic. Conversely, some industrial buildings, due to the processes they contain, operate at very high temperatures and high ventilation levels. In these cases, the building envelope will be maintained at temperatures that will avoid condensation. In both examples above, either the ventilation rates or protective gear required in the work environment would protect the occupants from unacceptable levels of pollutants.

Where adjacent interior environments are sufficiently different, controlling airflow between those spaces is necessary to maintain conditions. Referring again to the industrial building examples above, assemblies separating office space from the work floor would likely require an air barrier system.

An air barrier system may be required in components and assemblies in contact with the ground to control the transfer of soil gases such as radon and methane.

The word "minimize" is used in Clause 5.4.1.1.(1)(c) because not all moisture accumulation in an assembly need be of concern. Incidental condensation is normal but should be sufficiently rare and in sufficiently limited quantities, and should dry rapidly enough, to avoid material deterioration and the growth of mould or fungi.

An air barrier system is required in components and assemblies in contact with the ground to control the ingress of radon, and may be required to control the ingress of other soil gases such as methane.

In addition to an air barrier system, other measures may be required to reduce radon concentration to a level below the guideline specified by Health Canada. Further information on protection from radon ingress can be found in:

- "Radon: A Guide for Canadian Homeowners" (CMHC/HC),
- "Guide for Radon Measurements for Public Buildings (Schools, Hospitals, Care Facilities, Detention Centres)" (HC), and
- EPA 625/R-92/016, "Radon Prevention and the Design and Construction of Schools and Other Large Buildings".

a10.1 ## A-5.4.1.2.(1) and (2) Air Leakage Through the Air Barrier System.

The current requirements specify only a maximum air leakage rate for the material in the air barrier system that provides the principal resistance to air leakage.

Research and in-situ testing of installed air barrier systems have shown that the bulk of air leakage occurs through joints (between air barrier materials) and junctions (between air barrier components).

Ideally, a maximum air leakage rate for the complete air barrier system would be specified. The maximum acceptable rate will ultimately depend on warm and cold side temperatures and humidity conditions, and on the susceptibility of the environmental separator to moisture-related deterioration. Recommended maximum leakage rates for the air barrier system in an exterior envelope in most locations in Ontario are shown in Table A-5.4.1.2.(1) and (2). These values are for air barrier systems in opaque, insulated portions of the building envelope. They are not for whole buildings, as windows, doors and other openings are not included. The Table is provided for guidance when testing air barrier systems as portions of an envelope.

Table A-5.4.1.2.(1) and (2)
Recommended Maximum Air Leakage Rates

Warm Side Relative Humidity at 21°C	Recommended Maximum System Air Leakage Rate, L/(s • m^2) at 75 Pa
< 27%	0.15
27% to 55%	0.10
> 55%	0.05

Determining the leakage rate of a particular assembly, however, is problematic. There is little information available on the airtightness of the many air barrier systems used in building construction, and testing requires specialized equipment and expertise. Depending on the type of test,

- testing may not represent the performance of the complete installed system,
- the location of deficiencies may be difficult to identify, and
- rectification of deficiencies may not be feasible.

Despite the difficulties, when using a system whose performance is not known, it is recommended that tests be conducted. Testing options include:

- laboratory tests of small sections of the air barrier system, including the joints and intersections of different assemblies
- laboratory tests of large wall sections
- in-situ tests of characteristic envelope areas.

A-5.5.1.1. Required Resistance to Vapour Diffusion.

Resistance to vapour diffusion is required to reduce the likelihood of condensation within building assemblies, and the consequent potential for material deterioration and fungal growth. Deterioration such as rot and corrosion can lead to the failure of building components and connections, and interfere with the performance of building services. Some fungi can have very serious effects on health.

In Ontario, relatively few buildings that are subject to temperature and vapour pressure differences would be constructed or operated in such a manner that the control of vapour diffusion would not need to be addressed in their design. Assemblies enclosing certain industrial spaces, as described in Appendix Note A-5.4.1.1. for example, may be exempt.

For residential spaces and most other spaces that are conditioned for human occupancy, a means of vapour diffusion control is generally agreed to be necessary. The questions in those cases pertain to the degree of control needed.

The word "minimize" is used in Sentence 5.5.1.1.(1) because not all moisture accumulation in an assembly need be of concern. Incidental condensation is normal but should be sufficiently rare and in sufficiently limited quantities, and should dry rapidly enough, to avoid material deterioration and the growth of mould or fungi. The following publications address the effects of fungi on health:

- HC 2004, "Fungal Contamination in Public Buildings: Health Effects and Investigation Methods"
- "Guidelines on Assessment and Remediation of Fungi in Indoor Environments", New York City Department of Health and Mental Hygiene (NYCDOHMH)

A-5.5.1.2.(1) Vapour Barrier Materials and Installation.

In the summer, many buildings are subject to conditions where the interior temperature is lower than the exterior temperature. Vapour transfer during these periods is from the exterior to the interior. In general, in Canada, the duration of these periods is sufficiently short, the driving forces are sufficiently low, and assemblies are constructed such that any accumulated moisture will dissipate before deterioration will occur.

Buildings such as freezer plants, however, may operate for much of the year at temperatures that are below the ambient exterior temperature. In these cases, the "warm" side of the assembly would be the exterior and a detailed analysis on an annual basis is required.

Steady state heat transfer and vapour diffusion calculations may be used to determine acceptable permeance levels for the vapour barrier and to identify appropriate positions for the vapour barrier within the building assembly.

A-5.6.1.1. Required Protection from Precipitation.

Windows, cast-in-place concrete walls, and metal and glass curtain wall systems are examples of components and assemblies that, when properly designed and constructed, are expected to prevent the ingress of precipitation into a building. Assemblies such as roofs and veneer walls consist of materials specifically intended to screen precipitation.

Components and assemblies separating interior conditioned space from the exterior are generally required to provide protection from the ingress of precipitation. Components and assemblies separating interior unconditioned space from the exterior may or may not be required to provide protection from the ingress of precipitation. Buildings such as stadia, parking garages and some seasonally occupied buildings, for example, may not require complete protection from the ingress of precipitation. The degree of protection will depend to a large extent on the materials selected for the building elements that will be exposed to precipitation.

The word "minimize" is used in Sentence 5.6.1.1.(1) because not all moisture ingress or accumulation in an assembly need be of concern. The penetration of wind-driven rain past the cladding may not affect the long-term performance of the assembly, provided the moisture dries out or is drained away before it initiates any deterioration of building materials. When the design service life of a material or component is longer than the design service life of the overall assembly, taking into account the expected exposure to moisture, initiating deterioration of the material should not be of concern. That is to say, provided the material or component continues to provide the necessary level of performance for its intended service life and does not adversely affect the service life of the assembly of which it is a part, the deterioration of the material or component is not an issue.

A-5.6.1.2.(3) Ice Damming.

Water leakage through sloped roofs is often due to the formation of ice dams at the eaves, which can be limited by controlling the transfer of heat to the roof through a combination of insulation and venting to dissipate heat. See Subclause 5.3.1.2.(1)(a)(iv).

a10.1 ## A-5.6.1.2.(4) Vegetative Roofing Systems.

The integrity of some assemblies installed to provide the required protection from the ingress of precipitation in vegetative roofing systems can be compromised due to an inadequate resistance to the penetration of plant roots and rhizomes. Additional information on vegetative roofing systems and the performance of protective materials can be found in the German Landscape Research, Development and Construction Society's (FLL) "Guideline for the Planning, Execution and Upkeep of Green-Roof Sites" and in the National Roofing Contractors Association's Vegetative Roof Systems Manual.

A-5.6.2.1. Sealing and Drainage.

Providing a surface-sealed, durable, watertight cover on the outside of a building is difficult. Where there is a likelihood of some penetration by precipitation into a component or assembly, drainage is generally required to direct the moisture to the exterior.

a3 The degree of protection against precipitation ingress needed in any particular case and the approach taken to provide that protection will depend on factors such as,

- the exterior loads imposed on the assembly,
- the materials selected for the backing assembly,
- the use of the enclosed space, and
- the level of maintenance that will be acceptable to the owners.

a10.1 Where exterior loads are greater, it may be prudent to select a precipitation protection system whose small failures will not be as likely to have an immediate impact on the building or its occupants. For example, drained and vented wall and vented roof assemblies are typical for low-rise residential buildings. More robust drained and vented wall assemblies are recommended for mid- and high-rise buildings where the cost of maintenance and repair could be high.

Where materials with a greater resistance to moisture are used in the assembly, a less rugged precipitation protection system or a less rigorous maintenance schedule may be acceptable. This might be the case, for example, where the wall or backing wall is concrete or masonry.

a3 For spaces that are not intended for on-going human occupancy, some rainwater leakage may be of lesser concern. This may be the case for certain warehouse spaces for example, depending on how the spaces are used and conditioned.

Information on the installation of flashing to drain water to the exterior of roof and wall assemblies may be found in a number of publications including, but not limited to:

- "Architectural Sheet Metal Manual", Sheet Metal and Air-Conditioning Contractors National Association, Inc.
- "High-Rise Residential Construction Guide", Tarion Warranty Corporation (formerly Ontario New Home Warranty Program)
- Technical Notes, National Concrete Masonry Association
- Roofing Specifications, Canadian Roofing Contractors' Association

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- "The NRCA Roofing Manual: Membrane Roof Systems" and "The NRCA Waterproofing Manual," National Roofing Contractors Association
- Technical Notes on Brick Construction, Brick Industry Association

a10.1 Environmental separators installed in buildings of wood construction that exceed 4 storeys can be subjected to increased loading due to the height of the building. As such, certain design considerations may require different approaches from the common ones used by industry for buildings of 4 storeys or less. These considerations include, but are not limited to, the following:

- air barrier assemblies,
- fenestration selection,
- protection from precipitation,
- differential movement due to wood shrinkage,
- roofing selection and design, and
- risk of deterioration due to longer exposure of materials to the elements during construction.

A10.1 Information on environmental separators and the loading to which they are subjected when installed in buildings of wood construction, as well as recommendations on dealing with differential movement, can be found in the following publications, among others:

- "Moisture and Wood-Frame Buildings", Canadian Wood Council
- "Guide for Designing Energy-Efficient Building Enclosures for Wood-Frame Multi-Unit Residential Buildings in Marine to Cold Climate Zones in North America", FPInnovations and RDH Building Engineering Ltd.

A10.1 A-5.7. Protection from Interior Sources of Water.

Protection similar to that prescribed in Section 5.7. may be required where interior assemblies are in contact with water (such as site-built showers, steam rooms, swimming pool areas) and where adjacent interior spaces need to be protected from the transfer of water through these assemblies.

A10.1 A-5.7.1.2.(2) Drainage.

Water should be directed away from the building and, ultimately, to a municipal drainage system, drainage ditch, swale, or other acceptable water management means. This can be accomplished by setting the building grade higher than the surrounding grades, by sloping the grade away from the building, by installing a surface water drainage system, or by a combination of these approaches. The chosen approach should follow generally accepted guidelines, such as the Rational Method of Stormwater Design by David B. Thompson, or other design methods acceptable to the authority having jurisdiction.

A10.1 A-5.7.3.3.(1)(a) Imperfections.

Examples of imperfections include shrinkage cracks, air holes, honeycombing, form-tie cone holes, and form joint ridges.

A10.1 A-5.7.3.4.(1) Dampproofing.

Dampproofing refers to the application of a material or materials to an environmental separation assembly to protect it and the interior space against the transfer of moisture due to the mechanisms of water vapour transmission, capillary action and pressure differences other than hydrostatic pressure.

A dampproofed assembly should be designed such that it can provide short-term resistance to the ingress of water due to occasional hydrostatic pressure from ground water.

A10.1 A-5.8. Required Protection from Noise.

Section 5.8. applies to the separation of dwelling units from other dwelling units and from spaces where noise may be generated with regard to sound transmission irrespective of Clause 5.1.2.1.(1)(b), which deals with the separation of dissimilar environments. It is understood that, at any time, there is the potential for sound levels to be quite different in adjoining dwelling units.

A10.1 A-5.8.1.2. Using ASTC in Lieu of STC.

A designer may choose to use an ASTC rating of equal or higher numerical value than the required STC to show compliance where STC ratings are required.

An ASTC measurement or calculation will always yield a value equal to or lower than the STC for the same configuration, as the ASTC includes flanking transmission.

A10.1 A-5.8.1.4. Methods of Calculating ASTC.

The technical concepts, terminology, and calculation procedures relating to the detailed and simplified ASTC calculation methods are discussed in detail, with numerous worked examples, in the NRC publication entitled "Guide to Calculating Airborne Sound Transmission in Buildings". This Guide includes references to readily-available sources of pertinent data.

For many common constructions, the calculations required by Article 5.8.1.4. can be performed using software tools, such as soundPATHS, which is available on NRC's Web site.

The simplified calculation method may not always identify the prominent flanking paths. Furthermore, it corresponds more closely with the results of the detailed calculation method where the separating assembly and the flanking constructions are both constructed according to the same method, i.e. either both are lightweight construction (steel or wood framing) or both are heavyweight construction (masonry or concrete).

A-5.10.1.1.(1) Selection of Materials and Components and Compliance with Referenced Standards.

Note that Sentence 5.10.1.1.(1) is drafted in such a way that the selection of materials and components is not limited to those traditionally recognized as serving particular functions or those for which a standard is identified in Table 5.10.1.1. This approach permits more flexibility than is provided by similar requirements in Part 9. As long as the selected material meets the performance requirements stated elsewhere in Part 5, the material may be used to serve the required function.

However, where the selected material or component, or its installation, falls within the scope of any of the standards listed in Table 5.10.1.1., the material, component or installation must comply with that standard. For example, if some resistance to heat transfer is required between two interior spaces and standard partition construction will provide the necessary resistance, the installation of one of the "thermal insulation" materials identified in the standard list is not required. If, on the other hand, one decides to install glass fibre insulation, the material must conform to CAN/ULC-S702, "Mineral Fibre Thermal Insulation for Buildings".

A-Table 5.10.1.1. Selection and Installation of Sealants.

Analysis of many sealant joint failures indicates that the majority of failures can be attributed to improper joint preparation and deficient installation of the sealant and various joint components. The following ASTM guidelines describe several aspects that should be considered when applying sealants in unprotected environments to achieve a durable application:

- ASTM C 1193, "Use of Joint Sealants",
- ASTM C 1299, "Selection of Liquid-Applied Sealants",
- ASTM C 1472, "Calculating Movement and Other Effects When Establishing Sealant Joint Width".

The sealant manufacturer's literature should always be consulted for recommended procedures and materials.

A-5.10.2.1.(3) Airtightness and Watertightness of Wired Glass Windows.

Fixed wired glass assemblies are sometimes permitted as closures in vertical fire separations. The airtightness and watertightness requirements are waived for these windows when used in such an application, in recognition of the fact that the availability of assemblies that meet both the requirements of the window standards and the requirements for fire resistance may be limited. However, control of air and water leakage should not be ignored: measures should be taken to attempt to comply with applicable requirements.

A-5.10.2.2. Manufactured Windows, Doors and Skylights.

Design Values

e7 CSA A440S1, "Canadian Supplement to AAMA/WDMA/CSA 101/I.S.2/A440-11, NAFS – North American Fenestration Standard/Specification for Windows, Doors, and Skylights", requires that the individual performance levels achieved by the product for structural resistance, water penetration resistance and air leakage resistance be reported on the product's performance label.

Storm Doors and Windows

Where storm doors and storm windows are not incorporated in a rated window or door assembly, they should be designed and constructed to comply with the applicable requirements of Part 5 regarding such properties as appropriate air leakage and structural loads.

Forced Entry Test

Even though the performance label on rated windows, doors and skylights does not explicitly indicate that the product has passed the forced entry resistance test, products are required to pass this test in order to be rated.

a10.1 A-5.10.2.3.(1) Installation and Field Testing of Windows, Doors and Skylights.

Installation

The installation details of windows, doors, skylights and their components must be appropriately designed and implemented for the building envelope assembly to perform acceptably overall. The proper design of the installation details provides the information necessary to integrate the structure and air, vapour and moisture barrier functions of windows, doors and skylights into the overall design of the building envelope assembly. Construction should be carried out in accordance with these details to achieve an appropriate level of long-term performance. Further guidance on installation detailing can be found in CAN/CSA-A440.4, "Window, Door, and Skylight Installation".

Field Testing

It is recommended that the performance of installed windows, doors and skylights be field tested early in the envelope construction phase so that any discontinuities can be readily identified and corrected before construction of the building envelope assembly is completed. Additional field testing during subsequent construction phases to monitor installation consistency is also recommended. Field test procedures should be carried out in accordance with test standards such as ASTM E783, "Field Measurement of Air Leakage Through Installed Exterior Windows and Doors", and ASTM E1105, "Field Determination of Water Penetration of Installed Exterior Windows, Skylights, Doors, and Curtain Walls, by Uniform or Cyclic Static Air Pressure Difference". Further guidance can be found in Annex D of CAN/CSA-A440.4, "Window, Door, and Skylight Installation", however, the performance requirements developed in AAMA/WDMA/CSA 101/I.S.2/A440, "NAFS – North American Fenestration Standard/Specification for Windows, Doors, and Skylights", should be used rather than the industry performance data values listed in CAN/CSA-A440.4.

A-5.10.2.4.(3) Heat Transfer Through Fire-Rated Glazed Assemblies.

Thermal bridging through fire-rated glazed assemblies should not be ignored; measures should be taken to minimize condensation consistent with the intent of Sentence 5.10.2.4.(2).

a10.1 A-5.10.3.1.(1) Exterior Insulation Finish Systems (EIFS).

The reference to CAN/ULC-S716.1, "Exterior Insulation and Finish Systems (EIFS) – Materials and Systems", in Clause 5.10.3.1.(1)(b) does not preclude the use of other component materials that may also meet the intent of the Code. For example, using mineral-fibre insulation in lieu of other rigid insulation types, mechanical fastening methods for the insulation component in lieu of adhesive, or a type of water-resistive barrier other than a liquid-applied water-resistive barrier could be acceptable.

The following two companion standards facilitate the application of and conformance with CAN/ULC-S716.1:

- CAN/ULC-S716.2, "Exterior Insulation and Finish Systems (EIFS) – Installation of EIFS Components and Water Resistive Barrier", and
- CAN/ULC-S716.3, "Exterior Insulation and Finish System (EIFS) – Design Application".

Additional information on EIFS design and installation can be found in the EIFS Council of Canada's "EIFS Practice Manual" and the manufacturer's literature.

EIFS Selection

CAN/ULC-S716.1 provides minimum performance criteria for EIFS materials and systems that are tested under specific laboratory test protocols identified in the standard. However, compliance with this standard does not ensure that a system is appropriate for all projects. When selecting an EIFS product, designers should consider all relevant criteria—not only those covered by the tests in CAN/ULC-S716.1—including, but not limited to,

- building exposure
- local climate characteristics (wind, precipitation, temperature variations, solar exposure)
- intended building use
- intended resistance to damage and deterioration
- construction tolerances
- constructability

Design and Construction of EIFS Drainage Cavity

The drainage capacity and thermal performance of the EIFS assembly can be affected by the dimensions and configuration of the EIFS drainage cavity.

EIFS are installed over other building materials such as sheathing and primary structural components, which have various construction installation tolerances. Designers should take into consideration the cumulative effects of construction tolerances and sequencing when specifying the drainage method and the cavity dimensions and configuration in order to ensure adequate drainage.

Designers should also take into account the impact of air movement, which varies depending on cavity size and the extent of venting, on the EIFS' thermal performance when reviewing the overall thermal performance of the building envelope. ASTM C 1363, "Thermal Performance of Building Materials and Envelope Assemblies by Means of a Hot Box Apparatus", presents one method for assessing the thermal performance of assemblies.

a10.1 A-5.10.4. Testing Standards for Other Fenestration Assemblies.

Subsection 5.10.4. references ASTM test methods. The following AAMA standards can also be used to evaluate the performance characteristics of other fenestration assemblies:

- AAMA 501, "Test for Exterior Walls",
- AAMA 501.1, "Water Penetration of Windows, Curtain Walls and Doors Using Dynamic Pressure",
- AAMA 501.2, "Quality Assurance and Diagnostic Water Leakage Field Check of Installed Storefronts, Curtain Walls, and Sloped Glazing Systems",
- AAMA 501.4, "Recommended Static Test Method for Evaluating Curtain Wall and Storefront Systems Subjected to Seismic and Wind Induced Interstory Drifts",
- AAMA 501.5, "Thermal Cycling of Exterior Walls", and
- AAMA 501.6, "Recommended Dynamic Test Method for Determining The Seismic Drift Causing Glass Fallout From A Wall System".

a10.1 A-5.10.4.1.(1) Terminology for Other Fenestration Assemblies.

Curtain Wall

A curtain wall is considered to be a continuous wall cladding assembly (which may include fenestration and opaque portions) that is hung away from the edge of the primary floor structure. Curtain wall assemblies do not generally support vertical loads other than their own weight. Anchorage is typically provided by anchors that connect back to the floor structure. Curtain wall assemblies can be either "stick built," meaning each main unit is assembled on-site, or a "unitized" system, meaning factory-assembled main units are installed and connected together on-site.

Window Wall

A window wall is considered to be a wall cladding assembly (which may include fenestration and opaque portions) that spans from the top of a primary floor structure to the underside of the next higher primary floor structure. Window wall assemblies do not generally support vertical loads other than their own weight. Primary provision for anchorage occurs at head and sill connections with the adjoining floor structure. Window wall assemblies may include separate or integral floor edge covers.

Storefront

A storefront is considered to be a non-residential assembly (which may include fenestration and opaque portions) consisting of one or more elements that could include doors, windows and curtain wall framing. Storefronts do not generally support vertical loads other than their own weight. Storefront profiles are typically narrow, rectilinear framing members that hold a combination of pocket glazing and applied glazing stops to securely retain the infills. Vertical framing members typically span the height of one floor or are retained within a structural punched opening.

Storefront assemblies are designed/selected to take into account the anticipated service and exposure conditions, which may be different than for other portions of the building.

Glazed Architectural Structures

Glazed architectural structures are considered glazing assemblies that are supported in a non-traditional manner, such as corner-clamped, point-supported, linear-supported and edge-clamped glazing. Structural support systems can include, but are not limited to, tension cables, tension rods, steel and glass. Glazed architectural structures do not generally support vertical loads other than their own weight. These assemblies are designed/selected to take into account the anticipated service and exposure conditions, which may be different than those for other portions of the building.

Skylights that are not covered by AAMA/WDMA/CSA 101/I.S.2/A440, "NAFS – North American Fenestration Standard/Specification for Windows, Doors, and Skylights," are considered glazed architectural structures.

a10.1 A-5.10.4.2.(1) Structural Loads and Environmental Loads.

The applicable laboratory test method for demonstrating adequate structural performance of other fenestration assemblies is ASTM E330 / E330M, "Structural Performance of Exterior Windows, Doors, Skylights and Curtain Walls by Uniform Static Air Pressure Difference".

a10.1 A-5.10.4.3.(1) Resistance to Condensation.

Notwithstanding that other fenestration assemblies are not fully covered under the testing scope of CSA A440.2, "Fenestration Energy Performance", the test method described therein can be used to evaluate their resistance to condensation, with technical modifications to accommodate differences in the size and configuration of the specimen. It is also common practice to use one cold cycle of AAMA 501.5, "Thermal Cycling of Exterior Walls", to assess the potential for condensation. Both methods can be used for mock-ups in laboratory performance evaluations, however, only the test method in CSA A440.2 should be used if a Temperature Index is required. In most cases, the project specification documents establish the hygrothermal conditions (i.e., exterior temperature, interior temperature, interior relative humidity) for which the potential for condensation should be minimized. Under these conditions, the aforementioned test methods can be used to aid in the selection of the appropriate system performance to minimize the potential for interior surface condensation. In all cases, care should be taken in the construction and configuration of the specimen, as these parameters may have an impact on its thermal performance and resistance to condensation. These parameters may include, without limitation, interior wall construction and finishes, heating systems, ventilation systems, etc., to simulate the actual in-service conditions as closely as practicable.

a10.1 A-5.10.4.4.(2) Air Leakage.

Air Leakage Rate and Test Pressure

A lower air leakage rate and/or higher differential test pressure can be selected for specific applications of other fenestration assemblies where tight control of airflow is required to prevent interstitial condensation (e.g., in concealed spaces), improve thermal comfort (e.g., in hospitals, seniors' residences), or prevent the migration of airborne contaminants (e.g., in food and drug research, manufacturing applications, biological laboratories). It is typical of other fenestration assemblies to be used as the sole building envelope component; where this is the case, a correspondingly higher degree of airtightness may be required.

In addition, higher test pressure differentials can be used to evaluate assemblies with low air leakage, such as non-operable or fixed fenestration systems whose air leakage rates are not easily measurable at the lower standard pressure differentials.

Standard Test Methods

The applicable laboratory test method for determining the rate of air leakage is ASTM E 283, "Determining Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen". If field testing for air leakage is to be conducted, the applicable test method is ASTM E 783, "Field Measurement of Air Leakage Through Installed Exterior Windows and Doors".

a10.1 A-5.10.4.4.(3) Systems Excluded from Air Leakage Requirements.

The systems listed in Sentence 5.10.4.4.(3) perform different functions than other fenestration assemblies and are therefore exempted from complying with the air leakage requirements.

a10.1 A-5.10.4.5.(2) Standard Test Methods.

The applicable laboratory test method for determining the water penetration resistance of curtain walls and storefront assemblies is ASTM E331, "Water Penetration of Exterior Windows, Skylights, Doors, and Curtain Walls by Uniform Static Air Pressure Difference". The applicable laboratory test method for window wall assemblies is either ASTM E331 or ASTM E547, "Water Penetration of Exterior Windows, Skylights, Doors, and Curtain Walls by Cyclic Static Air Pressure Difference".

If field testing for water penetration is to be conducted, the applicable test method is ASTM E 1105, "Field Determination of Water Penetration of Installed Exterior Windows, Skylights, Doors, and Curtain Walls, by Uniform or Cyclic Static Air Pressure Difference".

a10.1 A-5.10.4.5.(3) Water Penetration.

Notwithstanding that other fenestration assemblies are not covered under the testing scope of CSA A440S1, "Canadian Supplement to AAMA/WDMA/CSA 101/I.S.2/A440-11, "NAFS – North American Fenestration Standard/Specification for Windows, Doors, and Skylights", they must be tested at the driving rain wind pressure calculated in accordance with the procedure described therein.

a10.1 A-5.10.4.5.(4) Systems Excluded from Water Penetration Requirements.

The systems listed in Sentence 5.10.4.5.(4) perform different functions than other fenestration assemblies and are therefore exempted from complying with the water penetration requirements.

A-6 Crawl Spaces Used as Warm Air Plenums.

The requirements for crawl spaces used as warm air plenums have not been included in this Part. Crawl spaces may be used as warm air plenums if design measures are taken to prevent moisture, soil or radon gases from entering the crawl space and being distributed throughout the space.

A-6.1.1.1.(2) Repairs and Alterations.

This requirement is to ensure that minimum life safety and health requirements are maintained when the operation and/or design is modified on existing heating, ventilating or air-conditioning systems. For example, this provision would apply to such cases as

(a) the conversion of a heating appliance from oil to gas where venting and clearance requirements differ for chimneys and
(b) the branching of a new duct from a main supply duct in which the new duct now penetrates a fire separation.

A-6.2.1.3. Structural Movement.

This Article is intended to remind designers and installers of mechanical systems of one aspect of the "good engineering practice" referred to in Article 6.2.1.1. In determining how to accommodate structural movement, there are two important principles to bear in mind:

- The prime concern of the Code is the safety of people in and around the building, as opposed to protection of the mechanical systems and equipment.
- The nature of the accommodation will vary with the type of movement being considered, taking into account particularly how often the movement is likely to be encountered over the life of the building.

For example, a gas line supported on columns that also support a crane must be installed in such a way that the movement of the columns, which occurs many times daily, does not cause the lines to break, thus creating a hazard. Even if the gas line installation could somehow be designed to break in a non-hazardous manner, it would hardly be recognized as good engineering practice if movement that occurs so frequently could disrupt the operation of the mechanical system.

On the other hand, earthquakes occur far less frequently and it would not be surprising to have a non-critical mechanical system fail as a result of an earthquake. However, even in this situation, the failure must occur in a manner that does not create a hazard to building occupants. For example, heavy mechanical equipment should be properly anchored so that it does not topple on building occupants during an earthquake. The design of the anchors should take into account accelerations consistent with the seismic data given in MMAH Supplementary Standard SB-1 for the location of the building. Part 4 provides guidance on the calculation of the loads such equipment would exert on the building structure during an earthquake; these same loads can be used in designing the anchors.

Some mechanical equipment can be an important component of post-disaster life safety systems. In these cases, the measures needed to accommodate the movements caused by an earthquake become even more critical since failure of the equipment would not be acceptable. Clearly, complying with this requirement will, in most cases, necessitate close coordination between the mechanical designer and the structural designer.

A-6.2.1.8.(1) Installation - General.

Ducts or pipes without dampers or valves are generally not considered to constitute "equipment" and are therefore not subject to this requirement.

A-6.2.2.1.(2) Minimum Flow Rate of Outdoor Make-up Air.

Except for self-contained mechanical ventilation systems serving a dwelling unit, the minimum flow rate of outdoor make-up air is listed in Table 2 of the ASHRAE 62 "Ventilation for Acceptable Indoor Air Quality" Standard. These values have been chosen to control air contaminants with an adequate margin of safety and to account for health variations among people, and varied activity levels.

A-6.2.2.1.(3) Self-Contained Mechanical Ventilation Systems.

When self-contained mechanical ventilation systems are to be designed under Part 6 instead of Subsection 9.32.3., the reference to Subsection 9.32.3. for conformance is intended to ensure that the principle design objectives of Subsection 9.32.3. (including total ventilation capacity, fan ratings, energy efficiency ratings for heat recovery ventilators, etc.) are met using good engineering practice criteria found in Part 6.

a10.1 A-6.2.2.3.(1) Storage Garages.

Areas where motor vehicles are parked with engine off for extended periods of time, such as car dealership showrooms, are not considered as storage garages.

A-6.2.2.3.(2) Ventilation of Storage Garages.

Storage garages are ventilated to protect occupants from exposure to carbon monoxide and other vehicular exhaust fumes. In certain cases, such as small two- or three-bay storage garages that are used for occasional vehicle storage, and where occupants are not present, carbon monoxide or nitrogen dioxide monitoring devices may be omitted if the ventilation system is interlocked with a local light switch or other controls to ensure continuous system operation whenever the area is occupied. In any event, the ventilation system capacity must be designed to limit the concentrations of carbon monoxide or nitrogen dioxide at or below the prescribed values.

a10.1 A-6.2.2.4. Indoor Air Contaminants.

Contaminants of Concern

Indoor air can contain complex mixtures of contaminants of concern such as formaldehyde, Legionella, mould and emissions from building materials. While some contaminants may be knowingly introduced — as in the case of processing and manufacturing environments—others may be unintentionally released into indoor environments. "Industrial Ventilation: A Manual of Recommended Practice for Design", published by the ACGIH, and the "Exposure Guidelines for Residential Indoor Air Quality", published by Health Canada, are useful references on the control of contaminants in industrial workplace environments and residential settings, respectively. These and other guidelines and manuals should be interpreted while keeping in mind the settings and purposes for which they were developed compared to those to which they will be applied. Note that such documents do not necessarily consider the interactions between various contaminants.

Minimizing the Growth and Spread of Bio-Contaminants

Bio-contaminants, such as bacteria, mould, mildew, fungi, viruses, and pollen, can thrive or be spread by sources like drain pans, spray- water air-washers, contaminated filters, poorly maintained cooling coils, water incursion into ductwork, cafeteria dishwasher drainage leaks, high humidity and stagnant water, potentially causing a wide range of adverse health effects including respiratory allergic reactions, asthma, and infectious diseases ranging from influenza to Legionnaires' disease.

Some of the control measures are as follows:

a) Air-handling equipment should be accessible for the maintenance of filters, cooling coils and condensate drain pans located below the cooling coils. Access doors should be large and easy to open to facilitate thorough and regular maintenance.
b) If moisture is added to building ventilation air to maintain humidity levels in a designated range, humidifiers that inject steam or water vapour into central air-handling units or main supply ducts are normally used. Injection nozzles should not be located in air-handling unit plenums or ductwork that is insulated with internal fibrous lining. If the lining becomes wet, conditions conducive to the growth and spread of bio-contaminants will result.

The above only addresses built-in features of an HVAC system that can help to minimize the growth and spread of bio-contaminants. Even more important than the built-in features is a program of regular maintenance and cleaning of those portions of the system where such growth is likely to occur.

A-6.2.2.4.(1) Removal of Contaminants.

While it is preferable to remove contaminants to the outdoors, if filtering devices are provided and are specifically designed for the purpose to clean the air to an acceptable indoor air quality limit, the cleaned air may be reused.

A-6.2.2.4.(2) Air Contaminants.

Shafts that constitute air ducts or that enclose air ducts used for the movement of environmental air shall not enclose

(a) exhaust ducts used for the removal of smoke- and grease-laden vapours from cooking equipment,
(b) ducts used for the removal of flammable vapours,
(c) ducts used for moving, conveying, or transporting stock, vapour or dust,
(d) ducts used for the removal of non-flammable corrosive fumes and vapours,
(e) refuse and linen chutes, or
(f) piping (except noncombustible piping conveying water or other nonhazardous or nontoxic materials).

A-6.2.2.5.(1) NFPA Publications Pertaining to the Heating, Ventilating and Air-Conditioning of Spaces Containing Hazardous Gases, Dusts or Liquids.

NFPA 30, "Flammable and Combustible Liquids Code"
NFPA 30A, "Motor Fuel Dispensing Facilities and Repair Garages"
NFPA 32, "Drycleaning Plants"
NFPA 33, "Spray Application Using Flammable and Combustible Materials"
NFPA 34, "Dipping and Coating Processes Using Flammable or Combustible Liquids"
NFPA 35, "Manufacture of Organic Coatings"
NFPA 36, "Solvent Extraction Plants"
NFPA 40, "Storage and Handling of Cellulose Nitrate Motion Picture Film"
NFPA 50A, "Gaseous Hydrogen Systems at Consumer Sites"
NFPA 50B, "Liquefied Hydrogen Systems at Consumer Sites,"
NFPA 51, "Design and Installation of Oxygen-Fuel Gas Systems for Welding and Cutting, and Allied Processes"
NFPA 51A, "Acetylene Cylinder Charging Plants"
NFPA 61, "Prevention of Fires and Dust Explosions in Agricultural and Food Processing Facilties"
NFPA 68, "Explosion Protection by Deflagration Venting"
NFPA 69, "Explosion Prevention Systems"
NFPA 85, "Boiler and Combustion Systems Hazards Code"

NFPA 86, "Ovens and Furnaces"
NFPA 88A, "Parking Structures"
NFPA 88B, "Repair Garages"
NFPA 91, "Exhaust Systems for Air Conveying of Vapors, Gases, Mists and Noncombustible Particulate Solids"
NFPA 96, "Ventilation Control and Fire Protection of Commercial Cooking Operations"
NFPA 204, "Smoke and Heat Venting"
NFPA 303, "Marinas and Boatyards"
NFPA 307, "Construction and Fire Protection of Marine Terminals, Piers and Wharfs"
NFPA 409, "Aircraft Hangars"
NFPA 415, "Airport Terminal Buildings, Fueling, Ramp Drainage, Loading Walkways"
NFPA 480, "Storage, Handling, and Processing of Magnesium Solids and Powders"
NFPA 481, "Production, Processing, Handling and Storage of Titanium"
NFPA 482, "Production, Processing, Handling, and Storage of Zirconium"
NFPA 490, "Storage of Ammonium Nitrate"
NFPA 650, "Pneumatic Conveying Systems for Handling Combustible Particulate Solid"
NFPA 651, "Machining and Finishing of Aluminium and the Production of Handling of Aluminum Powders"
NFPA 654, "Prevention of Fire and Dust Explosions from the Manufacturing, Processing, and Handling of Combustible Particulate Solids"
NFPA 655, "Prevention of Sulfur Fires and Explosions"
NFPA 664, "Prevention of Fires and Explosions in Wood Processing and Woodworking Facilities"
NFPA "Fire Protection Guide to Hazardous Materials"

A-6.2.2.7.(1) Ventilation and Venting of Crawl Spaces and Attic or Roof Spaces.

Sentence 6.2.2.7.(1) requires that crawl spaces be ventilated either by natural (above-grade only) or mechanical means. High moisture levels within the crawl space can lead to problems such as the formation of mould, lifting of flooring or long-term damage to structural components. Crawl space ventilation cannot be expected to correct moisture-related problems caused by other factors like inadequate surface drainage from the foundation walls or improper protection against moisture from the ground. These conditions must be properly addressed so that crawl space ventilation can meet its intended objectives.

Several factors favour the use of mechanical ventilation rather than reliance on natural drafts. Local conditions, such as areas with high water tables, may dictate the need for mechanical ventilation to remove excessive moisture.

Crawl spaces should be maintained at a negative pressure relative to the conditioned area above to prevent the migration of moisture into occupied areas. This can be achieved through the use of an exhaust fan and relying on air transfer through floor penetrations, such as pipes.

a10.1 A-6.2.3.4. Duct Coverings and Linings.

The Thermal Insulation Asscoiation of Canada (TIAC) "Mechanical Insulation Best Practices Guide" 2013 edition is a comprehensive source of information on the selection, installation and proper use of thermal insulation materials. (Note that Section 4 of this Guide is not included in the scope of this Note as it contains information on proprietary products, which are not within the mandate of the Code.)

A-6.2.3.8.(5) and (6) Exhausting to Garages.

A frequent practice in the design of ventilation systems serving buildings which have associated parking garages is to discharge exhaust air from the building to the garage in order to reduce the cost of heating the garage or reduce the length of the exhaust ducts. However, this practice entails a certain amount of risk since, when the exhaust system is not running, stack effect may turn the exhaust outlets into intakes and exhaust fumes (including carbon monoxide) can be drawn from the garage into the building. Incorporating a backdraft damper at the exhaust outlet provides some additional protection but backdraft dampers are generally not regarded as being very reliable. Therefore this practice is only permitted in very limited circumstances and one needs to avoid negative pressure in the accessory rooms which are accessible only from the storage garage.

A-6.2.3.8.(6)(c) Air Contaminants.

For the purpose of Clause 6.2.3.8.(6)(c), washroom exhaust air is not considered to contain contaminants that would adversely affect the air quality in the storage garage.

a10.1 A-6.2.3.8. (7) and (18) Exhaust Ducts and Outlets.

Clothes dryers are a major cause of fires in buildings often due to a build-up of lint in the system, which then ignites or obstructs the venting or ventilation. Proper cleaning and regular maintenance of lint traps is directly proportional to the ease of access to the lint traps. It is therefore important to ensure that lint traps in multiple installations of laundry-drying equipment are installed in such a way as to allow easy access for inspection, maintenance, repair and cleaning.

A-6.2.3.8.(10)(b) Operation Diversity Factor.

The operation diversity factor has to be assessed for each specific application. Good engineering practice (see Article 6.2.1.1.) design guidelines can provide information on the subject. Figure A-6.2.3.8.(10)(b), which originates from the ASHRAE handbooks, provides an example of factors that can be used for general applications.

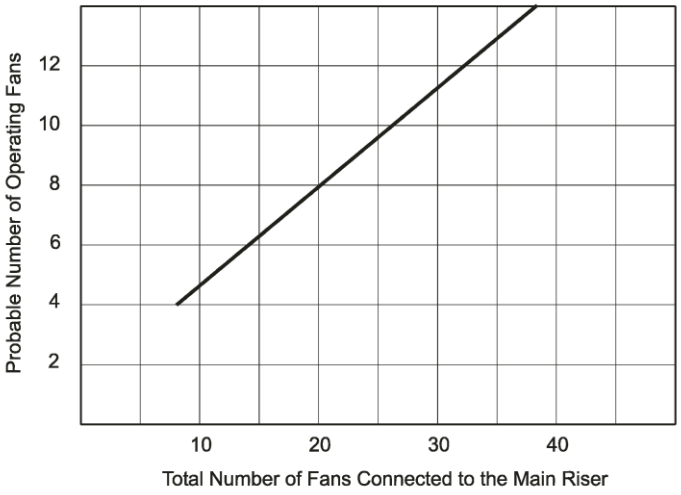


Figure A-6.2.3.8.(10)(b)
Operation Diversity Factor

A-6.2.3.12. Make-Up Air for Exhaust Systems.

When make-up air is introduced into a building in cold weather, it should be preheated when the comfort of people in the air path is a consideration.

a2 A-6.2.4.3.(11) Duct Seal Levels.

Seal Level	Sealing Requirements(1)
A	All transverse joints, longitudinal seams and duct wall penetrations.
B	All transverse joints and longitudinal seams.
C	All transverse joints.
Column 1	2

Notes to Table:

(1) Longitudinal seams are joints oriented in the direction of airflow. Transverse joints are connections of two duct sections oriented perpendicular to airflow. Duct wall penetrations are openings made by any screw fastener, pipe, rod, or wire. Spiral lock seams in ducts and adjustable joints of manufactured elbows need not be sealed. All other connections are considered transverse joints, including but not limited to spin-ins, taps, and other branch connections, access door frames and jambs, duct connections to equipment, etc.

A-6.2.4.4. Warm Air Supply Outlets.

If the heating system is designed to also distribute ventilation air, high inside wall or ceiling outlets with diffusers, and designed for such applications, may be used. In this case, low wall air-returns would be needed.

A-6.2.4.7.(3) Return Air System.

This requirement addresses radiant heat exposure directly between the heat exchanger or any other radiating parts located within the furnace cabinet, and the return air duct material. For the purposes of this Sentence, these parts do not include the furnace casing or cabinet. Clearances around the furnace casing are addressed by the Gas Installation Code and the appliance manufacturer's installation guide.

fitting as possible without interfering with access to fitting joints. Sometimes anchor rods may be used to hold the fitting against the blocks.

A-7.3.5.1.(1) Backfilling of Pipe Trench.

Stronger pipes may be required in deep fill or under driveways, parking lots, etc., and compaction for the full depth of the trench may be necessary.

Bedding is required primarily to provide uniform and adequate longitudinal support under the pipe. All drainage pipe shall be supported in such a manner as to maintain its alignment, and prevent sagging. Blocking alone shall not be used to maintain pipe grading. Bell holes at each joint shall be provided to permit the joint to be assembled properly while maintaining uniform pipe support. A compacted depth of 100 mm to 150 mm is generally sufficient bedding thickness. Ledge or sharp rocks and clods which could damage the pipe cannot be used. In general, select pipe bedding shall consist of a non-cohesive ballast material of which at least 50% will pass a ¼ inch sieve and 100% will pass a ½ inch sieve, and that completely surrounds the pipe by a radial depth of at least 100 mm and that is sufficiently consolidated so that the intended earth loading will not produce further compaction.

A-7.3.5.4.(1) Freeze Protection.

Piping Exposed to Freezing

No water, soil, or waste pipes shall be installed on the exterior of a building or in the uninsulated side of an exterior wall, or in any place where they may be subjected to freezing temperatures, unless adequate provision is made to protect such pipes from freezing (such as applying trace wires or insulation).

a10.1 The Thermal Insulation Association of Canada (TIAC) "Mechanical Insulation Best Practices Guide" 2013 edition is a comprehensive source of information on the selection, installation and proper use of thermal insulation materials. (Note that Section 4 of this Guide is not included in the scope of this Appendix Note as it contains information on proprietary products, which are not within the mandate of the Code.)

Insulation of Buried Piping

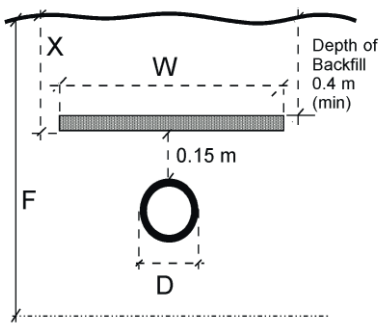
Failures in buried pipe are caused by improper installation, corrosion, poor design, soil movement caused by freeze-thaw situations, to name some of the causes. Designing for frost protection is a consideration in Ontario because all regions experience winter conditions, where temperatures drop below freezing, and it is impractical to bury piping below the depth of frost penetration, insulation may be used to protect the pipe from freezing temperatures.

There are two methods available:

(1) insulation is formed to fit around and encapsulate the pipe, or
(2) a sheet of insulation at some level above the buried pipe.

The type of backfill that is used to bury pipe is most important because this determines how the frost will pass through the backfill and penetrate the buried pipe.

Typical Water Pipe Protection by Horizontal Insulation



The width of a sheet of insulation may be calculated using the following formula: Width of Insulation:

$$W = D + 2\,(F\text{-}X) - 0.3$$

Where:

W = Width of Insulation (m)

D = Outside Diameter of Pipe (m)

X = Insulation Depth (m)

F = Estimated Frost Depth (m)

Having calculated the width of the insulation, the thickness can be found on a chart, similar to the one shown below.

Thickness of Foam Insulation, mm								
Amount of Backfill over the Insulation, m		Design Freezing Index (°C-Days)						
		850	1 125	1 400	1 675	1 950	2 225	2 500
	0.6	50	65	75	90	100	115	125
	0.9	40	50	65	75	90	100	115
	1.2	25	40	50	65	75	90	100
	1.5	25	25	40	50	65	75	90
	1.8	25	25	25	40	50	65	75
	2.1			25	25	40	50	65
	2.4				25	25	40	50
	2.7					25	25	40
	3.0						25	25
Column 1	2	3	4	5	6	7	8	9

A-7.3.5.7. Spatial Separation.

The provisions of this Article are intended to limit the probability that failure of an in-ground building drain or building sewer would lead to the contamination of potable water in a water service pipe.

Sentence (1) requires that a minimum 2 440 mm horizontal clearance be provided between a water service pipe and a building drains or a building sewer.

Sentence (2) describes certain exceptions which would permit the water service pipe to be closer than 2 440 mm to the building drain or building sewer.

Sentence (3) recognizes that in certain instances, the water service pipe and a building drain or building sewer may have to cross each other. In this case, the greatest risk of contamination to the potable water is through joints in the water service pipe under backflow conditions. In order to avoid this, the Code requires that there be no joints in the water service pipe within 2 440 mm horizontally of the intersection with the building drain or building sewer. The illustration below appears to meet this requirement, however it is intended that no joints in the water service line be located within 2 440 mm of the closest point on the building drain/sewer.

a5.1 A-7.6.3.4.(5) Water System Pipe Size.

Where separate water service piping connects into private water supply piping, the private water supply piping will be governed by Article 7.1.5.5.

a10.1 A-7.6.4.1.(3) and (5) Automatic Shut-off of Water Flow.

Examples of water shut-off devices include occupant sensors and self-closing valves.

a10.1 A-7.6.4.1.(4) Automatic Compensating Valves.

When replacing a shower head, the appropriate shower valve with a suitable compensating feature matching the flow rate should be chosen to decrease the possibility that users will suffer thermal shock. The water flow rate of automatic compensating mixing valves can be found in ASSE 1016 / ASME 112.1016 / CSA B125.16, "Performance Requirements for Automatic Compensating Valves for Individual Showers and Tub/Shower Combinations".

e6 A-7.6.4.2.(4) Plumbing Fixtures.

Heritage buildings including homes, may contain sanitary drainage piping that is sized in accordance with the flush cycle of period plumbing fixtures. Operational difficulties maybe encountered when these fixtures are replaced with one having a lower flush cycle.

A-7.6.5. Hot Water Temperature.

Hot water delivered at 60°C will severely burn human skin in 1 to 5 seconds. At 49°C the time for a full thickness scald burn to occur is 10 minutes. Children, the elderly and persons with disabilities are particularly at risk of scald burns. Compliance with Article 7.6.5.2. will reduce the risk of scalding in showers and bathtubs and reduce the risk of thermal shock in wall mounted showers. Devices installed to achieve compliance must conform to the applicable standard referenced in the Code.

Since a scald risk also exists at other fixtures, such as lavatories, sinks and bathtubs, the water outlet temperature at those fixtures is addressed by Articles 7.6.5.1. and 7.6.5.3.

A-8.1.3.1.(1) Sanitary Sewage.

Sanitary sewage of domestic origin is as described in (b) of the definition in Sentence 1.4.1.2.(1) of Division A. The addition of public swimming pool drainage to the definition of sanitary sewage is not intended to allow the discharge of the pool drainage water to an on-site sewage system.

A-8.1.3.1.(3) Evaluation of Waste from Industrial Processes.

When evaluating whether industrial process waste can go to an on-site sewage system, the total contaminant levels in the whole waste stream must be looked at. Heavy metals, pesticides and solvents are not found in domestic sewage and those levels must be brought down if present. The BOD_5 and suspended solids should be consistent with the levels found in domestic sanitary sewage. Slaughterhouses and milking operations have wastes that are similar to domestic sewage in chemical composition, but are characterized by high organic, highly nitrogenous and biologically degradable suspended and dissolved solids and grease in high concentrations. These wastes are not suitable for discharge to an on-site sewage system.

A-8.2.1.2.(1) Site Evaluation Information.

The evaluation required in Sentence (1) usually includes at least the following and is required on permit application

(a) date the evaluation was done,

(b) name, address, telephone number, and signature of the person who prepared the evaluation,

(c) a scaled plan of the site showing

(i) the legal description of the property, property lines and easements,

(ii) the location of items in Column 1 of Tables 8.2.1.6.A. and 8.2.1.6.B.,

(iii) the proposed location of the sewage system,

(iv) the location of any unsuitable, disturbed or compacted areas, and

(v) the access route for tank maintenance,

(d) depth to bedrock,
(e) evidence of high ground water,
(f) soil properties,
(g) soil conditions,
(h) utility corridors,
(i) permeability, and
(j) potential for flooding.

A-8.2.1.2.(2) Alternative Tests.

Other tests to determine percolation time may be suitable depending on the soil type(s) encountered on a site. The results of tests other than those described in this Code may be used by relying on provisions governing the use of alternative solutions (such as Clause 1.2.1.1.(l)(b) of Division A).

A-8.2.1.2.(3) Test Procedure.

Where a field percolation test is required, it is performed in the following manner:

(a) Make an excavation in the soil layer which is to be assessed for a percolation time. The excavation shall be:
  (i) between 100 and 300 mm in diameter
  (ii) be at least 200 mm in depth below the upper level of the soil layer being assessed.
(b) All loose material and smeared clay shall be removed from the sides and bottom of the excavation.
(c) Cover the bottom of the excavation with 50 mm of sand or fine gravel.
(d) Fill the hole with water to a depth of 300 mm (or to the surface) and determine the time it takes for the water to seep away; repeat, and if the second filling seeps away in 10 minutes or less proceed as follows:
  1. Establish a fixed reference point, add water to a depth of 150 mm above the sand or fine gravel, and measure the water drop every 10 minutes for one hour. If for one hour the first 150 mm seeps away in 10 minutes or less, use a shorter time interval between readings.
  2. Refill to the 150 mm level when necessary and start another series of readings. Continue readings until the last two series of readings show a similar drop pattern (approximately equal drop in the same number of readings) or, alternatively, until the difference in the maximum and minimum drops in 3 consecutive readings is less than 5 mm. In either case use the average drop of the last 3 readings in computing "T"
(e) If the initial fillings to 300 mm take more than 10 minutes to seep away, follow with this procedure:
  1. Maintain at least 300 mm of water in the hole for at least 4 hours, or until the soil being tested has become swollen and saturated with water. At least 12 hours should be allowed for swelling in clay soils, although dry clay soils may require longer periods to obtain a stabilized percolation rate.
  2. After swelling remove any loose material from the top of the sand or fine gravel.
  3. Using a fixed reference point, adjust the water level to 150 mm above the sand or gravel and measure the water drop every 30 minutes for four hours or until a stable rate of drop is reached. If the first 150 mm seeps away in less than 30 minutes, use a 10 minute interval and run the test for one hour or until the drop rate is stabilized. A drop of 5 mm or less in a 30 minute interval is indicative of a soil of "T" close to or greater than 50 min/cm. If it is to be assessed increase the reading interval to 60 minutes.
  4. Refill with water to the 150 mm level when necessary. Take readings until a stable rate of drop is reached. This may be when the drop in two successive readings does not vary by more than 1.5 mm or when the difference between the maximum and minimum readings of the last four readings does not exceed 5 mm. Once a stable rate is reached use the average drop of the last 3 readings in computing the percolation time.
(f)

$$\text{Percolation time} = \frac{\text{Time Interval (minutes)}}{\text{Average drop of last 3 readings (cm)}}$$

A-8.2.1.3.(1) and (2) Balancing Tanks.

Where variable daily flows or peak flows occur, the flows to the sewage system may be balanced. The sewage system and any pump(s) that are installed to move the sanitary sewage, should be sized to accommodate a daily design sanitary sewage flow at least equal to the average daily sanitary sewage flow for the week. Balancing tanks should be sized in accordance with good engineering practice to ensure that peak flows can be accommodated.

A-8.2.1.4. Clearance Requirements.

Where coarse natural soils exist it may be necessary to require greater clearance distances to wells or surface water than those listed in the Tables. This is of greater importance when applied to the shoreline properties of sensitive lakes, where it is desired to prevent phosphates from entering the lakes.

a7 A-8.6.2.2. Other Treatment Units.

Article 8.6.2.2. sets out the acceptable solution to achieve Building Code compliance for residential treatment units. Sentences (1) and (2) of Article 8.6.2.2. are the performance requirements that set out the maximum concentrations of suspended solids and CBOD5 for different classifications of treatment units.

As set out in Sentence (5), treatment units that are certified to CAN/BNQ 3680-600, "Onsite Residential Wastewater Treatment Technologies" using a temperature condition listed under option a) or b) of Clause 8.2.2. of that standard are deemed to comply with the requirements of Sentences (1) and (2).

CAN/BNQ 3680-600 uses slightly different terminology than the Building Code. Note (1) to Table 8.6.2.2., which forms part of Sentences 8.6.2.2. (1) and (2), states that the classifications of treatment units specified in Column 1 correspond to the levels of treatment described in CAN/BNQ 3680-600. A Building Code Level II treatment unit corresponds to a treatment Class B-II in CAN/BNQ 3680-600, a Level III corresponds to Class B-III, and Level IV corresponds to a Class B-IV.

CAN/BNQ 3680-600 -2009 requires:

- 12 continuous months of testing in a climate representative of Ontario conditions as specified in Annex B.3. of the standard
- A minimum of weekly sampling
- 30-day average concentrations in treated effluent that do not exceed the maximum concentrations set out in Table 8.6.2.2.
- A minimum of 80% of sample results that do not exceed the maximum concentrations set out in Table 8.6.2.2.
- Influent wastewater quality that meets the requirements described in Table 5 of the standard
- Influent wastewater temperature that is:
  - Non-controlled, or
  - Controlled so that the influent wastewater is heated to no more than 11°C ±1°C,
- Hydraulic loading as specified in Clause 8.2.2.1. of NSF/ANSI Standard 40 and Annex B.4.2.2. of the standard
- Stress loading in accordance with the procedures outlined in CAN/BNQ 3680-600, which includes wash-day stress, power/equipment failure stress, and working parent stress.

Installation of a CAN/BNQ 3680-600 certified residential treatment unit provides a clear and direct method of demonstrating compliance with the effluent quality criteria in Sentences (1) and (2). No further information is required by a principal authority to determine compliance with the effluent quality criteria in Sentences (1) and (2) of this provision.

It is also possible to achieve compliance for residential treatment units which do not have BNQ certification as Sentences (1) and (2) establish performance requirements.

If a residential treatment unit has not been certified to CAN/BNQ 3680-600, the treatment unit must be designed so that the effluent does not exceed, for the level of the treatment unit set out in Column 1 of Table 8.6.2.2., the maximum concentrations set out in Column 2 and 3 of Table 8.6.2.2. The treatment unit would need to be designed so that the effluent will not exceed the maximum concentrations in climatic conditions in the part of Ontario in which the system is to be installed.

The building permit applicant would need to demonstrate to the principal authority that the treatment unit complies with Sentences (1) and (2) for the particular climatic conditions where the unit would be used. It is the responsibility of the principal authority to review and determine compliance to the level of treatment required by Sentences (1) and (2).

Compliance would typically be demonstrated by providing the principal authority with test methods, engineering reports and other relevant documentation similar to that described above for CAN/BNQ 3680-600. Documents that could assist with demonstrating compliance could include:

- name of accredited testing organization,
- trade name of the on-site residential wastewater treatment technology being tested,
- the hydraulic capacity of the treatment unit,
- stress loading in accordance with the procedures outlined in standards such as CAN/BNQ 3680-600,
- the specific model and configuration chosen for the testing, and a comparison to the specific model and configuration being proposed in the permit application and associated scaling factors,
- installation, operation and maintenance manuals,
- the dates of testing and a summary of the results of the tests for all appropriate parameters for the type of treatment for the minimum duration of 12 continuous months, including but not limited to influent and effluent wastewater characteristics such as temperature and pH, number of samples, median, standard deviation, minimum and maximum, and
- an engineering letter, sealed and stamped.

CAN/BNQ 3680-600 only applies to residential systems. For non-residential onsite sewage systems that include treatment units, the applicant would need to demonstrate compliance with Sentences (1) and (2) of Article 8.6.2.2. Non-residential treatment units, therefore, must follow the second approach described above because BNQ certification is only available for residential treatment units. Compliance would typically be demonstrated by providing the principal authority with similar information as noted above.

a7 ## A-8.6.2.2.(5) Temperature Conditions for Testing of Treatment Units.

The temperature options that apply to the testing of treatment units which are certified to BNQ 3680-600 standard are referenced in Sentence 8.6.2.2.(5) of the Code and are set out in option a) and option b) of Clause 8.2.2. of the BNQ standard as follows:

(a) non-controlled temperature

(b) controlled temperature so that the influent wastewater is heated to 11°C ±1°C, whenever necessary to assure a minimum temperature of 10°C.

Note - this option is based on a temperature of 10°C, which is a typical temperature at the outlet of the septic tank and, as well, it is required for testing nitrogen reduction treatment technologies.

Additional treatment options that are available in this standard, but are not currently required by the Building Code, are as follows:

Class of Treatment	Fecal Coliforms or E. Coli (CFU/100 mL)(1)
D-I	50 000
D-II	200
D-III	ND(2)

Notes to Table:

(1) Maximum concentration in CFU/100 mL based on 30 day average.

(2) ND means non-detectable (median < 10 CFU/100 mL)

Class of Treatment	Total Phosphorus(1), mg/L	Total Nitrogen Reduction
P-I	1.0	—
P-II	0.30	—
N-I	—	50%
N-II	—	75%

Notes to Table:
(1) Maximum concentration in mg/L based on 30 day average.

A-8.7.4.2.(1) Fill Material.

Any leaching bed fill added to meet the requirements of 8.7.4.2.(1) shall be regarded as part of the sewage system and this fill must be contained on the lot or parcel of land in which the sewage system is located.

A-8.7.5.3.(2) Spacing of Distribution Pipes.

In order to evenly apply the effluent when a filter bed is used, the maximum spacing of distribution pipes should not be greater than 1.2 m.

A-8.7.6.1. Trench Construction.

Care must be taken when constructing a shallow buried trench system. Soils have to be dry and protected to ensure smearing of the trench does not take place. If smearing does take place additional measure will need to be undertaken to ensure that the permeability of the soil is not affected in the trench.

a3 A-8.7.7.1.(5) Extension of Sand Layer.

Where the underlying soil has a percolation time greater than 15 minutes, Sentence (5) requires the sand layer described in Sentence (4) be extended 15 m beyond the perimeter of the treatment unit in any direction that the effluent may move horizontally. Consideration may be given to whether the top 300 mm of native soil has the properties required in Sentence (4) prior to removing the existing soil and replacing with sand.

This would also apply to the additional loading area required in Clause (5)(b) of QT/400.

a3 A-8.7.7.1.(8) Open Bottom Treatment Units.

Where an open bottom treatment unit is used in conjunction with a Type A dispersal bed, the placement of the unit is important to achieve even distribution and consideration may be given to the following:

1) the treatment unit is placed in the centre of the stone layer where the topography is flat, or
2) uphill of the centre of the stone layer on sloping topography.

A-8.7.8.3. Type B Dispersal Beds.

The design of a Type B dispersal bed may be based on the use of Table 2-8 of the BCMOH Sewerage System Standard Practice Manual. The Building Code requires the effluent to be of Level IV effluent for a Type B dispersal bed. The loading rates to be used pertain to Type 2 effluent within Table 2-8. The percolation time given in this Table is in min/2.54 cm (inch) not min/cm and must be converted by dividing by 2.54.

A-9.1.1.9. Factory-Built Buildings.

Manufactured buildings intended for residential occupancy must comply with all appropriate Code requirements. Only those building components that are designed and constructed in manufacturing plants in accordance with the specified standards (CSA Z240.2.1 and CSA A277) are deemed to comply with the Code. Building components designed and constructed outside the place of manufacture (e.g. masonry chimneys, basement stairs, foundations, etc.) must conform to the requirements of the Code. The Code also applies to the site installation of manufactured buildings in terms of tie-down, spatial separation, grading, plumbing connections to street services, etc.

CSA standard CSA A277, "Procedures for Factory Certification of Buildings", describes a procedure whereby an independent certification agency can review the quality control procedures of a housing factory and make periodic, unannounced inspections of its products and thus, through suitable labelling, provide assurance to authorities at the final site that the components that cannot be inspected on site comply with the code indicated on the label. It is not a building code, only a procedure for certifying compliance of factory-built components with a building code or other standard. If a factory-built house bears the label of a creditable certification agency indicating that compliance with the National Building Code has been certified using the A277 procedure, the accepting authority will have some assurance that the hidden components do not need to be inspected again on site.

a10.1 A-9.3.1.7. Ratio of Water to Cementing Material.

While adding water to concrete on site may facilitate its distribution through formwork, this practice can have several undesirable results, such as reduced strength, greater porosity, and more propensity to shrinkage cracking. The ratio of water to cementing material is determined according to weight. For example, using Table 9.3.1.7., the maximum water-cement ratio of 0.45 for a 20 mm coarse aggregate would require 18 kg (or 18 L) of water (1 L of water weighs 1 kg).

roof area of the overall structure exceeds 4 550 m^2. Thus, the simplified specified snow load calculation may be used for typical townhouse construction but would not be appropriate for much larger commercial or industrial buildings, for example.

The simplified specified snow loads are also not designed to take into account roof configurations that seriously exacerbate snow accumulation. This does not pertain to typical projections above a sloped roof, such as dormers, nor does it pertain to buildings with higher and lower roofs. Although two-level roofs generally lead to drift loading, smaller light-frame buildings constructed according to Part 9 have not failed under these loads. Consequently, the simplified calculation may be used in these cases. Rather, this limitation on application of the simplified calculation pertains to roofs with high parapets or significant other projections above the roof, such as elevator penthouses, mechanical rooms or larger equipment that would effectively collect snow and preclude its blowing off the roof.

The reference to Article 9.4.3.1. invokes, for roof assemblies other than common lumber trusses, the same performance criteria for deflection.

The unit weight of snow on roofs, γ, obtained from measurements at a number of weather stations across Canada varied from about 1.0 to 4.5 kN/m^3. An average value for use in design in lieu of better local data is $\gamma = 3.0$ kN/m^3. In some locations the unit weight of snow may be considerably greater than 3.0 kN/m^3. Such locations include regions where the maximum snow load on the roof is reached only after contributions from many snowstorms, coastal regions, and regions where winter rains are considerable and where a unit weight as high as 4.0 kN/m^3 may be appropriate.

[a5] A-9.4.2.3.(1) Accessible Platforms Subject to Snow and Occupancy Loads.

Many platforms are subject to both occupancy loads and snow loads. These include balconies, decks, verandas, flat roofs over garages and carports. Where such a platform, or a segregated area of such a platform, serves a house or an individual dwelling unit, it must be designed for the greater of either the specified snow load or an occupancy load of 1.9 kPa. Where the platform serves more than one house or an individual dwelling unit or an occupancy other than a residential occupancy, higher occupancy loads will apply, as specified in Table 4.1.5.3.

A-9.4.2.4.(1) Specified Loads for Attics or Roof Spaces with Limited Accessibility.

Typical residential roofs are framed with roof trusses and the ceiling is insulated.

Residential trusses are placed at 600 mm on centre with web members joining top and bottom chords. Lateral web bracing is installed perpendicular to the span of the trusses. As a result, there is limited room for movement inside the attic or roof space or for storage of material. Access hatches are generally built to the minimum acceptable dimensions, further limiting the size of material that can be moved into the attic or roof space.

With exposed insulation in the attic or roof space, access is not recommended unless protective clothing and breathing apparatus are worn.

Thus, the attic or roof space is recognized as uninhabitable and loading can be based on actual dead load. In emergency situations or for the purpose of inspection, it is possible for a person to access the attic or roof space without over-stressing the truss or causing damaging deflections.

A-Table 9.4.4.1. Classification of Soils.

Sand or gravel may be classified by means of a picket test in which a 38 mm by 38 mm (2" x 2") picket bevelled at the end at 45° to a point is pushed into the soil. Such material is classified as “dense or compact” if a man of average weight cannot push the picket more than 200 mm into the soil and “loose” if the picket penetrates 200 mm or more.

Clay and silt may be classified as “stiff” if it is difficult to indent by thumb pressure, “firm” if it can be indented by moderate thumb pressure, “soft” if it can be easily penetrated by thumb pressure, where this test is carried out on undisturbed soil in the wall of a test pit.

A-9.4.4.4.(1) Soil Movement.

In susceptible soils, changes in temperature or moisture content can cause significant expansion and contraction. Soils containing pyrites can expand simply on exposure to air.

Expansion and Contraction due to Moisture

Clay soils are most prone to expansion and contraction due to moisture. Particularly wet seasons can sufficiently increase the volume of the soil under and around the structure to cause heaving of foundations and floors-on-ground, or cracking of foundation walls. Particularly dry seasons or draw-down of water by fast-growing trees can decrease the volume of the soil supporting foundations and floors-on-ground, thus causing settling.

Frost Heave

Frost heave is probably the most commonly recognized phenomenon related to freezing soil. Frost heave results when moisture in frost-susceptible soil (clay and silt) under the footings freezes and expands. This mechanism is addressed by requirements in Section 9.12. regarding the depth of excavations.

Ice Lenses

When moisture in frost-susceptible soils freezes, it forms an ice lens and reduces the vapour pressure in the soil in the area immediately around the lens. Moisture in the ground redistributes to rebalance the vapour pressures providing more moisture in the area of the ice lens. This moisture freezes to the lens and the cycle repeats itself. As the ice lens grows, it exerts pressure in the direction of heat flow. When lenses form close to foundations and heat flow is toward the foundation - as may be the case with unheated crawl spaces or open concrete block foundations insulated on the interior- the forces may be sufficient to crack the foundation.

Adfreezing

Ice lenses can adhere themselves to cold foundations. Where heat flow is essentially upward, parallel to the foundation, the pressures exerted will tend to lift the foundation. This may cause differential movement or cracking of the foundation. Heat loss through basement foundations of cast-in-place concrete or concrete block insulated on the exterior appears to be sufficient to prevent adfreezing. Care must be taken where the foundation does not enclose heated space or where open block foundations are insulated on the interior. The installation of semi-rigid glass fibre insulation has demonstrated some effectiveness as a separation layer to absorb the adfreezing forces.

Pyrites

Pyrite is the most common iron disulphide mineral in rock and has been identified in rock of all types and ages. It is most commonly found in metamorphic and sedimentary rock, and especially in coal and shale deposits.

Weathering of pyritic shale is a chemical-microbiological oxidation process that results in volume increases that can heave foundations and floors-on-ground. Concentrations of as little as 0.l% by weight have caused heaving. Weathering can be initiated simply by exposing the pyritic material to air. Thus, building on soils that contain pyrites in concentrations that will cause damage to the building should be avoided, or measures should be taken to remove the material or seal it. Material containing pyrites should not be used for backfill at foundations or for supporting foundations or floors-on-ground.

Where it is not known if the soil or backfill contains pyritic material in a deleterious concentration, a test is available to identify its presence and concentration.

References:

(1) Legget, R.F. and Crawford, C.B. Trees and Buildings. Canadian Building Digest 62, Division of Building Research, National Research Council Canada, Ottawa, 1965.
(2) Hamilton, J.J. Swelling and Shrinking Subsoils. Canadian Building Digest 84, Division of Building Research, National Research Council Canada, Ottawa, 1966.
(3) Hamilton, J.J. Foundations on Swelling and Shrinking Subsoils. Canadian Building Digest 184, Division of Building Research, National Research Council Canada, Ottawa, 1977.
(4) Penner, W., Eden, W.J., and Gratten-Bellew, P.E. Expansion of Pyritic Shales. Canadian Building Digest 152, Division of Building Research, National Research Council Canada, Ottawa, 1975.

(5) Swinton, M.C., Brown, W.C., and Chown, G.A. Controlling the Transfer of Heat, Air and Moisture through the Building Envelope. Small Buildings - Technology in Transition, Building Science Insight '90, Institute for Research in Construction, National Research Council Canada, Ottawa, 1990.

A-9.4.4.6. and A-9.15.1.1. Loads on Foundations.

The prescriptive solutions provided in Part 9 relating to footings and foundation walls only account for the loads imposed by drained earth. Drained earth is assumed to exert a load equivalent to the load that would be exerted by a fluid with a density of 480 kg/m^3. The prescriptive solutions do not account for surcharges from saturated soil or additional loads from heavy objects located adjacent to the building. Where such surcharges are expected, the footings and foundation walls must be designed and constructed according to Part 4.

A-9.5.1.4. Combination Rooms.

If a room draws natural light and natural ventilation from another area, the opening between the two areas must be large enough to effectively provide sufficient light and air. This is why a minimum opening of 3 m^2 is required, or the equivalent of the area of a set of double doors. The effectiveness of the transfer of light and air also depends on the size of the transfer opening in relation to the size of the dependent room; in measuring the area of the wall separating the two areas, the whole wall on the side of the dependent room should be considered, not taking into account offsets that may be in the surface of the wall.

The opening does not necessarily have to be in the form of a doorway; it may be an opening at eye level. However, if the dependent area is a bedroom, provision must be made for the escape window required by Article 9.7.1.3. to fulfill its safety function. This is why a direct passage is required between the bedroom and the other area; the equivalent of at least a doorway is therefore required for direct passage between the two areas.

e2.1 A-9.5.2.3.(1) Stud Wall Reinforcement.

This provision for future attachment of grab bars in the main bathroom of a residential occupancy including houses requires the installation of suitable blocking in the stud wall. Sentence 9.31.2.3.(1) specifies the required load resistance. Also, see Appendix Note A-3.3.4.9.(1).

e7 A-9.6.1.2.(2) Mirrored Glass Doors.

Standard CAN/CGSB-82.6-M, "Doors, Mirrored Glass, Sliding or Folding, Wardrobe", covers mirrored glass doors for use on reach-in closets. It specifies that such doors are not to be used for walk-in closets.

a10.1 A-9.6.1.3.(2) Maximum Glass Area.

Tables 9.6.1.3.A. to 9.6.1.3.F. are based on CAN/CGSB-12.20-M, "Structural Design of Glass for Buildings", and the wind load provisions in Article 4.1.7.3. The maximum glass area values given in these Tables are intended to be equal to or smaller than those that would be determined using the standard and wind load provisions directly to design for each individual case.

a10.1 A-Table 9.6.1.3.G. Glass in Doors.

Maximum areas in Table 9.6.1.3.G. for other than fully tempered glazing are cut off at 1.50 m^2, as this would be the practical limit after which safety glass would be required by Sentence 9.6.1.4.(2).

A-9.7.3.2.(1)(a) Minimizing Condensation.

The total prevention of condensation on the surfaces of fenestration products is difficult to achieve and, depending on the design and construction of the window or door, may not be absolutely necessary. Clause 9.7.3.2.(1)(a) therefore requires that condensation be minimized, which means that the amount of moisture that condenses on the inside surface of a window, door or skylight, and the frequency at which this occurs, must be limited. The occurrence of such condensation must be sufficiently rare, the accumulation of any water must be sufficiently small, and drying must be sufficiently rapid to prevent the deterioration of moisture-susceptible materials and the growth of fungi.

A-9.7.4.2.(1) Standards Referenced for Windows, Doors and Skylights.

Canadian Requirements in the Harmonized Standard

In addition to referencing the Canadian Supplement, CSA A440S1, "Canadian Supplement to AAMA/WDMA/CSA 101/I.S.2/A440, "NAFS - North American Fenestration Standard/Specification for Windows, Doors, and Skylights," the Harmonized Standard, AAMA/WDMA/CSA 101/I.S.2/A440, "NAFS - North American Fenestration Standard/Specification for Windows, Doors, and Skylights," contains some Canada-specific test criteria.

Standards Referenced for Excluded Products

Clause 1.1, General, of the Harmonized Standard defines the limits to the application of the standard with respect to various types of fenestration products. A list of exceptions to the application statement identifies a number of standards that apply to excluded products. Compliance with those standards is not required by the Code; the references are provided for information purposes only.

Label Indicating Performance and Compliance with Standard

The Canadian Supplement requires that a product's performance ratings be indicated on a label according to the designation requirements in the Harmonized Standard and that the label include

- design pressure, where applicable,
- negative design pressure, where applicable,
- water penetration test pressure, and
- the Canadian air infiltration and exfiltration levels.

It should be noted that, for a product to carry a label in Canada, it must meet all of the applicable requirements of both the Harmonized Standard and the Canadian Supplement, including the forced entry requirements.

Water Penetration Resistance

For the various performance grades listed in the Harmonized Standard, the corresponding water penetration resistance test pressures are a percentage of the design pressure. For R-class products, water penetration resistance test pressures are 15% of design pressure. In Ontario, driving rain wind pressures (DRWP) have been determined for the locations listed in MMAH Supplementary Standard SB-1.

To achieve equivalent levels of water penetration resistance for all locations, the Canadian Supplement includes a provision for calculating specified DRWP at the building site considering building exposure. Specified DRWP values are, in some cases, greater than 15% of design pressure and, in other cases, less than 15% of design pressure. For a fenestration product to comply with the Code, it must be able to resist the structural and water penetration loads at the building site. Reliance on a percentage of design pressure for water penetration resistance in the selection of an acceptable fenestration product will not always be adequate. Design pressure values are reported on a secondary designator, which is required by the Canadian Supplement to be affixed to the window. The DRWP given in the Canadian Supplement should be used for all products covered in the scope of the Harmonized Standard.

Uniform Load Structural Test

The Harmonized Standard specifies that fenestration products be tested at 150% of design pressure for wind (specified wind load) and that skylights and roof windows be tested at 200% of design pressure for snow (specified snow load). With the change in the 2006 Building Code to a 1-in-50 return period for wind load, a factor of 1.4 rather than 1.5 is now applied for wind. The Building Code has traditionally applied a factor of 1.5 rather than 2.0 for snow. Incorporating these lower load factors into the Code requirements for fenestration would better reflect acceptable minimum performance levels; however, this has not been done in order to avoid adding complexity to the Code, to recognize the benefits of Canada-US harmonization, and to recognize that differentiation of products that meet the Canadian versus the US requirements would add complexity for manufacturers, designers, specifiers and regulatory officials.

Condensation Resistance

The Harmonized Standard identifies three test procedures that can be used to determine the condensation resistance of windows and doors. Only the physical test procedure given in CSA A440.2, which is referenced in Table 9.7.3.3., can be used to establish Temperature Index (I) values. Computer simulation tools can also be used to estimate the relative condensation resistance of windows, but these methods employ different expressions of performance known as Condensation Resistance Factors (CR). I and CR values are not interchangeable.

Where removable multiple glazing panels (RMGP) are installed on the inside of a window, care should be taken to hermetically seal the RMGP against the leakage of moisture-laden air from the interior into the cavity on the exterior of the RMGP because the moisture transported by the air could lead to significant condensation on the interior surface of the outside glazing.

Basement Windows

a10.1 Clause 12.4.2, Basement Windows, of the Harmonized Standard refers to products that are intended to meet Code requirements for ventilation and emergency egress. The minimum test size of 800 mm x 360 mm (total area of 0.288 m^2) specified in the standard will not provide the minimum openable area required by the Code for bedrooms (i.e. 0.35 m^2 with no dimension less than 380 mm) and the means to provide minimum open area identified in the standard is inconsistent with the requirements of the Code (see Subsection 9.9.10. for bedroom windows). The minimum test size specified in the standard will also not provide the minimum ventilation area of 0.28 m^2 required for non-heating-season natural ventilation (see Article 9.32.2.2.).

Greenhouse Windows

Greenhouse-type windows feature a sloped, roof-like top portion, which is subjected to the same snow loads as roofs. The Canadian Supplement only applies the snow load calculation to skylights, which do not include greenhouse windows according to the definition for skylights given in the Canadian Supplement and the Harmonized Standard. Where such windows are used, it is recommended that snow loads on the top portion of the window be taken into account.

a10.1 Performance of Doors: Limited Water Ingress Control.

While the control of precipitation ingress is a performance requirement for exterior doors, side-hinged doors can comply with the referenced standard. AAMA/WDMA/CSA 101/I.S.2/A440, "NAFS – North American Fenestration Standard/Specification for Windows, Doors, and Skylights", when tested at a pressure differential of 0 Pa (0.0 psf) or higher, but less than the minimum test pressure required for the indicated performance class and performance grade. Such doors are identified with a "Limited Water" (LW) rating on the product label.

There is no restriction on the use of side-hinged doors having a limited water designation when the tested water penetration resistance of such doors is equal to or greater than the specified Driving Rain Wind Pressure for the building location, as stated in Clause A.4.4 of CSA A440S1, "Canadian Supplement to AAMA/WDMA/CSA 101/I.S.2/A440, NAFS – North American Fenestration Standard/Specification for Windows, Doors, and Skylights". When an LW door does not have sufficient water penetration resistance for the building location, Clause B.5.3.3 of CSA A440S1 states that these doors should only be used and installed in a protected location, such as under a porch roof. Other protected locations would be behind a storm door, or a door separating conditioned space from unconditioned space, such as in cold storage rooms. The Exposure Nomograph in Annex A of CAN/CSA-A440.4, "Window, Door, and Skylight Installation", provides an acceptable method to determine whether a door is considered protected, which depends on overhang ratio, and the terrain and moisture index of the building location. A door with an LW rating and a low exposure could provide acceptable water penetration resistance. However, given that the Exposure Nomograph in Annex A of CAN/CSA-A440.4 does not account for the intensity of wind driven rain, a door with an LW rating may not provide appropriate protection in some locations. In such cases, the risk of water penetration may remain the same as if the overhead protection were not provided.

A-9.7.5.2.(1) Forced Entry Via Glazing in Doors and Sidelights.

There is no mandatory requirement that special glass be used in doors or sidelights, primarily because of cost. It is, however, a common method of forced entry to break glass in doors and sidelights to gain access to door hardware and unlock the door from the inside. Although insulated glass provides increased resistance over single glazing, the highest resistance is provided by laminated glass. Tempered glass, while stronger against static loads, is prone to shattering under high, concentrated impact loads.

Laminated glass is more expensive than annealed glass and must be used in greater thicknesses. Figure A-9.7.5.2.(1) shows an insulated sidelight made of one pane of laminated glass and one pane of annealed glass. This method reduces the cost premium that would result if both panes were laminated.

Consideration should be given to using laminated glazing in doors and accompanying sidelights regulated by Article 9.6.1.3., in windows located within 900 mm of locks in such doors, and in basement windows.

Underwriters' Laboratories of Canada have produced ULC-S332, “Burglary Resisting Glazing Material”, which provides a test procedure to evaluate the resistance of glazing to attacks by thieves. While it is principally intended for plate glass show windows, it may be of value for residential purposes.

e6 A-9.8.8.5.(1) and (2) Risk of Falling Through Guards.

The risk of falling through a guard is especially prevalent for children. Therefore, the requirements are stringent for guards in all buildings except industrial buildings, where children are unlikely to be present except under strict supervision.

A-9.8.8.5.(3) Risk of Children Getting Their Heads Lodged Between Balusters.

The requirements to prevent children falling through guards also serve to provide adequate protection against this problem. However, guards are often installed where they are not required by the Code; i.e., in places where the difference in elevation is less than 600 mm. In these cases, there is no need to require the openings between balusters to be less than 100 mm. However, there is a range of openings between 100 mm and 200 mm in which children can get their heads stuck. Therefore, openings in this range are not permitted except in buildings of industrial occupancy, where children are unlikely to be present except under strict supervision.

A-9.8.8.6. Risk of Children Climbing Over Guards.

Guards are sometimes constructed with horizontal or near-horizontal members between balusters such that a ladder effect is achieved. This can be very tempting for young children to climb, thus exposing themselves to risk of falling over the guard. Such construction is not permitted for required guards in buildings of residential occupancy.

a2.1 A-9.8.9.6. Finish for Treads, Landings and Ramps.

A tactile indicator strip signals a warning to people with no or low vision that they are approaching a change in level. The strip is set back from the leading edge of the stair to provide sufficient warning of the change in level in advance. Also, see Appendix Note A-3.4.6.1.(2).

A-9.9.4.5.(1) Openings in Exterior Walls of Exits.

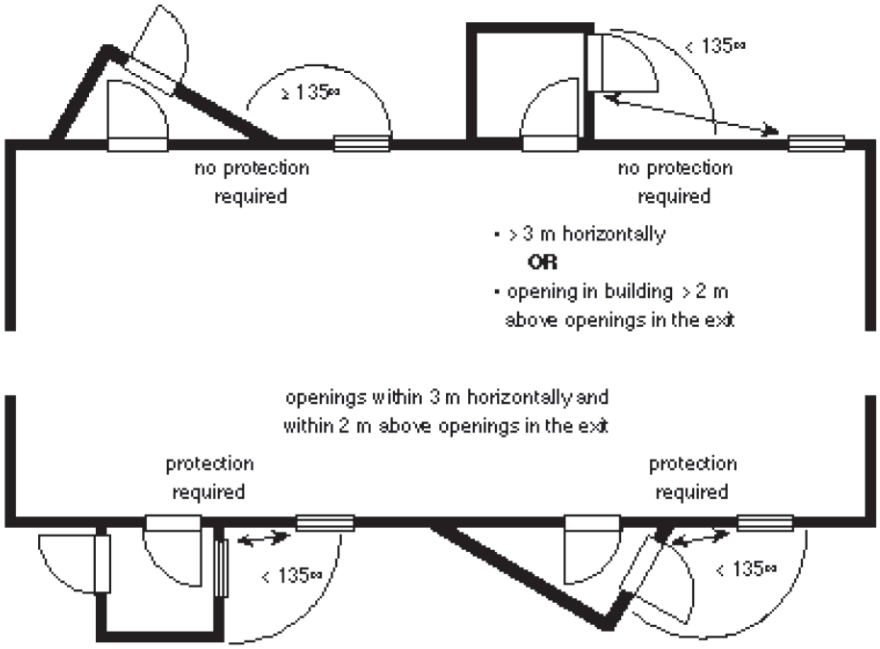


Figure A-9.9.4.5.(1)
Protection of Openings in Exterior Walls of Exits

A-9.9.8.4.(1) Independent and Remote Exits.

a10.1 Subsection 9.9.8. requires that some floor areas have more than one exit. The intent is to ensure that, if one exit is made untenable or inaccessible by a fire, or its exterior door is blocked by an exterior incident, one or more other exits will be available to permit the occupants to escape. However, if the exits are close together, all exits might be made untenable or inaccessible by the same fire. Sentence 9.9.8.4.(1), therefore, requires at least two of the exits to be located remotely from

each other. This is not a problem in many buildings falling under Part 9. For instance, apartment buildings usually have exits located at either end of long corridors. However, in other types of buildings (e.g., dormitory and college residence buildings) this is often difficult to accomplish and problems arise in interpreting the meaning of the word "remote". Article 3.4.2.3. is more specific, generally requiring the distance between exits to be one half the diagonal dimension of the floor area or at least 9 m. However, it is felt that such criteria would be too restrictive to impose on the design of all the smaller buildings which are governed by Part 9. Nevertheless, the exits should be placed as far apart as possible and the Part 3 criteria should be used as a target. Designs in which the exits are so close together that they will obviously both become contaminated in the event of a fire are not acceptable.

A-9.9.10.1.(1) Bedroom Window Opening Areas and Dimensions.

Although the minimum opening dimensions required for height and width are 380 mm, a window opening that is 380 mm by 380 mm would not comply with the minimum area requirements. (See Figure A-9.9.10.1.(1))

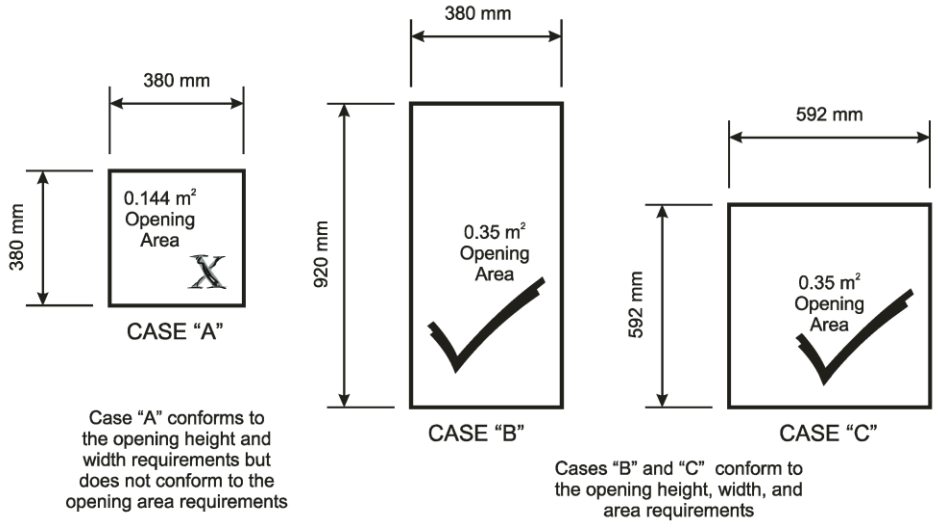


Figure A-9.9.10.1.(1)
Window Opening Areas and Dimensions

A-9.9.10.1.(2) Bedroom Window Height.

Sentence 9.9.10.1.(2) requires every floor level which contains a bedroom to have at least one window or door to the exterior that is large enough and easy enough to open that it can be used as an exit in case of a fire. However, Article 9.9.10.1. does not set a maximum sill height for such a window in a basement area. It is recommended that the sills of windows intended for use as emergency exits from basement bedroom areas be not higher than 1.5 m above the floor. Sometimes it is difficult to avoid having the sill higher than this; e.g., skylights, windows in basement bedrooms. In these cases, it is recommended that access to the window be improved by some means such as built-in furniture installed below the window. (See Figure A-9.9.10.1.(2))

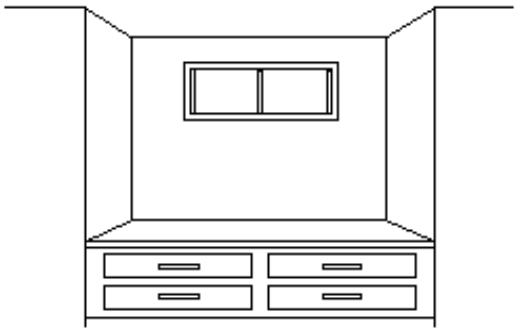


Figure A-9.9.10.1.(2)
Built-in Furniture to Improve Access to a Window

A-9.10.19.3.(1) Location of Smoke Alarms.

Statistics have shown that next to kitchen fires, fires originating in bedrooms within dwelling units account for the second highest causes of fire deaths in homes.

The requirement for smoke alarms in sleeping rooms (bedrooms) provides early detection and warning of fires originating in sleeping rooms. Smoke alarms located outside sleeping rooms are required as they are better capable of detecting a fire originating outside of the room.

A smoke alarm is not required on each level in a split-level dwelling unit as each level does not count as a separate storey. Determine the number of storeys in a split-level dwelling unit and which levels are part of which storey as follows:

1. establish grade, (See definition of "grade" in Sentence 1.4.1.2.(1) of Division A.);
2. identify the first storey, (See definition of "first storey" in Sentence 1.4.1.2.(1) of Division A.);
3. identify the basement, (See definition of "basement" in Sentence 1.4.1.2.(1) of Division A.);
4. identify the second storey and, where applicable, the third storey.

Additional Smoke Alarms Outside of Sleeping Areas

As a minimum, one smoke alarm is required to be installed on each storey, preferably on the upper level of each one. As noted above, however, when the dwelling unit contains more than one sleeping area, a smoke alarm must be installed to serve each area. Where the sleeping areas are on two levels of a single storey in a split-level dwelling unit, an additional smoke alarm must be installed so that both areas are protected. See Figure A-9.10.19.3.(1).

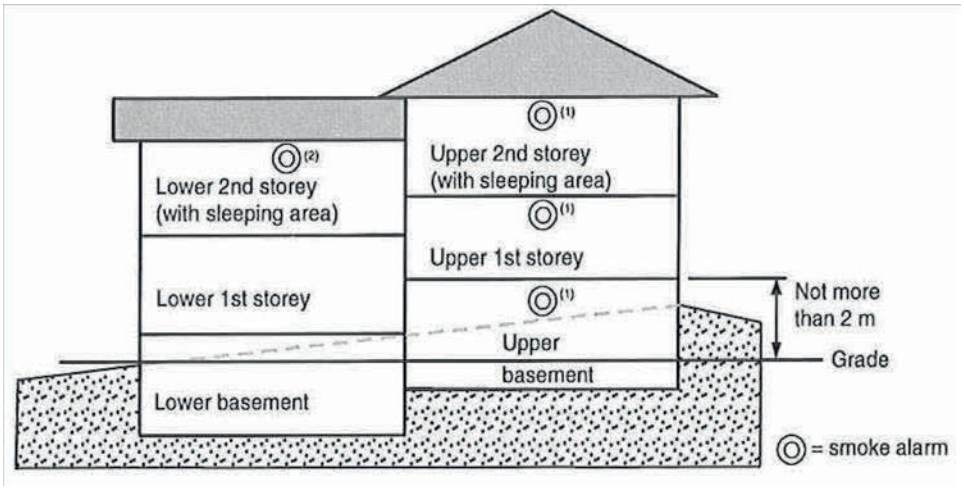


Figure A-9.10.19.3.(1)
Two-Storey Split-Level Building

Notes to Figure A-9.10.19.3.(1):

(1) One smoke alarm required lor each of the basement, first storey and second storey.
(2) An additional smoke alarm is required on the lower level of the second storey outside the sleeping rooms.

A-9.10.20.3.(1) Fire Department Access Route Modification.

In addition to other considerations taken into account in the planning of fire department access routes, special variations could be permitted for a house or residential building that is protected with an automatic sprinkler system. The sprinkler system must be designed in accordance with the appropriate NFPA standard and there must be assurance that water supply pressure and quantity are unlikely to fail. These considerations could apply to buildings that are located on the sides of hills and are not conveniently accessible by roads designed for fire fighting equipment and also to infill housing units that are located behind other buildings on a given property.

a10.1 A-9.10.22. Clearances from Gas, Propane and Electric Cooktops.

The Electrical Safety Code adopted under Ontario Regulation 164/99 (Electrical Safety Code), and Ontario Natural Gas Code address clearances directly above, in front of, behind and beside ranges. Where side clearances are zero, the standards do not address clearances to building elements located both above the level of the range elements or burners and to the side of the appliance. Through reference to the Electrical Safety Code adopted under Ontario Regulation 164/99 (Electrical Safety Code) and the requirements in Articles 9.10.22.2. and 9.10.22.3., the Building Code addresses all clearances. Where clearances are addressed by the Building Code and the Electrical Safety Code adopted under Ontario Regulation 164/99 (Electrical Safety Code) or Ontario Natural Gas Code, conformance with all relevant criteria is achieved by compliance with the most stringent criteria.

Installation of Microwave Ovens Over Cooktops

The minimum vertical clearances stated in Article 9.10.22.2. apply only to combustible framing, finishes and cabinets. They do not apply to microwave ovens installed over cooktops nor to range hoods. Microwave ovens must comply with CAN/CSA-C22.2 NO. 150, "Microwave Ovens", which is referenced in the Electrical Safety Code adopted under Ontario Regulation 164/99 (Electrical Safety Code). This standard includes tests to confirm that the appliance will not present a hazard when installed according to the manufacturer's instructions.

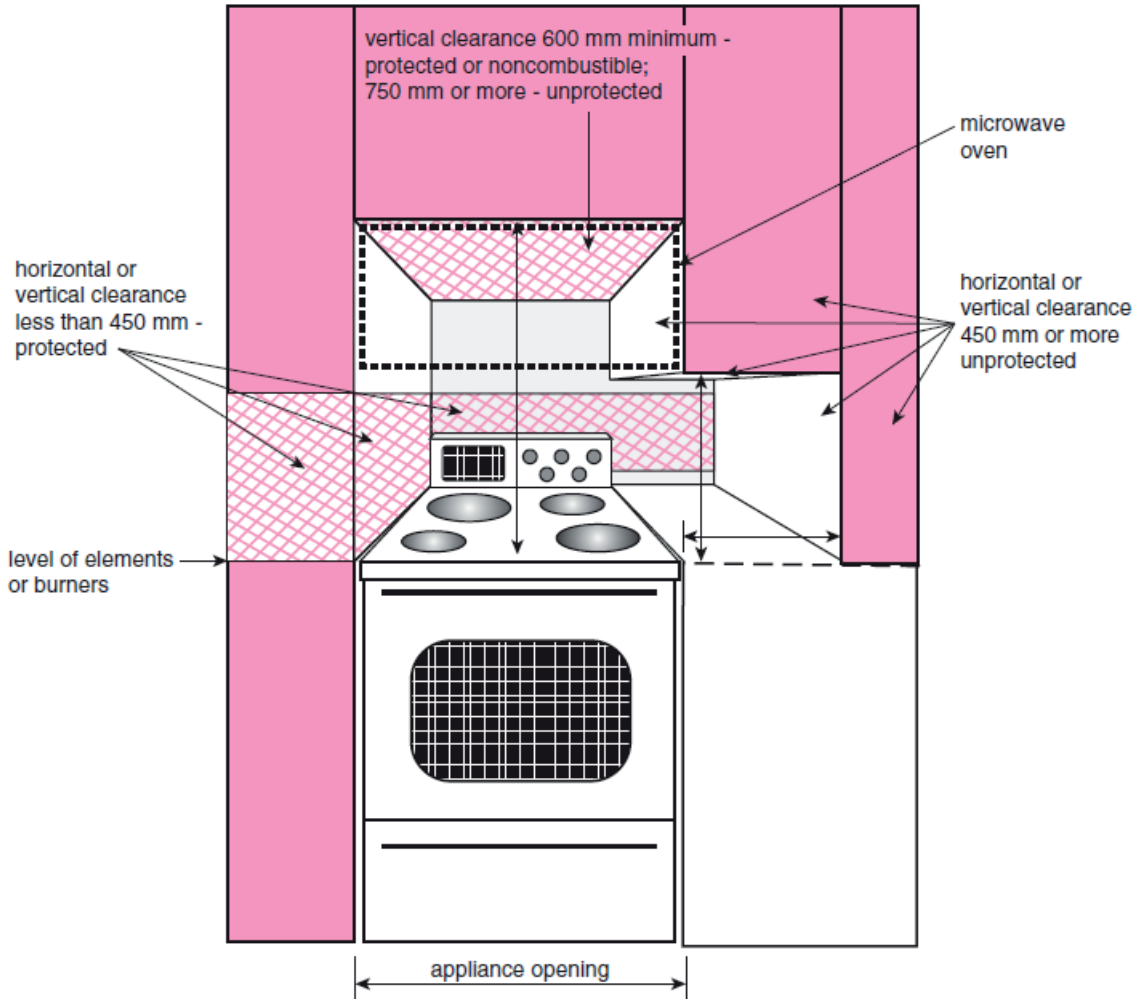


Figure A-9.10.22.
Clearances from Cooktops to Walls and Cabinetry

a10.1 A-9.11. Sound Transmission.

Airborne Sound

Airborne sound is transmitted between adjoining spaces directly through the separating wall, floor and ceiling assemblies and via the junctions between these separating assemblies and the flanking assemblies.

The Sound Transmission Class (STC) rating describes the performance of the separating wall or floor/ceiling assembly, whereas the Apparent Sound Transmission Class (ASTC) takes into consideration the performance of the separating element as well as the flanking transmission paths. Therefore, from the occupants' point of view, the best indicator of noise protection between the two spaces is the ASTC rating.

As a key principle, it is important to follow a "whole system" approach when designing or constructing assemblies that separate dwelling units because the overall sound performance of walls and floors is also influenced by fire protection measures and the structural design of the assemblies. Likewise, changes to the construction of assemblies to meet sound transmission requirements may have fire and structural implications. Another key principle is that enhancing the performance of the separating element does not automatically enhance the system's performance.

For horizontally adjoining spaces, the separating assembly is the intervening wall and the pertinent flanking surfaces include those of the floor, ceiling, and side wall assemblies that have junctions with the separating wall assembly, normally at its four edges. For each of these junctions, there are a set of sound transmission paths. Figure A-9.11.A. illustrates the horizontal sound transmission paths at the junction of a separating wall with flanking floor assemblies.

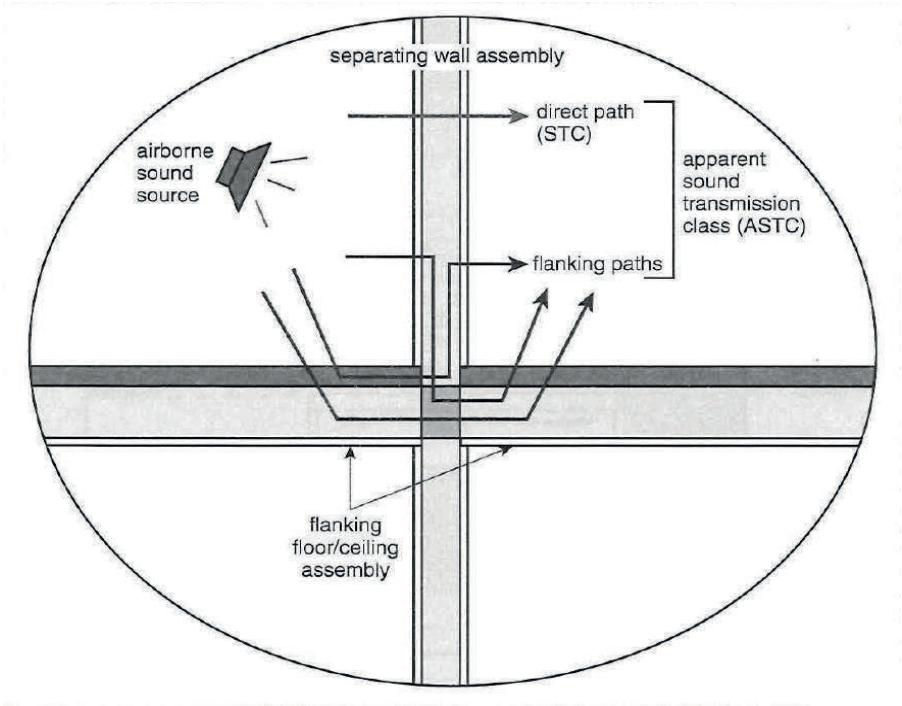


Figure A-9.11.A.
Horizontal Sound Transmission Paths Floor/Wall Junction

For vertically adjoining spaces, the separating assembly is the intervening floor/ceiling and the pertinent flanking surfaces include those of the side wall assemblies in the upper and lower rooms that have junctions with the separating floor/ceiling assembly at its edges, of which there are normally four. For each of these junctions, there is a set of sound ransmission paths. Figure A-9.11.B. illustrates the vertical sound transmission paths at the junction of a separating floor/ceiling assembly with two flanking wall assemblies.

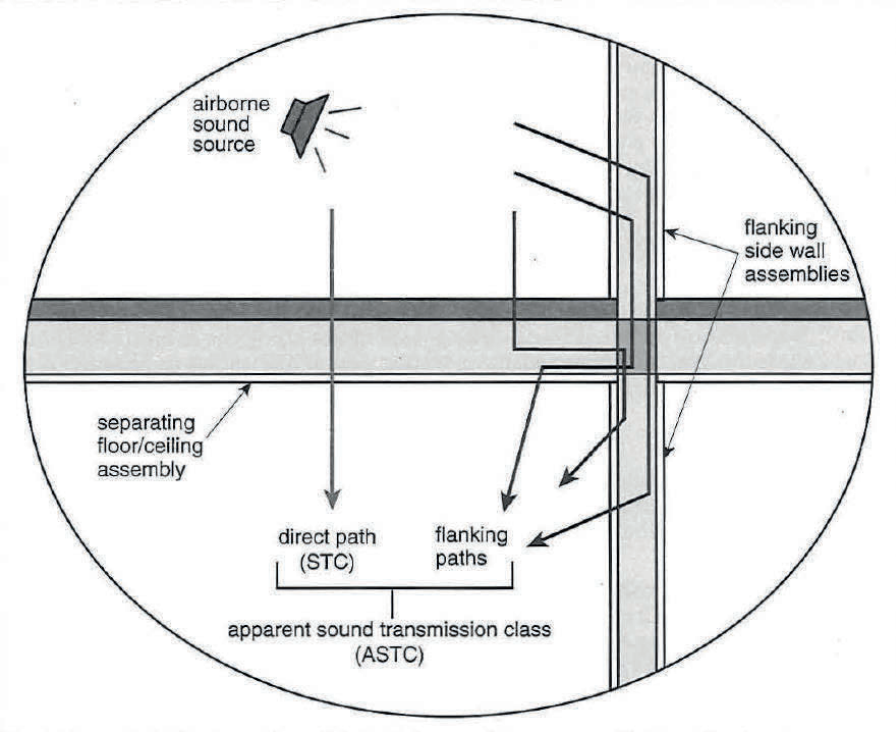


Figure A-9.11.B.
Vertical Sound Transmission Paths Floor/Wall Junction

Control of Sound Leaks

The metrics used to characterize the sound transmission performance of assemblies separating dwelling units do not account for the adverse effects of air leaks in those assemblies, which can transfer sound. Sound leaks can occur where a wall meets another wall, the floor, or the ceiling. They can also occur where the wall finish is cut for the installation of equipment or services. The following are examples of measures for controlling sound leaks:

- Avoid back-to-back electrical outlets or medicine cabinets;
- Carefully seal cracks or openings so structures are effectively airtight;
- Apply sealant below the plates in stud walls, between the bottom of gypsum board sheets and the structure behind, around all penetrations for services and, in general, wherever there is a crack, a hole or the possibility of one developing;
- Include sound-absorbing material inside the wall if not already required.

The reduction of air leakage is also addressed to some extent by the smoke tightness requirements in the Code.

The calculation of and laboratory testing for STC and ASTC ratings are performed on intact assemblies having no penetrations or doors. When measuring ASTC ratings in the field, openings can be blocked with insulation and drywall.

To verify that the required acoustical performance is being achieved, a field test can be done at an early stage in the construction; ASTM E336, "Measurement of Airborne Sound Attenuation Between Rooms in Buildings" gives a complete measurement. A simpler and less expensive method is presented in ASTM E597, "Determining a Single Number Rating of Airborne Sound Insulation for Use in Multi-Unit Building Specifications". The rating derived from this test is usually within 2 points of the STC obtained from ASTM E336. It is useful for verifying performance and finding problems during construction. Alterations can then be made prior to project completion.

Impact Noise

Section 9.11. has no requirements for control of impact noise transmission. Footstep and other impacts can cause severe annoyance in multi-family residences. Builders concerned about quality and reducing occupant complaints will ensure that floors are designed to minimize impact transmission. A recommended criterion is that bare floors (tested without a carpet) should achieve an impact insulation class (IIC) of 55. Some lightweight floors that satisfy this requirement may still cause complaints about low frequency impact noise transmission. Adding carpet to a floor will always increase the IIC rating but will not necessarily reduce low frequency noise transmission. Good footstep noise rejection requires fairly heavy floor slabs or floating floors.

Most frequently used methods of test for impact noise are ASTM E492, "Laboratory Measurement of Impact Sound Transmission Through Floor-Ceiling Assemblies Using The Tapping Machine", or ASTM E1007, "Field Measurement of Tapping Machine Impact Sound Transmission Through Floor-Ceiling Assemblies and Associated Support Structures".

Machinery Noise

Elevators, garbage chutes, plumbing, fans, and heat pumps are common sources of noise in buildings. To reduce annoyance from these, they should be placed as far as possible from sensitive areas. Vibrating parts should be isolated from the building structure using resilient materials such as neoprene or rubber.

a10.1 A-9.11.1.3.(2)(b) Control of Airborne Noise in Buildings.

Tables 1 and 2 of MMAH Supplementary Standard SB-3, "Fire and Sound Resistance of Building Assemblies" present separating assemblies that comply with Subsection 9.11. However, selecting an appropriate separating assembly is only one part of the solution for reducing airborne sound transmission between adjoining spaces. To fully address the sound performance of the whole system, flanking assemblies must be connected to the separating assembly in accordance with Article 9.11.1.4.

a10.1 A-9.11.1.4. Adjoining Construction.

Tables A-9.11.1.4.A. to A-9.11.1.4.D. present generic options for the design and construction of junctions between separating and flanking assemblies. Constructing according to these options is likely to meet or exceed an ASTC rating of 47. Other designs may be equally acceptable if their sound resistance can be demonstrated to meet the minimum ASTC rating or better on the basis of tests referred to in Article 9.11.1.2., or if they comply with Subsection 5.8.1. However, some caution should be applied when designing solutions that go beyond the options provided in these Tables: for example, adding more material to a wall could negatively impact its sound performance or have no effect at all.

Table A-9.11.1.4.A. presents compliance options for the construction of separating wall assemblies with flanking floor, ceiling and wall assemblies in horizontally adjoining spaces.

Table A-9.11.1.4.B. presents options for improving the sound performance of separating wall systems beyond that achieved by implementing the options presented in Table A-9.11.1.4.A. The suggested performance improvement options are listed in order of approximate acoustic priority and are interdependent, i.e., if options at the top of the list are not implemented, then options at the bottom of the list will have much lesser effect.

Table A-9.11.1.4.C. presents compliance options for the construction of separating floor/ceiling assemblies with flanking wall assemblies in vertically adjoining spaces.

Table A-9.11.1.4.D. presents options for improving the sound performance of separating floor/ceiling assemblies beyond that achieved by implementing the options presented in Table A-9.11.1.4.C. The suggested performance improvement options are listed in order of approximate acoustic priority and are interdependent, i.e., if options at the top of the list are not implemented, then options at the bottom of the list will have much lesser effect.

Table A-9.11.1.4.A.
Options for the Design and Construction of Junctions and Flanking Surfaces Between Separating Wall Assemblies in Horizontally Adjoining Spaces for Compliance with Clause 9.11.1.1.(1)(b)

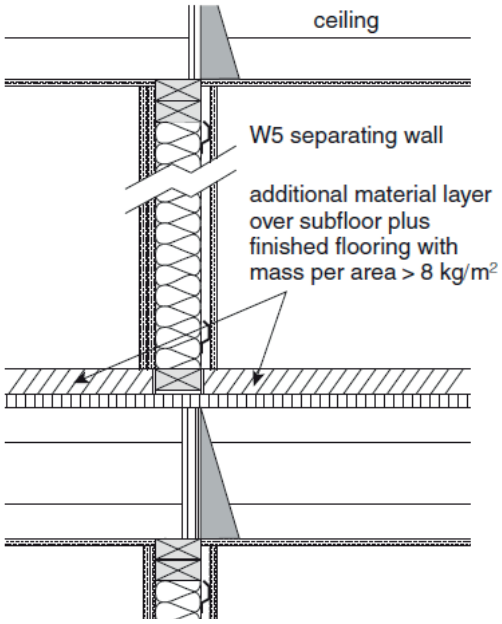
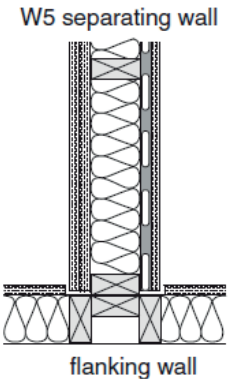
<table>
<tr><td rowspan="2">Type of Separating Wall Assembly with STC ≥ 50 from Table 1 of MMAH Supplementary Standard SB-3</td><td colspan="3">Options for Design and Construction of Junctions and Flanking Surfaces(1) to Address Horizontal Sound Transmission Paths</td></tr>
<tr><td>Bottom Junction
(between separating wall and flanking floors)</td><td>Top Junction
(between separating wall and flanking ceiling)</td><td>Side Junctions
(between separating wall and flanking walls)</td></tr>
<tr><td>W4, W5, W6 (single stud)
W8, W9, W10, W11, W12 (staggered studs)</td><td>• for additional material layer and finished flooring, see Table 9.11.1.4.
• subfloor on both sides of wall is plywood, OSB, waferboard (15.5 mm thick) or tongue and groove lumber (≥ 17 mm thick)
• floor is framed with wood joists, wood I-joists or wood trusses spaced ≥ 406 mm o.c., with or without absorptive material(2) in cavities
• floor joists or trusses are oriented parallel to separating wall (non-loadbearing case) or perpendicular to separating wall but are not continuous across junction (loadbearing case)</td><td>• ceiling is framed with wood joists, wood I-joists, or wood trusses, with or without absorptive material(2) in cavities
• ceiling joists or trusses are oriented perpendicular to separating wall but are not continuous across junction (loadbearing case) or parallel to junction (non-loadbearing case)
• gypsum board ceiling is fastened directly to bottom of ceiling framing or on resilient metal channels(3)</td><td>• gypsum board on flanking walls ends or is cut at separating wall and is fastened directly to framing or on resilient metal channels(3)
• flanking wall is framed with single row of wood studs, staggered studs on a single 38 mm x 140 mm plate, or 2 rows of 38 mm x 89 mm wood studs on separate 38 mm x 89 mm plates, with or without absorptive material(2) in cavities
• flanking wall framing is structurally connected to separating wall and terminates where it butts against framing of separating wall or is continuous across junction</td></tr>
<tr><td></td><td colspan="2">Example Showing Side View of Bottom and Top Junctions

</td><td>Example Showing Plan View of Side Junctions

</td></tr>
</table>

Table A-9.11.1.4.A. (Cont'd)
Options for the Design and Construction of Junctions and Flanking Surfaces Between Separating Wall Assemblies in Horizontally Adjoining Spaces for Compliance with Clause 9.11.1.1.(1)(b)

<table>
<tr><td rowspan="2">Type of Separating Wall Assembly with STC ≥ 50 from Table 1 of MMAH Supplementary Standard SB-3</td><td colspan="3">Options for Design and Construction of Junctions and Flanking Surfaces(1) to Address Horizontal Sound Transmission Paths</td></tr>
<tr><td>Bottom Junction (between separating wall and flanking floors)</td><td>Top Junction (between separating wall and flanking ceiling)</td><td>Side Junctions (between separating wall and flanking walls)</td></tr>
<tr><td>W4, W5, W6 (single stud)

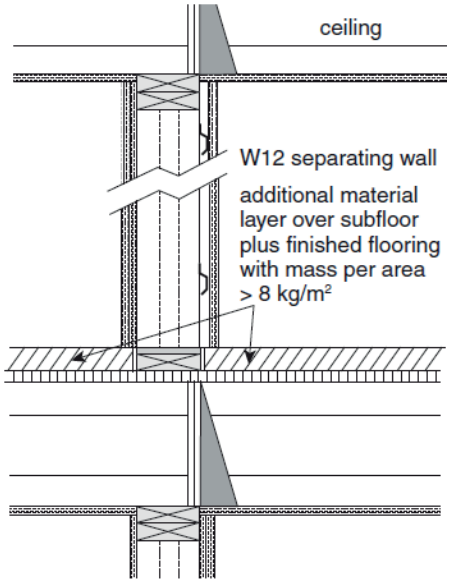
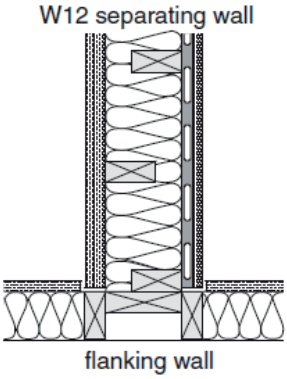
W8, W9, W10, W11, W12 (staggered studs)</td><td colspan="2">Example Showing Side View of Bottom and Top Junctions

</td><td>Example Showing Plan View of Side Junctions

</td></tr>
<tr><td>W13, W14, W15</td><td>• for additional material layer and finished flooring, see Table 9.11.1.4.
• subfloor on both sides of wall is plywood, OSB, waferboard (15.5 mm thick) or tongue and groove lumber (≥ 17 mm thick)
• floor is framed with wood joists, wood I-joists or wood trusses spaced ≥ 400 mm o.c., with or without absorptive material(2) in cavities
• floor joists or trusses are oriented parallel to separating wall (non-loadbearing case) or perpendicular to separating wall but are not continuous across junction (loadbearing case)
• near leaf of separating wall is supported on "designated" joist</td><td>• wood joists, wood I-joists or wood trusses are oriented perpendicular or parallel to separating wall, with or without absorptive material(2) in cavities
• joist framing at junction is supported on near leaf of separating wall
• gypsum board ceiling panels end at wall framing and are fastened directly to bottom of ceiling framing or on resilient metal channels(3)</td><td>• flanking wall framing is fastened to adjacent leaf of separating wall
• flanking wall is framed with single row of wood studs, staggered studs on a single 38 mm x 140 mm plate, or 2 rows of 38 mm x 89 mm wood studs on separate 38 mm x 89 mm plates, with or without absorptive material(2) in cavities
• gypsum board panels on flanking walls ends or is cut at framing of separating wall and is fastened on resilient metal channels(3) or directly to framing of flanking wall if that framing and any sheathing are not continuous across the junction</td></tr>
</table>

Table A-9.11.1.4.A. (Cont'd)
Options for the Design and Construction of Junctions and Flanking Surfaces Between Separating Wall Assemblies in Horizontally Adjoining Spaces for Compliance with Clause 9.11.1.1.(1)(b)

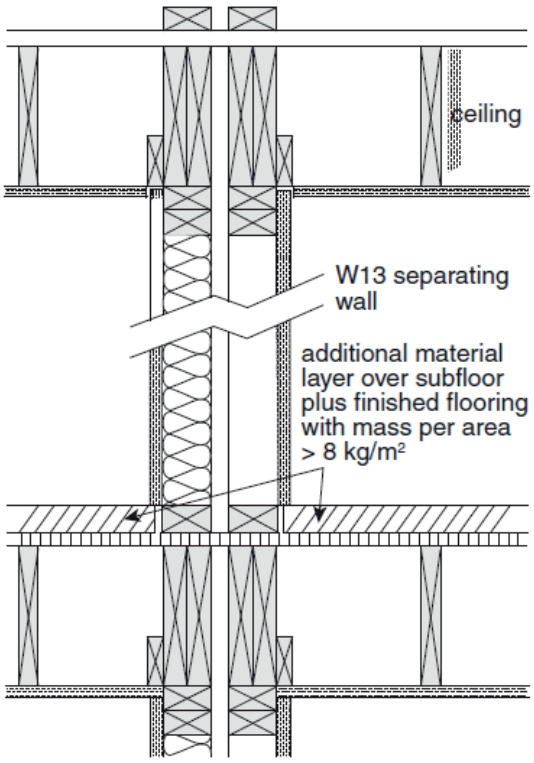
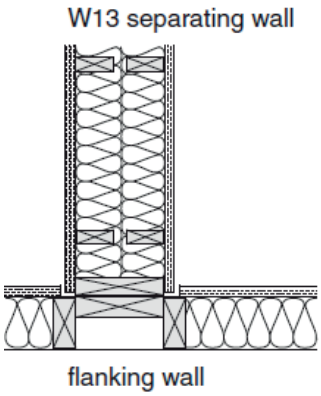
Type of Separating Wall Assembly with STC ≥ 50 from Table 1 of MMAH Supplementary Standard SB-3	Options for Design and Construction of Junctions and Flanking Surfaces(1) to Address Horizontal Sound Transmission Paths		
	Bottom Junction (between separating wall and flanking floors)	Top Junction (between separating wall and flanking ceiling)	Side Junctions (between separating wall and flanking walls)
W13, W14, W15	Example Showing Side View of Bottom and Top Junctions 		Example Showing Plan View of Side Junctions 

Table A-9.11.1.4.A. (Cont'd)
Options for the Design and Construction of Junctions and Flanking Surfaces Between Separating Wall Assemblies in Horizontally Adjoining Spaces for Compliance with Clause 9.11.1.1.(1)(b)

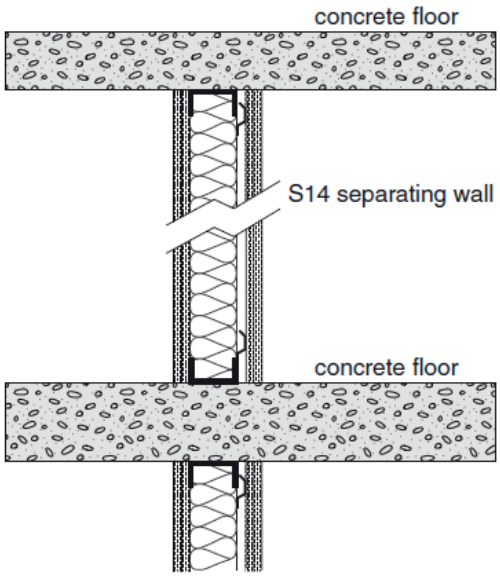
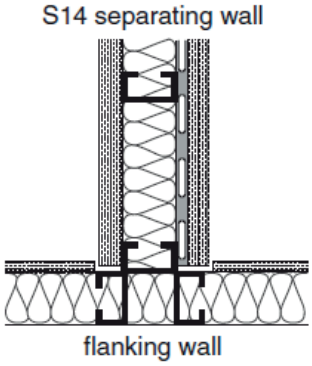
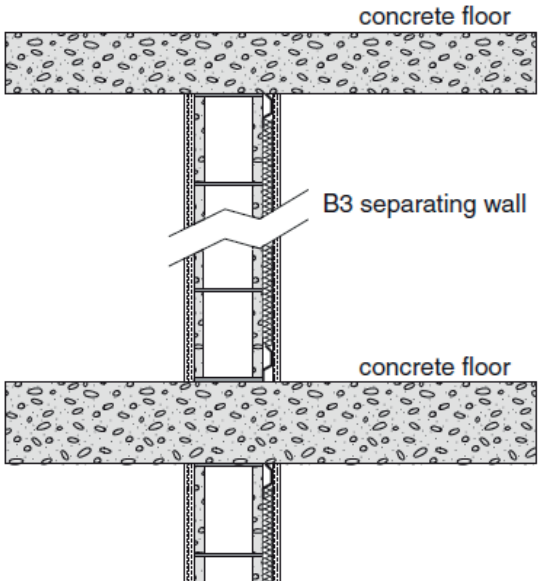
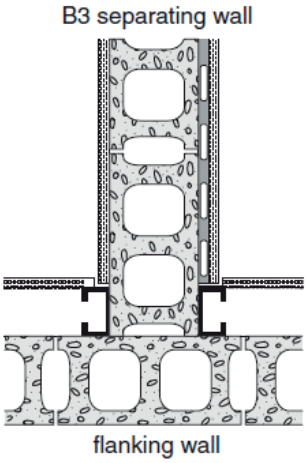
Type of Separating Wall Assembly with STC ≥ 50 from Table 1 of MMAH Supplementary Standard SB-3	Options for Design and Construction of Junctions and Flanking Surfaces[1] to Address Horizontal Sound Transmission Paths		
	Bottom Junction (between separating wall and flanking floors)	Top Junction (between separating wall and flanking ceiling)	Side Junctions (between separating wall and flanking walls)
S1 to S15	• F1 concrete floor assembly from Table 2 with mass per area not less than 300 kg/m^2 (e.g. normal-weight concrete with average thickness of 130 mm) • with or without an additional material layer or finished flooring	• F1 concrete floor assembly from Table 2 with mass per area not less than 300 kg/m^2 (e.g. normal-weight concrete with average thickness of 130 mm) • with or without gypsum board ceiling suspended below concrete floor	• flanking wall framing is structurally connected to separating wall and terminates where it butts against framing of separating wall or is continuous across junction • gypsum board on flanking walls ends or is cut at separating wall and is fastened directly to framing or on resilient metal channels[3] • flanking wall consists of steel framing (loadbearing or non-loadbearing steel studs) or concrete blocks with mass per area not less than 200 kg/m^2 (e.g. normal-weight hollow core concrete block units[4] with a gypsum board lining supported on framing providing a cavity not less than 50 mm deep) • with or without absorptive material[2] in cavities behind gypsum board of flanking walls
	Example Showing Side View of Bottom and Top Junctions  		Example Showing Plan View of Side Junctions 

Table A-9.11.1.4.A. (Cont'd)
Options for the Design and Construction of Junctions and Flanking Surfaces Between Separating Wall Assemblies in Horizontally Adjoining Spaces for Compliance with Clause 9.11.1.1.(1)(b)

<table>
<tr><td rowspan="2">Type of Separating Wall Assembly with STC ≥ 50 from Table 1 of MMAH Supplementary Standard SB-3</td><td colspan="3">Options for Design and Construction of Junctions and Flanking Surfaces(1) to Address Horizontal Sound Transmission Paths</td></tr>
<tr><td>Bottom Junction (between separating wall and flanking floors)</td><td>Top Junction (between separating wall and flanking ceiling)</td><td>Side Junctions (between separating wall and flanking walls)</td></tr>
<tr><td rowspan="2">B1 to B10</td><td>• same options as stated above for walls S1 to S15</td><td>• same options as stated above for walls S1 to S15
• junction at top of concrete block assembly is loadbearing or non-loadbearing resilient joint</td><td>• same options as stated above for walls S1 to S15</td></tr>
<tr><td colspan="2">Example Showing Side View of Bottom and Top Junctions

</td><td>Examples Showing Plan View of Side Junctions

</td></tr>
</table>

Notes to Table A-9.11.1.4.A.:

(1) See also Table A-9.11.1.4.B.

(2) Sound absorptive material is porous (closed-cell foam was not tested) and includes fibre processed from rock, slag, glass or cellulose fibre with a maximum density of 32 kg/m^3. See Notes (3) and (6) of Table 1 and Note (4) of Table 2 of MMAH Supplementary Standard SB- 3, "Fire and Sound Resistance of Building Assemblies" for additional information.

(3) Resilient metal channels are formed from steel having a maximum thickness of 0.46 mm (25 gauge) with slits or holes in the single "leg" between the faces fastened to the framing and to the gypsum board (see Figure 4 in MMAH Supplementary Standard SB-3). ASTM C754, "Installation of Steel Framing Members to Receive Screw-Attached Gypsum Panel Products", describes the installation of resilient metal channels.

(4) Normal-weight concrete block units conforming to CSA A165.1, "Concrete Block Masonry Units", have aggregate with a density not less than 2 000 kg/m^3; 190 mm hollow core units are 53% solid, providing a wall mass per area over 200 kg/m^2; 140 mm hollow core units are 75% solid, providing a wall mass per area over 200 kg/m^2.

Table A-9.11.1.4.B.
Options for the Construction of a Separating Wall System to Further Improve the Sound Insulation Performance Achieved with the Options in Table A-9.11.1.4.A.

Type of Separating Wall Assembly with STC ≥ 50 from Table 1 of MMAH Supplementary Standard SB-3	Performance Improvement Options for Junctions Between Separating Walls and Flanking Floor/Ceiling Assemblies
W4, W5, W6, W8, W9, W10, W11, W12	• Increase mass per area of additional material layer and finished flooring over subfloor (e.g. concrete or gypsum concrete topping) • Choose separating wall assembly with higher STC rating • Orient floor and ceiling joists parallel to separating wall (non-loadbearing case) • Add resilient layer under additional material layer over subfloor or between additional material layer and finished flooring • Support gypsum board panels of ceiling on resilient metal channels(1) • Support gypsum board panels of flanking walls on resilient metal channels(1)

W13, W14, W15	• If seismic or other structural requirements permit, choose a fire block detail at floor/wall junction in accordance with Subsection 9.10.16. that does not provide a rigid connection between the two rows of framing of the separating wall (e.g. subfloor not continuous across junction and semi-rigid fibre insulation board filling the gap in accordance with Article 9.10.16.3.). In this case, an additional material layer would not be necessary. Also, choose separating wall assembly with higher STC rating (e.g. more absorptive material(2) in cavities and/or more gypsum board).
	• If having a rigid structural connection at the floor/wall junction (such as subfloor continuous across the junction) is required for seismic or other structural reasons, obtain a higher ASTC rating as follows:
	  • Increase combined mass per area of additional material layer over subfloor and finished flooring (e.g. concrete or gypsum concrete topping)
	  • Choose separating wall assembly with higher STC rating (e.g. more absorptive material(2) and/or more gypsum board)
	  • Support gypsum board panels of ceiling on resilient metal channels(1)
	  • Support gypsum board panels of flanking walls on resilient metal channels(1)
	  • Add resilient layer under additional material layer over subfloor or between additional material layer and finished flooring

S1 to S15	• Choose separating wall assembly with higher STC rating • Increase thickness of concrete floor slab and/or add material layer and finished flooring over subfloor • Add gypsum board ceiling on framing supported under the floor above, with cavity not less than 100 mm deep • Add resilient layer under additional material layer over subfloor or between additional material layer and finished flooring • Support gypsum board panels of flanking walls on resilient metal channels(1) if steel studs are loadbearing type

Table A-9.11.1.4.B. (Cont'd)
Options for the Construction of a Separating Wall System to Further Improve the Sound Insulation Performance Achieved with the Options in Table A-9.11.1.4.A.

Type of Separating Wall Assembly with STC ≥ 50 from Table 1 of MMAH Supplementary Standard SB-3	Performance Improvement Options for Junctions Between Separating Walls and Flanking Floor/Ceiling Assemblies
B1 to B10	• Choose separating wall assembly with higher STC rating • Add gypsum board ceiling supported below concrete floor with cavity not less than 100 mm deep and sound absorptive material(2) in cavity • Increase thickness of concrete floor slab and/or add material layer and finished flooring over subfloor • Add resilient layer under additional material layer over subfloor or between additional material layer and finished flooring and increase mass per area of additional material layer and finished flooring (e.g. floating concrete or gypsum concrete topping) • Support gypsum board panels of flanking walls on resilient metal channels(1) if steel studs are loadbearing type

Notes to Table A-9.11.1.4.B.:

(1) Resilient metal channels are formed from steel having a maximum thickness of 0.46 mm (25 gauge) with slits or holes in the single "leg" between the faces fastened to the framing and to the gypsum board (see Figure 4 in MMAH Supplementary Standard SB-3). ASTM C754, "Installation of Steel Framing Members to Receive Screw-Attached Gypsum Panel Products", describes the installation of resilient metal channels.

(2) Sound absorptive material is porous (closed-cell foam was not tested) and includes fibre processed from rock, slag, glass or cellulose fibre with a maximum density of 32 kg/m^3. See Notes (3) and (6) of Table 1 and Note (4) of Table 2 of MMAH Supplementary Standard SB-3, "Fire and Sound Resistance for Existing Buildings" for additional information.

Table A-9.11.1.4.C.
Options for the Design and Construction of Junctions and Flanking Surfaces Between Separating Floor/Ceiling Assemblies in Vertically Adjoining Spaces for Compliance with Clause 9.11.1.1.(1)(b)

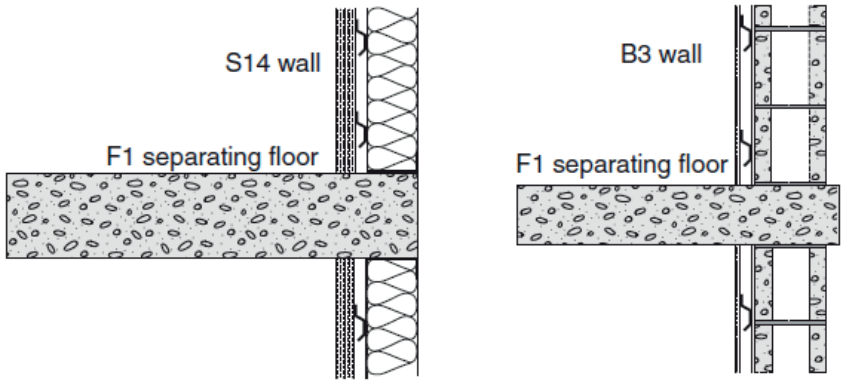
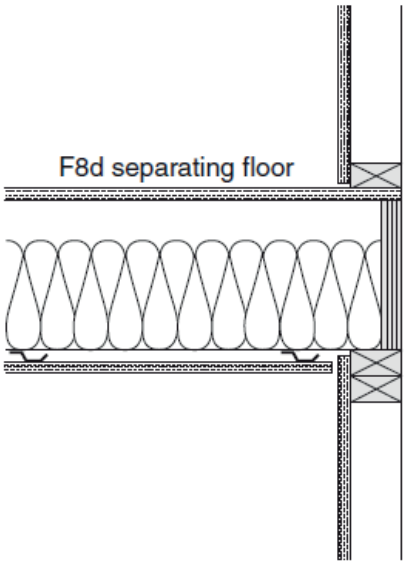
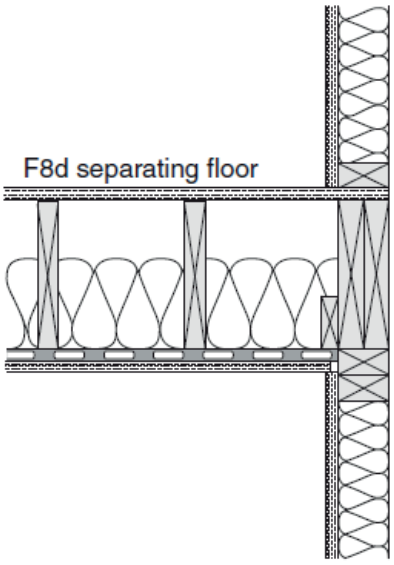
<table>
<tr><td>Type of Separating Floor/Ceiling Assembly with STC ≥ 50 from Table 2 of MMAH Supplementary Standard SB-3</td><td colspan="2">Options for Design and Construction of Junctions and Flanking Surfaces(1) to Address Vertical Sound Transmission Paths</td></tr>
<tr><td rowspan="3">F1 (with or without gypsum board ceiling)</td><td>Junctions with Flanking Steel-Framed Walls</td><td>Junctions with Flanking Concrete Walls</td></tr>
<tr><td>• floor ends at flanking wall assembly (T-junction) or extends beyond it (cross-junction)
• steel framing of flanking walls is loadbearing or non-loadbearing, with a single row of steel studs, staggered studs, or 2 rows of studs, with studs spaced not less than 406 mm o.c., with or without absorptive material(2) in cavities
• flanking wall structure is fastened to separating concrete floor but is not continuous across junction
• gypsum board on flanking walls is not continuous across junction and is fastened directly to wall framing or on resilient metal channels(3)</td><td>• floor ends at flanking wall assembly (T-junction) or extends beyond it (cross-junction)
• one wythe of concrete blocks with mass per area not less than 200 kg/m^2 (e.g. normal-weight hollow core concrete block units(4))
• loadbearing (solid) or non-loadbearing (resilient) junction between top of flanking concrete block wall and floor structure
• gypsum board lining is supported on wood or steel framing providing a cavity not less than 50 mm deep, with or without absorptive material(2) in cavities
• gypsum board on flanking walls is not continuous across junction and is fastened directly to wall framing or on resilient metal channels(3)</td></tr>
<tr><td colspan="2">Examples Showing Side View of Junctions

</td></tr>
</table>

Table A-9.11.1.4.C. (Cont'd)
Options for the Design and Construction of Junctions and Flanking Surfaces Between Separating Floor/Ceiling Assemblies in Vertically Adjoining Spaces for Compliance with Clause 9.11.1.1.(1)(b)

<table>
<tr><td>Type of Separating Floor/Ceiling Assembly with STC ≥ 50 from Table 2 of MMAH Supplementary Standard SB-3</td><td colspan="2">Options for Design and Construction of Junctions and Flanking Surfaces(1) to Address Vertical Sound Transmission Paths</td></tr>
<tr><td rowspan="3">F8 to F38</td><td colspan="2">Junctions with Flanking Loadbearing or Non-Loadbearing Walls</td></tr>
<tr><td colspan="2">• wood studs of flanking wall are 38 mm x 89 mm or 38 mm x 140 mm and spaced 400 mm or 600 mm o.c.
• flanking wall framing consists of single row of wood studs, staggered studs on a single 38 mm x 140 mm plate, or 2 rows of 38 mm x 89 mm wood studs on separate 38 mm x 89 mm plates, with or without absorptive material(2) in wall cavities
• gypsum board on flanking walls ends or is cut near floor framing and is fastened directly to wall framing or supported on resilient metal channels(3)</td></tr>
<tr><td>Example Showing Side View of Junctions in Flanking Loadbearing Wall

</td><td>Example Showing Side View of Junctions in Flanking Non-Loadbearing Wall

</td></tr>
</table>

Notes to Table A-9.11.1.4.C.:

(1) See also Table A-9.11.1.4.D.

(2) Sound absorptive material is porous (closed-cell foam was not tested) and includes fibre processed from rock, slag, glass or cellulose fibre with a maximum density of 32 kg/m^3. See Notes (3) and (6) of Table 1 and Note (4) of Table 2 of MMAH Supplementary Standard SB-3, "Fire and Sound Resistance of Building Assemblies" for additional information.

(3) Resilient metal channels are formed from steel having a maximum thickness of 0.46 mm (25 gauge) with slits or holes in the single "leg" between the faces fastened to the framing and to the gypsum board (see Figure 4 in MMAH Supplementary Standard SB-3). ASTM C754, "Installation of Steel Framing Members to Receive Screw-Attached Gypsum Panel Products", describes the installation of resilient metal channels.

(4) Normal-weight concrete block units conforming to CSA A165.1, "Concrete Block Masonry Units", have aggregate with a density not less than 2 000 kg/m^3;190 mm hollow core units are 53% solid, providing a wall mass per area over 200 kg/m^2; 140 mm hollow core units are 75% solid, providing a wall mass per area over 200 kg/m^2.

Table A-9.11.1.4.D.
Options for the Construction of a Separating Floor System to Further Improve the Sound Insulation Performance Achieved with the Options in Table A-9.11.1.4.C.

Type of Separating Floor Assembly with STC ≥ 50 from Table 2 of MMAH Supplementary Standard SB-3	Performance Improvement Options for Junctions Between Separating Floors and Flanking Wall Assemblies
F1 (with or without gypsum board ceiling)	• Add heavier additional material layer over subfloor and/or resilient layer under additional material layer or between additional material layer and finished flooring • Add gypsum board ceiling supported at least 100 mm below concrete floor with minimal structural connection (e.g. ceiling framing supported resiliently) and sound absorptive material(1) in cavity • Support gypsum board of flanking walls of lower room on resilient metal channels(2) (if framed with loadbearing studs)
F8 to F38	• Add heavier additional material layer over subfloor and/or resilient layer under additional material layer or between additional material layer and finished flooring • Add more/heavier gypsum board to ceiling and increase spacing of resilient metal channels(2) to 600 mm o.c. • Support gypsum board of flanking loadbearing walls of lower room on resilient metal channels(2) • Support gypsum board on flanking non-loadbearing walls of lower room on resilient metal channels(2)

Notes to Table A-9.11.1.4.D.:

(1) Sound absorptive material is porous (closed-cell foam was not tested) and includes fibre processed from rock, slag, glass or cellulose fibre with a maximum density of 32 kg/m^3. See Notes (3) and (6) of Table 1 and Note (4) of Table 2 of MMAH Supplementary Standard SB-3, "Fire and Sound Resistance of Building Assemblies" for additional information.

(2) Resilient metal channels are formed from steel having a maximum thickness of 0.46 mm (25 gauge) with slits or holes in the single "leg" between the faces fastened to the framing and to the gypsum board (see Figure 4 in MMAH Supplementary Standard SB-3). ASTM C754, "Installation of Steel Framing Members to Receive Screw-Attached Gypsum Panel Products", describes the installation of resilient metal channels.

a10.1 A-Table 9.11.1.4. Floor Treatments.

The sound insulation performance of lightweight framed floors can be improved by adding floor treatments, i.e., additional layers of material over the subfloor (e.g. concrete topping, OSB or plywood) and finished flooring or coverings (e.g., carpet, engineered wood). Table A-Table 9.11.1.4. presents the mass per area values based on thickness and density of a number of generic floor treatment materials (the values for proprietary products may be different; consult the manufacturer's current data sheets for their products' values).

Table A-Table 9.11.1.4.
Mass per Area of Floor Treatment Materials

Floor Treatment Material	Thickness, mm	Density, kg/m³	Mass per Area, kg/m²
Materials Typically Having a Mass per Area Less than 8 kg/m²			
Medium-density fibreboard (MDF)	2.9 – 6.1	790 – 810	2.3 – 5.0
Plywood – generic softwood	12.5 – 13.3 15.5 – 16.3	450 – 500	5.6 – 6.6 7.0 – 8.1
Ceramic tile	8.4	700 – 1 000	5.9 – 8.4
Materials Typically Having a Mass per Area Greater than 8 kg/m² but Less than 16 kg/m²			
Particleboard	11.3 – 19.2 13.9 – 21.1	710 – 755 640 – 755	8.1 – 14.5 8.9 – 15.9
Medium-density fibreboard (MDF)			
Oriented strandboard (OSB)	14.3 – 15.8 17.3 – 18.8	600 – 680	8.6 – 10.7 10.4 – 12.8
Plywood – generic softwood	25.5	450 – 500	11.5 – 13.1
Materials Typically Having a Mass per Area Greater than 16 kg/m² but Less than 32 kg/m²			
Medium-density fibreboard (MDF)	25.0 – 32.1	640 – 740	16.0 – 23.7
Materials Typically Having a Mass per Area Greater than 32 kg/m²			
Concrete	40.0 – 50.0	2 015 – 2 380	80.6 – 119.0
Gypsum concrete	25.0	1 840 – 1 870	46.1 – 46.7
Column 1	2	3	4

A-Table 9.12.2.2. Minimum Depths of Foundations.

The requirements for clay soils or soils not clearly defined are intended to apply to those soils that are subject to significant volume changes with changes in moisture content.

A-9.12.2.2.(2) Depth and Insulation of Foundations.

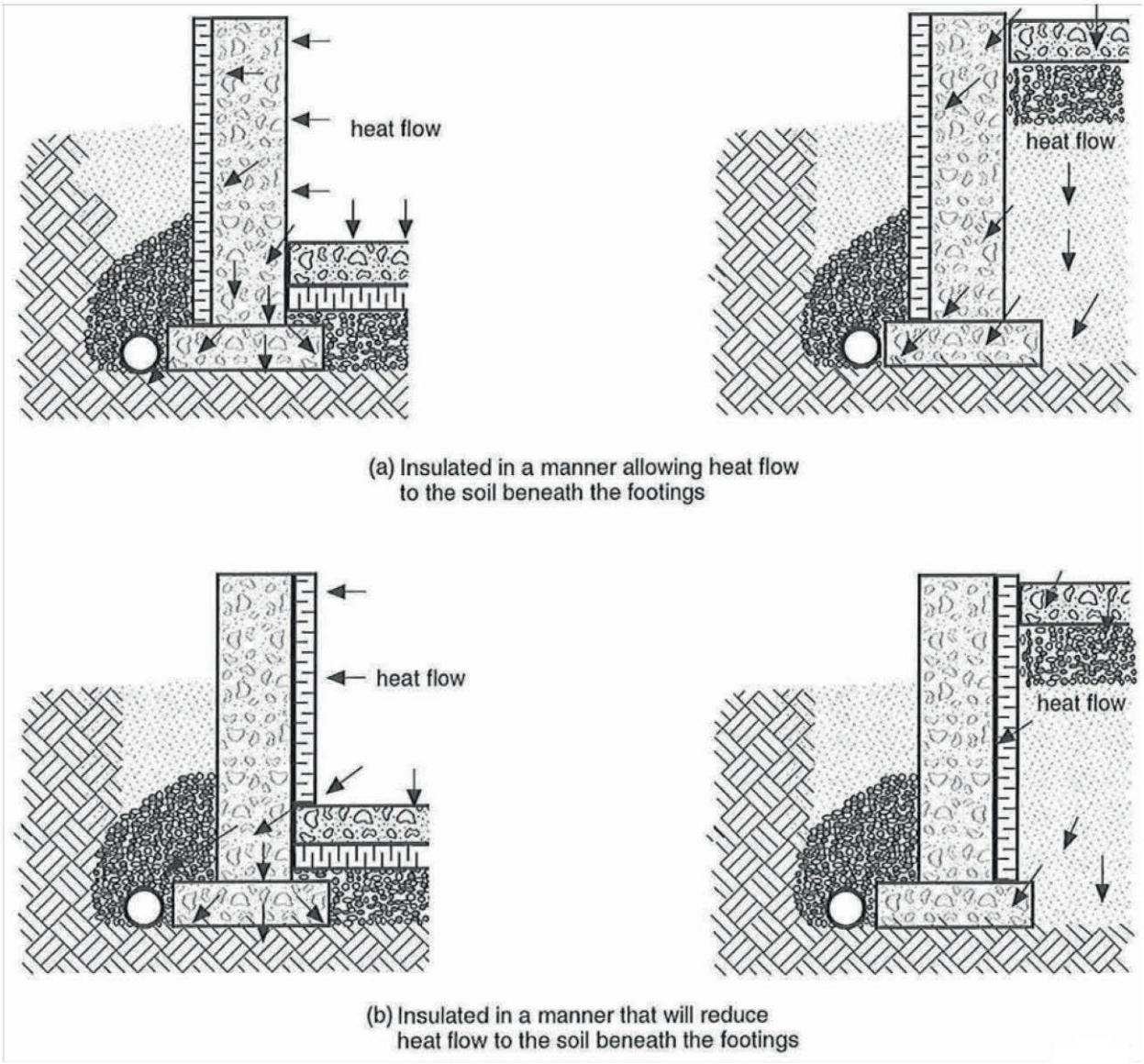


Figure A-9.12.2.2.(2)
Foundation Insulation and Heat Flow to Footings

A-9.12.3.3.(1) Deleterious Material in Backfill.

The deleterious debris referred to in this provision includes, but is not limited to:

- organic material and other material subject to decomposition and compaction, which could have an adverse effect on grading around the building,
- materials that will off-gas and have the potential to pose a health hazard, and
- materials that are incompatible with materials used in the foundations, footings, drainage materials or components, or other elements of the building whose required performance would be adversely affected.

e7 A-9.13.2.5. Protection of Interior Finishes from Moisture.

Excess water from cast-in-place concrete and ground moisture tends to migrate toward interior spaces, particularly in the spring and summer. Where moisture-susceptible materials, such as finishes or wood members, are in contact with the foundation wall, the moisture needs to be controlled by installing a moisture barrier on the interior surface of the foundation wall that extends from the underside of the interior finish up the face of the wall to a point just above the level of the ground outside.

The reason the moisture barrier on the interior surface of the foundation wall must be terminated near ground level is to allow any moisture that finds its way into the finished wall cavity from the interior space (through leaks in the air or vapour barrier) to diffuse to the exterior. If the vapour permeance of dampproofing membranes or coatings exceeds 170 ng/(Pa•s•m^2), such moisture barriers may be carried full height; if their vapour permeance is less than that, this moisture risks being trapped on the interior surface of the moisture barriers. The permeance limit corresponds to the lower limit for breather-type membranes, such as asphalt-impregnated sheathing paper.

Some insulation products can also be used to protect interior finishes from the effects of moisture. They have shown acceptable performance when applied over the entire foundation wall because, in this case, they also provide vapour barrier and moisture barrier functions and possibly also the air barrier function. Where a single product provides all these functions, there is no risk of trapping moisture between two functional barriers with low water vapour permeance.

e7 A-9.13.2.6.(1) Polyethylene Under Slabs-on-Ground.

Finishing a concrete slab placed directly on polyethylene can, in many cases, cause problems for the inexperienced finisher. A rule of finishing, whether concrete is placed on polyethylene or not, is to never finish or "work" the surface of the slab while bleed water is present or before all the bleed water has risen to the surface and evaporated. If finishing operations are performed too early, such as before all the bleed water has risen and evaporated, surface defects such as blisters, crazing, scaling and dusting can result. This is often the case with slabs placed directly on polyethylene. The amount of bleed water that may come to the surface and the time required for this to happen is increased from that of a slab placed on a compacted granular base. The excess water in the mix from the bottom portion of the slab cannot bleed downward and out of the slab and be absorbed into the granular material below, because of the polyethylene. Therefore, all bleed water, including that from the bottom of the slab, must now rise through the slab to the surface. Quite often in such cases, finishing operations are begun too soon and surface defects result.

One solution that is often suggested is to place a layer of sand between the polyethylene and the concrete. However, this is not an acceptable solution for the following reason: it is unlikely that the polyethylene will survive the slab pouring process entirely intact. Nevertheless, the polyethylene will still be effective in retarding the flow of soil gas if it is in intimate contact with the concrete; soil gas will only be able to penetrate where a break in the polyethylene coincides with a crack in the concrete. The majority of concrete cracks will probably be underlain by intact polyethylene. On the other hand, if there is an intervening layer of a porous medium, such as sand, soil gas will be able to travel laterally from a break in the polyethylene to the nearest crack in the concrete and the total system will be much less resistant to soil gas penetration.

To reduce and/or control the cracking of concrete slabs, it is necessary to understand the nature and causes of volume changes of concrete and in particular those relating to drying shrinkage. The total amount of water in a mix is by far the largest contributor to the amount of drying shrinkage and resulting potential cracking that may be expected from a given concrete. The less total amount of water in the mix, the less volume change (due to evaporation of water), which means the less drying shrinkage that will occur. To lessen the volume change and potential cracking due to drying shrinkage, a mix with the lowest total amount of water that is practicable should always be used. To lower the water content of a mix, superplasticizers are often used to provide the needed workability of the concrete during the placing operation. High water/cementing materials

a10.1 A-9.20.8.5.(1) Distance from Edge of Masonry to Edge of Supporting Members.

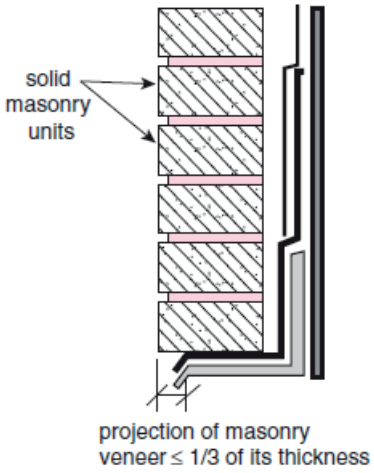


Figure A-9.20.8.5.(1)
Maximum Projection of Masonry Veneer Beyond its Support

A-9.20.12.2.(2) Corbelling of Masonry Foundation Walls.

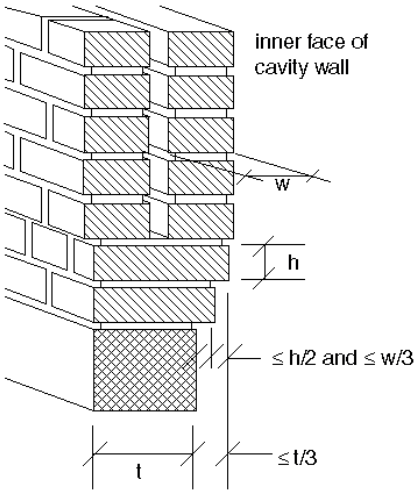


Figure A-9.20.12.2.(2)
Maximum Corbel Dimensions

A-9.20.13.9.(3) Dampproofing of Masonry Walls.

The reason for installing sheathing paper behind masonry walls is to prevent rainwater from reaching the interior finish if it should leak past the masonry. The sheathing paper intercepts the rainwater and leads it to the bottom of the wall where the flashing directs it to the exterior via weep holes. If the insulation is a type that effectively resists the penetration of water, and is installed so that water will not collect behind it, then there is no need for sheathing paper. If water that runs down between the masonry and the insulation is able to leak out at the joints in the insulation, such insulation will not act as a substitute for sheathing paper. If water cannot leak through the joints in the insulation but collects in cavities between the masonry and insulation, subsequent freezing could damage the wall. Where sheathing paper is not used, therefore, the adhesive or mortar should be applied to form a continuous bond between the masonry and the insulation. If this is not practicable because of an irregular masonry surface, then sheathing paper is necessary.

A-9.21.1.2.(1) Factory-Built Chimneys.

Certain solid-fuel burning appliances may be connected to factory-built chimneys other than those specified in Sentence 9.21.1.2.(1) if tests show that the use of such a chimney will provide an equivalent level of safety, as an alternative solution pursuant to Section 2.1. of Division C.

A-9.21.3.6.(2) Metal Chimney Liners.

Masonry chimneys with metal liners may be permitted to serve solid-fuel burning appliances if tests show that such liners will provide an equivalent level of safety, as an alternative solution pursuant to Section 2.1. of Division C.

A-9.21.4.4.(1) Location of Chimney Top.

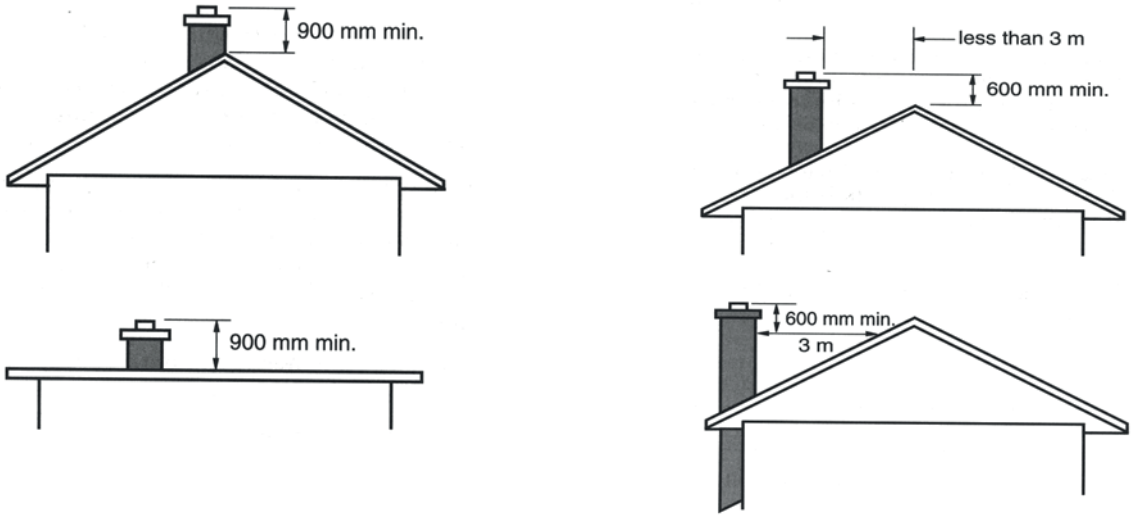


Figure A-9.21.4.4.(1)
Vertical and Horizontal Distance from Chimney Top to Roof

A-9.21.4.5.(2) Lateral Support for Chimneys.

Where a chimney is fastened to the house framing with metal anchors, in accordance with CAN/CSA-A370, "Connectors for Masonry", it is considered to have adequate lateral support. The portion of the chimney stack above the roof is considered as free standing and may require additional lateral support.

A-9.21.5.1.(1) Clearance from Combustible Materials.

For purposes of this Sentence, an exterior chimney can be considered to be one which has at least one surface exposed to the outside atmosphere or unheated space over the majority of its height. All other chimneys should be considered to be interior.

A-9.23.1.1. Structural Framing Systems Other than Light Wood-Frame Construction.

The prescriptive requirements in Section 9.23. apply only to standard light wood-frame construction. Other structural framing systems, such as post, beam and plank construction, plank frame wall construction, and log construction must be designed in accordance with Part 4.

A-9.23.1.1.(1) Application of Section 9.23.

In previous editions of the Code, Sentence 9.23.1.1.(1) referred to "conventional" wood-frame construction. Over time, conventions have changed and the application of Part 9 has expanded.

The prescriptive requirements provided in Section 9.23. still focus on lumber beams, joists, studs and rafters as the main structural elements of "wood-frame construction". The requirements recognize - and have recognized for some time - that walls and floors may be supported by components made of material other than lumber; for example, by foundations described in Section 9.15. or by steel beams described in Article 9.23.4.3. These components still fall within the general category of wood-frame construction.

With more recent innovations, alternative structural components are being incorporated into wood-frame buildings. Wood I-joists, for example, are very common. Where these components are used in lieu of lumber, the requirements in Section 9.23. that specifically apply to lumber joists do not apply to these components: for example, limits on spans and acceptable locations for notches and holes. However, requirements regarding the fastening of floor sheathing to floor joists still apply, and the use of wood I-joists does not affect the requirements for wall or roof framing.

Similarly, if steel floor joists are used in lieu of lumber joists, the requirements regarding wall or roof framing are not affected.

Conversely, Sentence 9.23.1.1.(1) precludes the installation of pre-cast concrete floors on wood-frame walls since these are not "generally comprised of … small repetitive structural members … spaced not more than 610 mm o.c."

Thus, the reference to "engineered components" in Sentence 9.23.1.1.(1) is intended to indicate that, where an engineered product is used in lieu of lumber for one part of the building, this does not preclude the application of the remainder of Section 9.23. to the structure, provided the limits to application with respect to cladding, sheathing or bracing, spacing of framing members, supported loads and maximum spans are respected.

e7 ## A-9.23.3.1.(3) Standard for Screws.

The requirement that wood screws conform to ANSI/ASME B18.6.1., "Wood Screws (Inch Series)" is not intended to preclude the use of Robertson head screws. The requirement is intended to specify the mechanical properties of the fastener, not to restrict the means of driving the fastener.

A-9.23.3.3.(1) Prevention of Splitting.

The intent of the phrase "staggering the nails in the direction of the grain" is illustrated in Figure A-9.23.3.3.(1).

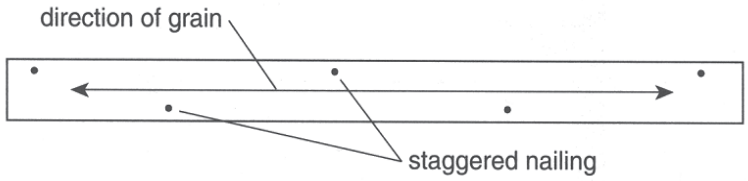


Figure A-9.23.3.3.(1)
Staggered Nailing

A-9.23.4.2. Span Tables for Wood Joists, Rafters and Beams.

In these span tables the term "rafter" refers to a sloping wood framing member which supports the roof sheathing and encloses an attic space but does not support a ceiling. The term "roof joist" refers to a horizontal or sloping wood framing member that supports the roof sheathing and the ceiling finish but does not enclose an attic space. Where rafters or roof joists are intended for use in a locality having a higher specified roof snow load than shown in the tables, the maximum member spacing may be calculated as the product of the member spacing and specified snow load shown in the span tables divided by the specified snow load for the locality being considered. The following examples show how this principle can be applied:

(a) For a 3.5 kPa specified snow load, use spans for 2.5 kPa and 610 mm o.c. spacing but space members 406 mm o.c.
(b) For a 4.0 kPa specified snow load, use spans for 2.0 kPa and 610 mm o.c. spacing but space members 305 mm o.c.

The maximum spans in the span tables are measured from the inside face or edge of support to the inside face or edge of support.

In the case of sloping roof framing members, the spans are expressed in terms of the horizontal distance between supports rather than the length of the sloping member. The snow loads are also expressed in terms of the horizontal projection of the sloping roof. Spans for odd size lumber may be estimated by straight line interpolation in the tables.

These span tables may be used where members support a uniform live load only. Where the members are required to be designed to support a concentrated load, they must be designed in conformance with Subsection 4.3.1.

Supported joist length in Tables A-8, A-9 and A-10 means half the sum of the joist spans on both sides of the beam. For supported joist lengths between those shown in the tables, straight line interpolation may be used in determining the maximum beam span.

Tables A-1 to A-16 cover only the most common configurations. Especially in the area of floors, a wide variety of other configurations is possible: glued subfloors, concrete toppings, machine stress rated lumber, etc. The Canadian Wood Council publishes "The Span Book", a compilation of span tables covering many of these alternative configurations. Although these tables have not been subject to the formal committee review process, the Canadian Wood Council generates, these span tables for wood structural components; thus Building Code users can be confident that the alternative span tables in "The Span Book" are consistent with the span tables in the Building Code and with relevant Building Code requirements.

Spans for wood joists, rafters and beams which fall outside the scope of these tables, including those for U.S. species and individual species not marketed in the commercial species combinations described in the span tables, can be calculated in conformance with CSA O86.1, "Engineering Design in Wood".

A-9.23.4.2.(2) Numerical Method to Establish Vibration-Controlled Spans for Wood Frame Floors.

In addition to the normal strength and deflection analyses, the calculations on which the floor joist span tables are based include a method of ensuring that the spans are not so long that floor vibrations could lead to occupants perceiving the floors as too "bouncy" or "springy". Limiting deflection under the normal uniformly distributed loads to 1/360 of the span does not provide this assurance. Normally, vibration analysis requires detailed dynamic modelling. However, the calculations for the span tables use the following simplified static analysis method of estimating vibration-acceptable spans:

- The span which will result in a 2 mm deflection of a single joist supporting a 1 kN concentrated midpoint load is calculated.
- This span is multiplied by a factor, K, to determine the "vibration-controlled" span for the entire floor system. If this span is less than the strength- or deflection-controlled span under uniformly distributed load, the vibration-controlled span becomes the maximum span.
- The K factor is determined from the following relationship:

$$\ln(K) = A - B \bullet \ln(S_i/S_{184}) + G$$

where

A, B = constants, the values of which are determined from Tables A-9.23.4.2.(2)A. or B.

G = constant, the value of which is determined from Table A-9.23.4.2.(2)C.

S_i = span which results in a 2 mm deflection of the joist in question under a 1 kN concentrated midpoint load

S_{184} = span which results in a 2 mm deflection of a 38 x 184 mm joist of same species and grade as the joist in question under a 1 kN concentrated midpoint load.

Notes to Table A-9.25.5.1.(1)

(1) Air leakage and vapour permeance values derived from:

- Bombaru, D., Jutras, R. and Patenaude, A. Air Permeance of Building Materials. Summary Report prepared by AIR-INS Inc. for Canada Mortgage and Housing Corporation, Ottawa, 1988. Values indicate properties of tested materials only; values for specific products may vary significantly.
- Details of Air Barrier Systems for Houses. Tarion Warranty Corporation (formerly Ontario New Home Warranty Program), Toronto, 1993.
- Kumaran, M.K., el al., ASHRAE Research Report 1018 RP, A Thermal and Moisture Transport Property Database for Common Building and Insulating Materials.
- Kumaran, M.K., Lackey, J., Normandin, N., van Reenen, D., Tariku, F., Summary Report from Task 3 of MEWS Project at the Institute for Research in Construction-Hygrothermal Properties of Several Building Materials, IRC- RR-110, March 2002.
- Mukhopadhyaya, P., Kumarai M.K., et al., Hygrothermal Properties of Exterior Claddings, Sheathing Boards, Membranes and Insulation Materials for Building Envelope Design, Proceedings of Thermal Performance of the Exterior Envelopes of Whole Building X, Clearwater, Florida, December 2-7, 2007, pp. 1-16 (NRCC-50287).

(2) This water vapour permeance value is for a 25 mm thick core layer of medium density polyurethane spray foam. When installed in the field, a low permeance resin layer forms where the foam is in contact with the substrate. The water vapour permeance of the installed foam, were it measured including the resin layer, would therefore likely be lower than the value listed in the Table.

a10.1 A-9.25.5.1.(1)(a)(ii) Reduced Potential for Condensation in the Building Envelope.

The requirements in Article 9.25.5.2. aim to reduce the risk of condensation being introduced into wall assemblies due to the water vapour permeance of the outboard materials. Research has confirmed that the reduced condensation potential of exterior continuous insulation with a thermal resistance of at least 0.7 ($m^2 \cdot K$)/W and a water vapour permeance between 30 and 1 800 ng/(Pa·s·m^2) compares to reference assemblies without exterior insulation in a given geographic location and climatic exposure.

a10.1 A-9.25.5.1.(3) Wood-Based Sheathing Materials.

Wood-based sheathing materials, such as plywood and OSB, that are not more than 12.5 mm thick are exempt from complying with Sentence 9.25.5.1.(1) because wood has an adaptive vapour permeance based on relative humidity: it has a low vapour permeance in an environment with low relative humidity and a higher vapour permeance in an environment with high relative humidity (see Figure A-9.25.5.1.(3)). This adaptive vapour permeance means that wood-based materials located on the outboard side of an assembly in winter, where the RH is typically 75% or higher, are relatively vapour-open, thus allowing greater vapour movement. The same wood-based material located on the inboard side of an assembly, where the RH is typically much lower in winter, has a low vapour permeance, thus mitigating the movement of vapour.

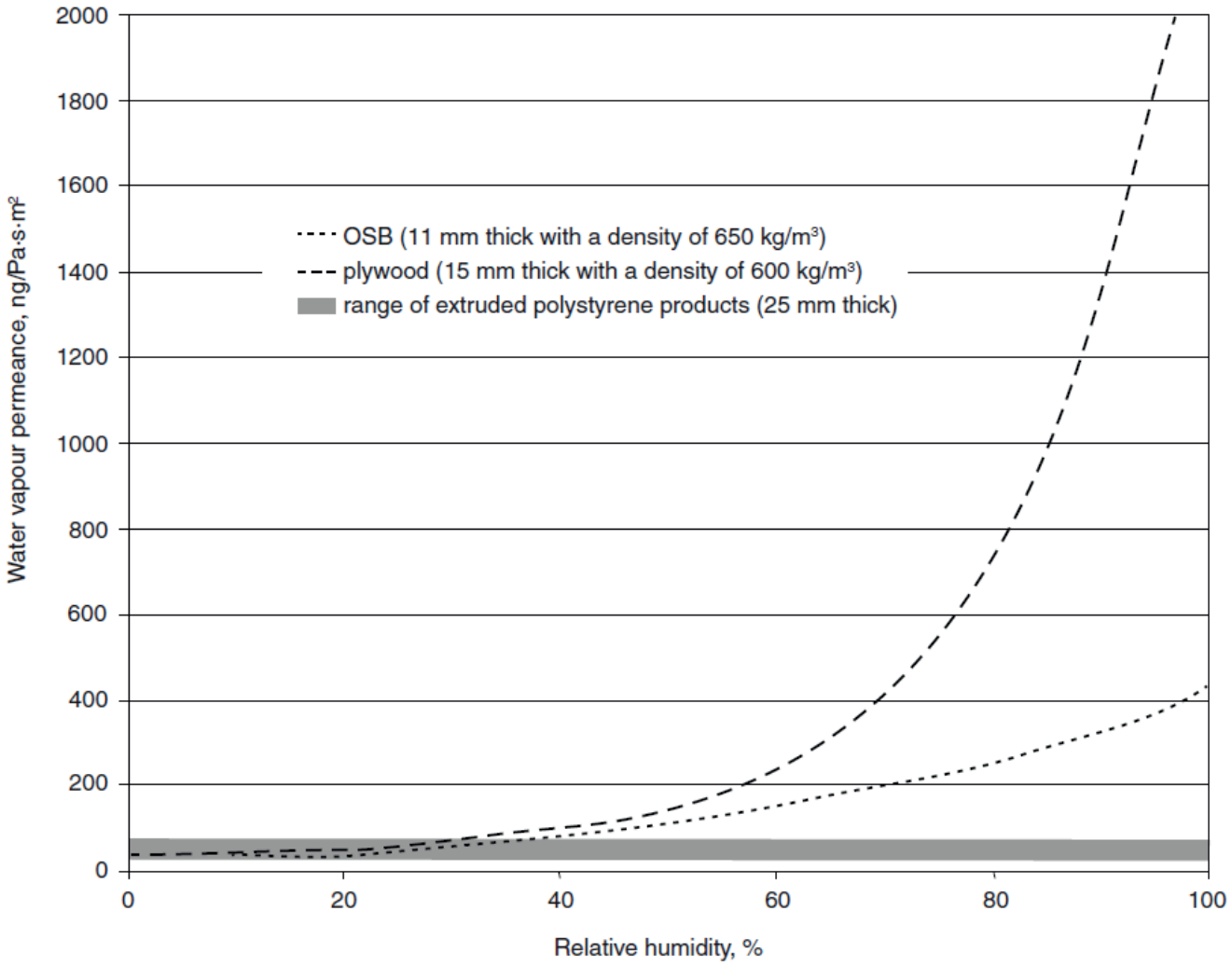


Figure A-9.25.5.1.(3)
Adaptive Water Vapour Permeance of Wood-Based Sheathing Materials

A-9.25.5.2. Assumptions Followed in Developing Table 9.25.5.2.

Article 9.25.5.2. specifies that a low air- and vapour-permeance material must be located on the warm face of the assembly, outboard of a vented air space, or within the assembly at a position where its inner surface is likely to be warm enough for most of the heating season such that no significant accumulation of moisture will occur. This last position is defined by the ratio of the thermal resistance values outboard and inboard of the innermost impermeable surface of the material in question

The design values given in Table 9.25.5.2. are based on the assumption that the building includes a mechanical ventilation system (between 0.3 and 0.5 air changes per hour), a 60 ng/(Pa•s•m^2) vapour barrier, and an air barrier (values between 0.024 and 0.1 L/(s•m^2) through the assembly were used). The moisture generated by occupants and their use of bathrooms, cleaning, laundry and kitchen appliances was assumed to fall between 7.5 and 11.5 L per day.

It has been demonstrated through modelling under these conditions that assemblies constructed according to the requirements in Table 9.25.5.2. do not lead to moisture accumulation levels that may lead to deterioration as long as the average monthly vapour pressure difference between the exterior and interior sides over the heating season does not increase above 750 Pa, which would translate into an interior relative humidity (RH) of 35% in colder climates and 60% in mild climates.

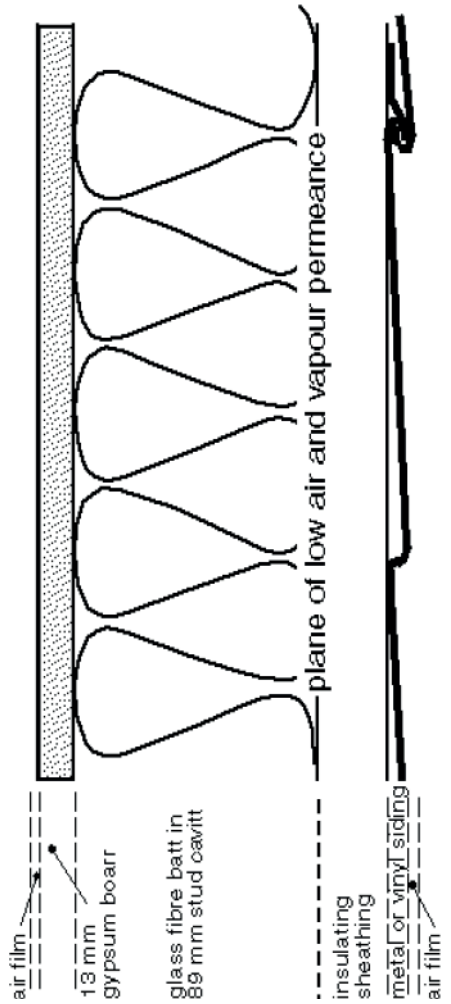
Health Canada recommends indoor relative humidities between 35% and 50% for healthy conditions. ASHRAE accepts a 30% to 60% range. Environments that are much drier tend to exacerbate respiratory problems and allergies; more humid environments tend to support the spread of microbes, moulds and dust mites, which can adversely affect health.

In most of Canada in the winter, indoor RH is limited by the exterior temperature and the corresponding temperature on the inside of windows. During colder periods, indoor RH higher than 35% will cause significant condensation on windows. When this occurs, occupants are likely to increase the ventilation to remove excess moisture. Although indoor RH may exceed 35% for short periods when the outside temperature is warmer, the criteria provided in Table 9.25.5.2. will still apply. Where higher relative humidities are maintained for extended periods in these colder climates, the ratios listed in the Table may not provide adequate protection.

Table 9.25.5.2. cannot be used for occupancies that require that RH be maintained above 35% throughout the year and for those interior spaces that support activities, such as swimming, that create high relative humidities. In these cases the position of the materials must be determined according to Part 5.

lt should be noted that Part 9 building envelopes in regions with colder winters have historically performed acceptably when the indoor RH does not exceed 35% over most of the heating season. With tighter building envelopes, it is possible to raise indoor RH levels above 35%. There is no information, however, on how Part 9 building envelopes will perform when exposed to these higher indoor RH levels for extended periods during the heating season over many years. Operation of the ventilation system, as intended to remove indoor pollutants, will maintain the lower RH levels as necessary.

The method of calculating the inboard to outboard thermal resistance ratio is illustrated in Figure A-9.25.5.2. The example wall section shows three planes where low air- and vapour-permeance materials have been installed. A vapour barrier, installed to meet the requirements of Subsection 9.25.4., is on the warm side of the insulation consistent with Clause 9.25.1.2.(1)(a) and Sentences 9.25.4.1.(1) and 9.25.4.3.(2). The vinyl siding has an integral drained and vented air space consistent with Clause 9.25.1.2.(1)(c). The position of the interior face of the low-permeance insulating sheathing, however, must be reviewed in terms of its thermal resistance relative to the overall thermal resistance of the wall, and the climate where the building is located.



	Inboard			Outboard		
RSI value	0.12	0.08	2.11	0.87	0.12	0.03
Total RSI value	2.31			1.02		
Ratio	1.02 / 2.31 = 0.44					

Figure A-9.25.5.2.
Example Wall Section Showing Thermal Resistance Inboard and Outboard of a Plane of Low Air and Vapour Permeance

Comparing the RS1 ratio from the example wall section with those in Table 9.25.5.2. indicates that this wall would be acceptable in areas with Celsius degree-day values up to 7999, which includes, for example, Geraldton. (Degree-day values for various locations in Ontario are provided in MMAH Supplementary Standard SB-1.

A similar calculation would indicate that, for a similar assembly but with a 140 mm stud cavity filled with an RSI 3.52 batt, the ratio would be 0.28. Thus such a wall could be used in areas with Celsius degree-day values up to 4999, which includes, for example, Ottawa.

Similarly, if half the thickness of the same low permeance sheathing were used, the ratio with an 89 mm cavity would be 0.25, permitting its use in areas with Celsius degree-day values up to 4999. The ratio with a 140 mm cavity would be 0.16; thus this assembly could not be used anywhere, since this ratio is below the minimum permitted in Table A-9.25.5.2.

Table A-9.25.5.2. shows the minimum thicknesses of low permeance insulating sheathing necessary to satisfy Article 9.25.5.2. in various degree-day zones for a range of resistivity values of insulating sheathing. These thicknesses are based on the detail shown in Figure A-9.25.5.2. but could also be used with cladding details, such as brick veneer or wood siding, which provide equal or greater outboard thermal resistance.

Table A-9.25.5.2.
Minimum Thicknesses of Low Permeance Insulating Sheathing

Celsius Heating Degree-days	Min. RSI Ratio	38 x 89 mm Framing					38 x 140 mm Framing				
		Min. Outboard Thermal Resistance, RSI	Min. Sheathing Thickness, mm				Min. Outboard Thermal Resistance, RSI	Min. Sheathing Thickness, mm			
			Sheathing Thermal Resistance, RSI/mm					Sheathing Thermal Resistance, RSI/mm			
			0.0300	0.0325	0.0350	0.0400		0.0300	0.0325	0.0350	0.0400
≤ 4999	0.20	0.46	10	10	9	8	0.72	19	17	16	14
5000 to 5999	0.30	0.69	18	17	16	14	1.07	31	28	26	23
6000 to 6999	0.35	0.81	22	20	19	16	1.25	37	34	32	28
7000 to 7999	0.40	0.92	26	24	22	19	1.43	43	39	37	32
Column 1	2	3	4	5	6	7	8	9	10	11	12

References

(1) Exposure Guidelines for Residential Indoor Air Quality, Environmental Health Directorate, Health Protection Branch, Health Canada, Ottawa, April 1987 (Revised July 1989).
(2) ANSI/ASHRAE 62, "Ventilation for Acceptable Indoor Air Quality."

a10.1 A-9.26.1.1.(1) Platforms that Effectively Serve as Roofs.

Decks, balconies, exterior walkways and similar exterior surfaces effectively serve as roofs where these platforms do not permit the free drainage of water through the deck. When water is driven by wind across the deck (roof) surface, it can be driven upward when it encounters an interruption.

A-9.26.2.2.(4) Fasteners for Treated Shingles.

Where shingles or shakes have been chemically treated with a preservative or a fire retardant, the fastener should be of a material known to be compatible with the chemicals used in the treatment.

A-9.26.4.1. Junctions Between Roofs and Walls or Guards.

Drainage of water from decks and other platforms that effectively serve as roofs will be blocked by walls, and blocked or restricted by guards where significant lengths and heights of material are connected to the deck. Without proper flashing at such roof-wall junctions or roof-guard junctions, water will generally leak into the adjoining elements and can penetrate into supporting assemblies below. Exceptions include platforms where waterproof curbs of sufficient height are cast-in or where the deck and wall or guard are unit-formed. In these cases, the monolithic deck-wall or deck-guard junctions will minimize the likelihood of water ingress. (See also Appendix Note A-9.26.1.1.(2).)

A-9.26.6.1.(1) Underlay Beneath Shingles.

While underlayment has not traditionally been required by the Code, some shingle manufacturers require its use beneath their products.

A-9.26.17.1.(1) Installation of Concrete Roof Tiles.

Where concrete roof tiles are to be installed, the dead load imposed by this material should be considered in determining the minimum sizes and maximum spans of the supporting roof members.

a10.1 **A-9.27.1.1.(5) EIFS on Walls with Cold-Formed Steel Stud Framing.**

While Part 9 permits the installation of exterior insulation finish systems on walls with cold-formed steel stud framing, the design of loadbearing steel walls is outside the scope of Part 9 and is addressed in Part 4 (see Sentence 9.24.1.1.(2)).

A-9.27.2. Required Protection from Precipitation.

Part 5 and Part 9 of the Building Code recognize that mass walls and face-sealed, concealed barrier and rainscreen assemblies have their place in the Canadian context.

Mass walls are generally constructed of cast-in-place concrete or masonry. Without cladding or surface finish, they can be exposed to precipitation for a significant period before moisture will penetrate from the exterior to the interior. The critical characteristics of these walls are related to thickness, mass, and moisture transfer properties, such as shedding, absorption and moisture diffusion.

Face-sealed assemblies have only a single plane of protection. Sealant installed between cladding elements and other envelope components is part of the air barrier system and is exposed to the weather. Face-sealed assemblies are appropriate where it can be demonstrated that they will provide acceptable performance with respect to the health and safety of the occupants, the operation of building services and the provision of conditions suitable for the intended occupancy. These assemblies, however, require more intensive, regular and on-going maintenance, and should only be selected on the basis of life-cycle costing considering the risk of failure and all implications should failure occur. Climate loads such as wind-driven rain, for example, should be considered. Face-sealed assemblies are not recommended where the building owner may not be aware of the maintenance issue or where regular maintenance may be problematic.

Concealed barrier assemblies include both a first and second plane of protection. The first plane comprises the cladding, which is intended to handle the majority of the precipitation load. The second plane of protection is intended to handle any water that penetrates the cladding plane. It allows for the dissipation of this water, primarily by gravity drainage, and provides a barrier to further ingress.

Like concealed barrier assemblies, rainscreen assemblies include both a first and second plane of protection. The first plane comprises the cladding, which is designed and constructed to handle virtually all of the precipitation load. The second plane of protection is designed and constructed to handle only very small quantities of incidental water; composition of the second plane is described in Appendix Note A-9.27.3.1. In these assemblies, the air barrier system, which plays a role in controlling precipitation ingress due to air pressure difference, is protected from the elements. (See Figure A-9.27.2.)

- terminate at the jambs or, where the face of the jambs is not at least flush with the face of the cladding and the sills extend beyond the jambs, incorporate end dams sufficiently high to protect against overflow in wind-driven rain conditions.

A wind pressure of 10 Pa can raise water 1 mm. Thus, for example, if a window is exposed to a driving rain wind pressure of 200 Pa, end dams should be at least 20 mm high.

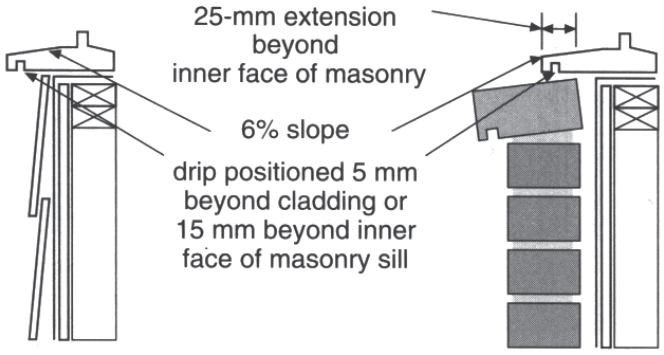


Figure A-9.27.3.8.(5)
Examples of Configurations of Self-Flashing Sills

A-9.27.4.2.(1) Selection and Installation of Sealants.

Analysis of many sealant joint failures indicates that the majority of failures can be attributed to improper joint preparation and deficient installation of the sealant and various joint components. The following ASTM guidelines describe several aspects that should be considered when applying sealants in unprotected environments to achieve a durable application:

- ASTM C1193, "Use of Joint Sealants,"
- ASTM C1299, "Selection of Liquid-Applied Sealants,"
- ASTM C1472, "Calculating Movement and Other Effects When Establishing Sealant Joint Width."

The sealant manufacturer's literature should always be consulted for recommended procedures and materials.

A-9.27.9.2.(3) Grooves in Hardboard Cladding.

Grooves deeper than that specified may be used in thicker cladding providing they do not reduce the thickness to less than the required thickness minus 1.5 mm. Thus for Type 1 or 2 cladding, grooves must not reduce the thickness to less than 4.5 mm or 6 mm depending on method of support, or to less than 7.5 mm for Type 5 material.

A-9.27.10.2.(2) Thickness of Grade O-2 OSB.

In using Table 9.27.8.2. to determine the thickness of Grade O-2 OSB cladding, substitute "face orientation" for "face grain" in the column headings.

A-9.27.11.1.(3) and (4) Material Standards for Aluminum Cladding.

Compliance with Sentence 9.27.11.1.(3) and CAN/CGSB-93.2-M, "Prefinished Aluminum Siding, Soffits, and Fascia for Residential Use", is required for aluminum siding that is installed in horizontal or vertical strips. Compliance with Sentence 9.27.11.1.(4) and CAN/CGSB-93.1-M, "Sheet, Aluminum Alloy, Prefinished, Residential", is required for aluminum cladding that is installed in large sheets.

a10.1 A-9.27.13.1.(1) Geometrically Defined Drainage Cavity.

"Geometrically defined drainage cavity" (GDDC) refers to the channels, grooves or profiles cut into the insulation backing of an EIFS panel for the purpose of providing a way for water that gets behind the system to drain out. The channels, grooves or profiles of one panel need to connect to the channels, grooves or profiles of adjacent panels in order for drainage to occur consistently and uniformly across the entire EIFS. While the size of a channel, groove or profile can be verified by inspecting a single panel, the intent of Sentence 9.27.13.1.(1) is that the required drainage capacity be achieved across the entire system.

Additional information on the design and installation of EIFS can be found in

- the EIFS Practice Manual published by the EIFS Council of Canada, and
- the manufacturer's literature.

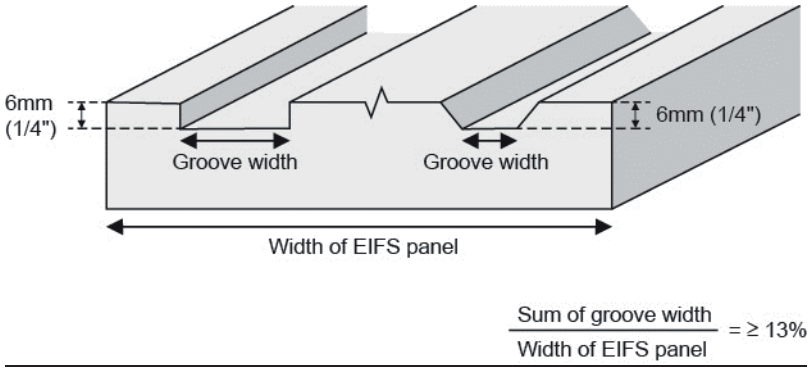


Figure A-9.27.13.1.(1)
Geometrically Defined Drainage Cavity

a10.1 A-9.27.13.2.(2)(a) Substrates for Exterior Insulation Finish Systems.

The list of acceptable substrates for each type of EIFS can be found in a system's respective test report to CAN/ULC-S716.1, "Exterior Insulation and Finish Systems (EIFS) – Materials and Systems"; however, the following substrates are generally considered acceptable:

- minimum 11 mm thick exposure 1 OSB classified as PS2 exterior wall sheathing
- minimum 11 mm thick exterior-rated plywood sheathing
- minimum 12.7 mm thick exterior gypsum sheathing conforming to ASTM C1177 / C1177M, "Glass Mat Gypsum Substrate for Use as Sheathing"
- cementitious panels
- fibre-cement panels
- concrete block
- clay masonry
- cast-in-place concrete

Note that, in some cases, the list of acceptable substrates may be limited by the EIFS manufacturer.

A-Table 9.28.4.3. Stucco Lath.

Paper-backed welded wire lath may also be used on horizontal surfaces provided its characteristics are suitable for such application.

A-9.30.1.2.(1) Water Resistance.

In some areas of buildings, water and other substances may frequently be splashed or spilled onto the floor. It is preferable, in such areas, that the finish flooring be a type that will not absorb moisture or permit it to pass through; otherwise, both the flooring itself and the subfloor beneath it may deteriorate. Also, particularly in food preparation areas and bathrooms, unsanitary conditions may be created by the absorbed moisture. Where absorbent or permeable flooring materials are used in these areas, they should be installed in such a way that they can be conveniently removed periodically for cleaning or replacement, i.e., they should not be glued or nailed down. Also, if the subfloor is a type that is susceptible to moisture damage (this includes virtually all of the wood-based subfloor materials used in wood frame construction), it should be protected by an impermeable membrane placed between the finish flooring and the subfloor. The minimum degree of impermeability required by Sentence 9.30.1.2.(1) would be provided by such materials as polyethylene, aluminum foil, and most single-ply roofing membranes (EPDM, PVC).

A-9.31.6.2.(3) Securement of Service Water Heaters.

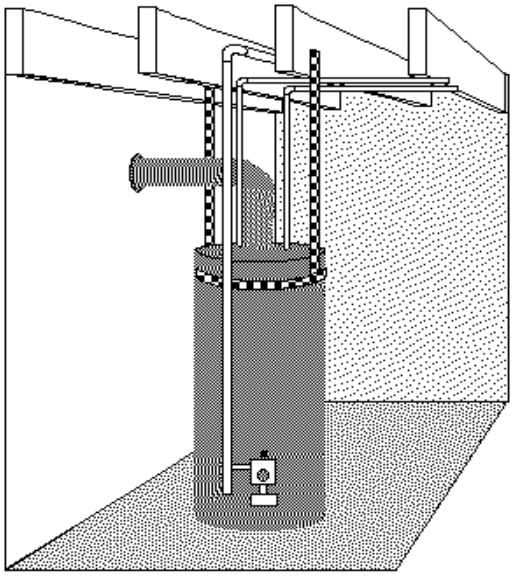


Figure A-9.31.6.2.(3)
Securement of Service Water Heater Using Strapping Fastened to Floor Joists Overhead

A-9.32.3. Mechanical Ventilation.

For many years, houses were constructed without mechanical ventilation systems and relied on natural air leakage through the building envelope for winter ventilation. However, houses have become progressively more airtight through the introduction of new products and practices, e.g., the substitution of panel sheathings such as plywood and waferboard for board sheathing, the replacement of paper-backed insulation batts with friction-fit batts and polyethylene film, improved caulking materials, tighter windows and doors, and more efficient heating systems. Following the energy crisis in the early 1970's, considerable emphasis was placed on reducing air leakage in order to conserve energy. Electric heating systems were encouraged and higher efficiency furnaces were developed, which further reduced air change rates in buildings. This led to concern that the natural air change in dwelling units might be insufficient in some instances to provide adequate indoor air quality. Condensation problems resulting from higher humidity levels were also a concern.

Mechanical ventilation requirements in the Building Code have evolved from a simple requirement in the 1983 edition that exhaust fans be incorporated in electrically heated houses, through requirements in the 1986 and 1990 editions that all houses have mechanical ventilation systems capable of exchanging the indoor air for outdoor air at a specified rate: 0.5 air changes per hour in the 1986 edition and 0.3 air changes per hour in the 1990 edition. The current requirements address not only the overall air change rate created by the mechanical ventilation system but also the need to ensure that the outdoor air brought into the house by the system is distributed throughout the house.

A-9.33.1.1. Combustion Air and Tight Houses.

The operation of an air exhaust system or of a fuel-burning appliance removes the air from a house, creating a slight negative pressure inside. In certain cases the natural flow of air up a chimney can be reversed, leading to a possible danger of carbon monoxide poisoning for the inhabitants.

Newer houses are generally more tightly constructed than older ones because of improved construction practices, including tighter windows, weather stripping and caulking. This fact increases the probability that infiltration may not be able to supply enough air to compensate for simultaneous operation of exhaust fans, fireplaces, clothes dryers, furnaces and space heaters. It is necessary, therefore, to introduce outside air to the space containing the fuel-burning appliance. Information regarding combustion air requirements for various types of appliances can be found in the installation standards referenced in Articles 6.2.1.4. and 9.33.1.2. In the case of solid-fuel burning stoves, ranges and space heaters, CAN/CSA-B365, "Installation Code for Solid-Fuel-Burning Appliances and Equipment" suggests that the minimum size of openings be determined by trial and error to accommodate the flue characteristics, the firing rate, the building characteristics, etc., and that, as a guide, the combustion air opening should be 0.5 times the flue collar area.

Further information is available in Canadian Building Digest 222, "Airtight Houses and Carbon Monoxide Poisoning", from the Institute for Research in Construction, National Research Council of Canada, Ottawa K1A 0R6.

A-9.33.1.2.(1) Design, Construction and Installation Standard for Solid-Fuel-Burning Appliances.

CSA B365, "Installation Code for Solid-Fuel-Burning Appliances and Equipment" is essentially an installation standard, and covers such issues as accessibility, air for combustion and ventilation, chimney and venting, mounting and floor protection, wall and ceiling clearances, installation of ducts, pipes, thimbles and manifolds, and control and safety devices. But the standard also includes a requirement that solid-fuel-burning appliances and equipment satisfy the requirements of one of a series of standards, depending on the appliance or equipment, therefore also making it a design and construction standard. It is required that stoves, ranges, central furnaces and other space heaters be designed and built in conformity with the relevant referenced standard.

a10.1 A-9.33.1.2.(2) Emission Limits.

CSA B415.1-10 and the US EPA Standard cover appliances that burn biomass fuels other than coal and require appliances equipped with catalytic combustors have an average particulate emission rate ≤ 2.5 g/h and appliances not equipped with catalytic combustors have an average particulate emission rate ≤ 4.5 g/h. Both CSA and EPA test particulate emissions using the same testing methods. These standards do not cover site-built masonry fireplaces or site-built masonry heaters. They do not apply to factory-built fireplaces with a minimum burn rate ≥ 5 kg/h.

A-9.33.4. Carbon Monoxide Alarms.

Carbon monoxide (CO) is a colourless, odourless gas that can build up to lethal concentrations in an enclosed space without the occupants being aware of it. Thus, where an enclosed space incorporates or is near a potential source of CO, it is prudent to provide some means of detecting its presence.

Dwelling units have two common potential sources of CO:

- fuel-fired space- or water-heating equipment within the dwelling unit or in adjacent spaces within the building, and
- attached storage garages.

Most fuel-fired heating appliances do not normally produce CO and, even if they do, it is normally conveyed outside the building bv the appliance's venting system. Nevertheless, appliances can malfunction and venting systems can fail. Therefore, the provision of appropriately placed CO alarms in the dwelling unit is a relatively low-cost back-up safety measure. Similarly, although Article 9.10.9.16. requires that the walls and floor/ceiling assemblies separating attached garages from dwelling units incorporate an air barrier system, there have been several instances of CO from garages being drawn into houses, which indicates that a fully gas-tight barrier is difficult to achieve. The likelihood of preventing the entry of all CO is decreased if the dwelling unit is depressurized in relation to the garage. This can readily occur due to the operation of exhaust equipment or simply due to the stack effect created by heating the dwelling unit. Again, CO alarms in the dwelling unit provide a relatively low-cost back-up safety measure.

a10 A-9.34.4.1. Reserved.

A-9.39. Cold Room Slabs.

Design Assumptions

1. Density of Reinforced Concrete = 23.5 kN/m^3.

2. Live Loads - As per Sentence 9.4.2.3 (1) of the Building Code, the live load is the lesser of the following:
   - 1.9 kPa,
   - Specified roof snow load, which for Ontario is up to 2.9 kPa.

Therefore a specified design load of 3.0 kPa is appropriate; however, the slab specified is capable of carrying higher live loads since the crack control requirements of CSA A23.3 and cover requirements as given below govern the design of the slab.

3. Design Standards: CSA A23.3-94, "Design of Concrete Structures".

4. Exposure and Cover for Reinforcing Steel:
   - The slab is considered to be exposed to weather and de-icing chemicals.
   - Minimum top cover is 60 mm as per CSA A23.3 Clause A15.1.7.1 plus a 12 mm tolerance on placement.
   - Minimum bottom cover is 30 mm as per CSA A23.3 Clause A12.6.2 (slab cast against formwork).
   - For 10M reinforcing bars the minimum slab thickness is 72 mm cover + 11.3 mm bar + 11.3 mm bar + 30 mm cover = 125 mm.

5. Design Assumptions:
   - Concrete compressive strength of 32 MPa at 28 days as per Sentence 9.3.1.6.(1) of the Building Code.
   - Reinforcing steel yield strength of 400 Mpa.
   - Slab design is based on a one-way slab simply supported on foundation walls along the edges. Since the slab can be square or rectangular, the same steel is provided in both directions.
   - Maximum span is limited to 20 times the slab thickness as per CSA A23.3 Table 9.1.

A-10 Change of Use.

The successful application of Code requirements to a change of use of an existing building or parts thereof without any proposed construction becomes a matter of balancing the cost of implementing a requirement with the relative importance of that requirement to the overall Code objectives. In general, the degree to which any particular requirement can be relaxed without affecting the intended level of safety of the Code requires considerable judgment on the part of both the designer and the authority having jurisdiction. Therefore, this Part sets out a minimum performance level which the change of use must maintain.

A-11.2.1.1.(1)(a) Construction Index.

The scale of 1 (lowest) to 8 (highest) was formulated for existing buildings, to be used to determine their existing performance level; the numbers, or indices, were established based on the requirements of 3.2.2.20. to 3.2.2.83. Classification of existing buildings will now be in accord with Table 11.2.1.1.A. rather than Subsection 3.2.2. The construction index is established by evaluating all floors and roofs of the existing building.

A-11.2.1.1.(1)(b) Hazard Index.

While the construction index refers to construction of the existing building, hazard index refers to the proposed major occupancy or use of the building; the scales of 1 (lowest hazard) to 8 (highest hazard) are compatible with those of the construction index. In effect, a building with a C.I. of say 3, will support a major occupancy with a H.I. of 3 or lower; if you wish to change to a major occupancy with a H.I. higher than 3, then you must increase the fire protection construction of the building to support that higher hazard according to Table 11.2.1.1.A., or provide the additional upgrading in accordance with Column 4 of Table 11.4.3.4.A.

A-11.3.1.1.(1) Performance Level.

States the philosophy and intent of this Article: "after construction, the performance level of the building may remain the same, or be made better, but may not be made worse".

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MMAH Supplementary Standard SA-1

Objectives and Functional Statements Attributed to the Acceptable Solutions

January 15, 2019 update

Effective Date: January 1, 2020

Issued July 26, 2019

COMMENCEMENT

MMAH Supplementary Standard SA-1 comes into force on the 1st day of January, 2014.

m1 Ruling of the Minister of Municipal Affairs and Housing (Minister's Ruling) MR-13-S-24 takes effect on the 1st day of January, 2014.
r3 SA-1 as amended by Ontario Regulation 361/13 comes into force on the 1st day of January, 2014.
r3.1 SA-1 as amended by Ontario Regulation 361/13 corresponding to Ontario Regulation 361/13 provisions that come into force on the 1st day of January, 2015.
r4 SA-1 as amended by Ontario Regulation 361/13 corresponding to Ontario Regulation 368/13 provisions that come into force on the 1st day of January, 2015.
r5 SA-1 as amended by Ontario Regulation 191/14 comes into force on the 1st day of January, 2015.
r6 SA-1 as amended by Ontario Regulation 139/17 comes into force on the 1st day of July, 2017.
r6.1 SA-1 as amended by Ontario Regulation 139/17 comes into force on the 1st day of January, 2018.
m5 Ruling of the Minister of Municipal Affairs (Minister's Ruling) MR-17-S-28 takes effect on the 1st day of January, 2018.
r11 SA-1 as amended by Ontario Regulation 88/19 comes into force on the 2nd day of May, 2019.
r11.1 SA-1 as amended by Ontario Regulation 88/19 comes into force on the 1st day of January, 2020.
r11.2 SA-1 as amended by Ontario Regulation 88/19 comes into force on the 1st day of January, 2022.

EDITORIAL

e1 Editorial correction issued for January 1st, 2014.
e2 Editorial correction issued for January 1st, 2014.
e2.1 Editorial correction issued for January 1st, 2015.
e3 Editorial correction issued for January 1st, 2015.
e4 Editorial correction issued for July 1st, 2017.
e4.1 Editorial correction issued for January 1, 2018.
e5 Editorial correction issued for January 1, 2018.
e6 Editorial correction issued for May 2, 2019.
e6.1 Editorial correction issued for January 1, 2020.
e6.2 Editorial correction issued for January 1, 2022.

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SA-1 Objectives and Functional Statements Attributed to the Acceptable Solutions

1. Scope

This standard specifies, for the purposes of Article 1.2.1.1. of Division A of the Building Code, the objectives and functional statements that have been attributed to acceptable solutions provided in Division B of the Building Code.

2. Objectives and Functional Statements

The objectives listed in this standard are those set out in Part 2 of Division A of the Building Code.

The functional statements listed in this standard are set out in Part 3 of Division A of the Building Code.

3. Attribution to Acceptable Solutions

For the purposes of compliance with the Building Code, as required in Sentence 1.2.1.1.(2) of Division A of the Building Code, the objectives and functional statements attributed to the acceptable solutions in Division B shall be the objectives and functional statements listed in Tables 3 to 12.

Table 3
Objectives and Functional Statements Attributed to the Acceptable Solutions in Part 3 of Division B

	Acceptable Solutions	Objectives and Functional Statements
	3.1.1.1.	**Scope**
	(1)	
	3.1.1.2.	**Radon**
	(1)	[F40, F50-OH1.1]
	3.1.1.3.	**Building in Flood Plains**
	(1)	(a) [F20-OP2.1]
		(a) [F20-OS2.1, OS2.3]
		(a) [F61-OH1.3]
		(b) [F10, F12-OS3.1] [F10, F30-OS3.7]
	3.1.2.1.	**Classification of Buildings**
	(1)	
	(2)	
	3.1.2.2.	**Occupancies of the Same Classification**
	(1)	
	3.1.2.3.	**Arena Type Buildings**
	(1)	
	3.1.2.4.	**Police Stations**
	(1)	
	3.1.2.5.	**Group B, Division 3 Occupancies**
	(1)	
	3.1.2.6.	**Restaurants**
	(1)	
	3.1.2.7.	**Storage of Combustible Fibres**
	(1)	
	3.1.3.1.	**Separation of Major Occupancies**
	(1)	[F03-OP1.2]
		[F03-OS1.2]
r5	(2)	
r5	(3)	[F03-OP1.2]
		[F03-OS1.2]
r5	(4)	[F03-OP1.2]
		[F03-OS1.2]
r5	(5)	
	3.1.3.2.	**Prohibition of Occupancy Combinations**
	(1)	[F02, F03-OS1.2] [F10-OS1.5]
	(2)	[F02, F03-OS1.2] [F10-OS1.5]
	(3)	[F41-OH2.1]
	(4)	
r5	(5)	[F02, F03-OS1.2] [F10-OS1.5]
r5	(6)	
	3.1.4.1.	**Combustible Materials Permitted**
	(1)	
r11.1	**3.1.4.2.**	**Protection of Foamed Plastics**
	(1) to (3)	[F01-OP1.1] [F02-OP1.2]
		[F01-OS1.1] [F02-OS1.2]
	(4)	
	3.1.4.3.	**Wires and Cables**
	(1)	[F02-OP1.2]
		[F02-OS1.2]

	Acceptable Solutions	Objectives and Functional Statements
	(2)	
	(3)	
	3.1.4.4.	**Nonmetallic Raceways**
	(1)	
	3.1.4.5.	**Fire-Retardant Treated Wood**
	(1)	[F02-OP1.2]
		[F02-OS1.2]
	3.1.4.6.	**Heavy Timber Construction Alternative**
e3	(1), (2)	
	3.1.4.7.	**Heavy Timber Construction**
e3	(1) to (12)	
r5	**3.1.4.8.**	**Cladding**
	(1)	[F02, F03-OP3.1]
r5	**3.1.4.9.**	**Combustible Piping**
	(1)	[F02-OP1.2]
		[F02-OS1.2]
	(2)	
	3.1.5.1.	**Noncombustible Materials**
	(1)	[F02-OP1.2]
		[F02-OS1.2]
	(2)	
	(3)	
	(4)	
	3.1.5.2.	**Minor Combustible Components**
	(1)	
	3.1.5.3.	**Combustible Roofing Materials**
	(1)	
	(2)	
	(3)	
	(4)	
	3.1.5.4.	**Combustible Glazing and Skylights**
	(1)	
	(2)	
	(3)	
	(4)	
	(5)	
r11.1	**3.1.5.5.**	**Combustible Components for Exterior Walls**
	(1)	
	(2)	[F02, F03-OP3.1]
	(3), (4)	
r11.1	**3.1.5.5A.**	**Factory-Assembled Panels**
	(1) to (3)	
	3.1.5.6.	**Nailing Elements**
	(1)	
	3.1.5.7.	**Combustible Millwork**
	(1)	
	3.1.5.8.	**Combustible Flooring Elements**
	(1)	
	(2)	
	(3)	
	(4)	

	Acceptable Solutions	Objectives and Functional Statements
	3.1.5.9.	**Combustible Stairs in Dwelling Units**
	(1)	
r11.1	**3.1.5.10.**	**Combustible Interior Finish**
	(1) to (4)	
	3.1.5.11.	**Gypsum Board**
	(1)	
r11.1	**3.1.5.12.**	**Combustible Insulation**
	(1)	
	(2)	
	(3)	
	(4)	
	(5)	
	(6)	
r11.1	**3.1.5.12A.**	**Foam Plastic Insulation**
	(1) to (4)	
	3.1.5.13.	**Combustible Elements in Partitions**
	(1)	
	(2)	
	(3)	
	3.1.5.14.	**Storage Lockers in Residential Buildings**
	(1)	
	3.1.5.15.	**Combustible Ducts**
	(1)	
	(2)	
	(3)	
	3.1.5.16.	**Combustible Piping Materials**
	(1)	
	(2)	
	(3)	
	3.1.5.17.	**Combustible Plumbing Fixtures**
	(1)	
	3.1.5.18.	**Wires and Cables**
	(1)	
	(2)	
	3.1.5.19.	**Combustible Travelling Cables for Elevators**
	(1)	
	3.1.5.20.	**Nonmetallic Raceways**
	(1)	[F02-OP1.2]
		[F02-OS1.2]
	3.1.5.21.	**Wires in Computer Room Floors**
	(1)	
	(2)	
	3.1.5.22.	**Combustible Components in Public Pools and Public Spas**
	(1)	
	3.1.5.23.	**Marquees Having Combustible Elements**
	(1)	
	(2)	
	3.1.5.24.	**Combustible Mezzanines**
	(1)	
	3.1.5.25.	**Wood Decorative Cladding**
	(1)	

Acceptable Solutions	Objectives and Functional Statements
3.1.5.26.	**Combustible Solar Collector Systems**
(1)	
3.1.7.1.	**Determination of Ratings**
(1)	[F03-OP1.2] [F04-OP1.3]
	[F03-OS1.2] [F04-OS1.3]
(2)	
3.1.7.2.	**Exception for Exterior Walls**
(1)	
3.1.7.3.	**Exposure Conditions for Rating**
(1)	
(2)	
(3)	
3.1.7.4.	**Minimum Fire-Resistance Rating**
(1)	
3.1.7.5.	**Rating of Supporting Construction**
(1)	[F04-OP1.3]
	[F04-OS1.3]
(2)	
(3)	[F04-OP1.3]
	[F04-OS1.3]
3.1.8.1.	**General Requirements**
(1)	(a) [F03-OP1.2]
	(a) [F03-OS1.2]
(2)	[F03-OP1.2] Applies to the requirement that openings in *fire separations* be protected with *closures,* shafts or other means.
	[F03-OS1.2] Applies to the requirement that openings in *fire separations* be protected with *closures,* shafts or other means.
3.1.8.2.	**Combustible Construction Support**
(1)	[F04-OP1.2]
	[F04-OS1.2]
3.1.8.3.	**Continuity of Fire Separations**
(1)	[F03-OP1.2]
	[F03-OS1.2]
(2)	[F03-OP1.2]
	[F03-OS1.2]
(3)	(a), (b) [F03-OP1.2]
	(a), (b) [F03-OS1.2]
(4)	[F03-OP1.2]
	[F03-OS1.2]
r11.1 **3.1.8.4.**	**Determination of Ratings**
(1) to (4)	[F03-OP1.2]
	[F03-OS1.2]
r11.1 **3.1.8.5.**	**Installation of Closures**
(1)	
(2)	[F03-OP1.2]
	[F03-OS1.2]
(3)	[F03-OP1.2]
	[F03-OS1.2]
(4)	[F81-OP1.2]
	[F81-OS1.2]
(5), (6)	[F03-OP1.2]
	[F03-OS1.2]
(7)	

	Acceptable Solutions	Objectives and Functional Statements
	3.1.8.6.	**Maximum Openings**
	(1)	[F03-OP1.2]
		[F03-OS1.2]
	(2)	[F03-OP1.2]
		[F03-OS1.2]
r11.1	**3.1.8.7.**	**Location of Fire Dampers and Smoke Dampers**
	(1), (2)	[F03-OP1.2]
		[F03-OS1.2]
r11.1	**3.1.8.8.**	**Fire Dampers Waived**
	(1) to (4)	
r11.1	**3.1.8.8A.**	**Smoke Dampers Waived**
	(1), (2)	
	3.1.8.9.	**Installation of Fire Dampers**
r11.1	(1)	[F04-OP1.2]
		[F04-OS1.2]
	(2)	[F03-OP1.2]
		[F03-OS1.2]
	(3)	[F04-OP1.2]
		[F04-OS1.2]
	(4)	[F03-OP1.2]
		[F03-OS1.2]
	(5)	[F82-OH1.2] Applies to portion of code text "A tightly fitted access door shall be installed for each *fire damper* to provide access for ... the resetting of the release device."
		[F82-OP1.2] Applies to portion of code text "A tightly fitted access door shall be installed for each *fire damper* to provide access for the inspection of the damper..."
		[F82-OS1.2] Applies to portion of code text "A tightly fitted access door shall be installed for each *fire damper* to provide access for the inspection of the damper..."
r11.1	**3.1.8.9A.**	**Installation of Smoke Dampers**
	(1) to (4)	[F03-OP1.2]
		[F03-OS1.2]
	(5)	[F82-OH1.2] Applies to portion of code text "A tightly fitted access door shall be installed for each *fire damper* to provide access for ... the resetting of the release device."
		[F82-OP1.2] Applies to portion of code text "A tightly fitted access door shall be installed for each *fire damper* to provide access for the inspection of the damper..."
		[F82-OS1.2] Applies to portion of code text "A tightly fitted access door shall be installed for each *fire damper* to provide access for the inspection of the damper..."
	3.1.8.10.	**Twenty-Minute Closures**
	(1)	
	(2)	
	(3)	[F03-OP1.2]
		[F03-OS1.2]
	(4)	
	3.1.8.11.	**Self-Closing Devices**
	(1)	[F03-OP1.2]
		[F03-OS1.2]
	(2)	
	(3)	
	(4)	
	(5)	
r11.1	**3.1.8.12.**	**Hold-Open Devices**
	(1)	[F03-OS1.2]
		[F03-OP1.2]
	(2)	[F03-OP1.2]
		[F03-OS1.2]

Acceptable Solutions	Objectives and Functional Statements
(3)	[F03-OP1.2]
	[F03-OS1.2]
(4)	[F03-OP1.2]
	[F03-OS1.2]
(5)	[F03-OP1.2]
	[F03-OS1.2]
(6)	
3.1.8.13.	**Door Latches**
(1)	[F03-OP1.2]
	[F03-OS1.2]
3.1.8.14.	**Wired Glass and Glass Block**
(1)	
(2)	
(3)	[F04-OP1.2] Applies to portion of Code text: "Glass blocks permitted by Sentence (1) shall be ... reinforced with steel reinforcement in each horizontal joint."
	[F04-OS1.2] Applies to portion of Code text: "Glass blocks permitted by Sentence (1) shall be ... reinforced with steel reinforcement in each horizontal joint."
3.1.8.15.	**Temperature Rise Limit for Doors**
(1)	[F03-OP1.2]
	[F03, F31-OS1.2] [F05-OS1.5]
3.1.8.16.	**Area Limits for Wired Glass and Glass Block**
(1)	[F31-OS1.2] [F05-OS1.5]
	[F30-OS3.1]
(2)	[F31-OS1.2] [F05-OS1.5]
3.1.8.17.	**Temperature Rise and Area Limits Waived**
(1)	
3.1.8.18.	**Sprinkler Protected Glazed Wall Assembly**
(1)	[F03-OP1.2] [F04-OP1.3]
	[F03-OS1.2] [F04-OS1.3]
(2)	[F03-OP1.2] [F04-OP1.3]
	[F03-OS1.2] [F04-OS1.3]
(3)	[F03, F06-OS1.2] [F05, F06-OS1.5]
	[F03, F06-OP1.2]
3.1.9.1.	**Fire Stopping of Service Penetrations**
(1)	[F03-OP1.2] [F04-OP1.3]
	[F03-OS1.2] [F04-OS1.3]
(2)	[F03-OP1.2]
	[F03-OP3.1]
	[F03-OS1.2]
(3)	(a) [F03-OP1.2]
	(a) [F03-OS1.2]
	[F10-OS1.5]
(4)	
(5)	
3.1.9.2.	**Combustibility of Service Penetrations**
(1)	[F03-OP1.2] [F02, F04-OP1.3] Applies to portion of Code text: "Except as permitted by Articles 3.1.9.3. and 3.1.9.4., pipes, ducts, electrical outlet boxes, totally enclosed raceways or other similar service equipment that penetrate an assembly required to have a *fire-resistance rating* shall be *noncombustible...*"
	[F03-OS1.2] [F02, F04-OS1.3] Applies to portion of Code text: "Except as permitted by Articles 3.1.9.3. and 3.1.9.4., pipes, ducts, electrical outlet boxes, totally enclosed raceways or other similar service equipment that penetrate an assembly required to have a *fire-resistance rating* shall be *noncombustible…*"
3.1.9.3.	**Penetration by Wires, Cables and Outlet Boxes**
(1)	

Acceptable Solutions	Objectives and Functional Statements
(2)	
(3)	
(4)	
(5)	
(6)	
(7)	[F03-OP1.2]
	[F03-OS1.2]
r11.1 **3.1.9.3A.**	**Penetration by Outlet Boxes**
(1)	[F03-OP1.2]
	[F03-OS1.2]
(2)	
(3)	[F03-OP1.2]
	[F03-OS1.2]
3.1.9.4.	**Combustible Piping Penetrations**
(1)	[F03-OP1.2] [F02, F04-OP1.3]
	[F03-OS1.2] [F02, F04-OS1.3]
(2)	[F03-OP1.2] [F02, F04-OP1.3]
	[F03-OS1.2] [F02, F04-OS1.3]
(3)	
(4)	
(5)	
(6)	
(7)	[F03-OP1.2] [F02, F04-OP1.3]
	[F03-OS1.2] [F02, F04-OS1.3]
(8)	
3.1.9.5.	**Openings through a Membrane Ceiling**
(1)	[F04-OP1.3]
	[F04-OS1.3]
(2)	[F04-OP1.3]
	[F04-OS1.3]
3.1.9.6.	**Plenums**
(1)	
3.1.10.1.	**Prevention of Firewall Collapse**
(1)	[F04-OP1.2]
	[F04-OP3.1]
	[F04-OS1.2]
(2)	[F03, F04-OP1.2]
	[F03, F04-OP3.1]
	[F03, F04-OS1.2]
(3)	
(4)	[F04-OP1.2]
	[F04-OP3.1]
	[F04-OS1.2]
3.1.10.2.	**Rating of Firewalls**
(1)	[F03-OP1.2] Applies to portion of Code text: "A *firewall* which separates a *building* or *buildings* with *floor areas* containing a Group E or a Group F, Division 1 or 2 *major occupancy* shall be constructed as a *fire separation* of *noncombustible construction* having a *fire-resistance rating* not less than 4 h ..."
	[F03-OP3.1] Applies to portion of Code text: "A *firewall* which separates a *building or buildings* with *floor areas* containing a Group E or a Group F, Division 1 or 2 *major occupancy* shall be constructed as a *fire separation* of *noncombustible construction having* a *fire-resistance rating* not less than 4 h …"
	[F03-OS1.2] Applies to portion of Code text: "A *firewall* which separates a *building* or *buildings* with *floor areas* containing a Group E or a Group F, Division 1 or 2 *major occupancy* shall be constructed as a *fire separation* of *noncombustible construction* having a *fire-resistance rating* not less than 4 h ..."

Acceptable Solutions	Objectives and Functional Statements
3.1.13.7.	**High Buildings**
(1)	[F02-OP1.2]
	[F02-OS1.2]
(2)	
(3)	
(4)	[F02-OP1.2]
	[F02-OS1.2]
(5)	
(6)	
(7)	
3.1.13.8.	**Noncombustible Construction**
(1)	
3.1.13.9.	**Underground Walkways**
(1)	[F02-OP3.1]
	[F02-OS1.2]
3.1.13.10.	**Exterior Exit Passageway**
(1)	[F02-OS1.5]
3.1.13.11.	**Elevator Cars**
(1)	[F02-OP1.2]
	[F02-OS1.2]
(2)	[F02-OP1.2]
	[F02-OS1.2]
3.1.14.1.	**Fire-Retardant Treated Wood Roof Systems**
(1)	[F02-OP1.2]
	[F02-OS1.2]
(2)	[F02-OP1.3]
	[F02-OS1.2, OS1.3]
3.1.14.2.	**Metal Roof Deck Assemblies**
(1)	[F02-OP1.2]
	[F02-OS1.2]
(2)	
3.1.15.1.	**Roof Covering Classification**
(1)	[F02-OP1.2]
	[F02-OP3.1]
	[F02-OS1.2]
3.1.15.2.	**Roof Coverings**
(1)	[F02-OP1.2]
	[F02-OP3.1]
	[F02-OS1.2]
(2)	
r5 (3)	[F02-OP1.2]
	[F02-OP3.1]
	[F02-OS1.2]
3.1.16.1.	**Fabric Awnings, Canopies and Marquees**
(1)	[F02-OP1.2]
	[F02-OS1.2, OS1.5]
3.1.17.1.	**Occupant Load Determination**
(1)	[F10-OS3.7]
	[F72-OH2.1] [F71-OH2.3]
(2)	[F10-OS3.7]
	[F72-OH2.1] [F71-OH2.3]
(3)	

	Acceptable Solutions	Objectives and Functional Statements
	(4)	[F10-OS3.7]
		[F72-OH2.1] [F71-OH2.3]
	(5)	[F10-OS3.7]
		[F72-OH2.1] [F71-OH2.3]
e5	(6), (7)	
	3.1.17.2.	**Dance Floor**
	(1)	
	3.1.17.3.	**Public Pools**
	(1)	[F10-OS3.7]
		[F72-OH2.1] [F71-OH2.3]
	(2)	[F10-OS3.7]
		[F72-OH2.1] [F71-OH2.3]
	3.1.18.1.	**Drainage**
	(1)	[F60-OH1.1, OH1.2, OH1.3]
		[F60-OS2.3]
	3.1.19.1.	**Clearance to Buildings**
	(1)	[F01-OP1.1]
		[F01-OS1.1]
		[F32-OS3.3]
	(2)	[F01-OP1.1]
		[F01-OS1.1]
		[F32-OS3.3]
	(3)	[F01-OP1.1]
		[F01-OS1.1]
		[F32-OS3.3]
	(4)	
	3.1.20.1.	**Glass**
	(1)	[F30-OS2.3, OS3.1]
r11	**3.1.21.1.**	**Revoked**
	3.2.1.1.	**Exceptions in Determining Building Height**
e3	(1) to (9)	
e6	**3.2.1.2.**	**Storage Garage Considered as a Separate Building**
	(1)	[F03-OP1.2]
		[F03-OS1.2]
	(2)	[F03-OP1.2]
		[F03-OS1.2]
	(3)	[F03-OP1.2]
		[F03-OS1.2]
	3.2.1.3.	**Roof Considered as a Wall**
	(1)	
	3.2.1.4.	**Floor Assembly over Basement**
	(1)	[F03-OP1.2] [F04-OP1.3]
		[F03-OS1.2] [F04-OS1.3]
	(2)	[F04-OP1.2, OP1.3]
		[F04-OS1.2, OS1.3]
	3.2.1.5.	**Fire Containment in Basements**
	(1)	[F02-OP1.2, OP1.3]
		[F02-OS1.2, OS1.3]
	(2)	
	3.2.1.6.	**Mezzanines**
	(1)	

	Acceptable Solutions	Objectives and Functional Statements
	3.2.2.82.	**Group F, Division 3, One Storey, Any Area, Low Fire Load Occupancy**
	(1)	
	(2)	[F02-OP1.2]
		[F02-OS1.2]
	3.2.2.83.	**Group F, Division 3, Storage Garages up to 22 m High**
	(1)	[F02-OP1.2] Applies to portion of Code text: "A *building* used as a *storage garage* with all *storeys* constructed as *open-air storeys* and having on other *occupancy* above it is permitted to have its floor, wall, ceiling and roof assemblies constructed without a *fire-resistance rating* provided it is a) of *noncombustible construction*,"
		[F02-OS1.2] Applies to portion of Code text: "A *building* used as a *storage garage* with all *storeys* constructed as *open-air storeys* and having on other *occupancy* above it is permitted to have its floor, wall, ceiling and roof assemblies constructed without a *fire-resistance rating* provided it is a) of *noncombustible construction*,"
	3.2.3.1.	**Limiting Distance and Area of Unprotected Openings**
	(1)	[F03-OP3.1]
	(2)	
	(3)	
	(4)	
	(5)	[F03-OP3.1]
	(6)	[F03-OP3.1]
	(7)	
	(8)	[F03-OP3.1]
	(9)	[F03-OP3.1]
	(10)	[F03-OP3.1]
e6.1	(11), (12)	
	3.2.3.2.	**Area of Exposing Building Face**
	(1)	
	(2)	[F03-OP3.1]
	(3)	
	3.2.3.3.	**Wall Enclosing Attic or Roof Space**
	(1)	
	3.2.3.4.	**Reserved**
	3.2.3.5.	**Wall with Limiting Distance Less Than 1.2 m**
	(1)	[F03-OP3.1]
	(2)	[F03-OP3.1]
	3.2.3.6.	**Combustible Projections**
	(1)	[F03-OP3.1]
	(2)	[F03-OP3.1]
	(3)	[F03-OP3.1]
r11.1	(3.1)	
	(4)	[F03-OP3.1]
	(5)	
r5	**3.2.3.7.**	**Construction of Exposing Building Face**
	(1)	[F02, F03-OP3.1]
	(2)	
	(3)	[F02, F03-OP3.1]
	(4)	
	(5)	[F02, F03-OP3.1]
	(6)	[F02, F03-OP3.1]
	(7), (8)	
	3.2.3.8.	**Protection of Exterior Building Face**
	(1)	[F02, F03-OP3.1]
	(2)	
	(3)	

Acceptable Solutions	Objectives and Functional Statements
3.2.3.9.	**Protection of Structural Members**
(1)	[F04-OP1.3]
	[F04-OS1.3]
(2)	
3.2.3.10.	**Unlimited Unprotected Openings**
(1)	[F03-OP3.1]
(2)	[F03-OP3.1]
3.2.3.11.	**Low Fire Load, One Storey Building**
(1)	(a) [F04-OP3.1]
	(b) [F03-OP3.1]
3.2.3.12.	**Area Increase for Unprotected Openings**
(1)	[F03-OP3.1]
3.2.3.13.	**Protection of Exit Facilities**
(1)	
(2)	
(3)	
(4)	[F06-OP1.2]
	[F05, F06-OS1.2]
3.2.3.14.	**Wall Exposed to Another Wall**
(1)	[F03-OP1.2]
	[F03-OP3.1]
	[F03-OS1.2]
(2)	[F03-OP1.2]
	[F03-OP3.1]
	[F03-OS1.2]
(3)	
3.2.3.15.	**Wall Exposed to Adjoining Roof**
(1)	[F03-OP1.2]
	[F03-OS1.2]
3.2.3.16.	**Protection of Soffits**
(1)	[F03-OP1.2]
	[F03-OS1.2]
(2)	[F03-OP1.2]
	[F03-OS1.2]
(3)	[F03-OP1.2]
	[F03-OS1.2]
(4)	[F02-OP1.2]
	[F02-OS1.2]
3.2.3.17.	**Canopy Protection for Vertically Separated Openings**
(1)	[F03-OP1.2]
	[F03-OS1.2]
(2)	[F03-OP1.2]
	[F03-OS1.2]
(3)	[F02-OP1.2]
	[F02-OS1.2]
3.2.3.18.	**Covered Vehicular Passageway**
(1)	[F03-OP3.1]
(2)	[F03-OP3.1]
3.2.3.19.	**Walkway between Buildings**
(1)	[F03-OP3.1]
(2)	[F02-OP3.1]
(3)	[F02, F12-OP3.1]

Acceptable Solutions	Objectives and Functional Statements
(4)	
(5)	
3.2.3.20.	**Underground Walkway**
(1)	[F01, F02-OP3.1]
(2)	[F03-OP3.1]
(3)	[F02-OP3.1] Applies to portion of Code text: "An underground walkway shall be of *noncombustible construction*..."
	[F80-OP2.3] Applies to portion of Code text: "An underground walkway shall be ... suitable for an underground location."
(4)	(a) [F06-OS1.2] [F05-OS1.5]
	(b) [F12-OS1.2] [F10-OS1.5]
(5)	
3.2.3.21.	**Installation of Services Lines Under Buildings**
(1)	[F01-OS1.1]
3.2.4.1.	**Determination of Requirement for a Fire Alarm System**
(1)	
(2)	[F11-OS1.5]
(3)	
(4)	
(5)	
3.2.4.2.	**Continuity of Fire Alarm System**
(1)	[F11-OS1.5]
(2)	[F11-OS1.5]
(3)	[F11-OS1.5]
(4)	[F03-OS1.2] [F10-OS1.5]
(5)	[F11, F13-OS1.2]
	[F11-OS1.5]
3.2.4.3.	**Types of Fire Alarm Systems**
(1)	(a) [F11-OS1.5]
	(b) [F11-OS1.4] [F13-OS1.5]
	(c), (d), (e) [F11-OS1.5]
3.2.4.4.	**Description of Fire Alarm Systems**
(1)	[F11-OS1.5]
(2)	(a), (d) [F11-OS1.4] [F13-OS1.5]
	(b), (c) [F11-OS1.5]
(3)	[F13-OS1.5]
(4)	[F13-OS1.5]
3.2.4.5.	**Installation and Verification of Fire Alarm Systems**
(1)	[F12, F13, F81-OS1.2] [F11, F12, F13, F81-OS1.5]
	[F11, F12-OS3.7] Applies to voice communication systems.
(2)	[F82-OS1.5]
r11.1 **3.2.4.6.**	**Reserved**
3.2.4.7.	**Silencing of Alarm Signals**
(1)	[F11-OS1.5]
(2)	[F34, F81-OS1.5]
(3)	
3.2.4.8.	**Signals to Fire Department**
(1)	[F13-OP1.2]
	[F13-OS1.2, OS1.5]
(2)	[F13-OP1.2]
	[F13-OS1.2, OS1.5]
(3)	[F13-OP1.2]
	[F13-OS1.2, OS1.5]

Acceptable Solutions	Objectives and Functional Statements
(4)	[F13, F81-OP1.2]
	[F13, F81-OS1.2, OS1.5]
(5)	[F13-OP1.2]
	[F13-OS1.2, OS1.5]
3.2.4.9.	**Annunciator and Zone Indication**
(1)	[F12-OS1.2, OS1.5]
(2)	[F12-OS1.2, OS1.5]
(3)	
(4)	[F12-OS1.2, OS1.5]
(5)	
(6)	
(7)	[F12-OS1.2, OS1.5]
(8)	[F12-OS1.2, OS1.5]
(9)	[F12-OS1.2, OS1.5]
3.2.4.10.	**Electrical Supervision**
(1)	[F82-OS1.2, OS1.5]
(2)	F82-OS1.2]
	F82-OP1.2]
(3)	(a), (d), (e), (f), (g) [F82-OP1.2]
	(a), (d), (e), (f), (g) [F82-OS1.2]
	b), (c) [F82-OS1.5]
(4)	[F81, F82-OP1.2]
	[F81, F82-OS1.2]
(5)	(a), (b) [F81, F82-OP1.2]
	(a), (b) [F81, F82-OS1.2]
	(c) [F81, F82 - OS1.5]
(6)	[F82-OP1.2]
	[F82-OS1.2]
3.2.4.11.	**Fire Detectors**
(1)	[F11-OS1.5]
(2)	[F11-OS1.5]
3.2.4.12.	**Smoke and Heat Detectors**
(1)	[F11-OS1.5]
(2)	[F11-OS1.5]
(3)	[F12-OS1.5]
(4)	[F10-OS1.5]
(5)	[F11-OS1.5]
(6)	
(7)	[F11-OS1.4,OS1.5]
3.2.4.13.	**Prevention of Smoke Circulation**
(1)	[F03-OS1.2]
3.2.4.14.	**Vacuum Cleaning System Shutdown**
(1)	[F03-OS1.2]
3.2.4.15.	**Elevator Emergency Return**
(1)	[F10-OS1.5]
(2)	[F11-OS1.5]
(3)	[F02-OS1.2]
3.2.4.16.	**Sprinklers in Lieu of Fire Detectors**
(1)	[F02-OS1.2] [F11-OS1.5]
3.2.4.17.	**System Monitoring**
(1)	[F12-OS1.2] [F11, F12-OS1.5]
	[F12-OP1.2]

	Acceptable Solutions	Objectives and Functional Statements
	(2)	[F13-OS1.2] [F11, F13-OS1.5]
		[F13-OP1.2]
	3.2.4.18.	**Manual Pull Stations**
	(1)	[F11-OS1.5]
	(2)	[F02, F12-OS1.2] [F10, F12-OS1.5]
	(3)	[F02, F12-OS1.2] [F10, F12-OS1.5]
	(4)	[F11-OS1.5]
	(5)	[F11-OS1.5]
	(6)	[F81-OS1.2] [F11, F81-OS1.5]
	(7)	[F11-OS1.5]
	(8)	
	3.2.4.19.	**Alert and Alarm Signals**
	(1)	
	(2)	[F11-OS1.5]
	(3)	[F11-OS1.5]
	(4)	[F11-OS1.5]
e2.1	(5), (6)	
	3.2.4.20.	**Audibility of Alarm Systems**
	(1)	[F11-OS1.5]
	(2)	[F11-OS1.5]
	(3)	[F11-OS1.5]
	(4)	[F33-OS3.5]
	(5)	[F11-OS1.5]
	(6)	[F11-OS1.5]
	(7)	[F11-OS1.5]
	(8)	
	(9)	[F11, F81-OS1.5]
	(10)	[F11, F81-OS1.5]
	(11)	[F11, F81-OS1.5]
	(12)	[F11-OS1.5]
	(13)	
	(14)	[F11-OS1.5]
	3.2.4.21.	**Visual Signals**
	(1)	[F11-OS1.5]
	(2)	[F11-OS1.5]
	3.2.4.22.	**Smoke Alarms**
r11.1	(0.1)	
	(1)	[F11, F81-OS1.5]
	(2)	[F11-OS1.5]
	(3)	[F11-OS1.5]
	(4)	[F11-OS1.5]
	(5)	[F11,F81-OS1.5]
	(6)	[F11,F81-OS1.5]
	(7)	
	(8)	[F11-OS1.5]
	(9)	[F81,F11-OS1.5]
	(10)	[F81,F11-OS1.5]
	(11)	
	(12)	[F11-OS1.5]
r5	(13)	[F74-OA-2] [F11-OS1.5]
r5	(14)	
r5	(15)	[F74-OA-2] [F11-OS1.5]
r6	(16)	[F11,F81-OS1.5]

	Acceptable Solutions	Objectives and Functional Statements
r11.1	**3.2.4.22A.**	**Residential Fire Warning Systems**
	(1)	[F81, F11-OS1.5]
r11.1	**3.2.4.23.**	**Two-Way Voice Communication Systems**
	(1)	[F11, F12-OS3.7]
	(2)	[F11-OS1.5]
	(3)	[F11-OS1.5]
	(4)	F11-OS1.5] [F13-OS1.4, OS1.5]
	(5)	[F11-OS1.5]
	(6)	[F12-OS3.7]
	(7)	[F11-OS1.5]
r11.1	**3.2.4.24.**	**One-Way Voice Communication Systems**
	(1) to (3)	[F11-OS1.5]
	(4)	
	3.2.5.1.	**Access to Above Grade Storeys**
	(1)	[F12-OP1.2]
		[F12-OS1.2, OS1.5]
	(2)	[F12-OP1.2]
		[F12-OS1.2, OS1.5]
	(3)	[F12-OP1.2]
		[F12-OS1.2, OS1.5]
	3.2.5.2.	**Access to Basements**
e3	(1), (2)	[F12-OP1.2]
		[F12-OS1.2, OS1.5]
	3.2.5.3.	**Roof Access**
	(1)	[F12-OP1.2]
		[F12-OS1.2]
	(2)	[F12-OP1.2]
		[F12-OS1.2]
		[F05, F06, F10, F12-OS3.7]
	3.2.5.4.	**Access Routes**
	(1)	[F12-OP1.2]
		[F12-OS1.2, OS1.5]
	3.2.5.5.	**Location of Access Routes**
	(1)	[F12-OP1.2]
		[F06-OS1.1] [F12-OS1.2, OS1.5]
	(2)	[F12-OP1.2]
		[F12-OS1.2]
	(3)	
	(4)	[F12-OP1.2]
		[F12-OS1.2]
	3.2.5.6.	**Access Route Design**
	(1)	[F12-OP1.2]
		[F12-OS1.2]
r5	(2)	[F12-OP1.2]
		[F12-OS1.2]
	3.2.5.7.	**Water Supply**
	(1)	[F02-OP1.2]
		[F02-OP3.1]
		[F02-OS1.2]
	(2)	[F02, F12-OP1.2]
		[F02-OP3.1]
		[F02, F12-OS1.2]

	Acceptable Solutions	Objectives and Functional Statements
e3	**3.2.5.8. to 3.2.5.12.**	**Reserved**
	3.2.5.13.	**Automatic Sprinkler Systems**
	(1)	[F02, F81, F82-OP1.2]
		[F02, F81, F82-OS1.2]
	(2)	[F02, F81, F82-OP1.2]
		[F02, F81, F82-OS1.2]
	(3)	[F02, F81, F82-OP1.2]
		[F02, F81, F82-OS1.2]
	(4)	[F02-OP1.2]
		[F02-OS1.2]
	(5)	[F81-OP1.2]
		[F81-OS1.2]
	(6)	[F02-OP1.2]
		[F02-OS1.2]
r5	(7)	[F02, F81, F82-OP1.2]
		[F02, F81, F82-OS1.2]
r5	(8)	[F81-OS3.3, OS3.6]
r5	(9)	[F02, F04 – OP1.2, OP1.3]
		[F02, F04 – OS1.2, OS1.3]
	3.2.5.14.	**Combustible Sprinkler Piping**
	(1)	[F06-OP1.2]
		[F06-OS1.2]
	(2)	[F02, F81-OP1.2]
		[F02, F81-OS1.2]
	(3)	[F06-OP1.2]
		[F06-OS1.2]
	(4)	[F06-OP1.2]
		[F06-OS1.2]
	(5)	
	3.2.5.15.	**Sprinklered Service Space**
	(1)	[F02-OP1.2]
		[F02-OS1.2]
	(2)	[F12-OP1.2]
		[F12-OS1.2]
	(3)	[F12-OS1.2] [F11, F12-OS1.5]
		[F12-OP1.2]
	(4)	[F02-OP1.2]
		[F02-OS1.2]
	(5)	
	3.2.5.16.	**Fire Department Connections**
	(1)	[F12-OP1.2]
		[F12-OS1.2]
	(2)	[F12-OP1.2]
		[F12-OS1.2]
	(3)	[F12-OP1.2]
		[F12-OS1.2]
	3.2.5.17.	**Portable Fire Extinguishers**
	(1)	[F02, F12, F81-OP1.2]
		[F02, F12, F81-OS1.2]
	(2)	[F12-OP1.2]
		[F12-OS1.2]

	Acceptable Solutions	Objectives and Functional Statements
	3.2.5.18.	**Protection from Freezing**
	(1)	[F81-OP1.2]
		[F81-OS1.2]
	3.2.5.19.	**Fire Pumps**
	(1)	[F02, F81-OP1.2]
		[F02, F81-OS1.2]
	3.2.6.1.	**Application**
	(1)	
	3.2.6.2.	**Limits to Smoke Movement**
	(1)	[F02-OP1.2]
		[F02-OS1.2, OS1.5]
e6.1	(2), (3)	[F06-OP1.2]
		[F06-OS1.2] [F05, F06-OS1.5]
	(4)	[F03, F12-OP1.2]
		[F03 F12-OS1.2, OS1.5]
	(5)	[F03-OP1.2]
		[F03-OS1.2, OS1.5]
r11.1	(5.1)	[F03, F12-OP1.2]
		[F03, F12-OS1.2, OS1.5]
	(6)	[F02-OP1.2]
		[F02-OS1.2, OS1.5]
	3.2.6.3.	**Connected Buildings**
	(1)	[F03-OP1.2]
		[F03-OP3.1]
		[F03-OS1.2,OS1.5]
	3.2.6.4.	**Emergency Operation of Elevators**
	(1)	[F12-OP1.2]
		[F12-OS1.2, OS1.5]
	(2)	[F12-OP1.2]
		[F12-OS1.2, OS1.5]
	(3)	[F12-OP1.2]
		[F12-OS1.2, OS1.5]
	(4)	[F12-OP1.2]
		[F12-OS1.2, OS1.5]
	(5)	[F12-OP1.2]
		[F12-OS1.2, OS1.5]
	(6)	[F12-OP1.2]
		[F12-OS1.2, OS1.5]
	(7)	[F11-OS1.5]
	3.2.6.5.	**Elevator for Use by Firefighters**
	(1)	[F12,F06-OP1.2]
		[F12,F06-OS1.2, OS1.5]
	(2)	[F12-OP1.2]
		[F12-OS1.2, OS1.5]
	(3)	[F06-OP1.2]
		[F06-OS1.2, OS1.5]
	(4)	[F12-OP1.2]
		[F12-OS1.2, OS1.5]
	(5)	[F12-OP1.2]
		[F12-OS1.2, OS1.5]
	(6)	[F06-OP1.2]
		[F06-OS1.2, OS1.5]

Acceptable Solutions	Objectives and Functional Statements
3.2.6.6.	**Venting to Aid Firefighting**
(1)	[F06-OP1.2]
	[F06-OS1.2, OS1.5]
(2)	[F30-OS3.1]
(3)	[F12-OP1.2]
	[F12-OS1.2, OS1.5]
(4)	[F03-OS1.2] [F12-OS1.2, OS1.5]
(5)	
3.2.6.7.	**Central Alarm and Control Facility**
(1)	[F12-OP1.2]
	[F12-OS1.2, OS1.5]
(2)	[F12-OP1.2]
	[F12-OS1.2, OS1.5] [F11-OS1.5]
3.2.6.8.	**Voice Communication System**
(1)	[F12,F11-OS3.7]
3.2.6.9.	**Testing**
(1)	[F82-OP1.2]
	[F82-OS1.2, OS1.5]
3.2.7.1.	**Minimum Lighting Requirements**
(1)	[F30-OS3.1] [F10-OS3.7]
(2)	[F30-OS3.1] [F10-OS3.7]
(3)	
(4)	
(5)	[F30-OS3.1] [F10-OS3.7]
(6)	[F30-OS3.1] [F10-OS3.7]
(7)	[F30-OS3.1] [F10-OS3.7]
	[F40-OH2.4]
(8)	[F30-OS3.1] [F10-OS3.7]
	[F40-OH2.4]
3.2.7.2.	**Recessed Lighting Fixtures**
(1)	[F01-OP1.1, OP1.2]
	[F01-OS1.1, OS1.2]
3.2.7.3.	**Emergency Lighting**
(1)	[F30-OS3.1] [F10-OS3.7]
(2)	[F30-OS3.1] [F10-OS3.7]
(3)	[F30-OS3.1] [F10-OS3.7]
(4)	[F30-OS3.1] [F10-OS3.7]
3.2.7.4.	**Emergency Power for Lighting**
(1)	[F30-OS3.1] [F10-OS3.7]
(2)	[F30, F81-OS3.1] [F10, F81-OS3.7]
3.2.7.5.	**Emergency Power Supply Installation**
(1)	[F02, F03, F06, F10, F11, F12, F81-OS1.2, OS1.5]
	[F02, F06, F30, F81-OS3.1] [F10, F11, F12, F81-OS3.7]
	[F02, F03, F06, F81-OP1.2]
(2)	[F12-OS1.5]
3.2.7.6.	**Emergency Power for Hospitals**
(1)	[F02, F03, F06, F10, F11, F12, F81-OS1.2, OS1.5]
	[F02, F06, F30, F81-OS3.1] [F10, F11, F12, F81-OS3.7]
	[F02, F03, F06, F81-OP1.2]
3.2.7.7.	**Fuel Supply Shut-off Valves and Exhaust Pipes**
(1)	[F12-OH5] Applies to the requirement for a suitably identified shut-off valve outside the *building*
	[F12-OP1.2] Applies to the requirement for a suitably identified shut-off valve outside the building

Acceptable Solutions	Objectives and Functional Statements
(1) (Cont'd)	[F12-OS1.1, OS1.2] Applies to the requirement for a suitably identified shut-off valve outside the building [F12-OS1.2, OS1.5] Applies to the requirement for a suitably identified separate shut-off valve.
	[F81-OS3.1, OS3.7] Applies to the requirement for a suitably identified separate shut-off valve.
(2)	[F03-OP1.2]
	[F03-OS1.2]
3.2.7.8.	**Emergency Power for Fire Alarm Systems**
(1)	[F13-OS1.2] [F11, F13-OS1.5]
	[F13-OP1.2] Applies to the requirement for fire alarm systems, including those with a voice communication system, to be provided with an emergency power supply.
(2)	[F13-OS1.2] [F11, F13-OS1.5]
	[F13-OP1.2]
(3)	[F13-OS1.2] [F11, F13-OS1.5]
	[F13-OP1.2]
(4)	[F13-OS1.2] [F11, F13-OS1.5]
	[F13-OP1.2]
3.2.7.9.	**Emergency Power for Building Services**
(1)	[F02, F03, F12-OP1.2]
	[F02, F03, F12-OS1.2, OS1.5]
	(a) [F36-OS3.6] [F10, F12-OS3.7]
	(b) [F02-OP3.1]
(2)	[F12-OP1.2]
	[F12-OS1.2, OS1.5]
	[F36-OS3.6] [F12-OS3.7]
(3)	
(4)	[F02, F03-OP1.2]
	[F02, F03-OS1.2, OS1.5]
	[F02-OP3.1]
(5)	
(6)	
3.2.7.10.	**Protection of Electrical Conductors**
(1)	
(2)	[F06-OP1.2]
	[F06-OS1.2, OS1.5]
(3)	[F06-OP1.2]
	[F06-OS1.2, OS1.5]
(4)	[F06-OP1.2]
	[F06-OS1.2, OS1.5]
(5)	
(6)	[F06-OP1.2]
	[F06-OS1.2, OS1.5]
(7)	
(8)	[F06-OP1.2]
	[F06-OS1.2, OS1.5]
(9)	
r11.1 (10)	[F06-OS1.4]
	[F06-OP1.2]
	[F10-OS3.7]
r11.1 (11)	
3.2.8.1.	**Application**
(1)	[F03, F06-OP1.2]
	[F03, F06-OS1.2] [F05-OS1.5]
e6.1 (2) to (5)	

	Acceptable Solutions	Objectives and Functional Statements
	(6)	[F03-OP1.2]
		[F03-OS1.2]
	(7)	
	(8)	[F03-OP1.2]
		[F03-OS1.2]
	(9)	[F10-OS1.5]
	(10)	[F81-OP1.2]
		[F81-OS1.2]
	3.2.9.5.	**Supervisory Signal Annunciation for Valves**
	(1)	[F82-OP1.2]
		[F82-OS1.2]
	3.2.9.6.	**Water Supply for 38 mm Hose Connections**
	(1)	[F02-OP1.2]
		[F02-OS1.2]
	3.2.9.7.	**Water Supply for 65 mm Hose Connections**
	(1)	[F02-OP1.2]
		[F02-OS1.2]
e6.1	(2) to (4)	
r11.1	**3.2.10.1.**	**Testing**
	(1)	[F02, F81, F82-OS1.2, OS1.5]
		[F02, F81, F82-OP1.2]
	3.3.1.1.	**Separation of Suites**
	(1)	[F03-OP1.2]
		[F03-OS1.2]
	(2)	[F02-OP1.2]
		[F02-OS1.2]
	(3)	[F02-OP1.2]
		[F02-OS1.2]
	3.3.1.2.	**Hazardous Substances, Equipment and Processes**
	(1)	[F01, F02, F03-OP1.1, OP1.2]
		[F01, F02, F03-OS1.1, OS1.2]
		[F43-OS3.4]
	(2)	
	(3)	[F05-OS1.5]
		[F43-OS3.7]
	3.3.1.3.	**Means of Egress**
	(1)	
	(2)	
	(3)	[F10-OS3.7]
	(4)	[F05, F06, F10, F12-OS3.7]
	(5)	[F10, F12-OS3.7]
	(6)	[F05, F06, F10, F12-OS3.7]
	(7)	[F05, F06, F10, F12-OS3.7]
	(8)	[F05-OS1.5]
	(9)	[F05, F06, F10, F12-OS3.7]
	(10)	
	3.3.1.4.	**Public Corridor Separations**
	(1)	[F06-OS1.2] [F03, F05, F06-OS1.5]
		[F03, F06-OP1.2]
	(2)	[F06-OS1.2] [F03, F05, F06-OS1.5]
		[F03, F06-OP1.2]
	(3)	[F06-OS1.2] [F03, F05, F06-OS1.5]
		[F03, F06-OP1.2]

Acceptable Solutions	Objectives and Functional Statements
(4)	(a), (b) [F06, F12-OS1.2] [F03, F05, F06, F10, F12-OS1.5]
	(a), (b) [F03, F06, F12-OP1.2]
	(c) [F03, F06-OS1.2] [F03, F05, F06-OS1.5]
	(c) [F03, F06-OP1.2]
(5)	[F13-OP1.2]
	[F13,[F82-OS1.5,OS1.2]
3.3.1.5.	**Egress Doorways**
(1)	[F10,F05-OS1.5]
(2)	[F10,F05-OS1.5]
(3)	[F05, F10-OS1.2]
(4)	
(5)	[F10-OS1.5]
3.3.1.6.	**Travel Distance**
(1)	[F10-OS1.5]
3.3.1.7.	**Protection on Floor Areas with a Barrier-Free Path of Travel**
(1)	[F05, F10-OS1.5]
	(a) [F06-OS1.5]
(2)	[F05, F10-OS1.5]
(3)	[F02-OP1.2]
	[F02-OS1.2]
(4)	[F03-OS1.2] [F06-OS1.5]
(5)	
(6)	[F03-OS1.2] [F06-OS1.5]
(7)	(a), (b) [F10, F73-OS1.5]
	(c), (d) [F10-OS1.5]
3.3.1.8.	**Headroom Clearance**
(1)	
3.3.1.9.	**Corridors**
(1)	[F10, F12-OS3.7]
(2)	[F10, F12-OS3.7]
(3)	[F30, F73-OS3.1]
(4)	
(5)	[F10, F12-OS3.7]
(6)	(a) [F10, F12-OS3.7]
	(b) [F06-OS1.2] [F05, F06-OS1.5]
(7)	
(8)	[F10-OS3.7]
(9)	[F10-OS3.7]
(10)	[F10-OS1.5]
e6.1 (11) to (13)	[F10-OS1.5]
	[F10-OS3.7]
(14)	[F10-OS3.7]
(15)	
3.3.1.10.	**Door Swing**
(1)	[F10-OS3.7]
(2)	[F10-OS3.7]
(3)	[F10-OS3.7]
(4)	[F10-OS3.7]
r11.1 (5)	
3.3.1.11.	**Sliding Doors**
(1)	(b) [F10-OS3.7]
(2)	
(3)	

	Acceptable Solutions	Objectives and Functional Statements
	3.3.1.12.	**Doors and Door Hardware**
r11.1	(1)	(a), (b) [F10, F12-OS3.7]
		(c) [F30-OS3.1] [F10-OS3.7]
		(d) [F10-OS3.7]
	(2)	[F10-OS3.7]
	(3)	[F10-OS3.7]
	(4)	[F10-OS3.7]
	(5)	[F10-OS3.7]
		[F73-OA1]
	(6)	
	(7)	[F12-OS3.7]
	(8)	[F12-OS3.7]
	(9)	[F12-OS3.7]
	(10)	
	(11)	
	3.3.1.13.	**Ramps and Stairways**
	(1)	
	(2)	
	3.3.1.14.	**Exterior Passageways**
	(1)	
	3.3.1.15.	**Curved or Spiral Stairs**
	(1)	
	3.3.1.16.	**Capacity of Access to Exits**
	(1)	
	(2)	[F10-OS3.7]
	(3)	[F10-OS3.7]
	(4)	
	(5)	
r11.1	(6)	[F10-OS3.7]
	3.3.1.17.	**Guards**
	(1)	[F30-OS3.1]
	(2)	[F30-OS3.1]
	(3)	
	(4)	[F30-OS3.1]
	(5)	[F30-OS3.1]
	(6)	
	3.3.1.18.	**Transparent Doors and Panels**
	(1)	[F30-OS3.1] [F10-OS3.7]
r11.1	(1.1)	[F30-OS3.1] [F10-OS3.7]
	(2)	[F20-OS3.1]
	(3)	[F30-OS3.1] [F10-OS3.7]
	(4)	
r11.1	(4.1)	[F30-OS3.1][F10-OS3.7]
	(5)	
	(6)	[F30-OS3.1]
r11.1	**3.3.1.19.**	**Exhaust Ventilation and Explosion Venting**
	(1)	[F01-OS1.1]
	(2)	[F02-OP1.2]
		[F02-OS1.2]
	(3)	
	(4)	[F02-OP1.3] Applies to the requirement for explosion-relief devices and vents.
		[F02-OS1.3] Applies to the requirement for explosion-relief devices and vents.

Acceptable Solutions	Objectives and Functional Statements
3.3.1.20.	**Janitors' Rooms**
(1)	[F03-OP1.2]
	[F03-OS1.2]
(2)	
(3)	[F02-OP1.2]
	[F02-OS1.2]
3.3.1.21.	**Common Laundry Rooms**
(1)	[F03-OP1.2]
	[F03-OS1.2]
(2)	
(3)	[F02-OP1.2]
	[F02-OS1.2]
3.3.1.22.	**Obstructions**
(1)	[F10-OS3.7]
3.3.1.23.	**Signs in Service Spaces**
(1)	[F10-OS3.7]
3.3.1.24.	**Welding and Cutting**
(1)	[F02, F03-OP1.2]
	[F02, F03-OS1.2]
(2)	
3.3.2.1.	**Scope**
(1)	
3.3.2.2.	**Fire Separations**
(1)	[F03-OS1.2]
(2)	
(3)	[F03-OS1.2] Applies where space under tiers of seats is *sprinklered.*
	[F03-OS1.2] Applies where space under tiers of seats is not *sprinklered.*
(4)	[F03-OS1.2]
	[F03-OP1.2]
(5)	[F03-OS1.2]
	[F03-OP1.2]
(6)	
(7)	[F03-OS1.2]
	[F03-OP1.2]
(8)	[F03-OS1.2]
(9)	[F03-OS1.2]
	[F03-OP1.2]
3.3.2.3.	**Fixed Seats**
(1)	[F30-OS3.1] [F10-OS3.7]
(2)	
(3)	[F10-OS3.7]
(4)	
(5)	
(6)	
3.3.2.4.	**Aisles**
(1)	
(2)	
(3)	[F10-OS3.7]
(4)	[F10-OS3.7]
(5)	[F10-OS3.7]
(6)	
e6.1 (7) to (10)	[F10-OS3.7]

Acceptable Solutions	Objectives and Functional Statements
(5)	
r11.1 (6)	
(7)	[F10-OS1.5]
(8)	[F10-OS1.5]
(9)	[F03, F05-OS1.2] [F06-OS1.5]
(10)	
(11)	
(12)	[F03, F05-OS1.2] [F06-OS1.5]
3.3.3.6.	**Protection for Special Care and Treatment Facilities**
(1)	[F03-OS1.2]
3.3.3.7.	**Contained Use Areas**
(1)	
(2)	[F03, F06-OS1.2] [F06-OS1.5]
	[F03, F06-OP1.2]
(3)	[F02, F06-OS1.2] [F06-OS1.5]
	[F02, F06-OP1.2]
(4)	[F02, F06-OS1.2] [F06-OS1.5]
	[F02, F06-OP1.2]
(5)	[F10-OS3.7]
3.3.3.8.	**Handrails**
(1)	[F30-OS3.1]
	[F73-OA1]
3.3.4.1.	**Scope**
(1)	
3.3.4.2.	**Fire Separations**
(1)	[F03, F06-OS1.2] [F05, F06-OS1.5]
	[F03, F06-OP1.2]
(2)	
(3)	
(4)	[F44-OS1.1] [F02, F03-OS1.2]
	(a), (b) [F02, F03-OP1.2]
(5)	[F01-OS1.1] [F03-OS1.2]
	[F44-OS3.4]
	(a) [F03-OP1.2]
3.3.4.3.	**Storage Rooms**
(1)	[F02-OP1.2]
	[F02-OS1.2]
(2)	[F03-OP1.2]
	[F03-OS1.2]
(3)	
(4)	[F12-OP1.2]
	[F12-OS1.2]
3.3.4.4.	**Egress from Dwelling Units**
(1)	
(2)	[F05, F10-OS3.7]
(3)	[F10-OS3.7]
(4)	[F05-OS1.2, OS1.5]
(5)	[F05, F10-OS3.7]
(6)	[F05, F10-OS3.7]

Acceptable Solutions	Objectives and Functional Statements
(7)	[F05, F10-OS3.7]
(8)	[F05-OS1.2]
	[F10-OS3.7]
(9)	[F05, F10-OS3.7]
3.3.4.5.	**Automatic Locking Prohibition**
(1)	[F10-OS3.7]
3.3.4.6.	**Sound Transmission**
(1)	
3.3.4.7.	**Stairs, Handrails and Guards for Dwelling Units**
(1)	
(2)	
3.3.4.8.	**Window Protection**
(1)	[F30-OS3.1]
(2)	
3.3.4.9.	**Stud Wall Reinforcement**
(1)	[F74-OA2]
3.3.4.10.	**Resistance to Forced Entry**
(1)	[F4.1-OS3.1]
r6 **3.3.4.11.**	**Retirement Homes**
(1)	
(2)	[F06-OS1.2] [F05, F06-OS1.5]
	[F06-OP1.2]
(3)	
(4)	[F03, F06-OP1.2]
	[F05, F06-OS1.2] [F06-OS1.5]
(5)	
(6)	[F05-OS1.2] [F06-OS1.5]
(7)	[F10-OS1.5]
(8)	[F10-OS1.5]
(9)	[F03-OS1.2]
	[F03-OP1.2]
(10)	[F10-OS3.7]
(11)	[F10, F12-OS3.7]
(12)	[F11, F12-OS3.7]
3.3.5.1.	**Scope**
(1)	
3.3.5.2.	**Fire Extinguishing Systems**
(1)	[F03-OP1.2]
	[F03-OS1.2]
3.3.5.3.	**Basements**
(1)	[F12-OP1.2]
	[F01-OS1.1] [F12-OS1.2, OS1.5]
(2)	[F06-OS1.2] [F05, F06-OS1.5,] Applies to the separation of *exits* from the remainder of the *building.* [F06-OS1.2, OS1.5] Applies to the separation of entrances to *basements* and to rooms containing *building* services from the remainder of the *building.*
	[F06-OP1.2] Applies to the separation of *exits* from the remainder of the *building.* [F06-OP1.2] Applies to the separation of entrances from the remainder of the *building.*
(3)	[F44-OS1.1]

Acceptable Solutions	Objectives and Functional Statements
3.3.5.8.	**Toe-Boards Required**
(1)	[F30-OS3.1]
3.3.6.1.	**Application**
(1)	
r11.1 **3.3.6.2.**	**Storage of Dangerous Goods**
(1)	[F03-OS1.2]
	[F03-OP1.2]
(2)	[F03-OS1.2]
	[F03-OP1.2]
(3)	[F01, F02, F03, F81-OS1.1, OS1.2]
	[F01, F02, F03, F81-OP1.1, OP1.2]
3.3.6.3.	**Indoor Storage of Compressed Gases**
(1)	(a) [F03-OS1.2] [F44-OS1.1]
	(a) [F03-OP1.2]
	(a) [F44-OS1.2, OS1.5, OS1.1] Applies to gas-tight fire separations.
	(b) [F12-OS1.2] [F01-OS1.1] [F02-OS1.3]
	(b) [F02-OP1.3]
	(c) [F12-OS1.1]
	(e) [F02-OS1.1]
	(e) [F02-OP1.1]
	(f) (g) [F01-OS1.1]
	(f) (g) [F01-OP1.1]
(2)	[F44-OS1.1]
(3)	(a) [F03-OS1.2] [F44-OS1.1]
	(a) [F03-OP1.2]
	(a) [F44- OS1.2, OS1.5, OS1.1] Applies to gas-tight fire separations.
	(b) [F12-OS1.2] [F02-OS1.3]
	(b) [F02-OP1.3]
(4)	[F44-OS1.1]
	[F44-OP1.1]
	[F50-OH1.1]
(5)	[F44, F01-OS1.1]
	[F44, F01-OP1.1]
(6)	
(7)	
3.3.6.4.	**Storage and Dispensing Rooms for Flammable Liquids and Combustible Liquids**
(1)	[F03-OS1.2]
	[F03-OP1.2]
(2)	[F02-OS1.3]
	[F02-OP1.3]
(3)	
(4)	[F02-OS1.3]
	[F02-OP1.3]
(5)	
(6)	[F10-OS1.5]
(7)	[F05, F10-OS1.5]
(8)	[F10-OS1.5]
3.3.6.5.	**Tire Storage**
(1)	[F03-OS1.2]
	[F03-OP1.2]

Acceptable Solutions	Objectives and Functional Statements
3.3.6.6.	**Ammonium Nitrate Storage**
(1)	(a) [F01-OS1.1] [F02,F12-OS1.2]
	(a) [F01-OP1.1] [F02,F12-OP1.2]
	(b) (c) [F03-OS1.2][F01-OS1.1]
	(b) (c) [F03-OP1.2][F01-OP1.1]
	(c) [F44-OH5]
	(d) [F01-OS1.1][F02-OS1.2]
	(d) [F43-OS3.4]
	(e) [F01,F81-OS1.1]
	(f) [F12,F02-OS1.1]
	(f) [F12,F02-OP1.2]
3.3.6.7.	**Flooring Material**
(1)	[F43-OS3.4]
	[F44-OH5]
	[F01-OS1.1]
3.3.6.8.	**Fire Separations in Process Plants**
(1)	[F03-OP1.2]
	[F03-OS1.2]
3.3.6.9.	**Basements and Pits**
(1)	[F01-OS1.1]
	[F01-OP1.1]
3.4.1.1.	**Scope**
(1)	
3.4.1.2.	**Separation of Exits**
(1)	[F05, F06, F10, F12-OS3.7]
	[F06, F12-OP1.2]
	[F06, F12-OS1.2, OS1.5]
(2)	[F10-OS3.7]
3.4.1.3.	**Access to Exits**
(1)	
3.4.1.4.	**Types of Exit**
(1)	
3.4.1.5.	**Exterior Exit Passageways**
(1)	[F10-OS3.7]
(2)	
3.4.1.6.	**Restricted Use of Horizontal Exits**
(1)	[F10-OS3.7]
(2)	[F05, F10-OS3.7]
(3)	
3.4.1.7.	**Slide Escapes**
(1)	[F10-OS3.7]
3.4.1.8.	**Transparent Doors and Panels**
(1)	
3.4.1.9.	**Mirrors near Exits**
(1)	[F30-OS3.1] [F10-OS3.7]
3.4.1.10.	**Combustible Glazing in Exits**
(1)	[F03, F06-OP1.2]
	[F05, F06-OS1.2] [F06-OS1.5]
3.4.1.11.	**Exterior Stairway for Nursing Home**
(1)	[F10-OS3.1, OS3.7]

	Acceptable Solutions	Objectives and Functional Statements
	3.4.2.1.	**Minimum Number of Exits**
	(1)	[F05, F06, F10, F12-OS3.7]
		[F06, F12-OP1.2]
		[F06, F12-OS1.2]
	(2)	
	(3)	[F10-OS3.7]
	(4)	
	(5)	
	(6)	[F10-OS3.7]
	(7)	
	3.4.2.2.	**Mezzanine Exiting**
	(1)	[F05-OS1.5]
	(2)	
	(3)	
	(4)	
	3.4.2.3.	**Distance Between Exits**
	(1)	[F05, F10-OS1.5]
	(2)	
	(3)	
r11.1	(4)	[F10-OS3.7]
	3.4.2.4.	**Travel Distance**
	(1)	
	(2)	
	(3)	[F10-OS3.7]
	(4)	
	3.4.2.5.	**Location of Exits**
	(1)	[F10-OS3.7]
	(2)	
	(3)	[F10-OS3.7]
	3.4.2.6.	**Principal Entrance**
	(1)	[F10-OS3.7]
r11.1	(2)	[F10-OS3.7]
	3.4.3.1.	**Exit Width Based on Occupant Load**
	(1)	
	(2)	[F10-OS3.7]
	3.4.3.2.	**Exit Width**
	(1)	[F10-OS3.7]
	(2)	[F10-OS3.7]
	(3)	[F10-OS3.7]
	(4)	
	(5)	
	(6)	[F10-OS3.7]
	(7)	[F12-OP1.2]
		[F12-OS1.2]
		[F30-OS3.1] [F10, F12-OS3.7]
	3.4.3.3.	**Exits from Interconnected Floor Space**
	(1)	
	3.4.3.4.	**Exit Width Reduction**
	(1)	[F12-OS1.2]
		[F30-OS3.1] [F10, F12-OS3.7]
		[F12-OP1.2]

	Acceptable Solutions	Objectives and Functional Statements
e6.1	(2) to (5)	[F12-OS1.2]
		[F10, F12-OS3.7]
		[F12-OP1.2]
	3.4.3.5.	**Headroom Clearance**
	(1)	[F12-OP1.2]
		[F12-OS1.2]
		[F30-OS3.1] [F10, F12-OS3.7]
	(2)	
	(3)	
	(4)	[F12-OP1.2]
		[F12-OS1.2]
		[F30-OS3.1] [F10, F12-OS3.7]
	(5)	[F12-OP1.2]
		[F12-OS1.2]
		[F30-OS3.1] [F10, F12-OS3.7]
	3.4.4.1.	**Fire-Resistance Rating of Exit Separations**
	(1)	[F03, F06-OS1.2] [F05, F06-OS1.5]
		[F03, F06-OP1.2]
	(2)	
r5	(3)	
r5	(4)	
r5	(5)	
	3.4.4.2.	**Exits Through Lobbies**
	(1)	[F05, F06-OS1.5]
	(2)	[F05, F06, F10, F12-OS1.5]
	3.4.4.3.	**Exterior Passageway Exceptions**
	(1)	[F05, F06, F10-OS1.5]
	3.4.4.4.	**Integrity of Exits**
	(1)	[F03, F06-OS1.2] [F05, F06-OS1.5]
		[F03, F06-OP1.2]
	(2)	[F06-OS1.2] [F05, F06-OS1.5]
		[F06-OP1.2]
	(3)	[F06-OS1.2] [F05, F06-OS1.5]
		[F06-OP1.2]
	(4)	[F06-OS1.2] [F05, F06-OS1.5]
		[F43-OS3.7]
		[F06-OP1.2]
	(5)	[F03, F06-OP1.2]
		[F03, F06-OS1.2] [F05, F06-OS1.5]
	(6)	[F12-OS1.2] [F05, F10, F12-OS1.5]
		[F30-OS3.1] [F31-OS3.2] [F32-OS3.3] [F43-OS3.4] [F10, F12-OS3.7]
		[F12-OP1.2]
	(7)	[F06-OS1.2] [F05, F06-OS1.5]
		[F06-OP1.2]
		[F43-OS3.7]
	(8)	[F06-OS1.2] [F05, F06-OS1.5]
		[F06-OP1.2]
	(9)	[F06-OS1.2] [F05, F06-OS1.5]
		[F06-OP1.2]
	(10)	[F81-OS1.5]
		[F81-OS3.7]
		[F81-OP1.2]

	Acceptable Solutions	Objectives and Functional Statements
	3.4.5.1.	**Exit Signage**
	(1)	[F10-OS3.7]
	(2)	[F10-OS3.7]
	(3)	[F10,F81-OS3.7]
	(4)	[F10, F81-OS3.7]
e6.1	(5) to (9)	[F10-OS3.7]
	(10)	
	3.4.5.2.	**Signs within Exit Facilities**
	(1)	[F10-OS3.7]
	(2)	[F10-OS3.7]
r4	**3.4.6.1.**	**Surface Finish of Ramps and Stairs**
	(1)	(a), (b) [F30-OS3.1] [F10-OS3.7]
r5	(2)	[F73-OA1]
	(3)	[F12-OS1.2, OS1.5]
		[F30-OS3.1] [F10, F12-OS3.7]
		[F12-OP1.2]
	3.4.6.2.	**Minimum Number of Risers**
	(1)	[F30-OS3.1]
	3.4.6.3.	**Maximum Vertical Rise of Stair Flights and Required Landings**
	(1)	[F10-OS3.7]
	(2)	[F10-OS3.7] [F30-OS3.1]
	(3)	
	3.4.6.4.	**Dimensions of Landings**
	(1)	[F10,F12-OS3.7][F30-OS3.1]
		[F12-OP1.2]
		[F12-OS1.2,OS1.5]
	(2)	[F10,F12-OS3.7] [F30-OS3.1]
	(3)	[F10,F12-OS3.7] [F30-OS3.1]
	(4)	
	3.4.6.5.	**Handrails**
	(1)	[F30-OS3.1] [F10-OS3.7]
	(2)	[F30-OS3.1] [F10-OS3.7]
	(3)	[F30-OS3.1] [F10-OS3.7]
	(4)	
	(5)	[F30-OS3.1] [F10-OS3.7]
	(6)	
	(7)	
	(8)	[F30-OS3.1] [F10-OS3.7]
	(9)	[F30-OS3.1] [F10-OS3.7]
	(10)	[F30-OS3.1] [F10-OS3.7]
		[F73-OA1]
	(11)	[F30-OS3.1][F10-OS3.7]
	(12)	[F20-OS3.1,OS3.7]
	(13)	[F30-OS3.1][F10-OS3.7]
	(14)	[F30-OS3.1] [F10-OS3.7]
		[F73-OA1]
	3.4.6.6.	**Guards**
	(1)	[F30-OS3.1] [F10-OS3.7]
	(2)	[F30-OS3.1] [F10-OS3.7]
	(3)	[F30-OS3.1] [F10-OS3.7]
	(4)	
	(5)	[F30-OS3.1]

	Acceptable Solutions	Objectives and Functional Statements
	(6)	
	(7)	[F30-OS3.1]
	(8)	[F30-OS3.1]
	3.4.6.7.	**Ramp Slope**
	(1)	[F30-OS3.1] [F10-OS3.7]
	3.4.6.8.	**Treads and Risers**
	(1)	[F30-OS3.1] [F10-OS3.7]
	(2)	[F30-OS3.1] [F10-OS3.7]
	(3)	[F30-OS3.1] [F10-OS3.7]
	(4)	[F30-OS3.1] [F10-OS3.7]
	(5)	[F30-OS3.1] [F10-OS3.7]
	(6)	[F30-OS3.1] [F10-OS3.7]
	(7)	[F30-OS3.1] [F10-OS3.7]
	(8)	[F30-OS3.1]
	(9)	[F10-OS3.7][F30-OS3.1]
	(10)	[F30-OS3.1]
	3.4.6.9.	**Curved Stairs**
	(1)	[F30-OS3.1] [F10-OS3.7]
	(2)	[F30-OS3.1] [F10-OS3.7]
	3.4.6.10.	**Horizontal Exits**
	(1)	[F10-OS3.7]
	(2)	[F10-OS3.7]
	(3)	
	(4)	[F10, F73-OS3.7]
	(5)	[F10-OS3.7]
	(6)	
	(7)	[F10-OS1.5]
	3.4.6.11.	**Doors**
	(1)	[F30-OS3.1] [F10-OS3.7]
r11.1	(1.1)	[F30-OS3.1] [F10-OS3.7]
	(2)	[F30-OS3.1] [F10-OS3.7] Applies to portion of Code text: "No *exit* door shall open directly onto a step..."
		[F10, F81-OS3.7] Applies where there is a danger of blockage from ice or snow.
	(3)	[F10-OS3.7]
	(4)	[F10, F12-OS3.7]
r11.1	(5)	[F10-OS3.7]
	3.4.6.12.	**Direction of Door Swing**
	(1)	[F10-OS3.7]
	(2)	[F10-OS3.7]
	(3)	
r11.1	(4)	
	3.4.6.13.	**Self-Closing Devices**
	(1)	[F06-OS1.2] [F05, F06-OS1.5]
		[F03, F06-OP1.2]
	3.4.6.14.	**Sliding Doors**
	(1)	
	(2)	[F12-OS3.7]
	3.4.6.15.	**Revolving Doors**
	(1)	(a) [F30-OS3.1] [F10-OS3.7]
		(b) [F10, F12-OS3.7]
		(c) [F10-OS3.7]
		(d) [F30-OS3.1] [F10-OS3.7]
		(e) [F20-OS3.1]

Acceptable Solutions	Objectives and Functional Statements
(2)	[F10-OS3.7]
(3)	(a), (b), (d), (e) [F20, F30-OS3.1] [F10, F81-OS3.7]
3.4.6.16.	**Door Release Hardware**
(1)	[F10-OS3.7]
(2)	[F10-OS3.7]
(3)	[F10-OS3.7]
(4)	[F10, F81-OS3.7]
	[F10, F81-OS3.7]
(5)	[F10-OS3.7]
(6)	
(7)	[F02-OS1.2]
	[F10-OS3.7]
(8)	[F10-OS3.7]
	[F73-OA1]
3.4.6.17.	**Reserved**
r11.1 **3.4.6.18.**	**Emergency Crossover Access to Floor Areas**
(1)	[F10-OS3.7]
(2)	
(3)	[F10-OS3.7]
(4)	[F10, F12-OS3.7]
	[F12-OP1.2]
	[F12-OS1.2, OS1.5]
(5)	[F10-OS3.7]
(6)	
3.4.6.19.	**Floor Numbering**
(1)	[F12-OS1.2]
	[F10, F12, F73-OS3.7]
	[F12-OP1.2]
	[F73-OA1]
(2)	[F12-OS1.2]
	[F10, F12, F73-OS3.7]
	[F12-OP1.2]
	[F73-OA1]
3.4.7.1.	**Scope**
(1)	[F10, F12-OS3.7]
(2)	[F12-OS1.2] [F10-OS1.5]
	[F30-OS3.1] [F10-OS3.7]
3.4.7.2.	**Fire Escape Construction**
(1)	[F06-OS1.2] [F05-OS1.5] Applies to the combustibility of materials used in the construction of fire escapes.
	[F20-OS3.1] [F10, F12-OS3.7] Applies to the type and construction of fire escapes.
	[F20-OS2.1] Applies to the type and construction of fire escapes.
3.4.7.3.	**Access to Fire Escapes**
(1)	[F10-OS3.7] Applies to portion of Code text: "Access to fire escapes shall be from corridors through doors at floor level..."
(2)	[F30-OS3.1] [F10-OS3.7]
3.4.7.4.	**Protection of Fire Escapes**
(1)	[F05, F06-OS1.5]
(2)	
3.4.7.5.	**Stairs**
(1)	[F10-OS3.7]
(2)	[F10-OS3.7]
(3)	[F10-OS3.7] Applies to the reduction in width permitted under certain conditions.

Acceptable Solutions	Objectives and Functional Statements
(4)	[F30-OS3.1] [F10-OS3.7]
3.4.7.6.	**Guards and Railings**
(1)	[F30-OS3.1] [F10-OS3.7]
(2)	[F30-OS3.1] [F10-OS3.7]
(3)	[F30-OS3.1] [F10-OS3.7]
(4)	[F30-OS3.1]
(5)	[F30-OS3.1]
3.4.7.7.	**Landings**
(1)	
3.5.1.1.	**Scope**
(1)	
(2)	
3.5.2.1.	**Required Elevator**
(1)	[F12-OS3.7]
	[F73-OA1]
3.5.2.2.	**Barrier-Free Design**
(1)	[F73-OA1]
3.5.3.1.	**Fire Separations for Elevator Hoistways**
(1)	[F03-OP1.2]
	[F03-OS1.2]
(2)	
(3)	[F06-OP1.2]
	[F06-OS1.2] [F05, F06-OS1.5]
3.5.3.2.	**Vertical Service Spaces for Dumbwaiters**
(1)	[F03-OP1.2]
	[F03-OS1.2]
3.5.3.3.	**Fire Separations for Elevator Machine Rooms**
(1)	[F03-OP1.2]
	[F03-OS1.2]
(2)	[F03-OP1.2]
	[F03-OS1.2]
3.5.4.1.	**Elevator Car Dimensions**
(1)	[F12-OS3.7]
(2)	[F12-OS3.7]
3.6.1.1.	**Scope**
(1)	
(2)	
3.6.1.2.	**Reserved**
3.6.1.3.	**Storage Use Prohibition**
(1)	[F01-OS1.1] [F02-OS1.2]
3.6.1.4.	**Reserved**
3.6.1.5.	**Fixed Access Ladders**
(1)	[F20-OS2.1]
	[F30-OS3.1]
3.6.2.1.	**Fire Separations around Service Rooms**
(1)	[F03-OP1.2, OP1.4]
	[F03-OS1.2, OS1.4]
(2)	
(3)	[F01-OP1.1] [F03-OP1.2]
	[F01-OS1.1] [F03-OS1.2]

	Acceptable Solutions	Objectives and Functional Statements
	(7)	[F03-OP1.2]
		[F03-OS1.2]
	(8)	[F02-OS1.2]
		[F41-OH2.4, OH2.5]
	(9)	[F03-OP1.2]
		[F03-OS1.2]
	(10)	[F41-OH2.4, OH2.5] Applies to portion of Code text: "The room or bin into which a refuse chute discharges shall be ...impervious to moisture and be equipped with a water connection and floor drain for washing-down purposes:"
		[F03, F81-OS1.2] Applies to portion of Code text: "The room or bin into which a refuse chute discharges shall be of sufficient size to contain the refuse between normal intervals of emptying ..."
		[F41, F81-OH2.4, OH2.5] Applies to portion of Code text: "The room or bin into which a refuse chute discharges shall be of sufficient size to contain the refuse between normal intervals of emptying ..."
	(11)	[F01, F02-OS1.2]
	3.6.3.4.	**Exhaust Duct Negative Pressure**
	(1)	
r11.1	**3.6.3.5.**	**Grease Duct Enclosures**
	(1)	[F02, F03-OS1.2]
		[F03, F02-OP1.2]
	(2)	[F02, F03-OS1.2]
		[F03, F02-OP1.2]
	3.6.4.1.	**Scope**
	(1)	
	3.6.4.2.	**Fire Separations for Horizontal Service Spaces**
	(1)	
	(2)	[F03-OP1.2]
		[F03-OS1.2]
	3.6.4.3.	**Plenum Requirements**
	(1)	[F02-OS1.2]
r11.1	(2)	[F03-OP1.2, OP1.3]
		[F03-OS1.2, OS1.3]
	(3)	[F43-OH5]
	3.6.4.4.	**Attic or Roof Space Access**
	(1)	[F01, F02, F12-OP1.2]
		[F01, F02, F12-OS1.2]
	3.6.4.5.	**Horizontal Service Space Access**
	(1)	[F01, F02, F12-OP1.2]
		[F01, F02, F12-OS1.2]
	3.6.4.6.	**Crawl Space Access**
	(1)	[F01, F02, F12-OP1.2]
		[F01, F02, F12-OS1.2]
	3.7.1.1.	**Room and Space Height**
	(1)	[F30-OS3.1]
	(2)	
	3.7.1.2.	**Residential Room Dimensions**
	(1)	
	3.7.1.3.	**Sleeping Areas in Group B and Child Care Facilities**
	(1)	[F30-OS3.1]
	(2)	[F30-OS3.1]
	(3)	[F30-OS3.1]
	3.7.1.4.	**Sleeping Areas in Camps**
	(1)	[F30-OS3.1]
	(2)	[F30-OS3.1]

	Acceptable Solutions	Objectives and Functional Statements
	3.7.2.1.	**Window Areas**
	(1)	[F102-OH7]
	(2)	[F102-OH7]
	(3)	[F102-OH7]
	3.7.3.	**Reserved**
	3.7.4.1.	**Plumbing and Drainage Systems**
	(1)	[F72-OH2.1] [F70-OH2.2] [F71-OH2.3]
	(2)	[F72-OH2.1]
	(3)	
	3.7.4.2.	**Plumbing Fixtures, General**
	(1)	
	(2)	[F72-OH2.1] Applies to portion of Code text: "water closets shall be provided"
	(3)	
	(4)	
	(5)	[F71-OH2.3]
	(6)	
	(7)	[F74-OA2]
	(8)	
r4	(9)	
r4	(10)	[F30-OS3.1]
r4	(11)	[F71-OH2.3]
	3.7.4.3.	**Plumbing Fixtures for Assembly Occupancies**
	(1)	[F72-OH2.1]
	(2)	[F72-OH2.1]
	(3)	[F72-OH2.1]
	(4)	[F72-OH2.1]
	(5)	[F72-OH2.1]
	(6)	[F72-OH2.1] [F71-OH2.3]
	(7)	[F72-OH2.1]
	(8)	[F72-OH2.1]
		(b) [F101-OH6]
	(9)	
	(10)	[F72-OH2.1]
	(11)	[F72-OH2.1]
e6.1	(12) to (16)	[F72-OH2.1]
	3.7.4.4.	**Plumbing Fixtures for Care or Detention Occupancies**
	(1)	[F72-OH2.1] [F71-OH2.3]
	(2)	[F72-OH2.1] [F71-OH2.3]
	(3)	[F72-OH2.1]
	3.7.4.5.	**Plumbing Facilities for Dwelling Units**
	(1)	[F72-OH2.1] [F70-OH2.2] [F71-OH2.3]
	3.7.4.6.	**Plumbing Fixtures for Other Residential Occupancies**
	(1)	[F72-OH2.1]
	(2)	[F72-OH2.1]
	(3)	[F71-OH2.3]
	(4)	[F50-OH1.1]
		[F71-OH2.3]
	3.7.4.7.	**Plumbing Fixtures for Business and Personal Services Occupancies**
	(1)	[F72-OH2.1]
	(2)	
	3.7.4.8.	**Plumbing Fixtures for Mercantile Occupancies**
	(1)	[F72-OH2.1]

Acceptable Solutions	Objectives and Functional Statements
(2)	[F72-OH2.1]
(3)	
(4)	[F72-OH2.1] [F71-OH2.3]
3.7.4.9.	**Plumbing Fixtures for Industrial Occupancies**
(1)	[F72-OH2.1]
(2)	
3.7.4.10.	**Plumbing Fixtures for Mobile Home Facilities**
(1)	[F72-OH2.1] [F71-OH2.3]
(2)	[F72-OH2.1]
(3)	[F71-OH2.3] Applies to the minimum number of laundry trays or similar facilities, and of bathtubs or showers for each sex.
3.7.4.11.	**Safety Glass**
(1)	[F20-OS3.1]
3.7.4.12.	**Surface Protection**
(1)	[F72-OH2.1] [F40-OH2.4]
(2)	[F72-OH2.1] [F40-OH2.4]
3.7.4.13.	**Floor Drains**
(1)	[F30-OS3.1]
	[F40, F41-OH2.4, OH2.6]
3.7.4.14.	**Grab Bar Installation**
(1)	[F20-OS3.1]
3.7.4.15.	**Clearances for Water Closets**
(1)	[F30-OS3.1]
3.7.4.16.	**Privacy**
(1)	[F101-OH6]
(2)	[F101-OH6]
3.7.4.17.	**Water Temperature Control**
(1)	
3.7.4.18.	**Drinking Water**
(1)	[F70-OH2.2]
3.7.4.19.	**Pharmacies**
(1)	[F40-OH2.4]
3.7.5.1.	**Electrical Systems**
(1)	[F01-OS1.1]
	[F32-OS3.3]
	[F01-OP1.1]
3.7.5.2.	**Medical Gas Piping**
r11.1 (1)	[F43, F81, F82-OS3.4]
	(b) [F01, F02-OS1.1]
	(b) [F01, F02-OP1.1]
3.7.5.3.	**Shielding of X-Ray Equipment**
(1)	[F44-OS3.4]
3.7.6.1.	**Application**
(1)	
3.7.6.2.	**Room Finishes**
(1)	[F41-OH2.4]
(2)	
(3)	[F41-OH2.4]
3.7.6.3.	**Location of Plumbing Fixtures**
(1)	[F40-OH2.1, OH2.4]
(2)	[F72-OH2.1] [F71-OH2.3]

Acceptable Solutions	Objectives and Functional Statements
(3)	
3.7.6.4.	**Lavatories, Appliances and Sinks**
(1)	[F71-OH2.3]
(2)	[F40-OH2.4]
(3)	
3.7.6.5.	**Hot and Cold Water Supply**
(1)	(a) [F71-OH2.3] [F40-OH2.4]
	(b) [F70-OH2.2]
	(c) [F40-OH2.4]
(2)	
3.7.6.6.	**Employee Facilities**
(1)	[F41-OH2.4]
	[F101-OH6]
(2)	[F71-OH2.3]
3.7.6.7.	**Sleeping Quarters**
(1)	[F40-OH2.4]
3.8.1.1.	**Application**
(1)	
r4 **3.8.1.2.**	**Entrances**
(1)	[F73-OA1]
(2)	
(3)	[F73-OA1]
(4)	
(5)	
(6)	[F73-OA1]
3.8.1.3.	**Barrier-Free Path of Travel**
(1)	[F73-OA1]
(2)	(a), (b) [F30-OS3.1]
	(a), (b) [F73-OA1]
	(c) [F30-OS3.1]
	(c) [F73-OA1]
	(d), (e) [F30-OS3.1]
	(d), (e) [F73-OA1]
(3)	[F73-OA1]
(4)	[F73-OA1]
(5)	[F30-OS3.1]
r4 (6)	[F73-OA1]
r4 **3.8.1.4.**	**Escalators and Moving Walks**
(1)	[F73-OA1]
(2)	[F73-OA1]
(3)	[F73-OA1]
3.8.1.5.	**Controls**
(1)	[F10-OS3.7]
	[F73-OA1]
	[F74-OA2]
(2)	[F74-OA2]
3.8.1.6.	**Illumination**
(1)	
r4 **3.8.2.1.**	**Areas Requiring Barrier-Free Path of Travel**
(1)	[F73-OA1]
(2)	
(3)	

	Acceptable Solutions	Objectives and Functional Statements
	(4)	[F74-OA2]
	(5)	[F73-OA1]
		[F74-OA2]
	(6)	[F74-OA2]
	(7)	
	(8)	
	3.8.2.2.	**Access to Parking Areas**
	(1)	[F73-OA1]
	(2)	[F73-OA1]
	(3)	(a) [F74-OA2]
		(b) [F73-OA1]
		(c) [F74-OA2]
r4	**3.8.2.3.**	**Washrooms Required to be Barrier-Free**
	(1)	[F74-OA2]
	(2)	[F72-OH2.1] [F71-OH2.3]
	(3)	[F72-OH2.1] [F71-OH2.3]
	(4)	
	(5)	
	(6)	[F72-OH2.1] [F71-OH2.3]
		[F74-OA2]
r4	**3.8.2.4.**	**Hotels**
	(1)	[F73-OA1]
		[F74-OA2]
	(2)	
	(3)	[F74-OA2]
	(4)	[F74-OA2]
	(5)	[F74-OA1]
	(6)	[F74-OA1]
	(7)	[F74-OA2]
	(8)	[F73-OA1]
	3.8.3.1.	**Accessibility Signs**
	(1)	[F73-OA1]
	(2)	[F74-OA2]
	(3)	[F74-OA2]
	(4)	[F74-OA2]
	(5)	[F73-OA1]
		[F74-OA2]
r4	(6)	[F73-OA1]
		[F74-OA2]
	3.8.3.2.	**Exterior Walks**
	(1)	[F73-OA1]
		[F30-OS3.1]
	(2)	
	(3)	[F73-OA1]
		[F30-OS3.1]
	(4)	
	3.8.3.3.	**Doorways and Doors**
	(1)	[F73-OA1]
	(2)	[F74-OA2]
	(3)	[F10-OS3.7]
		[F74-OA2]
	(4)	[F73-OA1]

	Acceptable Solutions	Objectives and Functional Statements
	(5)	[F73-OA1]
r4	(6)	[F71-OH2.3]
		[F74-OA1]
	(7)	[F73-OA1]
	(8)	
	(9)	[F30-OS3.1]
		[F73-OA1]
	(10)	[F73-OA1]
	(11)	[F30-OS3.1]
		[F73-OA1]
	(12)	
	(13)	[F73-OA1]
	(14)	[F30-OS3.1]
	(15)	[F30-OS3.1]
	(16)	
	(17)	[F73-OA1]
r4	(18)	[F30-OS3.1]
r4	(19)	[F73-OA1]
	3.8.3.4.	**Ramps**
r4	(1)	(b), (c), (d), (e), (h) [F73-OA1]
		(b), (c), (d), (f), (g), (h) [F30-OS3.1]
		(e)(iii) [F30-OS3.1]
		(e)(v) [F30-OS3.1]
	(2)	
	(3)	
	3.8.3.5.	**Passenger Elevating Devices**
	(1)	[F30-OS3.1] [F10-OS3.7]
r4	**3.8.3.6.**	**Wheelchair Spaces and Adaptive Seating**
	(1)	[F30-OS3.1] Applies to portion of Code text: "... level, or level with removable seats ..."
		[F74-OA2] Applies to entire Sentence except for portion of Code text: "... without infringing on egress from any row of seating or any aisle requirements ..."
		(d) [F10-OS3.7]
	(2)	[F74-OA2]
	(3)	[F73-OA1]
	3.8.3.7.	**Assistive Listening Devices**
	(1)	[F11-OS3.7]
		[F74-OA2]
r11.1	**3.8.3.8.**	**Water Closet Stalls and Enclosures**
	(1)	[F72-OH2.1]
		[F74-OA2]
		(c) [F101-OH6]
		(c)(i) [F74-OA2]
		(c)(vii) [F36-OS3.6]
		(e) [F30-OS3.1] Applies to portion of Code text: "... be equipped with a coat hook ... projecting not more than 50 mm from the wall ..."
	(2)	[F74-OA2]
	(3)	[F72-OH2.1]
		[F74-OA2]
	(4)	[F72-OH2.1]
		[F74-OA2]
	(5)	[F30-OS3.1]
		[F74-OA2]

	Acceptable Solutions	Objectives and Functional Statements
	(6)	[F30-OS3.1]
		[F74-OA2]
	(7)	[F20-OS3.1]
		[F74-OA2]
	(8)	[F20-OS3.1]
		[F74-OA2]
	(9)	[F74-OA2]
	(10)	[F74-OA2]
		(b)(vi) [F36-OS3.6]
		(d) [F30-OS3.1]
r11.1	**3.8.3.9.**	**Water Closets**
	(1)	[F72-OH2.1]
		[F74-OA2]
r11.1	**3.8.3.10.**	**Urinals**
	(1)	[F74-OA2]
	(2)	[F74-OS2]
		(b) [F30-OS3.1]
	(3)	[F74-OA2]
		[F101-OH3.2]
	(4)	[F74-OA2]
r11.1	**3.8.3.11.**	**Lavatories, Mirrors and Washroom Accessories**
	(1)	[F71-OH2.3]
		[F74-OA2]
		(d) [F31-OS3.2]
	(2)	[F74-OA2]
	(3)	
r4	(4)	
r4	(5)	[F74-OA2]
r4	**3.8.3.12.**	**Universal Washrooms**
r11.1	(1)	[F72-OH2.1] [F71-OH2.3]
		[F74-OA2]
		(b) [F74-OA2] Applies to portion of Code text: "... b) ... a door that is capable of being locked from the inside ..."
		(b) [F10-OS3.7]
		(g) [F30-OS3.1] Applies to the requirement for a coat hook.
		(j) [F73-OA1]
		(k) [F131-OR2]
	(2)	[F36-OS3.6]
	(3)	
	(4)	[F20-OS3.1]
	(5)	[F74-OA2.1]
		[F71-OH2.3]
		(b) [F20-OS3.1]
	(6)	
r4	**3.8.3.13.**	**Showers and Bathtubs**
	(1)	[F74-OA2]
r11.1	(2)	[F74-OA2]
		(f)(iii) [F20-OS3.1]
r11.1	(2.1)	
	(3)	

	Acceptable Solutions	Objectives and Functional Statements
r11.1	(4)	[F74-OA2]
	(5)	[F74-OA2]
	3.8.3.14.	**Reserved**
	3.8.3.15.	**Shelves or Counters for Telephones**
	(1)	[F74-OA2]
	(2)	[F74-OA2]
	(3)	[F74-OA2]
r4	(4)	[F74-OA2]
r4	(5)	
r4	**3.8.3.16.**	**Drinking Fountains**
	(1)	[F74-OA2]
	(2)	[F74-OA2]
	(3)	[F74-OA2]
	(4)	
r4	**3.8.3.17.**	**Platforms**
	(1)	[F30-OS3.1]
	(2)	
r4	**3.8.3.18.**	**Tactile Attention Indicators**
	(1)	[F30-OS3.1]
r5	(2)	[F30-OS3.1]
	3.9.1.1.	**Application**
	(1)	
	3.9.1.2.	**Heating Systems**
	(1)	
	3.9.2.1.	**Flame-Spread Rating**
	(1)	[F02-OP1.2]
		[F02-OS1.2]
	3.9.3.1.	**Building Areas**
	(1)	[F02-OP1.1]
		[F02-OS1.1]
	(2)	
	3.9.3.2.	**Spatial Separations**
	(1)	[F03-OP3.1]
		[F03-OS1.1]
	(2)	[F03-OP3.1]
		[F03-OS1.1]
	3.9.3.3.	**Fire Alarm Systems**
	(1)	[F12-OS1.2, OS1.5]
	(2)	
	(3)	
	3.9.3.4.	**Provisions for Firefighting**
	(1)	[F12-OP1.2]
		[F12-OS1.2, OS1.5]
	3.9.3.5.	**Portable Fire Extinguishers**
	(1)	[F02, F12, F81-OP1.2]
		[F02, F12, F81-OS1.2]
	3.9.3.6.	**Means of Egress**
	(1)	

Acceptable Solution	Objectives and Functional Statements
4.1.5.13.	**Helicopter Landing Areas**
(1)	[F20-OS2.1]
	[F20-OP2.1] [F22-OP2.4]
4.1.5.14.	**Loads on Guards**
(1)	[F20-OS2.1]
(2)	[F20-OS2.1, OS2.4]
(3)	
(4)	[F20-OS2.1]
(5)	
4.1.5.15.	**Loads on Vehicle Guardrails**
(1)	[F20-OS2.1]
4.1.5.16.	**Loads on Walls Acting as Guards**
(1)	[F20-OS2.1]
4.1.5.17.	**Firewalls**
(1)	[F20-OS1.2]
	[F20-OP1.2]
	[F20-OP3.1]
(2)	[F04-OS1.2]
	[F04-OP1.2]
	[F04-OP3.1]
4.1.6.1.	**Specified Load Due to Rain or to Snow and Associated Rain**
(1)	
4.1.6.2.	**Specified Snow Load**
(1)	[F20-OS2.1]
	[F20-OP2.1] [F22-OP2.4]
(2)	[F20-OS2.1]
	[F20-OP2.1] [F22-OP2.4]
(3)	[F20-OS2.1]
	[F20-OP2.1] [F22-OP2.4]
(4)	
(5)	[F20-OS2.1]
	[F20-OP2.1] [F22-OP2.4]
(6)	[F20-OS2.1]
	[F20-OP2.1] [F22-OP2.4]
(7)	[F20-OS2.1]
	[F20-OP2.1] [F22-OP2.4]
r11.1 (8)	[F20-OS2.1] Applies to portion of Code text: "The accumulation factor, Ca, shall be 1.0, …"
	[F20-OP2.1] [F22-OP2.4] Applies to portion of Code text: "The accumulation factor, Ca, shall be 1.0,…"
	(a) to (f) [F20-OS2.1] Applies to roof shapes and configurations that call for a higher accumulation factor.
	(a) to (f) [F20-OP2.1] [F22-OP2.4] Applies to roof shapes and configurations that call for a higher accumulation factor.
r11.1 (9)	[F20-OS2.1]
	[F20-OP2.1] [F22-OP2.4]
4.1.6.3.	**Full and Partial Loading**
(1)	[F20-OS2.1]
	[F20-OP2.1] [F22-OP2.4]
(2)	[F20-OS2.1]
	[F20-OP2.1] [F22-OP2.4]
4.1.6.4.	**Specified Rain Load**
(1)	[F20-OS2.1]
	[F20-OP2.1] [F22-OP2.4]

	Acceptable Solution	Objectives and Functional Statements
	(2)	[F20-OS2.1]
		[F20-OP2.1] [F22-OP2.4]
	(3)	
	(4)	[F20-OS2.1]
		[F20-OP2.1] [F22-OP2.4]
r11.1	**4.1.6.5.**	**Multi-Level Roofs**
	(1)	[F20-OS2.1]
		[F20-OP2.1] [F22-OP2.4]
	(2)	[F20-OS2.1]
		[F20-OP2.1] [F22-OP2.4]
	(3)	[F20-OS2.1]
		F20-OP2.1] [F22-OP2.4]
	(4)	[F20-OS2.1]
		[F20-OP2.1] [F22-OP2.4]
r11.1	**4.1.6.6.**	**Horizontal Gap Between a Roof and a Higher Roof**
	(1)	[F20-OS2.1]
		[F20-OP2.1] [F22-OP2.4]
r11.1	**4.1.6.7.**	**Areas Adjacent to Roof Projections**
	(1)	[F20-OS2.1]
		[F20-OP2.1] [F22-OP2.4]
	(2)	
	(3)	
r11.1	**4.1.6.8.**	**Snow Drift at Corners**
	(1)	[F20-OS2.1]
		[F20-OP2.1] [F22-OP2.4]
	(2)	[F20-OS2.1]
		[F20-OP2.1] [F22-OP2.4]
r11.1	**4.1.6.9.**	**Gable Roofs**
	(1)	[F20-OS2.1]
		[F20-OP2.1] [F22-OP2.4]
	(2)	[F20-OS2.1]
		[F20-OP2.1] [F22-OP2.4]
	(3)	
	(4)	[F20-OS2.1]
		[F20-OP2.1] [F22-OP2.4]
r11.1	**4.1.6.10.**	**Arch Roofs, Curved Roofs and Domes**
	(1)	[F20-OS2.1]
		[F20-OP2.1] [F22-OP2.4]
	(2)	[F20-OS2.1]
		[F20-OP2.1] [F22-OP2.4]
	(3)	[F20-OS2.1]
		[F20-OP2.1] [F22-OP2.4]
	(4)	[F20-OS2.1]
		[F20-OP2.1] [F22-OP2.4]
	(5)	[F20-OS2.1]
		[F20-OP2.1] [F22-OP2.4]
	(6)	[F20-OS2.1]
		[F20-OP2.1] [F22-OP2.4]

	Acceptable Solution	Objectives and Functional Statements
	(7)	[F20-OS2.1]
		[F20-OP2.1] [F22-OP2.4]
	(8)	
	(9)	[F20-OS2.1]
		[F20-OP2.1] [F22-OP2.4]
r11.1	**4.1.6.11.**	**Snow Loads Due to Sliding**
	(1)	[F20-OS2.1]
		[F20-OP2.1] [F22-OP2.4]
	(2)	
	(3)	[F20-OS2.1]
		[F20-OP2.1] [F22-OP2.4]
r11.1	**4.1.6.12.**	**Valleys in Curved or Sloped Roofs**
	(1)	[F20-OS2.1]
		[F20-OP2.1] [F22-OP2.4]
	(2)	[F20-OS2.1]
		[F20-OP2.1] [F22-OP2.4]
	(3)	[F20-OS2.1]
		[F20-OP2.1] [F22-OP2.4]
r11.1	**4.1.6.13.**	**Specific Weight of Snow**
	(1)	[F20-OS2.1]
		[F20-OP2.1] [F22-OP2.4]
r11.1	**4.1.6.14.**	**Snow Removal**
	(1)	[F20-OS2.1]
		[F20-OP2.1] [F22-OP2.4]
r11.1	**4.1.6.15.**	**Ice Loading of Structures**
	(1)	[F20-OS2.1]
		[F20-OP2.1] [F22-OP2.4]
r11.1	**4.1.7.1.**	**Specified Wind Load**
	(1)	
	(2)	[F20-OS2.1]
		[F20-OP2.1] [F22-OP2.4]
		[F22-OH4]
	(3)	[F20-OS2.1]
		[F20-OP2.1][F22-OP2.4]
		[F22-OH4]
	(4)	[F20-OS2.1]
		[F20-OP2.1] [F22-OP2.4]
		[F22-OH4]
	(5)	[F20-OS2.1]
		[F20-OP2.1] [F22-OP2.4]
	(6)	[F20-OS2.1]
		[F20-OP2.1] [F22-OP2.4]
		[F22-OH4]
r11.1	**4.1.7.2.**	**Classification of Buildings**
	(1)	[F20-OS2.1]
		[F20-OP2.1] [F22-OP2.4]
		[F22-OH4]
	(2)	[F20-OS2.1]
		[F20-OP2.1] [F22-OP2.4]
		[F22-OH4]

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	(3)	[F20-OS2.1]
		[F20-OP2.1] [F22-OP2.4]
		[F22-OH4]
r11.1	**4.1.7.3.**	**Static Procedure**
	(1)	[F20-OS2.1]
		[F20-OP2.1] [F22-OP2.4]
		[F22-OH4]
	(2)	[F20-OS2.1]
		[F20-OP2.1] [F22-OP2.4]
		[F22-OH4]
	(3)	[F20-OS2.1]
		[F20-OP2.1] [F22-OP2.4]
		[F22-OH4]
	(4)	[F20-OS2.1]
		[F20-OP2.1] [F22-OP2.4]
		[F22-OH4]
	(5)	[F20-OS2.1]
		[F20-OP2.1] [F22-OP2.4]
		[F22-OH4]
	(6)	[F20-OS2.1]
		[F20-OP2.1] [F22-OP2.4]
		[F22-OH4]
	(7)	[F20-OS2.1]
		[F20-OP2.1] [F22-OP2.4]
		[F22-OH4]
	(8)	[F20-OS2.1]
		[F20-OP2.1] [F22-OP2.4]
		[F22-OH4]
	(9)	
	(10)	[F20-OS2.1]
		[F20-OP2.1] [F22-OP2.4]
		[F22-OH4]
r11.1	**4.1.7.4.**	**Topographic Factor**
	(1)	[F20-OS2.1]
		[F20-OP2.1] [F22-OP2.4]
		[F22-OH4]
	(2)	[F20-OS2.1]
		[F20-OP2.1] [F22-OP2.4]
		[F22-OH4]
r11.1	**4.1.7.5.**	**External Pressure Coefficients**
	(1)	
	(2)	[F20-OS2.1]
		[F20-OP2.1] [F22-OP2.4]
		[F22-OH4]
	(3)	[F20-OS2.1]
		[F20-OP2.1] [F22-OP2.4]
		[F22-OH4]
	(4)	[F20-OS2.1]
		[F20-OP2.1] [F22-OP2.4]
		[F22-OH4]

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	(5)	[F20-OS2.1]
r11.1	**4.1.7.6.**	**External Pressure Coefficients for Low Buildings**
	(1)	
	(2)	[F20-OS2.1]
		[F20-OP2.1] [F22-OP2.4]
		[F22-OH4]
	(3)	[F20-OS2.1]
		[F20-OP2.1] [F22-OP2.4]
		[F22-OH4]
	(4)	[F20-OS2.1]
		[F20-OP2.1] [F22-OP2.4]
		[F22-OH4]
	(5)	[F20-OS2.1]
		[F20-OP2.1] [F22-OP2.4]
		[F22-OH4]
	(6)	[F20-OS2.1]
		[F20-OP2.1] [F22-OP2.4]
		[F22-OH4]
	(7)	[F20-OS2.1]
		[F20-OP2.1] [F22-OP2.4]
		[F22-OH4]
	(8)	[F20-OS2.1]
		[F20-OP2.1] [F22-OP2.4]
		[F22-OH4]
	(9)	[F20-OS2.1]
		[F20-OP2.1] [F22-OP2.4]
		[F22-OH4]
r11.1	**4.1.7.7.**	**Internal Pressure Coefficient**
	(1)	[F20-OS2.1]
		[F20-OP2.1] [F22-OP2.4]
		[F22-OH4]
r11.1	**4.1.7.8.**	**Dynamic Procedure**
	(1)	[F20-OS2.1]
		[F20-OP2.1] [F22-OP2.4]
		[F22-OH4]
	(2)	[F20-OS2.1]
		[F20-OP2.1] [F22-OP2.4]
		[F22-OH4]
	(3)	[F20-OS2.1]
		[F20-OP2.1] [F22-OP2.4]
		[F22-OH4]
	(4)	[F20-OS2.1]
		[F20-OP2.1] [F22-OP2.4]
		[F22-OH4]
r11.1	**4.1.7.9.**	**Full and Partial Wind Loading**
	(1)	[F20-OS2.1]
		[F20-OP2.1] [F22-OP2.4]
		[F22-OH4]

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r11.1	**4.1.7.10.**	**Interior Walls and Partitions**
	(1)	[F20-OS2.1]
		[F20-OP2.1] [F22-OP2.4]
r11.1	**4.1.7.11.**	**Exterior Ornamentations, Equipment and Appendages**
	(1)	[F20-OS2.1]
		[F20-OP2.1] [F22-OP2.4]
	(2)	
r11.1	**4.1.7.12.**	**Wind Tunnel Procedure**
	(1)	[F20-OS2.1]
		[F20-OP2.1] [F22-OP2.4]
		[F22-OH4]
	(2)	[F20-OS2.1]
		[F20-OP2.1] [F22-OP2.4]
		[F22-OH4]
	(3)	[F20-OS2.1]
		[F20-OP2.1] [F22-OP2.4]
		[F22-OH4]
r11.1	**4.1.8.1.**	**Analysis**
	(1)	
	(2)	(a) [F20-OS2.1]
		(a) [F20-OP2.1,OP2.3] [F22-OP2.4]
		(b) [F20-OS2.1]
		(b) [F20-OP2.1] [F22-OP2.4]
	(3)	[F20-OS2.1]
		[F20-OP2.1, OP2.4]
	(4)	[F20-OS2.1]
		[F20-OP2.1] [F22-OP2.4]
	(5)	[F20-OS2.1]
		[F20-OP2.1] [F22-OP2.4]
	(6)	[F20-OS2.1]
		[F20-OP2.1] [F22-OP2.4]
	(7)	[F20-OS2.1]
		[F20-OP2.1] [F22-OP2.4]
	(8)	[F20-OS2.1]
		[F20-OP2.1] [F22-OP2.4]
	(9)	[F20-OS2.1]
		[F20-OP2.1] [F22-OP2.4]
	(10)	[F20-OS2.1]
		[F20-OP2.1] [F22-OP2.4]
	(11)	[F20-OS2.1]
		[F20-OP2.1] [F22-OP2.4]
	(12)	[F20-OS2.1]
		[F20-OP2.1] [F22-OP2.4]
	(13)	[F20-OS2.1]
		[F20-OP2.3] [F22-OP2.3, OP2.4]
	(14)	[F20-OS2.1]
		[F20-OP2.3] [F22-OP2.3, OP2.4]
	(15)	

Acceptable Solution	Objectives and Functional Statements
4.1.8.2.	**Notation**
(1)	
4.1.8.3.	**General Requirements**
(1)	
(2)	[F20-OS2.1]
	[F20-OP2.1, OP2.4]
(3)	[F20-OS2.1]
	[F20-OP2.1] [F22-OP2.4]
(4)	[F20-OS2.1]
	[F20-OP2.1] [F22-OP2.4]
(5)	[F20-OS2.1]
	[F20-OP2.1] [F22-OP2.4]
(6)	[F20-OS2.1]
	[F20-OP2.1] [F22-OP2.4]
(7)	[F20-OS2.1]
	[F20-OP2.1] [F22-OP2.4]
(8)	[F20-OS2.1]
	[F20-OP2.1] [F22-OP2.4]
r11.1 **4.1.8.4.**	**Site Properties**
(1)	[F20-OS2.1]
	[F20-OP2.1] [F22-OP2.4]
(2)	[F20-OS2.1]
	[F20-OP2.1] [F22-OP2.4]
(3)	
(4)	[F20-OS2.1]
	[F20-OP2.1] [F22-OP2.4]
(5)	[F20-OS2.1]
	[F20-OP2.1] [F22-OP2.4]
(6)	[F20-OS2.1]
	[F20-OP2.1] [F22-OP2.4]
(7)	
(8)	
(9)	[F20-OS2.1]
	[F20-OP2.1] [F22-OP2.4]
4.1.8.5.	**Importance Factor**
(1)	[F20-OS2.1]
	[F20-OP2.1, OP2.3] [F22-OP2.4]
4.1.8.6.	**Structural Configuration**
(1)	[F20-OS2.1]
	[F20-OP2.1] [F22-OP2.4]
(2)	
(3)	
4.1.8.7.	**Methods of Analysis**
(1)	[F20-OS2.1]
	[F20-OP2.1] [F22-OP2.4]
4.1.8.8.	**Direction of Loading**
(1)	[F20-OS2.1]
	[F20-OP2.1] [F22-OP2.4]
4.1.8.9.	**SFRS Force Reduction Factors, System Overstrength Factors, and General Restrictions**
(1)	[F20-OS2.1]
	[F20-OP2.1] [F22-OP2.4]

	Acceptable Solution	Objectives and Functional Statements
	(2)	[F20-OS2.1]
		[F20-OP2.1] [F22-OP2.4]
	(3)	[F20-OS2.1]
		[F20-OP2.1] [F22-OP2.4]
	(4)	[F20-OS2.1]
		[F20-OP2.1] [F22-OP2.4]
	(5)	
r11.1	**4.1.8.10.**	**Additional System Restrictions**
	(1)	[F20-OS2.1]
		[F20-OP2.1] [F22-OP2.4]
	(2)	(a) [F20-OP2.3] [F22-OP2.4]
		(b) [F20-OP2.3] [F22-OP2.4]
		(c) [F20-OP2.3] [F22-OP2.4]
		(d) [F20-OP2.3] [F22-OP2.4]
	(3)	[F20-OS2.1]
		[F20-OP2.1] [F22-OP2.4]
	(4)	[F20-OS2.1]
		[F20-OP2.1] [F22-OP2.4]
	(5)	
	(6)	[F22-OS2.3, OS2.4]
		[F22-OP2.3, OP2.4]
	(7)	[F22-OS2.1]
		[F20-OP2.1] [F22-OP2.4]
r11.1	**4.1.8.11.**	**Equivalent Static Force Procedure for Structures Satisfying the Conditions of Article 4.1.8.7.**
	(1)	
	(2)	[F20-OS2.1]
		[F20-OP2.1] [F22-OP2.4]
	(3)	[F20-OS2.1]
		[F20-OP2.1] [F22-OP2.4]
	(4)	[F20-OS2.1]
		[F20-OP2.1] [F22-OP2.4]
	(5)	[F20-OS2.1]
		[F20-OP2.1] [F22-OP2.4]
	(6)	[F20-OS2.1]
		[F20-OP2.1] [F22-OP2.4]
	(7)	[F20-OS2.1]
		[F20-OP2.1] [F22-OP2.4]
	(8)	[F20-OS2.1]
		[F20-OP2.1] [F22-OP2.4]
	(9)	(a) [F20-OS2.1]
		(a) [F20-OP2.1] [F22-OP2.4]
		(b) [F20-OS2.1]
		(b) [F20-OP2.1] [F22-OP2.4]
	(10)	[F20-OS2.1]
		[F20-OP2.1] [F22-OP2.4]
	(11)	(a) [F20-OP2.1] [F22-OP2.4]
		(a) [F20-OS2.1]
		(b) [F20-OS2.1]
		(b) [F20-OP2.1] [F22-OP2.4]
	(12)	[F20-OS2.1]
		[F20-OP2.1] [F22-OP2.4]

	Acceptable Solution	Objectives and Functional Statements
r11.1	**4.1.8.12.**	**Dynamic Analysis Procedure**
	(1)	[F20-OS2.1]
		[F20-OP2.1] [F22-OP2.4]
	(2)	[F20-OS2.1]
		[F20-OP2.1] [F22-OP2.4]
	(3)	[F20-OS2.1]
		[F20-OP2.1] [F22-OP2.4]
	(4)	(a) [F20-OP2.1] [F22-OP2.4]
		(a) [F20-OS2.1]
	(5)	[F20-OS2.1]
		[F20-OP2.1, OP2.3] [F22-OP2.4]
	(6)	
	(7)	[F20-OS2.1]
		[F20-OP2.1, OP2.3] [F22-OP2.4]
	(8)	[F20-OS2.1]
		[F20-OP2.1] [F22-OP2.4]
	(9)	[F20-OS2.1]
		[F20-OP2.1] [F22-OP2.4]
	(10)	[F20-OS2.1]
		[F20-OP2.1] [F22-OP2.4]
	(11)	
	(12)	[F20-OS2.1]
		[F20-OP2.1] [F22-OP2.4]
r11.1	**4.1.8.13.**	**Deflections and Drift Limits**
	(1)	[F22-OS2.3, OS2.4]
		[F22-OP2.3, OP2.4]
	(2)	[F22-OS2.3, OS2.4]
		[F22-OP2.3, OP2.4]
	(3)	[F22-OS2.3, OS2.4]
		[F22-OP2.3, OP2.4]
	(4)	
	(5)	
	(6)	
	4.1.8.14.	**Structural Separation**
	(1)	[F22-OS2.3, OS2.4]
		[F22-OP2.3, OP2.4]
		[F22-OP4.3]
	(2)	[F20-OS2.1, OS2.3, OS2.4]
		[F20-OP2.1, OP2.3, OP2.4]
		[F20-OP4.3]
	(3)	[F20-OS2.1, OS2.3, OS2.4]
		[F20-OP2.1, OP2.3, OP2.4]
		[F20-OP4.3]
	(4)	[F20-OS2.1, OS2.3, OS2.4]
		[F20-OP2.1, OP2.3, OP2.4]
		[F20-OP4.3]
r11.1	**4.1.8.15.**	**Design Provisions**
	(1)	[F20-OS2.1]
		[F20-OP2.1, OP2.3, OP2.4]
	(2)	[F20-OS2.1]
		[F20-OP2.1, OP2.3, OP2.4]

	Acceptable Solution	Objectives and Functional Statements
	(3)	[F20-OS2.1]
		[F20-OP2.1, OP2.3, OP2.4]
	(4)	[F20-OS2.1]
		[F20-OP2.1, OP2.4]
	(5)	[F20-OS2.1, OS2.4]
		[F20-OP2.1, OP2.4]
	(6)	[F20-OS2.1]
		[F20-OP2.1] [F22-OP2.4]
	(7)	[F20-OS2.1]
		[F20-OP2.1] [F22-OP2.4]
	(8)	
	(9)	
	(10)	
r11.1	**4.1.8.16.**	**Foundation Provisions**
	(1)	[F20-OS2.2, OS2.4]
		[F20-OP2.2, OP2.4]
	(2)	[F20-OS2.1]
		[F20-OP2.1]
	(3)	
	(4)	
	(5)	[F20-OS2.2, OS2.4]
		[F20-OP2.2, OP2.4]
	(6)	(a) [F22-OS2.4]
		(a) [F22-OP2.4]
		(b) [F22-OS2.4]
		(b) [F22-OP2.4]
		(c) [F20-OS2.4]
		(c) [F20-OP2.4]
	(7)	[F20-OS2.1]
		[F20-OP2.1, OP2.4]
	(8)	(a) [F20-OS2.1]
		(a) [F20-OP2.1]
		(b) [F22-OS2.4]
		(b) [F22-OP2.4]
	(9)	[F20-OS2.4]
		[F20-OP2.4]
	(10)	[F20-OS2.2] [F22-OS2.4]
		[F20-OP2.2] [F22-OP2.4]
	4.1.8.17.	**Site Stability**
	(1)	[F20-OP2.1] [F22-OP2.4]
		[F20-OS2.1]
r11.1	**4.1.8.18.**	**Elements of Structures, Non-structural Components and Equipment**
	(1)	[F20, F22-OS2.4]
		[F20-OP2.3] [F22-OP2.3, OP2.4]
	(2)	
	(3)	
	(4)	[F20, F22-OS2.4]
		[F20, F22-OP2.3, OP2.4]
	(5)	[F20, F22-OS2.1]
		[F20, F22-OP2.1, OP2.4]
	(6)	[F20, F22-OS2.4]
		[F20, F22-OP2.3, OP2.4]

	Acceptable Solution	Objectives and Functional Statements
	(7)	[F20, F22-OS2.4] Applies to portion of Code text: "Connections to the structure of elements and components listed in Table 4.1.8.18. shall be designed to support the component or element for gravity loads, shall conform to the requirements of Sentence 4.1.8.18.(1) …"
		[F20, F22-OP2.3, OP2.4] Applies to portion of Code text: "Connections to the structure of elements and components listed in Table 4.1.8.18. shall be designed to support the component or element for gravity loads, shall conform to the requirements of Sentence 4.1.8.18.(1)…"
		(a) [F20, F22-OS2.4]
		(a) [F20, F22-OP2.3, OP2.4]
		(b), (c) [F20, F22-OS2.4]
		(b), (c) [F20, F22-OP2.3, OP2.4]
		(d) [F20, F22-OS2.4]
		(d) [F20, F22-OP2.3,O P2.4]
		(e) [F20, F22-OS2.4]
		(e) [F20, F22-OP2.3, OP2.4]
	(8)	
	(9)	[F22-OS2.3, OS2.4]
		[F22-OP2.3, OP2.4]
	(10)	[F22-OS2.1, OS2.3, OS2.4]
		[F22-OP2.1, OP2.3, OP2.4]
	(11)	[F20-OS2.1] [F22-OS2.4]
		[F20, F22-OP2.3, OP2.4]
	(12)	[F20-OS2.1] [F22-OS2.3]
		[F20-OP2.1] [F22-OP2.3]
	(13)	
	(14)	[F20, F22-OS2.4]
	(15)	
	(16)	[F20, F22-OS2.4]
		[F20-OP2.3] [F22-OP2.3, OP2.4]
r11.1	**4.1.8.19.**	**Seismic Isolation**
	(1)	
	(2)	[F20-OS2.1] [F22-OS2.4]
		[F20-OP2.1] [F22-OP2.4]
	(3)	[F20-OS2.1]
		[F20-OP2.1] [F22-OP2.4]
	(4)	[F20-OS2.1]
		[F20-OP2.1] [F22-OP2.4]
r11.1	**4.1.8.20.**	**Seismic Isolation Design Provisions**
	(1)	[F20-OS2.1]
		[F20-OP2.1] [F22-OP2.4]
	(2)	[F20-OS2.1]
		[F20-OP2.1] [F22-OP2.4]
	(3)	[F20-OS2.1] [F22-OS2.4]
		[F20-OP2.1] [F22-OP2.4]
	(4)	[F20-OS2.1] [F22-OS2.4]
		[F20-OP2.1] [F22-OP2.4]
	(5)	[F20-OS2.1] [F22-OS2.4]
		[F20-OP2.1] [F22-OP2.4]
	(6)	[F20-OS2.1] [F22-OS2.4]
		[F20-OP2.1] [F22-OP2.4]
	(7)	[F20-OS2.1]
		[F20-OP2.1] [F22-OP2.4]
	(8)	

	Acceptable Solution	Objectives and Functional Statements
	(9)	[F20-OS2.1] [F22-OS2.4]
		[F20-OP2.1] [F22-OP2.4]
	(10)	[F22-OS2.4]
		[F22-OP2.3, OP2.4]
r11.1	**4.1.8.21.**	**Supplemental Energy Dissipation**
	(1)	
	(2)	[F20-OS2.1] [F22-OS2.4]
		[F20-OP2.1] [F22-OP2.4]
	(3)	
	(4)	[F20-OS2.1]
		[F20-OP2.1] [F22-OP2.4]
	(5)	[F20-OS2.1]
		[F20-OP2.1] [F22-OP2.4]
r11.1	**4.1.8.22.**	**Supplemental Energy Dissipation Design Consideration**
	(1)	[F20-OS2.1] [F22-OS2.4]
		[F20-OP2.1] [F22-OP2.4]
	(2)	
	(3)	[F20-OS2.1] [F22-OS2.4]
		[F20-OP2.1] [F22-OP2.4]
	(4)	[F20-OS2.1] [F22-OS2.4]
		[F20-OP2.1] [F22-OP2.4]
	(5)	[F20-OS2.1] [F22-OS2.4]
		[F20-OP2.1] [F22-OP2.4]
	(6)	[F20-OS2.1]
		[F20-OP2.1] [F22-OP2.4]
	(7)	[F20-OS2.1] [F22-OS2.4]
		[F20-OP2.1] [F22-OP2.4]
	(8)	[F20-OS2.1] [F22-OS2.4]
		[F20-OP2.1] [F22-OP2.4]
	4.2.1.1.	**Application**
	(1)	
	4.2.2.1.	**Subsurface Investigation**
	(1)	[F20-OS2.2] [F20, F21-OS2.6]
		[F20-OP2.2] [F21-OP2.6]
		[F21-OP4.1, OP4.4]
	4.2.2.2.	**Field Review**
	(1)	[F20-OP2.2] [F21-OP2.5]
		[F21-OP4.1, OP4.4]
		[F20-OS2.2] [F20, F21-OS2.6]
	(2)	
	4.2.2.3.	**Altered Subsurface Condition**
	(1)	[F20-OP2.2] [F21-OP2.6]
		[F21-OP4.1, OP4.4]
		[F20-OS2.2] [F20, F21-OS2.6]
	(2)	[F20-OP2.2] [F21-OP2.6]
		[F21-OP4.1, OP4.4]
		[F20-OS2.2] [F20, F21-OS2.6]
	4.2.3.1.	**Wood**
	(1)	

Acceptable Solution	Objectives and Functional Statements
(4)	[F80-OP2.3]
	[F80-OS2.3]
(5)	[F20-OP2.1] [F22-OP2.4]
	[F20-OS2.1]
	[F43-OS3.4]
	[F110-OE]
(6)	[F20-OP2.2] [F20, F21-OP2.4] [F21-OP2.6]
	[F20-OS2.2] [F21-OS2.5]
	[F43-OS3.4]

Table 5
Objectives and Functional Statements Attributed to the Acceptable Solutions in Part 5 of Division B

Acceptable Solution	Objectives and Functional Statements
5.1.1.1.	**Scope**
(1)	
5.1.2.1.	**Exposure to Exterior Space or the Ground and Separation of Dissimilar Environments**
(1)	
5.1.3.1.	**Reserved**
5.1.4.1.	**Structural and Environmental Loads**
(1)	[F61-OH4]
	(a) [F20, F51, F55-OS1.4] Applies where required life safety systems are incorporated in environmental separators.
	(a) [F60, F61, F63-OS2.2, OS2.3]
	(a) [F55, F61, F63-OH1.1, OH1.2, OH1.3]
	(b) [F20-OS2.1] [F21, F22-OS2.3, OS2.4] Applies to snow fences and sloped glazing.
	(b) [F20-OS3.1] Applies to snow fences and sloped glazing.
	(b) [F20, F21, F22-OH1.1, OH1.2, OH1.3]
	(b) [F20-OH4]
r11.1 (1.1)	
(2)	
(3)	[F20-OS2.1] [F21, F22-OS2.3, OS2.4]
	[F20, F21, F22-OH1.1, OH1.2, OH1.3]
(4)	(a), (b) [F20-OS2.1] [F21, F22-OS2.3, OS2.4]
	(a), (b) [F20, F21, F22-OH1.1, OH1.2, OH1.3]
(5)	[F20, F21, F22-OH1.1, OH1.2, OH1.3]
	(a) [F20-OS2.1, OS2.3]
	(b), (c) [F21, F22-OS2.3]
	(b), (c) [F22-OH4]
5.1.4.2.	**Resistance to Deterioration**
(1)	[F80, F81-OS1.4] Applies where required life safety systems are incorporated in environmental separators.
	[F80, F81-OS2.3]
	[F80, F81-OS3.1] Applies to floor assemblies.
	[F80, F81-OH1.1, OH1.2, OH1.3]
	[F80, F81-OH4] Applies to floor assemblies.
(2)	
(3)	
5.1.5.1.	**Requirements in Other Parts of the Code**
(1)	
5.2.1.1.	**Exterior Environmental Loads**
(1)	
(2)	[F20-OS2.1]
	[F20, F40-OH1.1] [F20-OH1.2, OH1.3]
(3)	
5.2.1.2.	**Interior Environmental Loads**
(1)	[F51, F55, F61, F63-OS1.4] Applies where required life safety systems are incorporated in environmental separators.
	[F55, F61, F63-OS2.3]
	[F51, F55, F61, F63-OH1.1, OH1.2]
5.2.1.3.	**Environmental Load and Transfer Calculations**
(1)	[F51, F61, F63-OS2.3] Applies to heat, air and moisture transfer calculations.
	[F51, F55, F61, F63-OH1.1, OH1.2] [F51, F61-OH1.3] Applies to heat, air and moisture transfer calculations.
	[F56-OH3.1] Applies to sound transmission calculations.
(2)	

	Acceptable Solution	Objectives and Functional Statements
	(3)	[F20-OS1.4] Applies where required life safety systems are incorporated in environmental separators.
		[F20-OS2.1]
		[F55, F61, F63-OH1.1, OH1.2] [F55, F61-OH1.3]
	5.2.2.1.	**Determination of Structural Loads and Effects**
	(1)	[F20-OS2.1] [F21, F22-OS2.3, OS2.4]
		[F20, F21, F22-OH1.1, OH1.2, OH1.3]
		[F20, F21, F22-OH4]
	(2)	
	(3)	[F20-OS2.1] [F21, F22-OS2.3, OS2.4]
		[F20, F21, F22-OH1.1, OH1.2, OH1.3]
		[F20, F21, F22-OH4]
r11.1	**5.2.2.2.**	**Determination of Wind Load**
	(1)	
	(2)	[F20-OS2.1] [F22-OS2.3, OS2.4]
		[F20, F22-OH1.1, OH1.2, OH1.3]
		[F20, F22-OH4]
	(3)	[F20-OS2.1] [F22-OS2.3, OS2.4]
		[F20, F22-OH1.1, OH1.2, OH1.3]
		[F20, F22-OH4]
	(4)	[F20, F55, F61-OS2.1, OS2.3]
		[F20, F55, F61-OH1.1, OH1.2, OH 1.3]
	(5)	
	5.2.2.3.	**Design Procedures**
	(1)	[F20-OS2.1] [F22-OS2.3, OS2.4]
		[F20, F22-OH1.1, OH1.2, OH1.3]
		[F20, F22-OH4]
	5.3.1.1.	**Required Resistance to Heat Transfer**
	(1)	[F51, F63-OS1.4] Applies where required life safety systems are incorporated in environmental separators.
		[F63-OS2.3]
		[F63-OH1.1] [F51, F63-OH1.2]
	(2)	
	5.3.1.2.	**Properties to Resist Heat Transfer or Dissipate Heat**
	(1)	[F51, F63-OH1.1]
		[F51, F63-OS1.4] Applies where required life safety systems are incorporated in environmental separators.
		[F51, F63-OS2.3]
		[F51-OH1.2]
		[F30-OS3.1]
r11.1	**5.3.1.3.**	**Location and Installation of Materials Providing Thermal Resistance**
	(1)	[F63-OS2.3]
		[F51, F63-OH1.1]
	(2)	[F51, F63-OS1.4] Applies where required life safety systems are incorporated in environmental separators.
		[F63-OS2.3]
		[F51, F63-OH1.1, OH1.2]
	5.4.1.1.	**Required Resistance to Air Leakage**
	(1)	(a), (b), (c) [F40, F55-OH1.1]
		(a), (b), (e) [F51, F52, F54, F55-OH1.2]
		(c) [F55, F61, F63-OH1.3]
		(c), (d) [F55, F61, F62, F63-OS2.3]
		(d) [F55, F62-OS3.1]
		(e) [F55, F62-OS1.4] Applies where required life safety systems are incorporated in environmental separators.
	(2)	[F51, F55-OS1.4] Applies where required life safety systems are incorporated in environmental separators.
		[F61, F63-OS2.3]
		[F40, F51, F55, F61, F63-OH1.1] [F51, F52, F54, F55, F61, F63-OH1.2] [F51, F55, F61, F63-OH1.3]

Acceptable Solution	Objectives and Functional Statements
(3)	
5.4.1.2.	**Air Barrier System Properties**
(1)	[F55-OS1.4] Applies where required life safety systems are incorporated in environmental separators.
	[F55-OS2.3]
	[F55-OH1.1, OH1.2, OH1.3]
(2)	
(3)	[F51, F61, F63-OS1.4] Applies where required life safety systems are incorporated in environmental separators.
	[F61, F63-OS2.3]
	[F51, F55, F61, F63-OH1.1, OH1.2] [F55, F61-OH1.3]
(4)	
5.5.1.1.	**Required Resistance to Vapour Diffusion**
(1)	[F63-OS2.3]
	[F63-OH1.1, OH1.2]
(2)	[F63-OS2.3]
	[F63-OH1.1, OH1.2]
(3)	
5.5.1.2.	**Vapour Barrier Properties and Installation**
(1)	[F63-OS2.3]
	[F63-OH1.1, OH1.2]
(2)	[F63-OS2.3]
	[F63-OH1.1, OH1.2]
(3)	[F63-OS2.3]
	[F63-OH1.1, OH1.2]
5.6.1.1.	**Required Protection from Precipitation**
(1)	[F61-OS2.3]
	[F61-OH1.1, OH1.2, OH1.3]
(2)	
r11.1 **5.6.1.2.**	**Installation of Protective Materials**
(1)	
(2)	
(3)	[F61-OS2.3]
	[F61-OH1.1, OH1.2, OH1.3]
(4)	[F61-OS2.3]
	[F61-OH1.1, OH1.2, OH1.3]
5.6.2.1.	**Sealing and Drainage**
(1)	[F61, F62-OS2.3]
	[F61, F62-OH1.1, OH1.2, OH1.3]
(2)	
5.6.2.2.	**Accumulation and Disposal**
(1)	[F30-OS3.1]
(2)	[F61-OS2.3]
	[F61-OH1.1, OH1.2, OH1.3]
(3)	[F21-OS2.2] [F60-OS2.3]
	[F61-OH1.1, OH1.2, OH1.3]
	(a)
	(b) [F21-OP2.6]
(4)	[F61-OS2.3]
	[F61-OH1.1, OH1.2, OH1.3]
r11.1 **5.7.1.1.**	**Application**
(1)	

	Acceptable Solution	Objectives and Functional Statements
r11.1	**5.7.1.2.**	**Required Protection**
	(1)	[F60-OS2.3]
		[F60-OH1.1, OH1.2, OH1.3]
	(2)	[F60-OS2.2, OS2.3]
		[F60-OH1.1, OH1.2, OH1.3]
r11.1	**5.7.2.1.**	**Application**
	(1)	
r11.1	**5.7.2.2.**	**Design of Building Elements under Hydrostatic Loads**
	(1)	
	(2)	
r11.1	**5.7.2.3.**	**Required Protection**
	(1)	
r11.1	**5.7.3.1.**	**Application**
	(1)	
r11.1	**5.7.3.2.**	**Required Protection**
	(1)	[F61-OH1.1, OH1.2, OH1.3]
		[F61-OS2.3]
	(2)	
r11.1	**5.7.3.3.**	**Waterproofing**
	(1)	[F61-OH1.1, OH1.2, OH1.3]
		[F61-OS2.3]
r11.1	**5.7.3.4.**	**Where Dampproofing is Permitted**
	(1)	[F61-OH1.1, OH1.2, OH1.3]
		[F61-OS2.3]
	(2)	[F61-OH1.1, OH1.2, OH1.3]
		[F61-OS2.3]
r11.1	**5.8.1.1.**	**Required Protection**
	(1)	[F56-OH3.1]
	(2)	[F56-OH3.1]
r11.1	**5.8.1.2.**	**Determination of Sound Transmission Ratings**
	(1)	[F56-OH3.1]
	(2)	[F56-OH3.1]
r11.1	**5.8.1.3.**	**Compliance with Required Ratings**
	(1)	
	(2)	
r11.1	**5.8.1.4.**	**Detailed Method for Calculating STC**
	(1)	[F56-OH3.1]
	(2)	[F56-OH3.1]
	(3)	[F56-OH3.1]
	(4)	[F56-OH3.1]
	(5)	[F56-OH3.1]
	(6)	[F56-OH3.1]
	(7)	[F56-OH3.1]
	(8)	[F56-OH3.1]
r11.1	**5.8.1.5.**	**Simplified Method for Calculating STC**
	(1)	[F56-OH3.1]
	(2)	[F56-OH3.1]
	(3)	[F56-OH3.1]
	(4)	[F56-OH3.1]
	(5)	[F56-OH3.1]
	(6)	[F56-OH3.1]

	Acceptable Solution	Objectives and Functional Statements
	(7)	[F56-OH3.1]
r11.1	**5.9.**	**Reserved**
	5.10.1.1.	**Compliance with Applicable Standards**
	(1)	[F20-OS2.1] [F51, F61, F63, F80-OS2.3] [F51-OS2.5]
		Objectives and Functional Statements
		[F61, F63, F80-OS3.1]
		[F41, F51, F54, F55, F61, F63, F80-OH1.1] [F51, F54, F55, F61, F63, F80-OH1.2] [F55, F61, F80-OH1.3]
		[[F61, F63, F80-OH4] Applies to floor assemblies.
		(a) [F61, F63-OS1.4] Applies where required life safety systems are incorporated in environmental separators.
	(2)	
	5.10.2.1.	**General**
	(1)	
	(2)	
	(3)	
	5.10.2.2.	**Applicable Standards**
	(1)	[F20, F55, F61, F63-OH1.1, OH1.3] [F20, F55, F61, F63, F81-OH1.3]
		[F20, F55, F61-OS2.3]
		[F20, F55, F61-OP2.3]
	(2)	
	(3)	
	5.10.2.3.	**Structural Loads, Air Leakage and Water Penetration**
	(1)	
	5.10.2.4.	**Heat Transfer**
	(1)	
	(2)	[F63-OS2.3]
		[F63-OH1.1, OH1.2]
	(3)	
r3.1	**5.10.3.1.**	**Applicable Standards**
	(1)	(b) [F63-OH1.1, OH1.2]
		(b) [F61, F62-OS2.3]
r11.1	**5.10.4.1.**	**Definition**
	(1)	
r11.1	**5.10.4.2.**	**Structural and Environmental Loads**
	(1)	
r11.1	**5.10.4.3.**	**Heat Transfer**
	(1)	
	(2)	[F63-OH1.1, OH1.2]
		[F63-OS2.3]
r11.1	**5.10.4.4.**	**Air Leakage**
	(1)	
	(2)	[F55, F63-OH1.1, OH1.2, OH1.3] [F55, F63-OS2.3] [F55-OS1.4] Applies where required life safety systems are incorporated in environmental separation.
	(3)	
r11.1	**5.10.4.5.**	**Water Penetration**
	(1)	
	(2)	[F61-OH1.1, OH11.2, OH1.3] [F61-OS2.3]
	(3)	
	(4)	

Table 6
Objectives and Functional Statements Attributed to the Acceptable Solutions in Part 6 of Division B

	Acceptable Solution	Objectives and Functional Statements
	6.1.1.1.	**Scope**
	(1)	
	(2)	
	6.1.1.2.	**Application**
	(1)	
	6.2.1.1	**Good Engineering Practice**
r11.1	(1)	[F31, F50, F51, F52, F54, F63-OS3.2, OS3.4]
		(a), (e), (f), (g), (h), (i) [F50, F51, F52, F54, F63-OH1.1, OH1.2, OH1.3]
		(a), (d), (e), (f), (g) [F31, F51-OP1.1]
		(b) [F63-OH1.1] [F51-OH1.2]
		(b) [F63-OS2.3]
		(c) [F40, F50, F52-OH1.1] [F51, F52-OH1.2]
		(c) [F40, F50, F53-OS3.4]
		(d) [F01-OS1.1]
		(k) [F131-OR2]
	6.2.1.2.	**Design Indoor Air Temperatures**
	(1)	[F51-OH1.2]
	(2)	[F51-OH1.2]
	6.2.1.3.	**Structural Movement**
	(1)	[F23-OS3.1]
		[F50, F51, F63-OH1.1, OH1.2, OH1.3]
	6.2.1.4.	**Installation Standards**
	(1)	[F43-OP1.1]
		[F43-OS1.1]
		[F43-OS3.4]
	(2)	[F43-OP1.1]
		[F43-OS1.1]
		[F43-OS3.4]
	(3)	[F41, F50, F63-OH1.1] [F51, F52-OH1.2]
		[F63-OS2.3]
		[F44-OS3.4]
	(4)	[F41, F50, F63-OH1.1] [F51, F52-OH1.2]
		[F63-OS2.3]
		[F44-OS3.4]
	(5)	[F43-OP1.1]
		[F43-OS1.1]
		[F43-OS3.4]
	(6)	[F51, F63-OH1.2, OH1.3]
		[F31, F51-OP1.1]
		[F31, F51, F63-OS3.2, OS3.4]
r3	(7)	[F110-OE]
	6.2.1.5.	**Fireplaces**
	(1)	
	6.2.1.6.	**Heat Recovery Ventilators**
	(1)	
r11.1	(2)	[F131-OH1.1, OR2]
	6.2.1.7.	**Outside Design Conditions**
	(1)	

Acceptable Solution	Objectives and Functional Statements
6.2.1.8.	**Installation - General**
(1)	[F82-OP1.1]
	[F82-OS1.1]
	[F82-OS3.4]
(2)	[F31-OS3.1]
(3)	[F81-OS1.1]
	[F81-OS3.2, OS3.3, OS3.4]
6.2.1.9.	**Expansion, Contraction and System Pressure**
(1)	[F20-OS3.2]
6.2.1.10.	**Asbestos**
(1)	[F43-OH1.1]
6.2.1.11.	**Access Openings**
(1)	[F36-OS3.6]
6.2.1.12.	**Combustible Tubing**
(1)	
6.2.2.1.	**Required Ventilation**
(1)	[F31, F50, F51, F52, F54, F63-OP1.1]
	[F31, F50, F51, F52, F54, F63-OS1.1]
(2)	[F50-OH1.1]
(3)	
(4)	
6.2.2.2.	**Natural Ventilation**
(1)	[F50-OH1.1]
(2)	[F50-OH1.1]
6.2.2.3.	**Ventilation of Storage and Repair Garages**
(1)	[F44, F50-OS3.4]
(2)	[F44-OS3.4]
(3)	[F44-OS3.4]
(4)	[F44, F50-OS3.4]
(5)	[F44, F50-OH1.1]
	[F44, F50-OS3.4]
(6)	
(7)	[F44, F50-OH1.1]
	[F44, F50-OS3.4]
(8)	[F44, F50-OH1.1]
	[F44, F50-OS3.4]
(9)	[F44, F50-OH1.1]
	[F44, F50-OS3.4]
(10)	
r11.1 **6.2.2.4.**	**Indoor Air Contaminants**
(1)	[F44-OH1.1]
	[F44-OS3.4]
(2)	[F44-OH1.1]
(3)	[F52-OH1.1]
(4)	[F44-OS3.4]
6.2.2.5.	**Hazardous Gases, Dusts or Liquids**
(1)	[F01-OP1.1]
	[F01-OS1.1]
(2)	[F01-OP1.1]
	[F01-OS1.1]

	Acceptable Solution	Objectives and Functional Statements
	6.2.2.6.	**Commercial Cooking Equipment**
	(1)	[F01, F44-OP1.1]
		[F01, F44-OS1.1]
	(2)	[F02, F81-OP1.2]
		[F02, F81-OS1.2]
	6.2.2.7.	**Crawl Spaces and Attic or Roof Spaces**
	(1)	[F41, F61, F63-OH1.1, OH1.3]
	6.2.3.1.	**Application**
	(1)	
	(2)	
r11.1	**6.2.3.1A.**	**Drain Pans**
	(1)	[F41, F44, F50-OH1.1]
	6.2.3.2.	**Materials in Air Duct Systems**
	(1)	[F01, F02-OS1.2]
	(2)	[F02-OS1.2]
	(3)	[F02-OS1.2]
	(4)	[F02-OS1.2]
	(5)	[F20, F80-OH1.1, OH1.2]
	(6)	[F81-OH1.1]
		[F44, F81-OS3.4]
	(7)	[F20, F80-OH1.1, OH1.2]
	6.2.3.3.	**Connections and Openings in Air Duct Systems**
	(1)	[F81-OH1.1, OH1.2]
		[F44, F81-OS3.4]
	(2)	[F82-OS1.1]
	6.2.3.4.	**Duct Coverings, Linings, Adhesives and Insulation**
	(1)	[F02-OS1.2]
	(2)	[F02-OS1.2]
	(3)	[F02-OS1.2]
	(4)	[F02-OS1.2]
	(5)	[F02-OS1.2]
	(6)	[F01, F02-OS1.2]
	(7)	[F81-OH1.1, OH1.2]
		[F81-OP1.1]
		[F81-OS1.1]
	6.2.3.5.	**Underground Ducts**
	(1)	(a) [F44, F81-OH1.2, OH1.3]
		(b), (c) [F44, F81-OH1.1]
	(2)	[F81-OH1.1, OH1.2, OH1.3]
	6.2.3.6.	**Fire Dampers**
	(1)	
	6.2.3.7.	**Smoke Detector Control**
	(1)	
	6.2.3.8.	**Exhaust Ducts and Outlets**
	(1)	[F44-OH1.1]
	(2)	[F44-OH1.1]
	(3)	[F81-OH1.1, OH1.2]
	(4)	[F81-OH1.1, OH1.2]
	(5)	[F81-OH1.1]
	(6)	[F81-OH1.1]
	(7)	[F81-OS1.1]
	(8)	[F81-OH1.1]
	(9)	[F44, F81-OH1.1]
		[F44, F81-OS1.1]

Acceptable Solution	Objectives and Functional Statements
(10)	[F44, F81-OH1.1]
(11)	[F44, F81-OH1.1]
	[F81-OH1.2]
(12)	
(13)	
(14)	[F40, F50-OH1.1]
(15)	[F40, F50-OH1.1]
(16)	[F40, F50-OH1.1]
(17)	
(18)	[F40, F44, F50, F52-OH1.1]
	[F44-OH3.4]
	[F01-OS1.1]
	[F01-OP1.1]
(19)	[F40, F44, F50, F52-OH1.1]
	[F44-OH3.4]
	[F01-OS1.1]
	[F01-OP1.1]
6.2.3.9.	**Interconnection of Systems**
(1)	[F40-OH1.1]
	[F44-OS1.1]
(2)	[F44, F81-OH1.1]
	[F44, F81-OP1.1]
	[F44, F81-OS1.1]
(3)	[F44, F81-OH1.1]
(4)	[F40-OH1.1]
	[F44-OS1.1]
	[F10-OS3.7]
(5)	
(6)	
6.2.3.10.	**Ducts in Exits**
(1)	
(2)	
6.2.3.11.	**Make-up Air**
(1)	[F50, F81-OH1.1]
	[F44, F81-OS3.4]
(2)	[F81-OH1.1]
	[F44, F81-OS3.4]
(3)	[F81-OH1.2]
6.2.3.12.	**Supply, Return, Intake and Exhaust Air**
(1)	[F81-OH1.2]
	[F30-OS3.1]
(2)	[F81-OH1.1]
	[F44, F81-OS3.4]
(3)	[F81-OH1.1]
(4)	[F81, F82-OH1.1]
	[F82-OS3.4]
(5)	[F02-OP1.2]
	[F02-OS1.2]
r11.1 (6)	[F41, F44-OH1.1]
6.2.3.13.	**Filters and Odour Removal Equipment**
(1)	[F80-OP1.1]
	[F80-OS1.1]

	Acceptable Solution	Objectives and Functional Statements
	(2)	[F30-OS3.3]
		[F43, F81-OH1.1]
	(3)	[F82-OH1.1]
	(4)	[F82-OH1.1]
r11.1	**6.2.3.14.**	**Evaporative Cooling Towers, Evaporative Fluid Coolers and Evaporative Condensers**
	(1)	[F41, 44-OH1.1]
	(2)	[F41, 44-OH1.1]
	(3)	[F41, 44-OH1.1] [F46, F81-OH2.2]
	(4)	[F82-OH1.1]
	(5)	[F01, F81-OS1.1]
r11.1	**6.2.3.14A.**	**Evaporative Cooling Sections, Evaporative Air Coolers, Misters, Atomizers, Air Washers and Humidifiers**
	(1)	[F80, F81-OP1.1]
		[F80, F81-OS1.1]
	(2)	[F82-OH1.1]
	(3)	[F44-OH1.1]
	(4)	[F01, F81-OS1.1]
	6.2.3.15.	**Fans and Associated Air Handling Equipment**
	(1)	[F44, F81-OH1.1]
		[F44, F81-OS3.4]
	(2)	[F81-OH1.1]
	6.2.3.16.	**Vibration Isolation Connectors**
	(1)	[F01, F02-OS1.2]
	6.2.3.17.	**Tape**
	(1)	[F02-OS1.2]
	6.2.3.18.	**Construction and Installation of Ducts and Plenums**
	(1)	[F20-OH4]
		[F20-OP2.4]
		[F20-OS2.3]
	(2)	[F03-OP1.1]
		[F03-OS1.1]
	(3)	[F63-OH1.1] [F51, F52-OH1.2]
		[F01-OS1.1]
		[F20, F63-OS2.3]
		[F20-OS3.1]
e6.1	(4) , (5)	[F43, F63-OH1.1] [F51, F52-OH1.2]
		[F01-OP1.1]
		[F01-OS1.1]
		[F63-OS2.3]
	(6)	[F63-OH1.1] [F51, F52-OH1.2]
		[F01-OP1.1]
		[F01-OS1.1]
		[F63-OS2.3]
	(7)	[F63-OH1.1] [F51, F52-OH1.2]
		[F63-OS2.3]
		[F20-OS3.1]
	(8)	[F80-OH1.1, OH1.2]
		[F80-OS2.3]
	(9)	[F44, F81-OH1.1] [F81-OH1.2]
	6.2.3.19.	**Clearances of Ducts and Plenums**
	(1)	
	6.2.3.20.	**Return-Air System**
	(1)	[F63-OH1.1] [F51-OH1.2]
		[F63-OS2.3]

Acceptable Solution	Objectives and Functional Statements
(2)	[F01-OP1.1]
	[F01-OS1.1]
(3)	[F01-OP1.1]
	[F01-OS1.1]
(4)	[F01-OP1.1]
	[F01-OS1.1]
(5)	[F44-OH1.1]
	[F44-OS3.4]
(6)	[F40, F44-OH1.1]
	[F40, F44-OS3.4]
6.2.4.1.	**Application**
(1)	
6.2.4.2.	**Duct Design**
(1)	
(2)	
(3)	[F20-OH1.1] [F20, F51, F52-OH1.2]
	[F20-OS2.3]
6.2.4.3.	**Construction and Installation of Ducts and Plenums**
(1)	[F20-OH4]
	[F20-OP2.4]
	[F20-OS2.3]
(2)	[F03-OP1.1]
	[F03-OS1.1]
(3)	[F63-OH1.1] [F51, F52-OH1.2]
	[F01-OS1.1]
	[F20, F63-OS2.3]
	[F20-OS3.1]
e6.1 (4), (5)	[F43, F63-OH1.1] [F51, F52-OH1.2]
	[F01-OP1.1]
	[F01-OS1.1]
	[F63-OS2.3]
(6)	[F63-OH1.1] [F51, F52-OH1.2]
	[F01-OP1.1]
	[F01-OS1.1]
	[F63-OS2.3]
(7)	[F63-OH1.1] [F51, F52-OH1.2]
	[F63-OS2.3]
	[F20-OS3.1]
(8)	[F01-OP1.1]
	[F01-OS1.1]
(9)	[F80-OH1.1, OH1.2]
	[F80-OS2.3]
(10)	[F44, F81-OH1.1] [F81-OH1.2]
(11)	[F44, F81-OH1.1] [F81-OH1.2]
(12)	[F131-OR2]
(13)	[F44, F81-OH1.1, OH1.2, OH1.3]
(14)	[F81-OH1.1, OH1.2, OH1.3]
6.2.4.4.	**Warm-Air Supply Outlets**
(1)	[F40, F63-OH1.1] [F51, F52-OH1.2]
	[F63-OS2.3]
(2)	[F63-OH1.1] [F51-OH1.2]
	[F63-OS2.3]

Acceptable Solution	Objectives and Functional Statements
(3)	[F40, F63-OH1.1] [F51-OH1.2]
(4)	[F40, F63-OH1.1] [F51-OH1.2]
	[F63-OS2.3]
(5)	[F40, F63-OH1.1] [F51-OH1.2]
	[F63-OS2.3]
(6)	[F40, F63-OH1.1] [F51-OH1.2]
	[F63-OS2.3]
(7)	
(8)	[F31-OS3.2]
(9)	[F40, F63-OH1.1] [F51-OH1.2]
	[F63-OS2.3] Applies to warm-air supply outlets located in finished areas.
(10)	[F40-OH1.1]
	[F40-OS3.4]
6.2.4.5.	**Reserved**
6.2.4.6.	**Adjustable Dampers and Balance Stops**
(1)	[F40, F63-OH1.1] [F51, F52-OH1.2]
	[F63-OS2.3] Applies to branch supply ducts that are not fitted with diffusers with adjustable stops.
6.2.4.7.	**Return-Air System**
(1)	[F63-OH1.1] [F51-OH1.2]
	[F63-OS2.3]
(2)	[F01, F02-OP1.1]
	[F01, F02-OS1.1]
(3)	[F01-OP1.1]
	[F01-OS1.1]
(4)	[F01-OP1.1]
	[F01-OS1.1]
(5)	[F01-OP1.1]
	[F01-OS1.1]
(6)	[F51, F52-OH1.1, OH1.2]
	[F51, F52-OS2.3]
(7)	[F63-OH1.1] [F51-OH1.2]
	[F63-OS2.3]
(8)	
(9)	[F44-OH1.1]
	[F44-OS3.4]
(10)	[F40-OH1.1]
	[F44-OS1.1]
(11)	[F63-OH1.1] [F51-OH1.2]
(12)	[F01-OP1.1]
	[F01-OS1.1]
(13)	[F40, F44-OH1.1]
	[F40, F44-OS3.4]
r6 (14)	
r11.1 **6.2.4.8.**	**Coverings, Linings and Insulation**
(0.1)	[F01-OP1.1]
	[F01-OS1.1]
(1)	
(1.1)	[F01-OS1.1]
	(c) [F01, F02, F05-OS1.5]
	(c) [F01-OP1.1]
(2)	[F81-OH1.1, OH1.2, OH1.3]

Acceptable Solution	Objectives and Functional Statements
6.2.4.9.	**Tape**
(1)	[F02-OS1.2]
6.2.4.10.	**Clearances of Ducts and Plenums**
(1)	(a), (b) [F01-OP1.1]
	(a), (b) [F01-OS1.1]
(2)	(a), (b) [F01-OP1.1]
	(a), (b) [F01-OS1.1]
(3)	(a), (b), (c) [F01-OP1.1]
	(a), (b), (c) [F01-OS1.1]
(4)	[F01-OP1.1]
	[F01-OS1.1]
6.2.4.11.	**Exhaust Ducts and Outlets**
(1)	[F44, F81-OH1.1] [F81-OH1.2]
(2)	[F81-OH1.1, OH1.2]
(3)	[F81-OS1.1]
(4)	[F81-OH1.1]
6.2.4.12.	**Make-up Air**
(1)	[F50, F81-OH1.1]
	[F44, F81-OS3.4]
6.2.4.13.	**Supply, Return, Intake and Exhaust Air Openings**
(1)	[F81-OH1.2]
	[F30-OS3.1]
(2)	[F81-OH1.1]
	[F44, F81-OS3.4]
(3)	[F81-OH1.1]
(4)	[F81, F82-OH1.1]
	[F82-OS3.4]
(5)	[F02-OP1.2]
	[F02-OS1.2]
6.2.4.14.	**Air Filters and Equipment**
(1)	[F80-OP1.1]
	[F80-OS1.1]
(2)	[F43, F81-OH1.1]
	[F30-OS3.3]
(3)	[F82-OH1.1]
6.2.5.1.	**Location of Appliances**
(1)	
6.2.5.2.	**Appliances Installed Outside the Building**
(1)	(a) [F81-OH1.1]
	(a) [F81-OP1.1]
	(a) [F81-OS1.1]
	(b) [F03-OP3.1]
	(b) [F03-OS1.2]
	(c) [F02-OP1.2]
	(c) [F02-OS1.1, OS1.2]
6.2.6.1.	**Applicable Standard**
(1)	[F81-OS1.1]
6.2.7.1.	**Clearances**
(1)	[F01-OP1.1]
	[F01-OS1.1]

	Acceptable Solution	Objective and Functional Statement
	(3)	[F45-OH2.1]
	(4)	[F45-OH2.1]
	7.2.2.4.	**Concealed Overflows**
	(1)	[F41, F81-OH2.1, OH2.4]
	7.2.2.5.	**Water Closets in Public Washrooms**
	(1)	[F40-OH2.4]
	7.2.2.6.	**Lavatories**
	(1)	[F41, F81-OH2.1, OH2.4]
	7.2.2.7.	**Trough Urinals**
	(1)	[F40-OH2.1, OH2.4]
	7.2.3.1.	**Traps**
	(1)	[F40, F81-OH1.1]
	(2)	[F44, F81-OH1.1]
	(3)	[F81-OH2.1, OH2.3, OH2.4,] [F81-OP5]
	(4)	[F81-OH1.1]
	(5)	[F81-OH1.1]
	(6)	[F81-OH1.1]
	(7)	
	(8)	[F81-OH1.1]
		[F81-OP5]
	7.2.3.2.	**Interceptors**
	(1)	[F81, F82-OH2.1, OH2.3, OH2.4]
	(2)	[F81-OH2.1, OH2.3, OH2.4]
	(3)	
r11.1	(4)	[F81-OP5]
	7.2.3.3.	**Tubular Traps**
	(1)	[F82-OH2.1, OH2.4]
		[F82-OP5]
	7.2.4.1.	**T and Cross Fittings**
	(1)	[F81-OH2.1, OH2.4]
		[F81-OP5]
	(2)	[F81-OH2.1, OH2.4]
		[F81-OP5]
	7.2.4.2.	**Sanitary T Fittings**
	(1)	[F81-OH2.1, OH2.4]
		[F81-OP5]
	(2)	[F81-OH2.1, OH2.4]
		[F81-OP5]
	7.2.4.3.	**90° Elbows**
	(1)	[F81-OH2.1, OH2.4]
		[F81-OP5]
	(2)	
	(3)	
	7.2.4.4.	**Fittings Restricted in Use**
	(1)	[F81-OH2.1, OH2.4]
		[F81-OP5]
	7.2.4.5.	**Assembled Pipe or Tubing**
	(1)	[F81-OH2.1, OH2.4]
		[F81-OP5]
r11.1	**7.2.5.1.**	**Reserved**
	7.2.5.2.	**Reserved**

Acceptable Solution	Objective and Functional Statement
7.2.5.3.	**Concrete Pipe and Fittings**
(1)	[F20, F80, F81-OH2.1, OH2.6]
	[F20, F80, F81-OP5]
(2)	[F20, F80, F81-OH2.1, OH2.6]
	[F20, F80, F81-OP5]
(3)	[F20, F80, F81-OH2.1, OH2.6]
	[F20, F80, F81-OP5]
(4)	[F20, F80, F81-OH2.1, OH2.6]
	[F20, F80, F81-OP5]
(5)	[F20, F80, F81-OH2.1, OH2.6]
	[F20, F80, F81-OP5]
7.2.5.4.	**Vitrified Clay Pipe and Fittings**
(1)	[F20, F80, F81-OH2.1, OH2.6]
	[F20, F80, F81-OP5]
(2)	[F20, F80, F81-OH2.1, OH2.6]
	[F20, F80, F81-OP5]
(3)	[F20, F80, F81-OH2.1, OH2.6]
	[F20, F80, F81-OP5]
7.2.5.5.	**Polyethylene Pipe and Fittings**
(1)	[F20, F81-OH2.2]
	[F20, F81-OP5]
(2)	[F20, F81-OH2.2]
	[F20, F81-OP5]
(3)	[F20, F81-OH2.2]
	[F20, F81-OP5]
7.2.5.6.	**Polyethylene Pipe Used Underground**
(1)	[F20, F81-OH2.1, OH2.6]
	[F20, F81-OP5]
7.2.5.7.	**Crosslinked Polyethylene Pipe and Fittings**
(1)	[F20, F81-OH2.2]
	[F20, F81-OP5]
7.2.5.8.	**PVC Pipe and Fittings**
(1)	[F20, F81-OH2.2]
	[F20, F81-OP5]
(2)	[F20, F81-OH2.2]
	[F20, F81-OP5]
7.2.5.9.	**CPVC Pipe, Fittings and Solvent Cements**
(1)	[F20, F81-OH2.2]
	[F20, F81-OP5]
(2)	[F20, F81-OH2.2]
	[F20, F81-OP5]
7.2.5.10.	**Plastic Pipe, Fittings and Solvent Cement Used Underground**
(1)	[F20, F80, F81, F113-OH2.1, OH2.6]
	[F20, F80, F81, F113-OP5]
(2)	[F20, F80, F81, F113-OH2.1, OH2.6]
	[F20, F80, F81, F113-OP5]
7.2.5.11.	**Transition Solvent Cement**
(1)	[F20, F80, F81, F113-OH2.1, OH2.6]
	[F20, F80, F81, F113-OP5]
(2)	[F20, F80, F81, F113-OH2.1, OH2.6]
	[F20, F80, F81, F113-OP5]

Acceptable Solution	Objective and Functional Statement
7.2.5.12.	**Plastic Pipe, Fittings and Solvent Cement Used in Buildings**
(1)	[F20, F43, F81-OH1.1] Applies to venting system.
	[F20, F80, F81, F113-OH2.1]
	[F20, F80, F81, F113-OP5]
(2)	[F20, F80, F81-OH1.3]
	[F20, F80, F81-OP5]
(3)	[F20-OH1.3]
	[F20-OP5]
(4)	
(5)	
7.2.5.13.	**Polyethylene/Aluminum/Polyethylene Composite Pipe and Fittings**
(1)	[F20-OH2.1, OH2.2, OH2.3]
	[F20-OP5]
(2)	[F20-OH2.1, OH2.2, OH2.3]
	[F20-OP5]
(3)	[F20-OH2.1, OH2.2, OH2.3]
	[F20-OP5]
(4)	[F20-OH2.1, OH2.2, OH2.3]
	[F20-OP5]
7.2.5.14.	**Crosslinked Polyethylene/Aluminum/Polyethylene Composite Pipe and Fittings**
(1)	[F20, F81-OH2.2]
	[F20, F81-OP5]
7.2.5.15.	**Polypropylene Pipe and Fittings**
(1)	[F20, F81-OH2.2]
	[F20, F81-OP5]
7.2.6.1.	**Cast Iron Drainage and Vent Pipe and Fittings**
(1)	[F20, F43, F81-OH1.1] Applies to venting system.
	[F20, F80, F81, F113-OH2.1]
	[F20, F80, F81, F113-OP5]
(2)	[F20, F81-OH2.2]
	[F20, F81-OP5]
r11.1 (3)	[F81-OH1.1]
	[F20-OS3.1]
r11.1 **7.2.6.2.**	**Reserved**
7.2.6.3.	**Threaded Cast Iron Drainage Fittings**
(1)	[F20, F80, F81, F113-OH2.1, OH2.6]
	[F20, F80, F81, F113-OP5]
(2)	[F20, F81-OH2.2]
	[F20, F81-OP5]
7.2.6.4.	**Cast Iron Water Pipe**
(1)	[F20, F81-OH2.2]
	[F20, F81-OP5]
(2)	[F20, F81-OH2.2]
	[F20, F81-OP5]
(3)	[F20, F81-OH2.2]
	[F20, F81-OP5]
(4)	[F20, F81-OH2.2]
	[F20, F81-OP5]
7.2.6.5.	**Screwed Cast Iron Water Fittings**
(1)	[F20, F81-OH2.2]
	[F20, F81-OP5]
(2)	[F20, F81-OH2.2]
	[F20, F81-OP5]
(3)	[F81-OH2.1]

Acceptable Solution	Objective and Functional Statement
7.2.6.6.	**Screwed Malleable Iron Water Fittings**
(1)	[F20, F81-OH2.2]
	[F20, F81-OP5]
(2)	[F20, F81-OH2.2]
	[F20, F81-OP5]
(3)	[F81-OH2.1]
7.2.6.7.	**Steel Pipe**
(1)	[F43, F81-OH1.1] Applies to venting system.
	[F80, F81, F113-OH2.1] Applies to drainage system. [F46, F80, F81-OH2.2] Applies to water piping.
	[F80, F81, F113-OP5] Applies to drainage system. [F46, F80, F81-OP5] Applies to water piping.
(2)	
(3)	[F46, F80, F81-OH2.2]
	[F46, F80, F81-OP5]
(4)	[F43, F81-OH1.1] Applies to venting system.
	[F80, F81, F113-OH2.1] Applies to drainage system.
	[F80, F81, F113-OP5] Applies to drainage system.
(5)	[F80, F81, F113-OH2.1]
	[F80, F81, F113-OP5]
(6)	[F43, F81-OH1.1] Applies to venting system.
	[F80, F81, F113-OH2.1] Applies to drainage system.
	[F80, F81, F113-OP5] Applies to drainage system.
7.2.6.8.	**Corrugated Steel Pipe and Couplings**
(1)	[F20, F80, F81-OH1.3]
	[F20, F80, F81-OP5]
(2)	[F80, F81-OH1.3]
	[F80, F81-OP5]
(3)	[F80, F81-OH1.3]
	[F80, F81-OP5]
	(b) [F20-OH1.3]
	(b) [F20-OP5]
7.2.6.9.	**Sheet Metal Leaders**
(1)	[F80, F81-OH1.3]
	[F80, F81-OP5]
r11.1 **7.2.6.10.**	**Stainless Steel Pipe**
(1)	[F80-OH2.1] Applies to drainage systems and venting systems. [F46, F80-OH2.2] Applies to water systems.
	[F80-OP5]
(2)	[F20-OP5] [F80-OH2.1] Applies to drainage systems and venting systems. [F46, F80-OH2.2] Applies to water systems.
r11.1 **7.2.6.11.**	**Stainless Steel Butt Weld Pipe Fittings**
(1)	[F80-OH2.1] Applies to drainage systems and venting systems. [F46, F80-OH2.2] Applies to water systems.
	[F80-OP5]
(2)	[F80-OH2.1] Applies to drainage systems and venting systems. [F46, F80-OH2.2] Applies to water systems.
	[F80-OP5]
r11.1 **7.2.6.12.**	**Stainless Steel Pipe Flanges**
(1)	[F80-OH2.1] Applies to drainage systems and venting systems. [F46, F80-OH2.2] Applies to water systems.
	[F80-OP5]

	Acceptable Solution	Objective and Functional Statement
	(2)	[F80-OH2.1] Applies to drainage systems and venting systems. [F46, F80-OH2.2] Applies to water systems.
		[F80-OP5]
r11.1	**7.2.6.13.**	**Stainless Steel Threaded Fittings**
	(1)	[F20-OP5] [F80-OH2.1] Applies to drainage systems and venting systems. [F46, F80-OH2.2] Applies to water systems.
	(2)	[F20-OP5] [F80-OH2.1] Applies to drainage systems and venting systems. [F46, F80-OH2.2] Applies to water systems.
r11.1	**7.2.6.14.**	**Stainless Steel Tube**
	(1)	[F46-OH2.2]
		[F80-OP5]
	(2)	[F46-OH2.2]
		[F80-OP5]
r11.1	**7.2.6.15.**	**Stainless Steel Pipe and Tube**
	(1)	[F80-OH2.1, OH2.2, OH2.3]
	7.2.7.1.	**Copper and Brass Pipe**
	(1)	[F43, F81-OH1.1] Applies to venting system.
		[F80, F81, F113-OH2.1] Applies to drainage system. [F46, F80, F81-OH2.2] Applies to water piping.
		[F80, F81, F113-OP5] Applies to drainage system. [F46, F80, F81-OP5] Applies to water piping.
	(2)	[F43, F81-OH1.1] Applies to venting system.
		[F80, F81, F113-OH2.1] Applies to drainage system. [F46, F80, F81-OH2.2] Applies to water piping.
		[F80, F81, F113-OP5] Applies to drainage system. [F46, F80, F81-OP5] Applies to water piping.
	7.2.7.2.	**Brass or Bronze Pipe Flanges and Flanged Fittings**
	(1)	[F43, F81-OH1.1] Applies to venting system.
		[F80, F81, F113-OH2.1] Applies to drainage system. [F46, F80, F81-OH2.2] Applies to water piping.
		[F80, F81, F113-OP5] Applies to drainage system. [F46, F80, F81-OP5] Applies to water piping.
	7.2.7.3.	**Brass or Bronze Threaded Water Fittings**
	(1)	[F46, F80, F81-OH2.2]
		[F46, F80, F81-OP5]
	(2)	[F80-OH2.1]
	7.2.7.4.	**Copper Tube**
	(1)	[F20, F43, F81-OH1.1] Applies to venting system.
		[F20, F80, F81, F113-OH2.1] Applies to drainage system. [F20, F46, F80, F81-OH2.2] Applies to water piping.
		[F20, F80, F81, F113-OP5] Applies to drainage system. [F20, F46, F80, F81-OP5] Applies to water piping.
	(2)	[F20, F43, F81-OH1.1] Applies to venting system.
		[F20, F80, F81, F113-OH2.1] Applies to drainage system. [F20, F46, F80, F81-OH2.2] Applies to water piping.
		[F20, F80, F81, F113-OP5] Applies to drainage system. [F20, F46, F80, F81-OP5] Applies to water piping.
	(3)	[F20, F46, F80, F81, F113-OH2.1, OH2.2]
		[F20, F46, F80, F81, F113-OP5]
	(4)	[F20, F46, F80, F81, F113-OH2.1, OH2.2]
		[F20, F46, F80, F81, F113-OP5]
r11.1	(5)	[F80-OH2.1, OH2.4]

Acceptable Solution	Objective and Functional Statement
7.2.7.5.	**Solder-Joint Drainage Fittings**
(1)	[F20, F80, F81, F113-OH2.1]
	[F20, F80, F81, F113-OP5]
(2)	[F20, F80, F81-OH2.2]
	[F20, F80, F81-OP5]
7.2.7.6.	**Solder-Joint Water Fittings**
(1)	[F20, F46, F80, F81-OH2.2]
	[F20, F46, F80, F81-OP5]
(2)	[F20, F46, F80, F81-OH2.2]
	[F20, F46, F80, F81-OP5]
7.2.7.7.	**Flared-Joint Fittings for Copper Tube Water Systems**
(1)	[F20, F46, F80, F81-OH2.2]
	[F20, F46, F80, F81-OP5]
(2)	[F20, F46, F80, F81-OH2.2]
	[F20, F46, F80, F81-OP5]
7.2.7.8.	**Lead Waste Pipe and Fittings**
(1)	[F20, F80, F81, F113-OH2.1] Applies to building sewer. [F20, F46, F80, F81-OH2.2] Applies to water piping.
	[F20, F80, F81, F113-OP5] Applies to drainage system. [F20, F46, F80, F81-OP5] Applies to water piping.
(2)	[F81, F113-OH2.1]
	[F81, F113-OP5]
7.2.8.1.	**Pipe and Fittings**
(1)	[F20, F43, F81-OH1.1] Applies to venting system.
	[F20, F80, F81, F113-OH2.1] Applies to drainage system.
	[F20, F80, F81, F113-OP5] Applies to drainage system.
7.2.9.1.	**Cement Mortar**
(1)	[F20, F43, F81-OH1.1] Applies to venting system.
	[F20, F80, F81, F113-OH2.1] Applies to drainage system. [F20, F46, F80, F81-OH2.2] Applies to water piping.
	[F20, F80, F81, F113-OP5] Applies to drainage system. [F20, F46, F80, F81-OP5] Applies to water piping.
7.2.9.2.	**Solder and Fluxes**
(1)	[F20, F43, F81-OH1.1] Applies to venting system.
	[F20, F80, F81, F113-OH2.1] Applies to drainage system. [F20, F46, F80, F81-OH2.2] Applies to water piping.
	[F20, F80, F81, F113-OP5] Applies to drainage system. [F20, F46, F80, F81-OP5] Applies to water piping.
(2)	[F46-OH2.2]
(3)	[F80-OH2.1, OH2.2]
(4)	[F80-OH2.1, OH2.3]
7.2.10.1.	**Floor Flanges**
(1)	[F20, F80, F81, F113-OH2.1]
	[F20, F80, F81, F113-OP5]
(2)	[F20, F80, F81, F113-OH2.1]
	[F20, F80, F81, F113-OP5]
(3)	[F20, F80, F81, F113-OH2.1]
	[F20, F80, F81, F113-OP5]
(4)	[F20, F80, F81, F113-OH2.1]
	[F20, F80, F81, F113-OP5]
7.2.10.2.	**Screws, Bolts, Nuts and Washers**
(1)	[F80-OH2.1]
	[F80-OP5]

Acceptable Solution	Objective and Functional Statement
7.2.10.3.	**Cleanout Fittings**
(1)	[F80-OH2.1, OH2.3] Applies to drainage systems. [F46-OH2.2] Applies to water systems.
(2)	[F43, F81-OH1.1] Applies to venting system.
	[F81-OH2.1] Applies to drainage system.
	[F81-OP5] Applies to drainage system.
(3)	[F80-OH2.1]
7.2.10.4.	**Mechanical Couplings**
(1)	[F20, F43, F81-OH1.1] Applies to venting system.
	[F20, F80, F81, F113-OH2.1] Applies to drainage system. [F20, F46, F80, F81-OH2.2] Applies to water piping.
	[F20, F80, F81, F113-OP5] Applies to drainage system. [F20, F46, F80, F81-OP5] Applies to water piping.
(2)	[F20, F43, F81-OH1.1] Applies to venting system.
	[F20, F80, F81, F113-OH2.1] Applies to drainage system.
	[F20, F80, F81, F113-OP5] Applies to drainage system.
7.2.10.5.	**Saddle Hubs**
(1)	[F81-OH2.1]
	[F81-OP5]
(2)	
7.2.10.6.	**Supply and Waste Fittings**
(1)	[F80-OP5]
(2)	[F80-OH2.1, OH2.3]
7.2.10.7.	**Linings and Coatings of Domestic Water Tanks**
(1)	[F20, F46, F80, F81-OH2.1, OP5]
7.2.10.8.	**Direct Flush Valves**
(1)	(a), (b), (c) [F130-OR1]
	(a), (b) [F80, F81-OP5]
	(c), (d) [F80-OH2.1] [F81-OH2.4]
	(d) [F46-OH2.2]
7.2.10.9.	**Drinking Fountain Bubblers**
(1)	[F40, F46-OH2.4]
(2)	[F41, F46-OH2.2]
	[F130-OR1]
7.2.10.10.	**Back-Siphonage Preventers and Backflow Preventers**
(1)	[F20, F46, F80, F81-OH2.2]
	[F20, F46, F80, F81-OP5]
(2)	[F20, F46, F80, F81-OH2.2]
	[F20, F46, F80, F81-OP5]
7.2.10.11.	**Relief Valves**
(1)	[F20, F46, F80, F81-OH2.2]
	[F20, F31, F46, F80, F81-OP5]
	[F31-OS3.2]
7.2.10.12.	**Reducing Valves**
(1)	[F20, F46, F80, F81-OH2.2]
	[F20, F46, F80, F81-OP5]
7.2.10.13.	**Solar Domestic Hot Water**
(1)	[F46-OH2.2]
	[F80, F81-OP5]
	[F81-OS3.2]
7.2.10.14.	**Vent Pipe Flashing**
(1)	[F61, F80-OH1.3]
	[F61, F80-OP2.3]

Acceptable Solution	Objective and Functional Statement
(2)	[F61, F80-OH1.3]
	[F61, F80-OP2.3]
7.2.10.15.	**Water Hammer Arresters**
(1)	[F20, F46, F80, F81-OH2.2]
	[F20, F46, F80, F81-OP5]
7.2.10.16.	**Air Admittance Valves**
(1)	[F20, F43, F81-OH1.1]
7.2.10.17.	**Drinking Water Treatment Systems**
(1)	[F46-OH2.2]
	[F40-OS3.4]
	[F70-OP5]
7.2.11.1.	**Design, Construction, Installation and Testing**
(1)	[F20, F46, F80, F81-OH2.2]
	[F12-OP1.4]
	[F20, F46, F80, F81-OP5]
	[F12-OS1.4]
7.2.11.2.	**Certification or Conformance**
(1)	[F20, F46, F80, F81-OH2.2]
	[F20, F46, F80, F81-OP5]
7.2.11.3.	**Tracer Wire**
(1)	[F82-OH2.2]
	[F82-OP5]
(2)	
7.2.11.4.	**Required Check Valve**
(1)	[F46-OH2.2]
(2)	[F46-OH2.2]
7.3.1.1.	**Application**
(1)	
7.3.2.1.	**Caulked Lead Drainage Joints**
(1)	[F80, F81-OH2.1] Applies to drainage system.
	[F80, F81-OP5] Applies to drainage system.
(2)	[F80-OH2.1]
(3)	[F43, F81-OH1.1] Applies to venting system.
	[F80, F81-OH2.1] Applies to drainage system.
	[F80, F81-OP5] Applies to drainage system.
(4)	[F81-OH2.1]
7.3.2.2.	**Wiped Joints**
(1)	[F43, F80, F81-OH1.1] Applies to venting system.
	[F80, F81-OH2.1] Applies to drainage system.
	[F80, F81-OP5] Applies to drainage system.
(2)	[F43, F80, F81-OH1.1] Applies to venting system.
	[F80, F81-OH2.1] Applies to drainage system.
	[F80, F81-OP5] Applies to drainage system.
(3)	[F43, F80, F81-OH1.1] Applies to venting system.
	[F80, F81-OH2.1] Applies to drainage system.
	[F80, F81-OP5] Applies to drainage system.
7.3.2.3.	**Screwed Joints**
(1)	[F81-OH2.1] Applies to drainage system. [F46, F81-OH2.2] Applies to water piping.
	[F81-OP5] Applies to drainage system.
(2)	[F46, F81-OH2.2] Applies to water piping.

Acceptable Solution	Objective and Functional Statement
7.3.2.4.	**Solder Joints**
(1)	[F43, F80, F81-OH1.1] Applies to venting system.
	[F80, F81-OH2.1] Applies to drainage system. [F20, F46, F81-OH2.2] Applies to water piping.
	[F20, F46, F81-OP5] Applies to water piping. [F20, F80, F81-OP5] Applies to drainage system.
7.3.2.5.	**Flared Joints**
(1)	[F43, F81-OH1.1] Applies to venting system.
	[F81-OH2.1] Applies to drainage system. [F20, F46, F81-OH2.2] Applies to water piping.
	[F20, F46, F81-OP5] Applies to water piping. [F20, F81-OP5] Applies to drainage system.
(2)	[F43, F81-OH1.1] Applies to venting system.
	[F81-OH2.1] Applies to drainage system. [F20, F46, F81-OH2.2] Applies to water piping.
	[F20, F46, F81-OP5] Applies to water piping. [F20, F81-OP5] Applies to drainage system.
7.3.2.6.	**Mechanical Joints**
(1)	[F43, F81-OH1.1] Applies to venting system.
	[F81-OH2.1] Applies to drainage system. [F20, F46, F81-OH2.2] Applies to water piping.
	[F20, F46, F81-OP5] Applies to water piping. [F20, F81-OP5] Applies to drainage system.
7.3.2.7.	**Cold-Caulked Joints**
(1)	[F20, F43, F81-OH1.1] Applies to bell and spigot joints in venting systems.
	[F20, F81-OH2.1] Applies to bell and spigot joints in drainage systems. [F20, F46, F81-OH2.2] Applies to water piping.
	[F20, F46, F81-OP5] Applies to water piping. [F20, F81-OP5] Applies to bell and spigot joints in drainage systems.
(2)	[F20, F43, F81-OH1.1] Applies to bell and spigot joints in venting systems.
	[F20, F81-OH2.1] Applies to bell and spigot joints in drainage systems. [F20, F46, F81-OH2.2] Applies to water piping.
	[F20, F46, F81-OP5] Applies to water piping. [F20, F81-OP5] Applies to bell and spigot joints in drainage systems.
(3)	[F20, F81-OH2.1] Applies to bell and spigot joints in drainage systems.
	[F20, F81-OP5] Applies to bell and spigot joints in drainage systems.
r11.1 **7.3.2.8.**	**Stainless Steel Welded Joints**
(1)	[F20, F81-OH2.1, OH2.2, OH2.3]
(2)	[F20, F81-OH2.1, OH2.2, OH2.3]
7.3.3.1.	**Drilled and Tapped Joints**
(1)	[F81-OH2.1] Applies to drainage piping. [F20, F46, F81-OH2.2] Applies to water piping.
	[F20, F46, F81-OP5] Applies to water piping. [F20, F81-OP5] Applies to drainage piping.
(2)	
(3)	
(4)	
(5)	[F81-OH2.1]
	[F81-OP5]
7.3.3.2.	**Reserved**
7.3.3.3.	**Prohibition of Welding of Pipes and Fittings**
(1)	[F20-OH1.1]
	[F20-OH2.1, OH2.2]
(2)	[F80-OH2.2]
	[F80-OP5]

Acceptable Solution	Objective and Functional Statement
7.3.3.4.	**Unions and Slip Joints**
(1)	[F81-OH1.1]
	[F81-OH2.1]
(2)	[F81-OH1.1]
	[F81-OH2.1]
7.3.3.5.	**Increaser or Reducer**
	[F81-OH1.1]
	[F70, F80-OH2.2]
(1)	
7.3.3.6.	**Connection of Dissimilar Materials**
(1)	[F80-OH1.1]
	[F80-OH2.1]
	[F80-OP5]
7.3.3.7.	**Connection of Roof Drain to Leader**
(1)	[F21, F61, F81-OP5]
7.3.3.8.	**Connection of Floor Outlet Fixtures**
(1)	[F80-OH2.1]
	[F80-OP5]
(2)	[F80-OH2.1]
	[F80-OP5]
(3)	
(4)	[F20-OH2.1]
	[F20-OP5]
	[F20-OS3.1]
r11.1 (4.1)	[F81-OH2.1]
(5)	[F21-OH2.1]
	[F21-OP5]
7.3.3.9.	**Expansion and Contraction**
(1)	[F21-OH1.1]
	[F21-OH2.1] [F21-OH2.2]
	[F21-OP5]
7.3.3.10.	**Copper Tube**
(1)	[F20-OH1.1]
	[F20-OH2.1] [F20-OH2.2]
	[F20-OP5]
(2)	[F20-OH1.1]
	[F20-OH2.1] [F20-OH2.2]
	[F20-OP5]
7.3.3.11.	**Indirect Connections**
(1)	[F81-OH2.2, OH2.4]
(2)	[F81-OH2.2, OH2.4]
7.3.3.12.	**Copper Joints Used Underground**
(1)	[F20, F80, F81, F113-OP5] Applies to drainage pipe. [F20, F46, F80, F81-OP5] Applies to water pipe.
(2)	[F80-OP5]
7.3.4.1.	**Capability of Support**
(1)	[F20-OH1.1]
	[F20-OH2.1, OH2.2]
	[F20-OP5]
	[F20-OS3.1]
(2)	[F20-OH2.1]
	[F20-OP5]
	[F20-OS3.1]

	Acceptable Solution	Objective and Functional Statement
	(3)	[F20-OH2.1]
		[F20-OP5]
		[F20-OS3.1]
	7.3.4.2.	**Independence of Support**
	(1)	[F20-OH2.1]
		[F20-OP5]
		[F20-OS3.1]
	7.3.4.3.	**Insulation of Support**
	(1)	[F80-OH1.1]
		[F80-OH2.1, OH2.2]
		[F80-OP5]
		[F80-OS3.1]
r11.1	(2)	[F80-OH2.1, OH2.3]
		[F80-OS3.1]
		[F80-OP5]
	7.3.4.4.	**Support for Vertical Piping**
e6.1	(1), (2)	[F20-OH1.1] Applies to vent piping.
		[F20-OH2.1] Applies to drainage piping. [F20-OH2.2] Applies to water piping.
		[F20-OP5]
		[F20-OS3.1]
	7.3.4.5.	**Support for Horizontal Piping**
e6.1	(1) to (3)	[F20-OH1.1] Applies to vent piping.
		[F20, F81-OH2.1] Applies to drainage piping. [F20-OH2.2] Applies to water piping.
		[F20-OP5]
		[F20-OS3.1]
	(4)	
	(5)	[F20-OH1.1] Applies to vent piping.
		[F20, F81-OH2.1] Applies to drainage piping. [F20-OH2.2] Applies to water piping.
		[F20-OP5]
		[F20-OS3.1]
	(6)	[F20-OH1.1] Applies to vent piping.
		[F20, F81-OH2.1] Applies to drainage piping. [F20-OH2.2] Applies to water piping.
		[F20-OP5]
		[F20-OS3.1]
	7.3.4.6.	**Support for Underground Horizontal Piping**
	(1)	[F20-OE] Applies to drainage piping.
		[F20, F81-OH2.1] Applies to drainage piping. [F20-OH2.2] Applies to water piping.
		[F20-OP5]
		[F20-OS3.1]
	(2)	[F20-OE] Applies to drainage piping.
		[F20-OH1.1] Applies to vent piping.
		[F20, F81-OH2.1] Applies to drainage piping. [F20-OH2.2] Applies to water piping.
		[F20-OP5]
		[F20-OS3.1]
	7.3.4.7.	**Support for Vent Pipe Above a Roof**
	(1)	[F20-OH1.1]
		[F61, F81-OP2.3]
		[F81-OS3.1]

Acceptable Solution	Objective and Functional Statement
7.3.4.8.	**Compression Fittings**
(1)	[F20-OH2.1, OH2.2]
	[F20-OP5]
	[F20-OS3.1]
7.3.4.9.	**Thrust Restraint of Water Service Pipes**
(1)	[F20, F81-OH2.2]
	[F20, F81-OP5]
(2)	[F20, F81-OH2.2]
(3)	[F20, F81-OH2.2]
(4)	[F20, F81-OH2.2]
7.3.5.1.	**Backfill of Pipe Trench**
(1)	[F20-OE]
	[F81-OH2.1]
	[F81-OP5]
7.3.5.2.	**Protection of Non-Metallic Pipe**
(1)	[F20-OE]
	[F81-OH2.1]
	[F81-OP5]
7.3.5.3.	**Isolation from Loads**
(1)	[F20-OE] Applies to underground drainage piping.
	[F81-OH2.1]
	[F81-OP5]
7.3.5.4.	**Protection from Frost**
(1)	[F20-OE] Applies to underground drainage piping.
	[F81-OH2.1]
	[F81-OP5]
7.3.5.5.	**Protection from Mechanical Damage**
(1)	[F81-OH1.1] Applies to venting system.
	[F81-OH2.1] Applies to drainage system. [F81-OH2.2] Applies to water system.
	[F81-OP5]
7.3.5.6.	**Protection from Condensation**
(1)	[F63-OH2.4]
	[F63-OP2.3]
7.3.5.7.	**Spatial Separation**
(1)	[F46-OH2.2]
	[F46-OP5]
(2)	[F46-OH2.2]
	[F46-OP5]
(3)	
(4)	[F46-OH2.2]
	[F46-OP5]
7.3.6.1.	**Tests and Inspection of Drainage or Venting Systems**
e6.1 (1) to (4)	[F81-OH1.1] Applies to venting systems.
	[F81-OH2.1] Applies to drainage systems.
	[F81-OP5] Applies to drainage systems.
(5)	[F81-OH2.1] Applies to drainage systems.
(6)	[F22-OS2.6]
	[F36-OS3.6]
7.3.6.2.	**Tests of Pipes in Drainage Systems**
(1)	[F81-OE] Applies to underground drainage piping.
	[F81-OH2.1]
	[F81-OP5] Applies to drainage systems.

Acceptable Solution	Objective and Functional Statement
(3)	[F02, F12, F81-OP1.2]
	[F02, F12, F81-OS1.2]
(4)	[F81-OH2.1] [F46, F70, F81-OH2.2]
7.6.2.5.	**Backflow from Buildings with a Solar Domestic Hot Water System**
(1)	[F70, F81, F46-OH2.1, OH 2.2, OH2.3]
(2) to (4)	
7.6.2.6.	**Premise Isolation**
(1)	[F81-OH2.1] [F46, F70, F81-OH2.2]
(2)	
(3)	[F46, F70, F81-OH2.2]
7.6.2.7.	**Reserved**
7.6.2.8.	**Cleaning of Systems**
(1)	[F81-OH2.1] [F46, F70, F81-OH2.2]
7.6.2.9.	**Air Gap**
(1)	[F81-OH2.1] [F46, F70, F81-OH2.2]
(2)	[F81-OH2.1] [F46, F70, F81-OH2.2]
7.6.2.10.	**Vacuum Breakers and Flood Levels**
(1)	
(2)	[F81-OH2.1] [F46, F70, F81-OH2.2]
(3)	[F81-OH2.1] [F46, F70, F81-OH2.2]
(4)	[F81-OH2.1] [F46, F70, F81-OH2.2]
7.6.3.1.	**Design**
(1)	[F70, F81-OH2.2]
(2)	[F70-OH2.2]
(3)	[F70, F81-OH2.2] [F40-OH2.1, OH2.4]
7.6.3.2.	**Hydraulic Load**
(1)	[F70, F81-OH2.2]
(2)	[F70, F81-OH2.2]
(3)	[F70, F81-OH2.2]
(4)	[F70,F81-OH2.2]
7.6.3.3.	**Static Pressure**
(1)	[F20, F81-OP1.1]
	[F20, F81-OP5]
	[F20, F81-OS1.1]
	[F20, F81-OS2.3]
	[F31, F81-OS3.2] Applies to pipes containing hot water
7.6.3.4.	**Size**
(1)	[F70, F81-OH2.2]
(2)	[F70, F81-OH2.2]
(3)	
(4)	[F70, F81-OH2.2]
r6.1 (5), (6)	[F71, F72-OH2.1, OH2.3]
r11.1 **7.6.4.1.**	**Water Supply Fittings**
(1)	[F130-OR1]
(2)	
(3)	[F130-OR1]
(4)	[F30-OS3.1]
	[F31-OS3.2]
(5)	[F130-OR1]
7.6.4.2.	**Plumbing Fixtures**
(1)	[F130-OR1]
(2)	[F130-OR1]

Acceptable Solution	Objective and Functional Statement
(3)	[F130-OR1]
(4)	
r11.1 (5)	[F130-OR1]
7.6.5.1.	**Maximum Temperature of Hot Water**
(1)	[F31-OS3.2]
(2)	[F31-OS3.2]
7.6.5.2.	**Showers**
(1)	[F31-OH1.2]
	[F30-OS3.1] [F31-OS3.2]
(2)	
(3)	
(4)	[F31-OH1.2]
	[F31-OS3.2]
7.6.5.3.	**Temperature Control Devices**
(1)	[F31-OH1.2]
	[F31-OS3.2]
7.7.1.1.	**Non-Potable Connection**
(1)	[F46-OH2.2]
(2)	[F81-OH2.1] [F46, F70, F81-OH2.2]
(3)	[F81-OH2.1] [F46, F70, F81-OH2.2]
7.7.2.1.	**Markings Required**
(1)	[F46, F81-OH2.2]
(2)	[F46, F81-OH2.2]
(3)	[F46, F81-OH2.2]
7.7.3.1.	**Pipes**
(1)	[F81-OH2.1, OH2.2, OH2.4]
	(c), (d) [F46-OH2.2]
7.7.3.2.	**Outlets**
(1)	[F46-OH2.2] [F40-OH2.4]
7.7.4.1.	**Conformance to Standards**
(1)	[F81, F82-OH2.1, OH2.2, OH2.4] [F130-OR1]

Acceptable Solution	Objectives and Functional Statements
9.5.2.2.	**Protection on Floor Areas with a Barrier-Free Path of Travel**
(1)	
9.5.2.3.	**Stud Wall Reinforcement**
(1)	[F74-OA2]
9.5.3.1.	**Ceiling Heights of Rooms or Spaces**
(1)	[F30-OS3.1] [F10-OS3.7]
(2)	
9.5.3.2.	**Mezzanines**
(1)	[F30-OS3.1] [F10-OS3.7]
9.5.3.3.	**Storage Garages**
(1)	[F30-OS3.1] [F10-OS3.7]
9.5.4.1.	**Areas of Living Rooms and Spaces**
(1)	[F10-OS3.7]
(2)	[F10-OS3.7]
9.5.5.1.	**Area of Dining Rooms or Spaces**
(1)	[F10-OS3.7]
(2)	[F10-OS3.7]
9.5.6.1.	**Kitchen Areas**
(1)	[F10-OS3.7]
9.5.7.1.	**Areas of Bedrooms**
(1)	[F10-OS3.7]
9.5.7.2.	**Areas of Master Bedrooms**
(1)	[F10-OS3.7]
9.5.7.3.	**Areas of Combination Bedrooms**
(1)	[F10-OS3.7]
9.5.7.4.	**Areas of Other Sleeping Rooms**
(1)	[F10-OS3.7]
9.5.7.5.	**Recreational Camps**
(1)	[F10-OS3.7]
9.5.7.6.	**Camps for Housing Workers**
(1)	[F10-OS3.7]
9.5.8.1.	**Combined Living, Dining, Bedroom and Kitchen Spaces**
(1)	[F10-OS3.7]
9.5.9.1.	**Space to Accommodate Fixtures**
(1)	[F70, F71-OH2.3]
	[F101-OH6]
9.5.9.2.	**Doors to Rooms Containing Water Closets**
(1)	[F101-OH6] Applies to portion of Code text: “to each room containing a water closet”
9.5.10.1.	**Hallway Width**
(1)	[F10-OS3.7]
9.5.11.1.	**Doorway Opening Sizes**
(1)	[F30-OS3.1] [F10-OS3.7]
9.5.11.2.	**Doors to Public Water Closet Rooms**
(1)	[F30-OS3.1] [F10-OS3.7]
9.5.11.3.	**Doors to Bathrooms**
(1)	[F74-OA2]
9.6.1.1.	**Application**
(1)	
9.6.1.2.	**Material Standards for Glass**
(1)	[F20-OS2.1] [F63-OS2.3]
(2)	[F30-OS3.1] [F10-OS3.7]

Acceptable Solution	Objectives and Functional Statements
(3)	[F30-OS3.1] [F10-OS3.7]
r11.1 **9.6.1.3.**	**Structural Sufficiency of Glass**
(1)	[F20-OS2.1]
(2)	[F20-OS2.1]
(3)	[F30-OS3.1] [F10-OS3.7]
9.6.1.4.	**Types of Glass and Protection of Glass**
(1)	[F30-OS3.1] [F10-OS3.7]
(2)	[F30-OS3.1] [F10-OS3.7]
(3)	[F30-OS3.1] [F10-OS3.7]
(4)	[F30-OS3.1] [F10-OS3.7] Applies to portion of Code text: "... except that such *partitions* shall be suitably marked to indicate their existence and position."
(5)	[F30-OS3.1] [F10-OS3.7]
(6)	[F30-OS3.1]
9.7.1.1.	**Application**
(1)	
(2)	
(3)	
9.7.2.1.	**Entrance Doors**
(1)	[F40, F42, F61-OH1.1] [F51, F54-OH1.2]
	[F42-OH2.5] Applies to portion of Code text: "at each entrance to a *dwelling unit*"
	[F131-OR2] Applies to portion of Code text: "at each entrance to a *dwelling unit*"
	[F42, F61-OS2.3] Applies to portion of Code text: "at each entrance to a *dwelling unit*"
(2)	[F35-OS4.2]
9.7.2.2.	**Other Requirements for Windows, Doors and Skylights**
(1)	
(2)	
(3)	
(4)	
(5)	
(6)	
(7)	
(8)	
(9)	
9.7.2.3.	**Minimum Window Areas**
(1)	[F102-OH7]
	[F10-OS3.7]
(2)	
(3)	
(4)	
9.7.3.1.	**General Performance Criteria**
(1)	[F42, F55, F61, F62, F63-OH1.1]
	[F81-OH1.1] Applies to windows that provide required non-heating season ventilation.
	[F54, F55, F61, F62, F63-OH1.2] [F63, F61, F62-OH1.3]
	[F20, F55, F61-OS2.1,OS2.3]
	[F42-OH2.5]
	[F81-OS3.7]
	[F34-OS4.1]
(2)	F81-OH1.1] Applies to skylights that provide required non-heating season ventilation.
	[F20, F22-OH1.3]
	[F20-OS2.1, OS2.3]
(3)	[F42, F55-OH1.1]
	[F42-OH2.5]
	[F81-OS3.7]

Acceptable Solution	Objectives and Functional Statements
9.9.9.2.	**Two Separate Exits**
(1)	[F10-OS3.7]
9.9.9.3.	**Shared Egress Facilities**
(1)	[F10-OS3.7]
9.9.10.1.	**Egress Windows or Doors for Bedrooms**
(1)	[F10-OS3.7]
(2)	[F10-OS3.7]
(3)	
(4)	
(5)	[F10-OS3.7]
(6)	[F10-OS3.7]
(7)	[F10-OS3.7]
9.9.11.1.	**Application**
(1)	
9.9.11.2.	**Visibility of Exits**
(1)	[F10-OS3.7]
r11.1 (2)	[F10-OS3.7]
9.9.11.3.	**Exit Signs**
(1)	[F10-OS3.7]
(2)	[F10, F81-OS3.7]
(3)	[F10, F81-OS3.7]
(4)	[F10-OS3.7]
(5)	[F10-OS3.7]
(6)	[F10-OS3.7]
(7)	[F10-OS3.7]
9.9.11.4.	**Signs for Stairs and Ramps at Exit Level**
(1)	[F10-OS3.7]
9.9.11.5.	**Floor Numbering**
(1)	[F10-OS3.7]
	[F73-OA1]
9.9.12.1.	**Application**
(1)	
9.9.12.2.	**Required Lighting in Egress Facilities**
(1)	[F30-OS3.1] [F10-OS3.7]
(2)	[F30-OS3.1] [F10-OS3.7]
9.9.12.3.	**Emergency Lighting**
(1)	[F30-OS3.1] [F10-OS3.7]
(2)	[F30-OS3.1] [F10-OS3.7]
(3)	[F30-OS3.1] [F10-OS3.7]
(4)	[F30-OS3.1] [F10-OS3.7]
(5)	[F30-OS3.1] [F10-OS3.7]
(6)	[F30-OS3.1] [F10-OS3.7]
(7)	[F30-OS3.1] [F10-OS3.7]
9.10.1.1.	**Support of Noncombustible Construction**
(1)	[F04-OP1.3]
	[F04-OS1.3]
9.10.1.2.	**Sloped Roofs**
(1)	
9.10.1.3.	**Items Under Part 3 Jurisdiction**
(1)	
(2)	
(3)	

Acceptable Solution	Objectives and Functional Statements
(4)	
(5)	
(6)	
(7)	
(8)	
(9)	
(10)	
9.10.1.4.	**Items Under Part 6 Jurisdiction**
(1)	
(2)	
9.10.2.1.	**Occupancy Classification**
(1)	
9.10.2.2.	**Reserved**
9.10.2.3.	**Major Occupancies above Other Major Occupancies**
(1)	
9.10.2.4.	**Buildings Containing More Than One Major Occupancy**
(1)	
9.10.3.1.	**Fire-Resistance and Fire-Protection Ratings**
(1)	
9.10.3.2.	**Flame-Spread Rating**
(1)	
(2)	
9.10.3.3.	**Fire Exposure**
(1)	
(2)	
(3)	
9.10.3.4.	**Suspended Membrane Ceiling**
(1)	[F03-OP1.3]
	[F04-OS1.3]
9.10.4.1.	**Mezzanines not Considered as Storeys**
(1)	
(2)	
9.10.4.2.	**More Than One Level of Mezzanine**
(1)	
9.10.4.3.	**Basement Storage Garages**
(1)	
9.10.4.4.	**Roof-Top Enclosures**
(1)	
9.10.5.1.	**Permitted Openings in Wall and Ceiling Membranes**
(1)	[F03-OP1.2] [F04-OP1.3]
	[F03-OS1.2] [F04-OS1.3]
(2)	[F04-OP1.3]
	[F04-OS1.3]
(3)	[F03-OP1.2]
	[F03-OS1.2]
(4)	[F04-OP1.3]
	[F04-OS1.2, OS1.3]
9.10.6.1.	**Combustible Elements in Noncombustible Construction**
(1)	
9.10.6.2.	**Heavy Timber Construction**
(1)	

Acceptable Solution	Objectives and Functional Statements
(3)	
(4)	[F03-OP3.1]
(5)	
9.10.15.5.	**Construction of Exposing Building Face of Houses**
(1)	[F02, F03-OP3.1]
(2)	[F02, F03-OP3.1]
(3)	[F02, F03-OP3.1]
(4)	
(5)	[F03-OP3.1]
(6)	
9.10.16.1.	**Required Fire Blocks in Concealed Spaces**
(1) to (4)	[F03-OP1.2]
	[F03-OS1.2]
(5)	[F02, F03-OP1.2]
	[F02, F03-OS1.2]
(6)	[F02, F03-OP1.2]
	[F02, F03-OS1.2]
9.10.16.2.	**Required Fire Blocks in Wall Assemblies**
(1)	[F03-OP1.2]
	[F03-OS1.2]
(2)	
9.10.16.3.	**Fire Block Materials**
(1)	[F03-OP1.2]
	[F03-OS1.2]
(2)	[F03-OP1.2]
	[F03-OS1.2]
(3)	[F04-OP1.2]
	[F04-OS1.2]
9.10.16.4.	**Penetration of Fire Blocks**
(1)	[F03-OP1.2]
	[F03-OS1.2]
9.10.17.1.	**Flame-Spread Rating of Interior Surfaces**
(1)	[F02-OS1.2]
(2)	
(3)	
9.10.17.2.	**Ceilings in Exits or Public Corridors**
(1)	[F05-OS1.5]
9.10.17.3.	**Walls in Exits**
(1)	[F05-OS1.5]
(2)	[F05-OS1.5]
9.10.17.4.	**Exterior Exit Passageways**
(1)	[F05-OS1.5]
9.10.17.5.	**Walls in Public Corridors**
(1)	[F05-OS1.5]
9.10.17.6.	**Calculation of Wall and Ceiling Areas**
(1)	
9.10.17.7.	**Corridors Containing an Occupancy**
(1)	
9.10.17.8.	**Light Diffusers and Lenses**
(1)	

e3

	Acceptable Solution	Objectives and Functional Statements
	9.10.17.9.	**Combustible Skylights**
	(1)	[F02, F05-OS1.5]
r11.1	**9.10.17.10.**	**Protection of Foamed Plastics**
	(1)	[F01, F02, F05-OS1.5]
	(2)	[F02-OS1.2] [F05-OS1.5]
		[F02-OP1.2]
	(3)	
	(4)	[F01, F02-OS1.2]
	9.10.17.11.	**Walls and Ceilings in Bathrooms**
	(1)	
	9.10.17.12.	**Coverings or Linings of Ducts**
	(1)	
	9.10.18.1.	**Access Provided through a Firewall**
	(1)	[F11-OS1.5]
	9.10.18.2.	**Fire Alarm System Required**
	(1)	[F11-OS1.5]
	(2)	
	9.10.18.3.	**Design and Installation Requirements**
e2.1	(1), (2)	
	9.10.18.4.	**Rooms and Spaces Requiring Heat Detectors or Smoke Detectors**
	(1)	[F11-OS1.5]
	(2)	[F11-OS1.5]
	(3)	[F02-OS1.2] Applies to *sprinklered buildings*. [F11-OS1.5] Applies to the supervision of the system and flow alarm.
	(4)	[F11-OS1.5]
	9.10.18.5.	**Smoke Detectors in Recirculating Air Handling Systems**
	(1)	[F03-OS1.2]
	9.10.18.6.	**Portions of Buildings Considered as Separate Buildings**
	(1)	[F03-OS1.2]
	(2)	[F11-OS1.2]
	9.10.18.7.	**Central Vacuum Systems**
	(1)	[F03-OS1.2]
	9.10.18.8.	**Open-Air Storage Garages**
	(1)	
	9.10.18.9.	**Fire Alarm System in a Hotel**
	(1)	[F11-OS1.5]
r11.1	**9.10.18.10.**	**Testing of Integrated Fire Protection and Life Safety Systems**
	(1)	[F02, F81, F82-OS1.2, OS1.5]
		[F02, F81, F82-OP1.2]
	(2)	
	9.10.19.1.	**Required Smoke Alarms**
	(1)	[F11, F81-OS1.5]
r5	(2)	[F11, F81-OS1.5]
		[F74-OA2]
r5	(3)	
r5	(4)	[F11, F81-OS1.5]
		[F74-OA2]
r5	(5)	[F11, F81-OS1.5]
		[F74-OA2]
	9.10.19.2.	**Sound Patterns of Smoke Alarms**
	(1)	[F11-OS1.5]

	Acceptable Solution	Objectives and Functional Statements
	9.10.19.3.	**Location of Smoke Alarms**
	(1)	[F11-OS1.5]
r6	(2)	[F11-OS1.5]
r6	(3)	[F11, F81-OS1.5]
r6	(4)	[F11-OS1.5]
r6	(5)	
r6	(6)	[F11, F81-OS1.5]
		[F74-OA2]
r6	(7)	[F11-OS1.5]
	9.10.19.4.	**Power Supply**
	(1)	[F81-OS1.5]
	(2)	
	(3)	[F81-OS1.5]
	(4)	
	9.10.19.5.	**Interconnection of Smoke Alarms**
	(1)	[F11-OS1.5]
	9.10.19.6.	**Silencing of Smoke Alarms**
	(1)	[F11, F81-OS1.5]
	(2)	
	9.10.19.7.	**Instructions for Maintenance and Care**
	(1)	[F82-OS1.5]
r11.1	**9.10.19.8.**	**Residential Fire Warning Systems**
	(1)	[F81, F11-OS1.5]
	9.10.20.1.	**Windows or Access Panels Required**
e3	(1), (2)	[F12-OP1.2]
		[F12-OS1.2, OS1.5]
	(3)	
	9.10.20.2.	**Access to Basements**
	(1)	[F12-OP1.2]
		[F12-OS1.2, OS1.5]
	(2)	[F12-OP1.2] Applies to portion of Code text: "Access required in Sentence (1) ... provides an opening not less than 1 100 mm high and 550 mm wide, the sill of which shall not be more than 900 mm above the floor."
		[F12-OS1.2, OS1.5] Applies to portion of Code text: "Access required in Sentence (1) ... provides an opening not less than 1 100 mm high and 550 mm wide, the sill of which shall not be more than 900 mm above the floor."
	(3)	
	9.10.20.3.	**Fire Department Access to Buildings**
e3	(1), (2)	[F12-OP1.2]
		[F12-OS1.2, OS1.5]
e2	**9.10.20.4.**	**Portable Fire Extinguishers**
	(1)	[F02, F12, F81-OP1.2]
		[F81, F02, F12-OS1.2]
	9.10.20.5.	**Freeze Protection for Fire Protection Systems**
	(1)	[F02, F81-OP1.2]
		[F02, F81-OS1.2]
	9.10.21.1	**Requirements for Construction Camps**
	(1)	
	9.10.21.2.	**Separation of Sleeping Rooms**
	(1)	[F03-OP1.2]
		[F03-OS1.2]
	9.10.21.3.	**Floor Assemblies Between the First and Second Storey**
	(1)	[F03-OP1.2]
		[F03-OS1.2, OS1.5]

Acceptable Solution	Objectives and Functional Statements
9.10.21.4.	**Walkways Connecting Buildings**
(1)	[F03-OP1.2]
	[F03-OP3.1]
	[F03, F06-OS1.2, OS1.5]
9.10.21.5.	**Spatial Separations**
(1)	[F03-OP3.1]
9.10.21.6.	**Flame-Spread Ratings**
(1)	[F05-OS1.2, OS1.5]
(2)	
9.10.21.7.	**Smoke Detectors**
(1)	[F11-OS1.5]
9.10.21.8.	**Portable Fire Extinguishers**
(1)	[F02, F12, F81-OP1.2]
	[F02, F12, F81-OS1.2]
9.10.21.9.	**Hose Stations**
(1)	[F02, F12, F81-OP1.2]
	[F02, F12, F81-OS1.2]
(2)	[F12-OP1.2]
	[F12-OS1.2]
(3)	[F12-OP1.2]
	[F12-OS1.2]
9.10.22.1.	**Installation of Ranges**
(1)	
(2)	
9.10.22.2.	**Vertical Clearances above Cooktops**
(1)	
(2)	[F01-OS1.1, OS1.2]
9.10.22.3.	**Protection Around Cooktops**
(1)	[F01-OS1.1, OS1.2]
(2)	
(3)	[F01-OS1.1, OS1.2]
r11.1 **9.11.1.1.**	**Required Protection**
(1)	[F56-OH3.1]
(2)	[F56-OH3.1]
r11.1 **9.11.1.2.**	**Determination of Sound Transmission Ratings**
(1)	[F56-OH3.1]
(2)	[F56-OH3.1]
r11.1 **9.11.1.3.**	**Compliance with Required Ratings**
(1)	
(2)	
r11.1 **9.11.1.4.**	**Adjoining Construction**
(1)	
(2)	[F56-OH3.1]
(3)	[F56-OH3.1]
(4)	[F56-OH3.1]
9.12.1.1.	**Removal of Topsoil and Organic Matter**
(1)	[F20, F40, F41-OH1.1]
(2)	[F81-OP2.3, OP2.4]
	[F81-OH1.1, OH1.2, OH1.3] Applies to elements that support or are part of an environmental separator.
	[F81-OS1.2] Applies to assemblies required to provide fire resistance.
	[F81-OS2.3]
	[F81-OS3.1] Applies to floors and elements that support floors.

Acceptable Solution	Objectives and Functional Statements
(3)	[F20-OP2.2] [F20, F21-OP2.3, OP2.4]
	[F20-OS2.2, OS2.3] [F21-OS2.3]
	[F20, F21-OS3.1] Applies to floors and elements that support floors.
	[F20, F21, F40, F41-OH1.1] [F20, F21-OH1.2, OH1.3] Applies to elements that support or are part of an environmental separator.
	[F20, F21-OH4] Applies to floors and elements that support floors.
9.12.1.2.	**Standing Water**
(1)	[F60-OP2.2, OP2.3, OP2.4]
	[F60-OS2.2, OS2.3]
	[F60-OS3.1] Applies to floors and elements that support floors.
	[F60-OH1.1, OH1.2, OH1.3] Applies to elements that support or are part of an environmental separator.
	[F60-OH4] Applies to floors and elements that support floors.
9.12.1.3.	**Protection from Freezing**
(1)	[F21-OP2.3, OP2.4]
	[F21-OS2.3]
	[F21-OS3.1] Applies to floors and elements that support floors.
	[F21-OH1.1, OH1.2, OH1.3] Applies to elements that support or are part of an environmental separator.
	[F21-OH4] Applies to floors and elements that support floors.
9.12.1.4.	**Precautions During Excavation**
(1)	[F20-OP2.3]
	[F20, F21, F22, F62, F80-OP4.1]
	[F20, F22, F80-OS2.6]
(2)	[F20-OP2.3]
	[F20, F21, F80-OP4.1]
	[F20, F80-OS2.6]
9.12.2.1.	**Excavation to Undisturbed Soil**
(1)	[F20-OP2.2, OP2.3, OP2.4]
	[F20-OS2.2, OS2.3]
	[F20-OS3.1] Applies to floors and elements that support floors.
	[F20-OH1.1, OH1.2, OH1.3] Applies to elements that support or are part of an environmental separator.
	[F20-OH4] Applies to floors and elements that support floors.
9.12.2.2.	**Minimum Depth of Foundations**
(1)	[F21-OP2.3, OP2.4]
	[F21-OS2.3]
	[F21-OS3.1] Applies to floors, elements that support floors, and concrete steps with more than 2 risers.
	[F21-OH1.1, OH1.2, OH1.3] Applies to elements that support or are part of an environmental separator.
	[F21-OH4] Applies to floors and elements that support floors.
(2)	
(3)	
(4)	
(5)	
(6)	
(7)	
9.12.3.1.	**Placement of Backfill**
(1)	[F81-OH1.1, OH1.2, OH1.3] Applies to elements that support or are part of an environmental separator.
	[F22-OH4] Applies to floors and elements that support floors.
	[F81-OP2.1] [F22-OP2.4] [F81-OP2.3] Applies to elements that support or are part of an environmental separator.
	[F81-OS2.1] [F81-OS2.3] Applies to elements that support or are part of an environmental separator.
	[F22-OS3.1] Applies to floors and elements that support floors. [F22-OS3.7] Applies to walls, and elements that support walls, that contain doors or windows required for emergency egress.

Acceptable Solution	Objectives and Functional Statements
9.12.3.2.	**Grading of Backfill**
(1)	[F60, F61-OH1.1, OH1.2, OH1.3]
	[F60, F61-OP2.3]
	[F60, F61-OS2.3]
9.12.3.3.	**Deleterious Debris and Boulders**
(1)	[F81-OH1.1, OH1.2, OH1.3]
	[F81-OP2.3]
	[F81-OS2.3]
	[F81-OS3.1] Applies to floors and elements that support floors.
(2)	[F20-OH1.1, OH1.2, OH1.3]
	[F20-OP2.1, OP2.3]
	[F20-OS2.1, OS2.3]
	[F20-OS3.1] Applies to floors and elements that support floors.
(3)	[F20-OH1.1, OH1.2, OH1.3]
	[F20-OP2.1, OP2.3]
	[F20-OS2.1, OS2.3]
	[F20-OS3.1] Applies to floors and elements that support floors.
9.12.3.4.	**Lateral Support of Foundation Wall**
(1)	[F20, F22-OP2.1]
	[F20, F22-OS2.1]
9.12.4.1.	**Compacting or Filling With Concrete**
(1)	[F21-OH1.1, OH1.2, OH1.3]
	[F21-OH2.1] Applies to sewer-line locations beneath footings.
	[F21-OP2.2] [F21-OP2.3] Applies to elements that support or are part of an environmental separator.
	[F21-OS2.1] [F21-OS2.3] Applies to elements that support or are part of an environmental separator.
	[F21-OS3.1] Applies to floors and elements that support floors.
r11.1 **9.13.1.1.**	**Scope and Application**
(1)	
(2)	
(3)	
(4)	
9.13.2.1.	**Dampproofing**
(1)	[F61-OH1.1, OH1.2, OH1.3]
	[F61-OS2.3]
(2)	[F61-OH1.1, OH1.2, OH1.3]
	[F61-OS2.3]
(3)	
(4)	
r11.1 **9.13.2.2.**	**Dampproofing Materials**
(1)	[F61-OS2.3]
	[F61-OH1.1, OH1.2, OH1.3]
(2)	[F61-OS2.3]
	[F61-OH1.1, OH1.2, OH1.3]
r11.1 **9.13.2.3.**	**Preparation of Surface**
(1)	[F61-OS2.3]
	[F61-OH1.1, OH1.2, OH1.3]
(2)	[F61-OS2.3]
	[F61-OH1.1, OH1.2, OH1.3]
(3)	[F61-OS2.3]
	[F61-OH1.1, OH1.2, OH1.3]

	Acceptable Solution	Objectives and Functional Statements
	(4)	[F61-OS2.3]
		[F61-OH1.1, OH1.2, OH1.3]
	(5)	[F61-OS2.3]
		[F61-OH1.1, OH1.2, OH1.3]
	(6)	[F61-OS2.3]
		[F61-OH1.1, OH1.2, OH1.3]
r11.1	**9.13.2.4.**	**Application of Dampproofing Material**
	(1)	[F61-OS2.3]
		[F61-OH1.1, OH1.2, OH1.3]
	(2)	[F61-OS2.3]
		[F61-OH1.1, OH1.2, OH1.3]
	(3)	[F61-OS2.3]
		[F61-OH1.1, OH1.2, OH1.3]
r11.1	**9.13.2.5.**	**Moisture Protection for Interior Finishes**
	(1) to (3)	[F61-OS2.3]
		[F61-OH1.1, OH1.2]
r11.1	**9.13.2.6.**	**Dampproofing of Floors-on-Ground**
	(1)	[F61-OS2.3]
		[F61-OH1.1, OH1.2, OH1.3]
	(2)	[F61-OS2.3]
		[F61-OH1.1, OH1.2, OH1.3]
r11.1	**9.13.2.7.**	**Dampproofing of Preserved Wood Foundation Walls**
	(1)	[F61-OS2.3]
		[F61-OH1.1, OH1.2, OH1.3]
	9.13.3.1.	**Required Waterproofing**
	(1)	[F61-OS2.3]
		[F61-OH1.1, OH1.2, OH1.3]
	(2)	[F61-OS2.3]
		[F61-OH1.1, OH1.2, OH1.3]
r11.1	**9.13.3.2.**	**Waterproofing Materials**
	(1)	[F61-OS2.3]
		[F61-OH1.1, OH1.2, OH1.3]
	(2)	[F61-OS2.3]
		[F61-OH1.1, OH1.2, OH1.3]
r11.1	**9.13.3.3.**	**Preparation of Surfaces**
	(1) to (5)	[F61-OS2.3]
		[F61-OH1.1, OH1.2, OH1.3]
r11.1	**9.13.3.4.**	**Application of Waterproofing Membranes**
	(1) to (4)	[F61-OS2.3]
		[F61-OH1.1, OH1.2, OH1.3]
r11.1	**9.13.3.5.**	**Floor Waterproofing System**
	(1)	[F61-OS2.3]
		[F61-OH1.1, OH1.2, OH1.3]
	9.13.4.1.	**Soil Gas Control**
	(1)	[F40-OH1.1]
	9.13.4.2.	**Required Soil Gas Control**
	(1)	[F40-OH1.1]
	(2)	
	(3)	[F40-OH1.1]
	(4)	[F40-OH1.1]
	9.13.4.3.	**Material Standards**
	(1)	[F40-OH1.1]

Acceptable Solution	Objectives and Functional Statements
9.14.1.1.	**Application**
(1)	
9.14.1.2.	**Crawl Spaces**
(1)	
9.14.1.3.	**Floors-on-Ground**
(1)	
9.14.2.1.	**Foundation Wall Drainage**
(1)	[F60-OH1.1, OH1.2, OH1.3]
	[F60-OP2.1, OP2.2, OP2.3]
	[F60-OS2.1, OS2.2, OS2.3]
(2)	[F60-OH1.1, OH1.2, OH1.3]
(3)	(a) [F60-OH1.1, OH1.2, OH1.3] Applies where *foundations* serve as or support an environmental separator.
	(a) [F60-OS2.1] (a) [F60-OS2.3] Applies where *foundations* serve as or support an environmental separator.
	(b) [F21-OH1.1, OH1.2, OH1.3] Applies where *foundations* serve as or support an environmental separator.
	(b) [F21-OH4.1] Applies where *foundations* support floors or elements supporting floors.
	(b) [F21-OP2.1] (b) [F21-OP2.3] Applies where *foundations* serve as or support an environmental separator. (b) [F21-OP2.4] Applies where foundations support walls or floors.
	(b) [F21-OS2.1] (b) [F21-OS2.3] Applies where *foundations* serve as or support an environmental separator.
	(b) [F21-OS3.1] Applies where *foundations* support floors or elements supporting floors. (b) [F21-OS3.7] Applies where *foundations* support walls that contain windows or doors required for emergency egress.
(4)	[F60-OH1.1, OH1.2, OH1.3]
(5)	
(6)	
9.14.3.1.	**Material Standards**
(1)	[F60-OH1.1, OH1.2, OH1.3]
	[F60-OP2.1, OP2.3]
	[F60-OS2.1, OS2.3]
9.14.3.2.	**Minimum Size**
(1)	[F60-OH1.1, OH1.2, OH1.3]
	[F60-OP2.1, OP2.2, OP2.3]
	[F60-OS2.1, OS2.2, OS2.3]
9.14.3.3.	**Installation**
(1)	[F60-OH1.1, OH1.2, OH1.3]
	[F60-OP2.1, OP2.2, OP2.3]
	[F60-OS2.1, OS2.2, OS2.3]
(2)	[F60-OH1.1, OH1.2, OH1.3]
	[F60-OP2.1, OP2.2, OP2.3]
	[F60-OS2.1, OS2.2, OS2.3]
(3)	[F60-OH1.1, OH1.2, OH1.3]
	[F60-OP2.1, OP2.2, OP2.3]
	[F60-OS2.1, OS2.2, OS2.3]
(4)	[F60-OH1.1, OH1.2, OH1.3]
	[F60-OP2.1, OP2.2, OP2.3]
	[F60-OS2.1, OS2.2, OS2.3]
9.14.4.1.	**Type of Granular Material**
(1)	(a) [F60-OH1.1, OH1.2, OH1.3]
	(a) [F60-OP2.3] [F21-OP2.6]
	(a) [F21-OS2.2] [F60-OS2.3]
	(b) [F21-OH1.1, OH1.2, OH1.3] Applies to elements that support or are part of an environmental separator.

Acceptable Solution	Objectives and Functional Statements
(3) (Cont'd)	[F21-OS2.1] [F21-OS2.3] Applies to elements that support or are part of an environmental separator or are exposed to moisture.
	[F21-OS3.1] Applies to floors and elements that support floors.
(4)	[F21-OH1.1, OH1.2, OH1.3] Applies to elements that support or are part of an environmental separator and to masonry used in *chimneys* and fireplaces.
	[F21-OH4] Applies to floors and elements that support floors.
	[F21-OP2.1, OP2.4] [F21-OP2.3] Applies to elements that support or are part of an environmental separator or are exposed to moisture.
	[F21-OS1.2] Applies to assemblies required to provide fire resistance.
	[F21-OS2.1] [F21-OS2.3] Applies to elements that support or are part of an environmental separator or are exposed to moisture.
	[F21-OS3.1] Applies to floors and elements that support floors.
9.20.3.2.	**Mortar and Grout Mixes**
(1)	[F20, F21, F61-OH1.1, OH1.2, OH1.3] Applies to elements that support or are part of an environmental separator and to masonry used in *chimneys* and fireplaces.
	[F20, F21, F61-OH4] Applies to floors and elements that support floors.
	[F20, F21, F61-OP2.1, OP2.4] [F20, F21, F61-OP2.3] Applies to elements that support or are part of an environmental separator.
	[F20, F21-OS1.2] Applies to assemblies required to provide fire resistance.
	[F20, F21, F61-OS2.1] [F20, F21, F61-OS2.3] Applies to elements that support or are part of an environmental separator.
	[F20, F21, F61-OS3.1] Applies to floors and elements that support floors.
(2)	(a) [F21, F55, F61-OH1.1, OH1.2, OH1.3]
	(a) [F21, F55, F61-OP2.1, OP2.3]
	(a) [F21, F55, F61-OS2.1, OS2.3]
	(b) [F2-OP2.1]
	(b) [F21, F44-OS1.2] Applies to assemblies required to provide fire resistance.
	(b) [F21-OS2.1]
(3)	[F20, F21, F61-OH1.1, OH1.2, OH1.3] Applies to elements that support or are part of an environmental separator and to masonry used in *chimneys* and fireplaces.
	[F20, F21, F61-OH4] Applies to floors and elements that support floors.
	[F20, F21, F61-OP2.1, OP2.4] [F20, F21, F61-OP2.3] Applies to elements that support or are part of an environmental separator.
	[F20, F21-OS1.2] Applies to assemblies required to provide fire resistance.
	[F20, F21, F61-OS2.1] [F20, F21, F61-OS2.3] Applies to elements that support or are part of an environmental separator.
	[F20, F21, F61-OS3.1] Applies to floors and elements that support floors.
(4)	[F20, F21-OH1.1, OH1.2, OH1.3] Applies to elements that support or are part of an environmental separator and to masonry used in *chimneys* and fireplaces.
	[F20, F21-OH4] Applies to floors and elements that support floors.
	[F20, F21-OP2.1, OP2.4] [F20, F21-OP2.3] Applies to elements that support or are part of an environmental separator.
	[F20, F21-OS1.2] Applies to assemblies required to provide fire resistance.
	[F20, F21-OS2.1] [F20, F21-OS2.3] Applies to elements that support or are part of an environmental separator.
	[F20, F21-OS3.1] Applies to floors and elements that support floors.
(5)	[F20-OH1.1, OH1.2, OH1.3] Applies to elements that support or are part of an environmental separator and to masonry used in *chimneys* and fireplaces.
	[F20-OH4] Applies to floors and elements that support floors.
	[F20-OP2.1, OP2.4] [F20-OP2.3] Applies to elements that support or are part of an environmental separator.
	[F20-OS1.2] Applies to assemblies required to provide fire resistance.

Acceptable Solution	Objectives and Functional Statements
(5) (Cont'd)	[F20-OS2.1] [F20-OS2.3] Applies to elements that support or are part of an environmental separator.
	[F20-OS3.1] Applies to floors and elements that support floors.
(6)	[F20-OH1.1, OH1.2, OH1.3] Applies to elements that support or are part of an environmental separator or are part of an environmental separator and to masonry used in *chimneys* and fireplaces.
	[F20-OH4] Applies to floors and elements that support floors.
	[F20-OP2.1, OP2.4] [F20-OP2.3] Applies to elements that support or are part of an environmental separator.
	[F20-OS1.2] Applies to assemblies required to provide fire resistance.
	[F20-OS2.1] [F20-OS2.3] Applies to elements that support or are part of an environmental separator.
	[F20-OS3.1] Applies to floors and elements that support floors.
(7)	[F20, F21, F61-OH1.1, OH1.2, OH1.3] Applies to elements that support or are part of an environmental separator and to masonry used in *chimneys* and fireplaces.
	[F20, F21, F61-OH4] Applies to floors and elements that support floors.
	[F20, F21, F61-OP2.1, OP2.4] [F20, F21, F61-OP2.3] Applies to elements that support or are part of an environmental separator.
	[F20, F21, F61-OS1.2] Applies to assemblies required to provide fire resistance.
	[F20, F21, F61-OS2.1] [F20, F21, F61-OS2.3] Applies to elements that support or are part of an environmental separator.
	[F20, F21, F61-OS3.1] Applies to floors and elements that support floors.
9.20.4.1.	**Thickness**
(1)	[F20, F61-OH1.1, OH1.2, OH1.3] Applies to elements that support or are part of an environmental separator.
	[F20, F61-OH4] Applies to floors and elements that support floors.
	[F20, F61-OP2.1, OP2.4] [F20, F61-OP2.3] Applies to elements that support or are part of an environmental separator or are exposed to moisture.
	[F20, F61-OS1.2] Applies to assemblies required to provide fire resistance.
	[F20, F61-OS2.1] [F20, F61-OS2.3] Applies to elements that support or are part of an environmental separator or are exposed to moisture.
	[F20, F61-OS3.1] Applies to floors and elements that support floors.
(2)	[F20, F61-OH1.1, OH1.2, OH1.3] Applies to elements that support or are part of an environmental separator.
	[F20, F61-OH4] Applies to floors and elements that support floors.
	[F20, F61-OP2.1, OP2.4] [F20, F61-OP2.3] Applies to elements that support or are part of an environmental separator or are exposed to moisture.
	[F20, F61-OS1.2] Applies to assemblies required to provide fire resistance.
	[F20, F61-OS2.1] [F20, F61-OS2.3] Applies to elements that support or are part of an environmental separator or are exposed to moisture.
	[F20, F61-OS3.1] Applies to floors and elements that support floors.
r11.1 **9.20.4.2.**	**Masonry Units**
(1)	[F20-OH1.1, OH1.2, OH1.3] Applies to elements that support or are part of an environmental separator and to masonry used in *chimneys* and fireplaces.
	[F20-OH4] Applies to floors and elements that support floors.
	[F20-OP2.1, OP2.4] [F20-OP2.3] Applies to elements that support or are part of an environmental separator or are exposed to moisture.
	[F20-OS1.2] Applies to assemblies required to provide fire resistance.
	[F20-OS2.1] [F20-OS2.3] Applies to elements that support or are part of an environmental separator or are exposed to moisture.
	[F20-OS3.1] Applies to floors and elements that support floors.

Acceptable Solution	Objectives and Functional Statements
(2)	[F20-OH1.1, OH1.2, OH1.3] Applies to elements that support or are part of an environmental separator and to masonry used in *chimneys* and fireplaces.
	[F20-OH4] Applies to floors and elements that support floors.
	[F20-OP2.1, OP2.4] [F20-OP2.3] Applies to elements that support or are part of an environmental separator or are exposed to moisture.
	[F20-OS1.2] Applies to assemblies required to provide fire resistance.
	[F20-OS2.1] [F20-OS2.3] Applies to elements that support or are part of an environmental separator or are exposed to moisture.
	[F20-OS3.1] Applies to floors and elements that support floors.
(3)	[F20-OH1.1, OH1.2, OH1.3] Applies to elements that support or are part of an environmental separator and to masonry used in *chimneys* and fireplaces.
	[F20-OH4] Applies to floors and elements that support floors.
	[F20-OP2.1, OP2.4] [F20-OP2.3] Applies to elements that support or are part of an environmental separator or are exposed to moisture.
	[F20-OS1.2] Applies to assemblies required to provide fire resistance.
	[F20-OS2.1] [F20-OS2.3] Applies to elements that support or are part of an environmental separator or are exposed to moisture.
	[F20-OS3.1] Applies to floors and elements that support floors.
9.20.5.1.	**Masonry Support**
(1)	[F20, F21-OH1.1, OH1.2, OH1.3] Applies to elements that support or are part of an environmental separator.
	[F20, F21-OH4] Applies to floors and elements that support floors.
	[F20, F21-OP2.1, OP2.4] [F20, F21-OP2.3] Applies to elements that support or are part of an environmental separator or are exposed to moisture.
	[F20, F21-OS1.2] Applies to assemblies required to provide fire resistance.
	[F20, F21-OS2.1] [F20, F21-OS2.3] Applies to elements that support or are part of an environmental separator or are exposed to moisture.
	[F20, F21-OS3.1] Applies to floors and elements that support floors.
(2)	[F20-OH1.1, OH1.2, OH1.3] Applies to elements that support or are part of an environmental separator.
	[F20-OH4] Applies to floors and elements that support floors.
	[F20-OP2.1, OP2.4] [F20-OP2.3] Applies to elements that support or are part of an environmental separator or are exposed to moisture.
	[F20-OS1.2] Applies to assemblies required to provide fire resistance.
	[F20-OS2.1] [F20-OS2.2] Applies to elements that support or are part of an environmental separator or are exposed to moisture.
	[F20-OS3.1] Applies to floors and elements that support floors.
9.20.5.2.	**Lintels or Arches**
(1)	[F20, F22-OH1.1, OH1.2, OH1.3] Applies to elements that support or are part of an environmental separator.
	[F20, F22-OH4] Applies to floors and elements that support floors.
	[F20, F22–OP2.1, OP2.4] [F20, F22-OP2.3] Applies to elements that support or are part of an environmental separator or are exposed to moisture.
	[F20, F22-OS1.2] Applies to assemblies required to provide fire resistance.
	[F20, F22-OS2.1] [F20, F22-OS2.3] Applies to elements that support or are part of an environmental separator or are exposed to moisture.
	[F20, F22-OS3.1] Applies to floors and elements that support floors.
(2)	[F20, F22-OH1.1, OH1.2, OH1.3]
	[F20, F22-OP2.1, OP2.3, OP2.4]

Acceptable Solution	Objectives and Functional Statements
(2) (Cont'd)	[F20, F22-OS1.2] Applies to assemblies required to provide fire resistance.
	[F20, F22-OS2.1, OS2.3]
(3)	[F20, F22-OH1.1, OH1.2, OH1.3]
	[F20, F22-OP2.1, OP2.3, OP2.4]
	[F20, F22-OS1.2] Applies to assemblies required to provide fire resistance.
	[F20, F22-OS2.1, OS2.3]
(4)	[F20, F22-OH1.1, OH1.2, OH1.3] Applies to elements that support or are part of an environmental separator.
	[F20, F22-OP2.1, OP2.4] [F20, F22-OP2.3] Applies to elements that support or are part of an environmental separator or are exposed to moisture.
	[F20, F22-OS1.2] Applies to assemblies required to provide fire resistance.
	[F20, F22-OS2.1] [F20, F22-OS2.3] Applies to elements that support or are part of an environmental separator.
(5)	[F80-OH1.1, OH1.2, OH1.3] Applies to elements that support or are part of an environmental separator.
	[F80-OH4] Applies to floors and elements that support floors.
	[F80-OP2.1, OP2.4] [F80-OP2.3] Applies to elements that support or are part of an environmental separator or are exposed to moisture.
	[F20-OS1.2] Applies to assemblies required to provide fire resistance.
	[F80-OS2.1] [F80-OS2.3] Applies to elements that support or are part of an environmental separator or are exposed to moisture.
	[F80-OS3.1] Applies to floors and elements that support floors.
	[F80-OS3.7] Applies to walls, and elements that support walls, that contain doors or windows required for emergency egress.
(6)	[F20, F22-OH1.1, OH1.2, OH1.3]
	[F20, F22-OP2.1, OP2.3, OP2.4]
	[F20, F22-OS1.2] Applies to assemblies required to provide fire resistance.
	[F20, F22-OS2.1, OS2.3]
(7)	[F20, F22-OH1.1, OH1.2, OH1.3] Applies to elements that support or are part of an environmental separator.
	[F20, F22-OP2.1, OP2.4] [F20, F22-OP2.3] Applies to elements that support or are part of an environmental separator or are exposed to moisture.
	[F20, F22-OS1.2] Applies to assemblies required to provide fire resistance.
	[F20, F22-OS2.1] [F20, F22-OS2.3] Applies to elements that support or are part of an environmental separator.
9.20.6.1.	**Thickness of Exterior Walls**
(1)	[F20-OP2.1, OP2.4, OP2.5] [F22-OP2.4, OP2.5] [F20, F22-OP2.3] Applies to elements that support or are part of an environmental separator.
	[F20, F22-OH1.1.OH1.2, OH1.3] Applies to elements that support or are part of an environmental separator.
	[F20, F22-OH4] Applies to floors and elements that support floors.
	[F20-OS2.1, OS2.5] [F22-OS2.5] [F20, F22-OS2.3] Applies to elements that support or are part of an environmental separator.
	[F20, F22-OS3.1] Applies to floors and elements that support floors.
(2)	[F20-OP2.1, OP2.4, OP2.5] [F22-OP2.4, OP2.5] [F20, F22-OP2.3] Applies to elements that support or are part of an environmental separator.
	[F20, F22-OH1.1, OH1.2, OH1.3] Applies to elements that support or are part of environmental separator.
	[F20, F22-OH4] Applies to floors and elements that support floors.
	[F20-OS2.1, OS2.5] [F22-OS2.5] [F20, F22-OS2.3] Applies to elements that support or are part of an environmental separator.
	[F20, F22-OS3.1] Applies to floors and elements that support floors.

Acceptable Solution	Objectives and Functional Statements
(3)	[F20-OP2.1, OP2.4, OP2.5] [F22-OP2.4, OP2.5] [F20, F22-OP2.3] Applies to elements that support are or part of an environmental separator.
	[F20, F22-OH1.1, OH1.2, OH1.3] Applies to elements that support or are part of an environmental separator.
	[F20, F22-OH4] Applies to floors and elements that support floors.
	[F20, F22-OS1.2] Applies to assemblies required to provide fire resistance.
	[F20-OS2.1, OS2.5] [F22-OS2.5] [F20, F22-OS2.3] Applies to elements that support or are part of an environmental separator.
	[F20, F22-OS3.1] Applies to floors and elements that support floors.
9.20.6.2.	**Cavity Walls**
(1)	[F20-OP2.1, OP2.4, OP2.5] [F22-OP2.4, OP2.5] [F20, F22-OP2.3] Applies to elements that support or are part of an environmental separator or are exposed to moisture.
	[F20, F22-OH1.1, OH1.2, OH1.3] Applies to elements that support or are part of an environmental separator.
	[F20, F22-OH4] Applies to floors and elements that support floors.
	[F20, F22-OS1.2] Applies to assembles required to provide fire resistance.
	[F20-OS2.1, OS2.5] [F22-OS2.5] [F20, F22-OS2.3] Applies to elements that support or are part of an environmental separator or are exposed to moisture.
	[F20, F22-OS3.1] Applies to floors and elements that support floors.
(2)	[F20-OP2.1, OP2.4, OP2.5] [F22-OP2.4, OP2.5] [F20, F22, F61-OP2.3] Applies to elements that support or are part of an environmental separator.
	[F61-OS1.2] Applies to assemblies required to provide fire resistance.
	[F20-OS2.1, OS2.5] [F22-OS2.5] [F20, F22, F61-OS2.3] Applies to elements that support or are part of an environmental separator.
	[F20, F22-OS3.1] Applies to floors and elements that support floors
	[F20, F22, F61-OH1.1, OH1.2, OH1.3] Applies to elements that support or are part of an environmental separator.
	[F20, F22-OH4] Applies to floors and elements that support floors.
(3)	[F20-OP2.1, OP2.4, OP2.5] [F22-OP2.4, OP2.5] [F20, F22-OP2.3] Applies to elements that support or are part of an environmental separator.
	[F20-OS2.1, OS2.5] [F22-OS2.5] [F20, F22-OS2.3] Applies to elements that support or are part of an environmental separator or are exposed to moisture
	[F20, F22-OS3.1] Applies to floors and elements that support floors.
	[F20, F22-OH1.1, OH1.2, OH1.3] Applies to elements that support or are part of an environmental separator.
	[F20, F22-OH4] Applies to floors and elements that support floors.
9.20.6.3.	**Thickness of Interior Walls**
(1)	
(2)	(b) [F20-OP2.1, OP2.3, OP2.5] [F22-OP2.5]
	(b) [F20-OS2.1, OS2.3, OS2.5] [F22-OS2.5]
9.20.6.4.	**Masonry Veneer**
(1)	[F20-OP2.1, OP2.5] [F22-OP2.5] [F20, F22-OP2.3] Applies to elements that are part of an environmental separator.
	[F20, F22-OH1.1, OH1.2, OH1.3] Applies to elements that are part of an environmental separator.
	[F20, F22-OS1.2] Applies to assemblies required to provide fire resistance.
	[F20-OS2.1, OS2.5] [F22-OS2.5] [F20, F22-OS2.3] Applies to elements that are part of an environmental separator.

Acceptable Solution	Objectives and Functional Statements
(2)	[F61-OH1.1, OH1.2, OH1.3]
	[F61-OP2.3]
	[F61-OS1.2] Applies to assemblies required to provide fire resistance.
	[F61-OS2.3]
(3)	[F20-OP2.1, OP2.3, OP2.5] [F22-OP2.3, OP2.5]
	[F20, F22-OH1.1, OH1.2, OH1.3]
	[F20, F22-OS1.2] Applies to assemblies required to provide fire resistance.
	[F20-OS2.1, OS2.3, OS2.5] [F22-OS2.3, OS2.5]
(4)	
9.20.6.5.	**Parapet Walls**
(1)	[F20-OP2.1, OP2.3, OP2.5] [F22-OP2.5]
	[F20-OS2.1, OP2.3, OP2.5] [F22-OS2.5]
	[F20, F22-OH1.1, OH1.2, OH1.3]
(2)	[F61-OH1.1, OH1.2, OH1.3]
	[F61-OP2.3]
	[F61-OS1.2]
	[F61-OS2.3]
r11.1 (3)	[F61-OH1.1, OH1.2, OH1.3]
	[F61-OP2.3]
	[F61-OS1.2]
	[F61-OS2.3]
9.20.6.6.	**Stone or Concrete Facings**
(1)	
9.20.7.1.	**Maximum Dimensions**
(1)	[F20-OP2.1, OP2.4, OP2.5] [F22-OP2.4, OP2.5] [F20, F22-OP2.3] Applies to elements that support or are part of an environmental separator.
	[F20, F22-OH1.1, OH1.2, OH1.3] Applies to elements that support or are part of an environmental separator.
	[F20, F22-OH4] Applies to floors and elements that support floors.
	[F20, F22-OS1.2] Applies to assemblies required to provide fire resistance.
	[F20-OS2.1, OS2.5] [F22-OS2.5] [F20, F22-OS2.3] Applies to elements that support or are part of an environmental separator.
	[F20, F22-OS3.1] Applies to floors and elements that support floors.
9.20.7.2.	**Minimum Wall Thickness**
(1)	[F20-OP2.1, OP2.4, OP2.5] [F22-OP2.4, OP2.5] [F20, F22-OP2.3] Applies to elements that support or are part of an environmental separator.
	[F20, F22-OH1.1, OH1.2, OH1.3] Applies to elements that support or are part of an environmental separator.
	[F20, F22-OH4] Applies to floors and elements that support floors.
	[F20, F22-OS1.2] Applies to assemblies required to provide fire resistance.
	[F20-OS2.1, OS2.5] [F22-OS2.5] [F20, F22-OS2.3] Applies to elements that support or are part of an environmental separator.
	[F20, F22-OS3.1] Applies to floors and elements that support floors.
(2)	[F20-OP2.1, OP2.4, OP2.5] [F22-OP2.4, OP2.5] [F20, F22-OP2.3] Applies to elements that support or are part of an environmental separator.
	[F20, F22-OH1.1, OH1.2, OH1.3] Applies to elements that support or are part of an environmental separator.
	[F20, F22-OH4] Applies to floors and elements that support floors.
	[F20, F22-OS1.2] Applies to assemblies required to provide fire resistance.
	[F20-OS2.1, OS2.5] [F22-OS2.5] [F20, F22-OS2.3] Applies to elements that support or are a part of an environmental separator.
	[F20, F22-OS3.1] Applies to floors and elements that support floors.

Acceptable Solution	Objectives and Functional Statements
(4)	[F20-OP2.1, OP2.4, OP2.5] [F22-OP2.4, OP2.5] [F20, F22-OP2.3] Applies to elements that support or are part of an environmental separator.
	[F20, F22-OH1.1, OH1.2, OH1.3] Applies to elements that support or are part of an environmental separator.
	[F20, F22-OH4] Applies to floors and elements that support floors.
	[F20, F22-OS1.2] Applies to assemblies required to provide fire resistance.
	[F20-OS2.1, OS2.5] [F22-OS2.5] [F20, F22-OS2.3] Applies to elements that support or are part of an environmental separator.
	[F20, F22-OS3.1] Applies to floors and elements that support floors.
(5)	[F20-OP2.1, OP2.4, OP2.5] [F22-OP2.4, OP2.5] [F20, F22-OP2.3] Applies to elements that support or are part of an environmental separator.
	[F20, F22-OH1.1, OH1.2, OH1.3] Applies to elements that support or are part of an environmental separator.
	[F20, F22-OH4] Applies to floors and elements that support floors.
	[F20, F22-OS1.2] Applies to assemblies required to provide fire resistance.
	[F20-OS2.1, OS2.4, OS2.5] [F22-OS2.4, OS2.5] [F20, F22-OS2.3] Applies to elements that support or are part of an environmental separator.
	[F20, F22-OS3.1] Applies to floors and elements that support floors.
r11.1 **9.20.8.5.**	**Projection of Masonry Veneer Beyond Supporting Members**
(1)	[F20-OP2.1, OP2.4, OP2.5] [F22-OP2.4, OP2.5] [F20, F22-OP2.3] Applies to elements that support or are part of an environmental separator.
	[F20, F22-OH1.1, OH1.2, OH1.3] Applies to elements that support or are part of an environmental separator.
	[F20, F22-OS1.2] Applies to assemblies required to provide fire resistance.
	[F20-OS2.1, OS2.5] [F22-OS2.5] [F20, F22-OS2.3] Applies to elements that support or are part of an environmental separator.
(2)	
9.20.9.1.	**Joints to be Offset or Reinforced**
(1)	[F20-OH1.1, OH1.2, OH1.3] Applies to elements that support or are part of an environmental separator.
	[F20-OH4] Applies to floors and elements that support floors.
	[F20-OP2.1, OP2.4] [F20-OP2.3] Applies to elements that support or are part of an environmental separator.
	[F20-OS1.2] Applies to assemblies required to provide fire resistance.
	[F20-OS2.1] [F20-OS2.3] Applies to elements that support or are part of an environmental separator.
	[F20-OS3.1] Applies to floors and elements that support floors.
(2)	[F20-OH1.1, OH1.2, OH1.3] Applies to elements that support or are part of an environmental separator.
	[F20-OH4] Applies to floors and elements that support floors.
	[F20-OP2.1, OP2.4] [F20-OP2.3] Applies to elements that support or are part of an environmental separator.
	[F20-OS1.2] Applies to assemblies required to provide fire resistance.
	[F20-OS2.1] [F20-OS2.3] Applies to elements that support or are part of an environmental separator.
	[F20-OS3.1] Applies to floors and elements that support floors.

Acceptable Solution	Objectives and Functional Statements
9.20.9.2.	**Bonding or Tying of Other than Masonry Veneer**
(1)	[F20-OP2.1, OP2.5] [F22-OP2.4, OP2.5] [F20, F22-OP2.3] Applies to elements that support or are part of an environmental separator.
	[F20, F22-OH1.1, OH1.2, OH1.3] Applies to elements that support or are part of an environmental separator.
	[F20, F22-OH4] Applies to floors and elements that support floors.
	[F20, F22-OS1.2] Applies to assemblies required to provide fire resistance.
	[F20-OS2.1, OS2.5] [F22-OS2.5] [F20, F22-OS2.3] Applies to elements that support or are part of an environmental separator.
	[F20, F22-OS3.1] Applies to floors and elements that support floors. [F20, F22-OS3.7] Applies to walls, and elements that support walls, that contains doors or windows required for emergency egress.
9.20.9.3.	**Bonding**
(1)	[F20-OH1.1, OH1.2, OH1.3] Applies to elements that support or are part of an environmental separator.
	[F20-OH4] Applies to floors and elements that support floors.
	[F20-OP2.1, OP2.4] [F20-OP2.3] Applies to elements that support or are part of an environmental separator.
	[F20-OS1.2] Applies to assemblies required to provide fire resistance.
	[F20-OS2.1] [F20-OS2.3] Applies to elements that support or are part of an environmental separator.
	[F20-OS3.1] Applies to floors and elements that support floors.
(2)	[F20-OH1.1, OH1.2, OH1.3] Applies to elements that support or are part of an environmental separator.
	[F20-OH4] Applies to floors and elements that support floors.
	[F20-OP2.1, OP2.4] [F20-OP2.3] Applies to elements that support or are part of an environmental separator.
	[F20-OS1.2] Applies to assemblies required to provide fire resistance.
	[F20-OS2.1] [F20-OS2.3] Applies to elements that support or are part of an environmental separator.
	[F20-OS3.1] Applies to floors and elements that support floors.
(3)	[F20-OH1.1, OH1.2, OH1.3] Applies to elements that support or are part of an environmental separator.
	[F20-OH4] Applies to floors and elements that support floors.
	[F20-OP2.1, OP2.4] [F20-OP2.3] Applies to elements that support or are part of an environmental separator.
	[F20-OS1.2] Applies to assemblies required to provide fire resistance.
	[F20-OS2.1] [F20-OS2.3] Applies to elements that support or are part of an environmental separator.
	[F20-OS3.1] Applies to floors and elements that support floors.
9.20.9.4.	**Tying**
(1)	
(2)	[F20, F80-OH1.1, OH1.2, OH1.3] Applies to elements that support or are part of an environmental separator.
	[F20, F80-OH4] Applies to floors and elements that support floors.
	[F20, F80-OP2.1, OP2.4] [F20, F80-OP2.3] Applies to elements that support or are part of an environmental separator.
	[F20, F80-OS1.2] Applies to assemblies required to provide fire resistance.
	[F20, F80-OS2.1] [F20, F80-OS2.3] Applies to elements that support or are part of an environmental separator.
	[F20, F80-OS3.1] Applies to floors and elements that support floors. [F20, F80-OS3.7] Applies to walls, and elements that support walls, that contain doors or windows required for emergency egress.
(3)	[F20, F80-OH1.1, OH1.2, OH1.3] Applies to elements that support or are part of an environmental separator.
	[F20, F80-OH4] Applies to floors and elements that support floors.
	[F20, F80-OP2.1, OP2.4] [F20, F80-OP2.3] Applies to elements that support or are part of an environmental separator.

Acceptable Solution	Objectives and Functional Statements
9.20.13.7.	**Flashing Joints**
(1)	[F61, F62-OH1.1, OH1.2, OH1.3]
	[F61, F62-OP2.1, OP2.3]
	[F61-OS1.2] Applies to assemblies required to provide fire resistance.
	[F61, F62-OS2.1, OS2.3]
9.20.13.8.	**Required Weep Holes**
(1)	[F62-OH1.1, OH1.2, OH1.3]
	[F62-OP2.1, OP2.3]
	[F62-OS1.2] Applies to assemblies required to provide fire resistance.
	[F62-OS2.1, OS2.3]
(2)	
(3)	[F61, F62-OH1.1, OH1.2, OH1.3]
	[F61, F62-OP2.1, OP2.3]
	[F61, F62-OS2.1, OS2.3]
9.20.13.9.	**Protection of Interior Finish**
(1)	[F61-OH1.1, OH1.2, OH1.3]
	[F61-OP2.1, OP2.3]
	[F61-OS2.1, OS2.3]
(2)	[F61, F62-OH1.1, OH1.2, OH1.3]
	[F61, F62-OP2.1, OP2.3]
	[F61, F62-OS2.1, OS2.3]
(3)	
9.20.13.10.	**Mortar Droppings**
(1)	[F61, F62-OH1.1, OH1.2, OH1.3]
	[F61, F62-OP2.1, OP2.3]
	[F61, F62-OS1.2] Applies to assemblies required to provide fire resistance.
	[F61, F62-OS2.1, OS2.3]
9.20.13.11.	**Caulking at Door and Window Frames**
(1)	
9.20.13.12.	**Drips Beneath Window Sills**
(1)	[F61, F62-OH1.1, OH1.2, OH1.3]
	[F61, F62-OP2.1, OP2.3]
	[F61, F62-OS1.2] Applies to assemblies required to provide fire resistance.
	[F61, F62-OS2.1, OS2.3]
9.20.14.1.	**Laying Temperature of Mortar and Masonry**
(1)	[F20, F80-OH1.1, OH1.2, OH1.3] Applies to elements that support or are part of an environmental separator.
	[F20, F80-OH4] Applies to floors and elements that support floors.
	[F20, F80-OP2.1, OP2.4] [F20, F80-OP2.3] Applies to elements that support or are part of an environmental separator or are exposed to moisture.
	[F20, F80-OS1.2] Applies to assemblies required to provide fire resistance. [F20, F80-OS1.3]
	[F20, F80-OS2.1] [F20, F80-OS2.3] Applies to elements that support or are part of an environmental separator or are exposed to moisture.
	[F20, F80-OS3.1] Applies to floors and elements that support floors. [F20, F80-OS3.7] Applies to walls, and elements that support walls, that contain doors or windows required for emergency egress.
(2)	[F20, F80-OH1.1, OH1.2, OH1.3] Applies to elements that support or are part of an environmental separator.
	[F20, F80-OH4] Applies to floors and elements that support floors.
	[F20, F80-OP2.1, OP2.4] [F20, F80-OP2.3] Applies to elements that support or are part of an environmental separator or are exposed to moisture.

Acceptable Solution	Objectives and Functional Statements
(2) (Cont'd)	[F20, F80-OS1.2] Applies to assemblies required to provide fire resistance. [F20, F80-OS1.3]
	[F20, F80-OS2.1] [F20, F80-OS2.3] Applies to elements that support or are part of environmental separator or are exposed to moisture.
	[F20, F80-OS3.1] Applies to floors and elements that support floors. [F20, F80-OS3.7] Applies to walls, and elements that support walls, that contain doors or windows required for emergency egress.
9.20.14.2.	**Protection from Weather**
(1)	[F80-OP2.1, OP2.3]
	[F80-OS2.1, OS2.3]
9.20.15.1.	**Amount of Reinforcement**
(1)	[F20-OP2.1, OP2.3]
	[F20-OS2.1, OS2.3]
r11.1 **9.20.15.2.**	**Installation Standard**
(1)	[F20-OP2.1, OP2.3]
	[F20-OS2.1, OS2.3]
9.20.16.1.	**Corrosion Resistance of Connectors**
(1)	[F80-OH1.1, OH1.2, OH1.3] Applies to elements that support or are part of an environmental separator.
	[F80-OH4] Applies to floors and elements that support floors.
	[F80-OP2.1, OP2.4] [F80-OP2.3] Applies to elements that support or are part of an environmental separator or are exposed to moisture.
	[F80-OS1.2] Applies to assemblies required to provide fire resistance.
	[F80-OS2.1] [F80-OS2.3] Applies to elements that support or are part of an environmental separator or are exposed to moisture.
	[F80-OS3.1] Applies to floors and elements that support floors. [F80-OS3.7] Applies to walls, and elements that support walls, that contain doors or windows required for emergency egress.
9.20.17.1.	**Thickness of Flat Insulating Concrete Form Walls**
(1)	[F20-OP2.1] [F22-OP2.4] [F20, F22-OP2.3] Applies to elements that support or are part of an environmental separator.
	[F20, F22-OH1.1, OH1.2, OH1.3] Applies to elements that support or are part of an environmental separator.
	[F20, F22-OH4] Applies to floors and elements that support floors.
	[F20-OS2.1] [F22-OS2.4] [F20, F22-OS2.3] Applies to elements that support or are part of an environmental separator.
	[F20, F22-OS3.1] Applies to floors and elements that support floors. [F20, F22-OS3.7] Applies to walls, and elements that support walls, that contain doors or windows required for emergency egress.
9.20.17.2.	**Reinforcement for Flat Insulating Concrete Form Walls**
(1)	[F20-OP2.1] [F22-OP2.4] [F20, F22-OP2.3] Applies to elements that support or are part of an environmental separator.
	[F20, F22-OH1.1, OH1.2, OH1.3] Applies to elements that support or are part of an environmental separator.
	[F20, F22-OH4] Applies to floors and elements that support floors.
	[F20-OS2.1] [F22-OS2.4] [F20, F22-OS2.3] Applies to elements that support or are part of an environmental separator.
	[F20, F22-OS3.1] Applies to floors and elements that support floors. [F20, F22-OS3.7] Applies to walls, and elements that support walls, that contain doors or windows required for emergency egress.

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(1) (Cont'd)	[F22, F80-OS3.7] Applies to walls, and elements that support walls, that contain doors or windows required for emergency egress.
(2)	[F20, F22-OH1.1, OH1.2, OH1.3]
	[F20-OP2.1, OP2.4] [F22-OP2.4] [F20, F22-OP2.3] Applies to elements that support or are part of an environmental separator.
	[F20-OS2.1, OS2.4] [F22-OS2.4] [F20, F22-OS2.3] Applies to elements that support or are part of an environmental separator.
	[F20, F22-OS1.2] Applies to assemblies required to provide fire resistance.
	[F22, F80-OS3.7] Applies to walls, and elements that support walls, that contain doors or windows required for emergency egress.
9.24.3.6.	**Attachment of Studs to Runners**
(1)	[F20, F22-OH1.1, OH1.2, OH1.3]
	[F20-OP2.1, OP2.4] [F22-OP2.4] [F20, F22-OP2.3] Applies to elements that support or are part of an environmental separator.
	[F20-OS2.1, OS2.4] [F22-OS2.4] [F20, F22-OS2.3] Applies to elements that support or are part of an environmental separator.
	[F20, F22-OS1.2] Applies to assemblies required to provide fire resistance.
	[F22, F80-OS3.7] Applies to walls, and elements that support walls, that contain doors or windows required for emergency egress.
(2)	[F21-OS1.2]
9.24.3.7.	**Openings for Fire Dampers**
(1)	[F20-OS1.2]
(2)	[F20-OS1.2]
(3)	[F03-OS1.2]
9.25.1.1.	**Scope and Application**
(1)	
(2)	[F51, F63-OH1.1, OH1.2] [F63-OS2.3]
(3)	
9.25.2.1.	**Required Insulation**
(1)	[F51, F63-OH1.1, OH1.2]
	[F63-OS2.3]
9.25.2.2.	**Insulation Materials**
(1)	[F51, F63, F80-OH1.1, OH1.2]
	[F63, F80-OS2.3]
(2)	
(3)	[F51, F63-OH1.1, OH1.2]
	[F63-OS2.3]
(4)	[F51, F63, F80-OH1.1, OH1.2]
	[F63, F80-OS2.3]
9.25.2.3.	**Installation of Thermal Insulation**
(1)	[F51, F63-OH1.1, OH1.2]
	[F63-OS2.3]
(2)	[F51, F63-OH1.1, OH1.2]
	[F63-OS2.3]
(3)	[F55-OH1.1, OH1.2]
	[F55-OS2.3]
(4)	[F51, F63, F80-OH1.1, OH1.2]
	[F63, F80-OS2.3]
(5)	[F21-OH1.1, OH1.2, OH1.3]
	[F21-OS2.2, OS2.3]
(6)	[F80-OH1.1, OH1.2]
	[F80-OS2.3]

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(7)	[F80-OH1.1, OH1.2]
	[F80-OS2.3]
(8)	
(9)	[F21-OH1.1, OH1.2]
	[F21-OS2.3]
9.25.2.4.	**Installation of Loose-Fill Insulation**
(1)	[F51, F63-OH1.1, OH1.2]
	[F63-OS2.3]
(2)	[F51-OH1.1, OH1.2, OH1.3]
	[F51-OS2.3]
(3)	
(4)	(a) [F21, F51-OH1.1, OH1.2]
	(a) [F21, F51-OS2.3]
	(c) [F81-OH1.1, OH1.2] (c) [F81-OH1.1, OH1.2, OH1.3] Applies where the interior finish provide the required bracing.
	(c) [F81-OH4] Applies where the interior finish provides the required bracing of walls that support floors.
	(c) [F81-OP2.1, OP2.3, OP2.4, OP2.5] Applies where the interior finish provides the required bracing.
	(c) [F81-OP3.1] Applies where the interior finish contributes to the required fire resistance of the wall.
	(c) [F81-OS2.1, OS2.3] (c) [F81-OS2.1, OS2.3, OS2.4, OS2.5] Applies where the interior finish provides the required bracing.
	(c) [F81-OS3.7] Applies where the interior finish provides the required bracing. (c) [F81-OS3.1] Applies where the interior finish provides the required bracing of walls that support floors.
	(d) [F80-OH1.1, OH1.2, OH1.3]
	(d) [F80-OS2.3]
(5)	[F51, F63-OH1.1, OH1.2]
	[F63-OS2.3]
(6)	(a) [F51, F62-OH1.1, OH1.2, OH1.3]
	(a) [F62, F51-OS2.3]
	(b) [F51, F63-OH1.1, OH1.2]
	(b) [F51, F63-OS2.3]
9.25.2.5.	**Installation of Spray-Applied Polyurethane**
(1)	[F41, F51, F63-OH1.1] [F51, F63-OH1.2]
	[F63-OS2.3]
9.25.3.1.	**Required Barrier to Air Leakage**
r11.1 (1), (2)	[F55-OH1.1, OH1.2, OH1.3]
	[F44-OS1.1] Applies where the *air barrier system* separates a garage, or *suite* containing a garage, from residential space.
	[F55-OS2.3]
	[F44-OS3.4] Applies where the *air barrier system* separates a garage, or *suite* containing a garage, from residential space.
9.25.3.2.	**Air Barrier System Properties**
(1)	[F20, F55-OH1.1, OH1.2, OH1.3]
	[F20, F44-OS1.1] Applies where the *air barrier system* separates a garage, or *suite* containing a garage, from residential space.
	[F55-OS2.3]
	[F20, F44-OS3.4] Applies where the *air barrier system* separates a garage, or *suite* containing a garage, from residential space.
(2)	[F20, F55-OH1.1, OH1.2, OH1.3]
	[F20, F44-OS1.1] Applies where the *air barrier system* separates a garage, or *suite* containing a garage, from residential space.
	[F55-OS2.3]
	[F20, F44-OS3.4] Applies where the *air barrier system* separates a garage, or *suite* containing a garage, from residential space.

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9.25.3.3.	**Continuity of the Air Barrier System**
(1)	[F55-OH1.1, OH1.2, OH1.3]
	[F44-OS1.1] Applies where the *air barrier system* separates a garage, or *suite* containing a garage, from residential space.
	[F55-OS2.3]
	[F44-OS3.4] Applies where the *air barrier system* separates a garage, or *suite* containing a garage, from residential space.
(2)	[F55-OH1.1, OH1.2, OH1.3] [F40-OH1.1]
	[F55-OS2.3]
	(a) [F44-OS1.1] Applies where the *air barrier system* separates a garage, or *suite* containing a garage, from residential space.
	(a) [F44-OS3.4] Applies where the *air barrier system* separates a garage, or *suite* containing a garage, from residential space.
(3)	[F55-OH1.1, OH1.2, OH1.3] [F40-OH1.1]
	[F55-OS2.3]
	(a) [F44-OS1.1] Applies where the *air barrier system* separates a garage, or *suite* containing a garage, from residential space.
	(a) [F44-OS3.4] Applies where the *air barrier system* separates a garage, or *suite* containing a garage, from residential space.
(4)	
(5)	
(6)	[F55-OH1.1, OH1.2, OH1.3][F40-OH1.1]
	[F44-OS1.1] Applies where the *air barrier system* separates a garage, or *suite* containing a garage, from residential space.
	[F55-OS2.3]
	[F44-OS3.4] Applies where the *air barrier system* separates a garage, or *suite* containing a garage, from residential space.
(7)	[F55-OH1.1, OH1.2, OH1.3] [F40-OH1.1]
	[F44-OS1.1] Applies where the *air barrier system* separates a garage, or *suite* containing a garage, from residential space.
	[F55-OS2.3]
	[F44-OS3.4] Applies where the *air barrier system* separates a garage, or *suite* containing a garage, from residential space.
(8)	[F55-OH1.1, OH1.2, OH1.3] [F40-OH1.1]
	[F44-OS1.1] Applies where the *air barrier system* separates a garage, or *suite* containing a garage, from residential space.
	[F55-OS2.3]
	[F44-OS3.4] Applies where the *air barrier system* separates a garage, or *suite* containing a garage, from residential space.
(9)	[F55-OH1.1, OH1.2, OH1.3] [F40-OH1.1]
	[F44-OS1.1] Applies where the *air barrier system* separates a garage, or *suite* containing a garage, from residential space.
	[F55-OS2.3]
	[F44-OS3.4] Applies where the *air barrier system* separates a garage, or *suite* containing a garage, from residential space.
(10)	[F55-OH1.1, OH1.2, OH1.3] [F40-OH1.1]
	[F44-OS1.1] Applies where the *air barrier system* separates a garage, or *suite* containing a garage, from residential space.
	[F55-OS2.3]
	[F44-OS3.4] Applies where the *air barrier system* separates a garage, or *suite* containing a garage, from residential space.

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(11)	[F55-OH1.1, OH1.2, OH1.3] [F40-OH1.1]
	[F44-OS1.1] Applies where the *air barrier system* separates a garage, or *suite* containing a garage, from residential space.
	[F55-OS2.3]
	[F44-OS3.4] Applies where the *air barrier system* separates a garage, or *suite* containing a garage, from residential space.
(12)	[F55-OH1.1, OH1.2, OH1.3] [F40-OH1.1]
	[F44-OS1.1] Applies where the *air barrier system* separates a garage, or *suite* containing a garage, from residential space.
	[F55-OS2.3]
	[F44-OS3.4] Applies where the *air barrier system* separates a garage, or *suite* containing a garage, from residential space.
(13)	[F55-OH1.1, OH1.2, OH1.3]
	[F55-OS2.3]
(14)	[F01-OS1.1]
(15)	[F55-OH1.1, OH1.2, OH1.3]
(16)	[F55-OH1.1, OH1.2, OH1.3] [F40-OH1.1]
	[F55-OS2.3]
9.25.3.4.	**Vapour Barriers Used as Air Barriers**
(1)	
9.25.4.1.	**Required Barrier to Vapour Diffusion**
(1)	[F63-OH1.1, OH1.2]
	[F63-OS2.3]
9.25.4.2.	**Vapour Barrier Materials**
(1)	[F63-OH1.1, OH1.2]
	[F63-OS2.3]
(2)	[F62, F63-OH1.1, OH1.2]
	[F62, F63-OS2.3]
(3)	[F63, F80-OH1.1, OH1.2]
	[F63, F80-OS2.3]
(4)	[F63, F80-OH1.1, OH1.2]
	[F63, F80-OS2.3]
(5)	[F63, OH1.1, OH1.2]
	[F63, OS2.3]
(6)	[F63-OH1.1, OH1.2]
	[F63-OS2.3]
9.25.4.3.	**Installation of Vapour Barriers**
(1)	[F63-OH1.1, OH1.2]
	[F63-OS2.3]
(2)	[F63-OH1.1, OH1.2]
	[F63-OS2.3]
(3)	[F63-OS2.3]
9.25.5.1.	**General**
(1)	
(2)	[F62, F63-OS2.3]
	[F62, F63-OH1.1, OH1.2]
(3)	
r11.1 (4)	
9.25.5.2.	**Position of Low Permeance Materials**
(1)	[F62, F63-OS2.3]
	[F62, F63-OH1.1, OH1.2]
(2)	

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r11.1	**9.26.1.1.**	**Purpose of Roofing**
	(1)	
r11.1	**9.26.1.1A.**	**Required Protection**
	(1)	[F61-OH1.1, OH1.2, OH1.3]
		[F61-OS2.3]
	(2)	
	9.26.1.2.	**Alternate Installation Methods**
	(1)	[F61-OH1.1, OH1.2, OH1.3]
		[F61-OS2.3]
	9.26.1.3.	**Solar Collector Systems**
	(1)	
r11.1	**9.26.2.1.**	**Material Standards**
	(1), (2)	[F61-OH1.1, OH1.2, OH1.3]
		[F61-OS2.3]
r11.1	**9.26.2.2.**	**Installation of Materials**
	(1)	[F61-OH1.1, OH1.2, OH1.3]
		[F61-OS2.3]
r11.1	**9.26.2.3.**	**Nails**
	(1)	[F20, F80-OH1.1, OH1.2, OH1.3]
		[F20, F80-OS2.3]
	(2), (3)	[F20-OH1.1, OH1.2, OH1.3]
		[F20-OS2.3]
	(4)	[F20, F80-OH1.1, OH1.2, OH1.3]
		[F20, F80-OS2.3]
r11.1	**9.26.2.4.**	**Staples**
	(1)	[F20, F80-OH1.1, OH1.2, OH1.3]
		[F20, F80-OS2.3]
	(2)	[F20-OH1.1, OH1.2, OH1.3]
		[F20-OS2.3]
	(3)	[F20, F80-OH1.1, OH1.2, OH1.3]
		[F20, F80-OS2.3]
	9.26.3.1.	**Slope**
	(1)	[F20, F61, F80-OH1.1, OH1.2, OH1.3]
		[F20-OS2.1, OS2.3] [F61, F80-OS2.3]
	(2)	[F20, F61, F80-OH1.1, OH1.2, OH1.3]
		[F20, F61, F80-OS2.3]
e6.1	(3), (4)	[F61, F80-OH1.1, OH1.2, OH1.3]
		[F61, F80-OS2.3]
	(5)	[F21-OH1.1, OH1.2, OH1.3]
		[F21-OS2.3]
r11.1	**9.26.4.1.**	**Required Flashing at Intersections**
	(1)	[F61-OH1.1, OH1.2, OH1.3]
		[F61-OS2.3]
	9.26.4.2.	**Materials**
	(1)	[F61, F62, F80-OH1.1, OH1.2, OH1.3]
		[F61, F62, F80-OS2.3]
	9.26.4.3.	**Valley Flashing**
	(1)	[F61-OH1.1, OH1.2, OH1.3]
		[F61-OS2.3]
	(2)	[F20, F22-OH1.1, OH1.2, OH1.3]
		[F20-OS2.1, OS2.3] [F22-OS2.3, OS2.4]

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(3)	[F61-OH1.1, OH1.2, OH1.3]
	[F61-OS2.3]
(4)	[F20, F61, F80-OH1.1, OH1.2, OH1.3]
	[F20, F61, F80-OS2.3]
(5)	[F20, F61, F80-OH1.1, OH1.2, OH1.3]
	[F20, F61, F80-OS2.3]
(6)	[F20, F61, F80-OH1.1, OH1.2, OH1.3]
	[F20, F61, F80-OS2.3]
(7)	[F20, F61, F80-OH1.1, OH1.2, OH1.3]
	[F20, F61, F80-OS2.3]
9.26.4.4.	**Intersection of Shingle Roofs and Masonry**
(1)	[F61-OH1.1, OH1.2, OH1.3]
	[F61-OP1.1] Applies where a shingle roof intersects with a masonry *chimney*.
	[F61-OS1.1] Applies where a shingle roof intersects with a masonry *chimney*.
	[F61-OS2.3]
	[F61-OS3.4] Applies where a shingle roof intersects with a masonry *chimney*.
(2)	[F61-OH1.1, OH1.2, OH1.3]
	[F61-OP1.1] Applies where counter flashing is installed between a shingle roof and a masonry *chimney*.
	[F61-OS1.1] Applies where counter flashing is installed between a shingle roof and a masonry *chimney*.
	[F61-OS2.3]
	[F61-OS3.4] Applies where counter flashing is installed between a shingle roof and a masonry *chimney*.
(3)	[F61-OH1.1, OH1.2, OH1.3]
	[F61-OP1.1] Applies where flashing is installed between a shingle roof and a masonry *chimney*.
	[F61-OS1.1] Applies where flashing is installed between a shingle roof and a masonry *chimney*.
	[F61-OS2.3]
	[F61-OS3.4] Applies where flashing is installed between a shingle roof and a masonry *chimney*.
(4)	[F61-OH1.1, OH1.2, OH1.3]
	[F61-OP1.1] Applies where a shingle roof slopes upward from a masonry *chimney*.
	[F61-OS1.1] Applies where a shingle roof slopes upward from a masonry *chimney*.
	[F61-OS2.3]
	[F61-OS3.4] Applies where a shingle roof slopes upward from a masonry *chimney*.
9.26.4.5.	**Intersection of Shingle Roofs and Walls Other Than Masonry**
(1)	[F61-OH1.1, OH1.2, OH1.3]
	[F61-OS2.3]
(2)	[F61-OH1.1, OH1.2, OH1.3]
	[F61-OS2.3]
(3)	[F61-OH1.1, OH1.2, OH1.3]
	[F61-OS2.3]
9.26.4.6.	**Intersection of Built-Up Roofs and Masonry**
(1)	[F61-OH1.1, OH1.2, OH1.3]
	[F61-OP1.1] Applies where a built-up roof intersects with a masonry *chimney*.
	[F61-OS1.1] Applies where a built-up roof intersects with a masonry *chimney*.
	[F61-OS2.3]
	[F61-OS3.4] Applies where a built-up roof intersects with a masonry *chimney*.
(2)	[F61-OH1.1, OH1.2, OH1.3]
	[F61-OP1.1] Applies where counter flashing is installed between a built-up roof and a masonry *chimney*.
	[F61-OS1.1] Applies where counter flashing is installed between a built-up roof and a masonry *chimney*.
	[F61-OS2.3]
	[F61-OS3.4] Applies where counter flashing is installed between a built-up roof and a masonry *chimney*.
9.26.4.7.	**Intersection of Built-Up Roofs and Walls Other Than Masonry**
(1)	[F61-OH1.1, OH1.2, OH1.3]
	[F61-OS2.3]

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(5)	[F61, F62-OH1.1, OH1.2, OH1.3]
	[F61, F62-OS2.3]
9.27.4.1.	**Required Sealants**
(1)	[F61-OH1.1, OH1.2, OH1.3]
	[F61-OS2.3]
(2)	[F61-OH1.1, OH1.2, OH1.3]
	[F61-OS2.3]
(3)	[F61-OH1.1, OH1.2, OH1.3]
	[F61-OS2.3]
9.27.4.2.	**Materials**
(1)	[F80-OH1.1, OH1.2, OH1.3]
	[F80-OS2.3]
(2)	[F80-OH1.1, OH1.2, OH1.3]
	[F80-OS2.3]
(3)	[F80-OH1.1, OH1.2, OH1.3]
	[F80-OS2.3]
r11.1 **9.27.5.1.**	**Attachment**
(1)	[F20-OH1.1, OH1.2, OH1.3] [F20, F22-OH1.1, OH1.2, OH1.3] Applies where panel-type cladding is installed to provide the required bracing.
	[F20-OP2.1, OP2.3, OP2.4] [F22-OP2.3, OP2.4, OP2.5] Applies where panel-type cladding is installed to provide the required bracing.
	[F20-OS2.1, OS2.3] [F20-OS2.1, OS2.3, OS2.4] [F22-OS2.3, OS2.4, OS2.5] Applies where panel-type cladding is installed to provide the required bracing.
	[F20, F22-OH4] Applies where panel-type cladding is installed to provide the required bracing of walls that support floors.
	[F20, F22-OS3.1] Applies where panel-type cladding is installed to provide the required bracing of walls that support floors. [F20, F22-OS3.7] Applies where panel-type cladding is installed to provide bracing of walls that contain doors or windows required for emergency egress.
(2)	[F20-OH1.1, OH1.2, OH1.3]
	[F20-OS2.1, OS2.3]
(3)	[F20-OH1.1, OH1.2, OH1.3]
	[F20-OS2.3]
(4)	[F20-OH1.1, OH1.2, OH1.3]
	[F20-OS2.1, OS2.3]
9.27.5.2.	**Blocking**
(1)	[F20-OH1.1, OH1.2, OH1.3] [F20, F22-OH1.1, OH1.2, OH1.3] Applies where panel-type cladding is installed to provide the required bracing.
	[F20-OP2.1, OP2.3, OP2.4][F22-OP2.3, OP2.4, OP2.5] Applies where panel-type cladding is installed to provide the required bracing.
	[F20-OS2.1, OS2.3] [F20-OS2.1, OS2.3, OS2.4] [F22-OS2.3, OS2.4, OS2.5] Applies where panel-type cladding is installed to provide the required bracing.

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	Acceptable Solution	Objectives and Functional Statements
	9.27.10.4.	**Clearance**
	(1)	[F21-OH1.1, OH1.2, OH1.3]
		[F21-OP2.1, OP2.3, OP2.4, OP2.5] Applies where panel-type cladding is installed to provide the required bracing.
		[F21-OS2.1, OS2.3]
		[F21-OS2.1, OS2.3, OS2.4, OS2.5] Applies where panel-type cladding is installed to provide the required bracing.
	9.27.11.1.	**Material Standards**
	(1)	[F20-OS2.1, OS2.3] [F22, F61-OS2.3]
		[F20, F22, F61, F62-OH1.1, OH1.2, OH1.3]
	(2)	[F20, F22, F61-OH1.1, OH1.2, OH1.3]
		[F20-OS2.1, OS2.3] [F22, F61-OS2.3]
		[F20-OS2.1, OS2.3, OS2.4] [F22-OS2.3, OS2.4, OS2.5] Applies where panel-type cladding is installed to provide the required bracing.
	(3)	[F20-OS2.1, OS2.3] [F22, F61-OS2.3]
		[F20, F22, F61-OH1.1, OH1.2, OH1.3]
	(4)	[F20, F22, F61-OH1.1, OH1.2, OH1.3]
		[F20-OS2.1, OS2.3] [F22, F61-OS2.3]
		[F20-OS2.1, OS2.3, OS2.4] [F22-OS2.3, OS2.4, OS2.5] Applies where panel-type cladding is installed to provide the required bracing.
	9.27.12.1.	**Material Standard**
	(1)	[F20, F61, F62-OH1.1, OH1.2, OH1.3]
		[F20, F61, F62-OS2.3]
	9.27.12.2.	**Attachment**
	(1)	
r3.1	**9.27.13.1.**	**Application**
r11.1	(1)	
	(2)	
r3.1	**9.27.13.2.**	**Materials**
	(1)	[F20, F61, F62-OH1.1, OH1.2, OH1.3]
		[F20, F61, F62-OH2.3]
	(2)	[F20, F22-OH1.1, OH1.2, OH1.3]
		[F20, F22-OS2.3]
r3.1	**9.27.13.3.**	**Design and Installation**
	(1)	[F20, F61, F62-OH1.1, OH1.2, OH1.3]
		[F20, F61, F62-OH2.3]
	(2)	[F20, F61, F62-OH1.1, OH1.2, OH1.3]
		[F20, F61, F62-OH2.3]
	9.28.1.1.	**Sheathing Beneath Stucco**
	(1)	[F20, F22-OH1.1, OH1.2, OH1.3]
		[F20, F22-OS2.3]
	(2)	
	9.28.1.2.	**Lath and Reinforcing**
	(1)	[F20-OH1.1, OH1.2, OH1.3]
		[F20-OS2.3]
	(2)	[F20-OH1.1, OH1.2, OH1.3]
		[F20-OS2.3]
	(3)	[F20, F21-OH1.1]
		[F20, F21-OP1.1]
		[F20, F21-OS1.1]
		[F20, F21-OS2.3]
		[F20, F21-OS3.4]

Acceptable Solution	Objectives and Functional Statements
9.28.1.3.	**Concrete Masonry Units**
(1)	[F80-OH1.1, OH1.2, OH1.3]
	[F80-OP1.1] Applies where stucco is applied to masonry *chimneys*.
	[F80-OS1.1] Applies where stucco is applied to masonry *chimneys*.
	[F80-OS2.3]
	[F80-OS3.4] Applies where stucco is applied to masonry *chimneys*.
9.28.1.4.	**Clearance over Ground Level**
(1)	[F80-OH1.1, OH1.2, OH1.3]
	[F80-OS2.3]
9.28.1.5.	**Flashing and Sealants**
(1)	[F80-OH1.1, OH1.2, OH1.3] Applies to the separation of aluminum flashing from stucco.
	[F80-OS2.3] Applies to the separation of aluminum flashing from stucco.
9.28.2.1.	**Portland Cement**
(1)	[F20-OH1.1, OH1.2, OH1.3]
	[F20-OP1.1] Applies where stucco is applied to masonry *chimneys*.
	[F20-OS1.1] Applies where stucco is applied to masonry *chimneys*.
	[F20-OS2.3]
	[F20-OS3.4] Applies where stucco is applied to masonry *chimneys*.
9.28.2.2.	**Aggregate**
(1)	[F80-OH1.1, OH1.2, OH1.3]
	[F80-OP1.1] Applies where stucco is applied to masonry *chimneys*.
	[F80-OS1.1] Applies where stucco is applied to masonry *chimneys*.
	[F80-OS2.3]
	[F80-OS3.4] Applies where stucco is applied to masonry *chimneys*.
(2)	[F20, F80-OH1.1, OH1.2, OH1.3]
	[F20, F80-OP1.1] Applies where stucco is applied to masonry *chimneys*.
	[F20, F80-OS1.1] Applies where stucco is applied to masonry *chimneys*.
	[F20, F80-OS2.3]
	[F20, F80-OS3.4] Applies where stucco is applied to masonry *chimneys*.
9.28.2.3.	**Water**
(1)	[F80-OH1.1, OH1.2, OH1.3]
	[F80-OP1.1] Applies where stucco is applied to masonry *chimneys*.
	[F80-OS1.1] Applies where stucco is applied to masonry *chimneys*.
	[F80-OS2.3]
	[F80-OS3.4] Applies where stucco is applied to masonry *chimneys*.
9.28.3.1.	**Materials**
(1)	[F80-OH1.1, OH1.2, OH1.3]
	[F80-OP1.1] Applies where stucco is applied to masonry *chimneys*.
	[F80-OS1.1] Applies where stucco is applied to masonry *chimneys*.
	[F80-OS2.3]
	[F80-OS3.4] Applies where stucco is applied to masonry *chimneys*.
9.28.3.2.	**Nails and Staples**
(1)	[F20-OH1.1, OH1.2, OH1.3]
	[F20-OP1.1] Applies where stucco is applied to masonry *chimneys*.
	[F20-OS1.1] Applies where stucco is applied to masonry *chimneys*.
	[F20-OS2.3]
	[F20-OS3.4] Applies where stucco is applied to masonry *chimneys*.
(2)	[F20-OH1.1, OH1.2, OH1.3]
	[F20-OS2.3]

Acceptable Solution	Objectives and Functional Statements
9.31.4.4.	**Floor Drains**
(1)	[F40, F41, F62-OH1.2, OH1.3] [F62-OH1.1]
9.31.6.1.	**Hot Water Temperature**
(1)	[F31-OS2.3] Applies to hot water supply equipment.
	[F41-OH2.2] Applies to hot water supply equipment.
(2)	[F41-OH2.2]
9.31.6.2.	**Equipment and Installation**
(1)	
(2)	
(3)	[F01-OS1.1]
	[F23-OS3.4]
9.31.6.3.	**Corrosion-Resistant Coating**
(1)	[F80, F81-OH2.3]
9.31.6.4.	**Fuel-Burning Heaters**
(1)	[F01-OS1.1]
	[F44-OH1.1]
9.31.6.5.	**Heating Coils**
(1)	[F31-OS2.3]
	[F71-OH2.3]
9.32.1.1.	**Application**
(1)	
(2)	
(3)	
(4)	
(5)	
9.32.1.2.	**Mechanical Ventilation for Dwelling Units**
(1)	[F40, F50, F52-OH1.1] [F51, F52-OH1.2]
9.32.1.3.	**Ventilation of Rooms and Spaces**
(1)	[F40, F50, F52-OH1.1] [F51, F52-OH1.2]
(2)	
(3)	[F40, F50, F52-OH1.1] [F51, F52-OH1.2]
r11.1 **9.32.1.4.**	**Venting of Laundry-Drying Equipment**
(1)	[F40, F44, F50, F52-OH1.2]
	[F01-OS1.1]
	[F01-OP1.1]
(2)	[F40, F80-OH1.1]
	[F81-OS1.1]
	[F63, F80-OS2.3]
	[F81-OP1.1]
(3)	[F40, F44, F50, F52-OH1.2]
	[F01-OS1.1]
	[F01-OP1.1]
9.32.2.1.	**Natural Ventilation Area**
(1)	[F40, F50, F52-OH1.1] [F51, F52-OH1.2]
(2)	
9.32.2.2.	**Protection from Weather and Insects**
(1)	[F42, F61 -OH1.1]
	[F42, F61-OS2.3] [F42-OH2.5]
(2)	[F42, F80-OH1.1, OH1.2]
	[F80-OH2.5]
9.32.3.1.	**General**
(1), (2)	

Acceptable Solution	Objectives and Functional Statements
9.32.3.2.	**Required Mechanical Ventilation**
(1)	
9.32.3.3.	**Total Ventilation Capacity**
(1)	[F40, F50, F52-OH1.1] [F51, F52-OH1.2]
9.32.3.4.	**Principal Exhaust**
(1)	[F40, F50, F52-OH1.1] [F51, F52-OH1.2]
(2)	[F81-OH1.1]
(3)	[F81-OH1.1]
(4)	[F81-OH1.1]
(5)	
(6)	[F131-OR2]
(7)	[F40, F50, F52-OH1.1]
(8)	[F40-OH1.1]
(9)	[F40, F50, F52, F53-OH1.1]
	[F53-OS3.4]
(10)	
9.32.3.5.	**Supplemental Exhaust**
(1)	[F40, F50, F52, F53-OH1.1]
	[F53-OS3.4]
(2)	[F40, F50, F52-OH1.1] [F52-OH1.2]
(3)	[F40-OH1.1]
(4)	[F40, F50, F52, F53-OH1.1]
	[F53-OS3.4]
(5)	[F40-OH1.1]
(6)	[F40-OH1.1]
(7)	[F40-OH1.1]
(8)	[F40-OH1.1]
(9)	
9.32.3.6.	**Ventilation Systems Coupled with Forced Air Heating Systems**
(1)	
(2)	
(3)	[F53, F81-OH1.1]
	[F43, F50, F53, F81-OS3.4]
(4)	[F53, F63-OH1.1]
	[F53, F63-OS2.3]
	[F50, F53-OS3.4]
(5)	[F81-OH1.1]
9.32.3.7.	**Ventilation Systems Not Coupled with Forced Air Heating Systems**
(1)	
(2)	[F40, F50, F52-OH1.1]
(3)	[F53, F81-OH1.1]
	[F43, F50, F53, F81-OS3.4]
(4)	[F40, F50, F52-OH1.1]
(5)	[F40, F50, F52, F53-OH1.1]
	[F53-OS3.4]
(6)	
(7)	[F40, F50, F52, F53-OH1.1]
(8)	
(9)	[F40, F50, F52, F53-OH1.1]
	[F53-OS3.4]
(10)	[F40, F50, F52-OH1.1]

Acceptable Solution	Objectives and Functional Statements
9.32.3.8.	**Protection Against Depressurization**
(1)	
(2)	[F53, F81-OH1.1]
	[F43, F50, F53, F81-OS3.4]
(3)	
9.32.3.9.	**Fan Ratings**
(1)	[F40, F50, F52, F53-OH1.1] [F51, F52-OH1.2]
	[F53, F63-OS2.3]
(2)	[F81-OH1.1, OH1.2]
(3)	[F53-OH1.1, OH1.2]
	[F53-OS3.4]
(4)	[F81-OH1.1, OH1.2]
(5)	[F40, F50, F52, F53-OH1.1] [F51, F52-OH1.2]
	[F53, F63-OS2.3]
(6)	[F40, F50, F52, F53-OH1.1] [F51, F52-OH1.2]
	[F81-OS3.4]
9.32.3.10.	**Ducts**
(1)	[F81-OH1.1]
(2)	[F40, F52, F63-OH1.1]
	[F52, F63-OS2.3]
(3)	[F63-OH1.1]
	[F63, F80-OS2.3]
	[F131-OR2]
r3 (4)	[F63-OH1.1] [F131-OR2]
	[F63,F80-OS2.3]
(5)	[F82-OH1.1]
	[F82-OP1.1]
	[F82-OS1.1]
(6)	[F02, F03, F80-OS1.1]
(7)	[F02, F03, F82-OS1.1]
(8)	[F40, F41-OH1.1]
	[F40, F63-OS2.3]
(9)	[F40, F41-OH1.1]
	[F40, F63-OS2.3]
(10)	[F40, F50, F52, F53-OH1.1]
	[F53-OS3.4]
9.32.3.11.	**Heat Recovery Ventilators**
(1)	
(2)	[F131-OR2]
(3)	[F51, F81-OH1.2]
(4)	[F40, F50, F52-OH1.1]
(5)	[F40, F50, F52-OH1.1]
(6)	[F81-OH1.1]
(7)	[F53-OH1.1, OH1.2]
	[F53, F63-OS2.3]
	[F43, F53-OS3.4]
(8)	[F62-OH1.1]
(9)	[F81-OH1.1]
(10)	[F53-OH1.1, OH1.2]
	[F53, F63-OS2.3]
	[F43, F53-OS3.4]

Acceptable Solution	Objectives and Functional Statements
9.32.3.12.	**Outdoor Intake and Exhaust Openings**
(1)	[F40, F50, F52-OH1.1]
	[F40, F44, F50-OS3.4]
(2)	[F40, F50, F52-OH1.1]
	[F40, F44, F50-OS3.4]
(3)	[F40, F50, F52, F53-OH1.1]
	[F43, F53-OS3.4]
(4)	[F40, F50, F52-OH1.1]
	[F40, F50, F44-OS3.4]
(5)	[F40, F50, F52-OH1.1]
	[F40, F44, F50, F53-OS3.4]
(6)	[F40, F53-OH1.1]
(7)	[F61-OH1.1]
	[F61-OS2.3]
(8)	[F42-OH1.1]
	[F42-OH2.5]
	[F01, F42-OS1.1]
(9)	[F42, F63-OH1.1]
	[F01, F42-OS1.1]
(10)	[F42-OH1.1]
(11)	[F53, F82-OH1.1]
	[F43, F53, F82-OS3.4]
(12)	[F53, F81-OH1.1]
	[F43, F53-OS3.4]
(13)	[F42, F80-OH2.5]
	[F01, F42, F80-OS1.1]
(14)	[F53, F81-OH1.1]
	[F43, F53-OS3.4]
9.32.3.13.	**Installation**
(1)	[F81-OH1.1]
	[F81-OS3.4]
(2)	[F40, F43, F50, F53-OH1.1]
	[F43, F53, F82-OS3.4]
(3)	[F82-OH1.1]
(4)	[F63, F81-OH1.1]
9.33.1.1.	**Design and Installation Requirements**
e2 (1) to (3)	
9.33.1.2.	**Solid Fuel-Burning Appliances**
(1)	[F43-OP1.1]
	[F43-OS1.1]
	[F43-OS3.4]
9.33.1.3.	**Structural Movement**
(1)	[F20-OS1.1]
	[F20-OS3.3, OS3.4]
9.33.2.1.	**Residential Heating Systems**
(1)	[F51, F52-OH1.2] [F63-OH1.1]
	[F63-OS2.3]
r3 (2)	[F110-OE]
9.33.2.2.	**Equipment Sizing**
(1)	[F131, F132, F133, F150-OR1.2]
(2)	[F131, F132, F133, F150-OR1.2]
(3)	[F131, F132, F133, F150-OR1.2]

	Acceptable Solution	Objectives and Functional Statements
	9.33.3.1.	**Indoor Design Temperatures**
	(1)	(a), (b), (c) [F51-OH1.2]
	9.33.3.2.	**Outdoor Design Temperatures**
	(1)	
	9.33.4.1.	**Application**
	(1)	
	9.33.4.2.	**Location of Carbon Monoxide Alarms**
	(1)	[F44-OS3.4]
	(2)	[F44-OS3.4]
	(3)	[F44-OS3.4]
	(4)	[F44-OS3.4]
	(5)	[F44-OS3.4]
	9.33.4.3.	**Installation and Conformance to Standards**
	(1)	[F44-OS3.4]
		(a), (d) [F81-OS3.4]
	(2)	
	9.34.1.1.	**Reserved**
	9.34.1.2.	**Required Facilities**
	(1)	
	9.34.1.3.	**Location of Equipment in Public Areas**
	(1)	[F10-OS3.1] [F32, F81-OS3.3]
	9.34.1.4.	**Recessed Lighting Fixtures**
	(1)	[F01-OS1.1]
	9.34.1.5.	**Wiring and Cables**
	(1)	[F02-OS1.2]
		[F02-OP1.2]
	(2)	
	9.34.2.1.	**Lighting of Entrances**
	(1)	[F30-OS3.1]
		[F34-OS4.2]
	(2)	
r6	**9.34.2.2.**	**Lighting Outlets in Houses and Dwelling Units**
e4.1	(1), (2)	[F30-OS3.1]
	9.34.2.3.	**Stairways**
e5	(1), (2)	[F30-OS3.1]
	(3)	
	9.34.2.4.	**Basements**
	(1)	[F30-OS3.1]
	(2)	[F30-OS3.1]
	9.34.2.5.	**Storage Rooms**
	(1)	[F30-OS3.1]
	9.34.2.6.	**Garages and Carports**
e4.1	(1) to (3)	[F30-OS3.1]
	(4)	
	9.34.2.7.	**Public and Service Areas**
e4.1	(1) to (3)	[F30-OS3.1]
	9.34.3.1.	**Emergency Lighting**
	(1)	
r11	**9.34.4.1.**	**Revoked**
	9.35.1.1.	**Application**
	(1)	
	9.35.1.2.	**Construction Requirements**
	(1)	

Acceptable Solution	Objectives and Functional Statements
9.35.2.1.	**Carport Considered to be Garage**
(1)	
9.35.2.2.	**Garage Floor**
(1)	[F40-OS1.1]
9.35.3.1.	**Foundation Required**
(1)	
r11.1 (2)	
9.35.3.2.	**Protection from Damage due to Soil Movement**
e6.1 (1), (2)	[F21-OH1.1, OH1.2, OH1.3]
	[F21-OH4] Applies to floors and elements that support floors.
	[F21-OP2.3, OP2.4]
	[F21-OS2.3]
	[F21-OS3.1] Applies to floors and elements that support floors.
(3)	
9.35.3.3.	**Small Garages**
(1)	
9.35.3.4.	**Column Piers**
(1)	[F80-OP2.3]
	[F80-OS2.3]
(2)	[F20-OP2.1, OP2.2]
	[F20-OS2.1, OS2.2]
9.35.4.1.	**Interior Finish**
(1)	
9.35.4.2.	**Columns**
(1)	[F20-OP2.1]
	[F20-OS2.1]
9.35.4.3.	**Anchorage**
(1)	[F22-OP2.4, OP2.5]
	[F22-OS2.4, OS2.5]
9.36.1.1.	**Application**
(1)	
(2)	
9.36.2.1.	**Exclusions**
(1)	
(2)	[F42-OH2.5]
	[F20-OP2.1]
	[F20-OS2.1] [F30-OS3.1]
(3)	
(4)	
(5)	
9.36.2.2.	**Foundations**
(1)	
(2)	[F20-OP2.1]
	[F20-OS2.1]
(3)	
9.36.2.3.	**Waterproofing and Dampproofing**
(1)	
9.36.2.4.	**Smoke Alarms**
(1)	
9.36.3.1.	**Buildings for Seasonal Tourist Accommodation or for Rent**
(1)	

MMAH Supplementary Standard SB-1

Climatic and Seismic Data

January 15, 2019 update

Effective Date: January 1, 2020

Issued July 26, 2019

COMMENCEMENT

MMAH Supplementary Standard SB-1 comes into force on the 1st day of January, 2014.

r5 SB-1 as amended by Ontario Regulation 191/14 comes into force on the 1st day of January, 2015.
r11.1 SB-1 as amended by Ontario Regulation 88/19 comes into force on the 1st day of January, 2020.

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r11.1 SB-1 Climatic and Seismic Data

Introduction

The great diversity of climate in Ontario has a considerable effect on the performance of buildings; consequently, building design must reflect this diversity. This Supplementary Standard briefly describes how climatic design values are computed and provides recommended design data for a number of cities, towns, and lesser populated locations. Through the use of such data, appropriate allowances can be made for climate variations in different localities of Ontario and the Building Code can be applied provincially.

The climatic design data provided in Table 2 are based on weather observations collected by the Atmospheric Environment Service, Environment Canada. The climatic design data were researched and analyzed for the Canadian Commission on Building and Fire Codes by Environment Canada .

As it is not practical to list values for all municipalities in Ontario, recommended climatic design values for locations not listed can be obtained by contacting the Atmospheric Environment Service, Environment Canada, 4905 Dufferin Street, Downsview, Ontario M3H 5T4, (416) 739-4365. It should be noted, however, that these recommended values may differ from the values accepted by municipal building authorities based on local experience.

The seismic design data in Table 3 has been provided by the Geological Survey of Canada of Natural Resources Canada. Information for municipalities not listed may be obtained at www.earthquakescanada.nrcan.gc.ca, or by writing to the Geological Survey of Canada at 7 Observatory Crescent, Ottawa, Ontario KIA OY3, or at P.O. Box 6000, Sidney, B.C. V8L 4B2.

General

The choice of climatic elements tabulated in this Supplementary Standard and the form in which they are expressed have been dictated largely by the requirements for specific values in several sections of the Building Code. These elements include the Ground Snow Loads, Wind Pressures, Design Temperatures, Heating Degree-Days, One-Day and 15-Minute Rainfalls, the Annual Total Precipitation values. The following notes briefly explain the significance of these particular elements in building design, and indicate which weather observations were used and how they were analyzed to yield the required design values.

Climatic design data in Table 2 provides weather information for over 230 locations which have been chosen based on a variety of reasons. Many incorporated cities and towns with significant populations are included unless located close to larger cities. For sparsely populated areas, many smaller towns and villages are listed. Other locations have been added to the list when the demand for climatic design recommendations at these sites has been significant. The named locations refer to the specific latitude and longitude defined by the Gazetteer of Canada (Natural Resources Canada), available from Publishing and Depository Services Canada, Public Works and Government Services Canada, Ottawa, Ontario KIA OS5.

Almost all of the weather observations used in preparing Table 2 were, of necessity, observed at inhabited locations. To estimate design values for arbitrary locations, the observed or computed values for the weather stations were mapped and interpolated appropriately. Where possible, adjustments have been applied for the influence of elevation and known topographical effects. Such influences include the tendency of cold air to collect in depressions, for precipitation to increase with elevation, and for generally stronger winds near large bodies of water. Elevations have been added to the Table because of their potential to significantly influence climatic design values. The elevations are given in metres and refer to heights above sea level.

Since interpolation from the values in Table 2 to other locations may not be valid due to local and other effects, Environment Canada will provide climatic design element recommendations for locations not listed in Table 2. Local effects are particularly significant in mountainous areas, where the values apply only to populated valleys and not to the mountain slopes and high passes, where very different conditions are known to exist.

Changing and Variable Climates

Climate is not static. At any location, weather and climatic conditions vary from season to season, year to year, and over longer time periods (climate cycles). This has always been the case. Evidence is mounting that the climates of Ontario are changing and will continue to change significantly in the future. When estimating climatic design loads, this variability can be considered using appropriate statistical analysis, data records spanning sufficient periods, and meteorological judgement. The analysis generally assumes that the past climate will be representative of the future climate.

Past and ongoing modifications to atmospheric chemistry (from greenhouse gas emissions and land use changes) are expected to alter most climatic regimes in the future despite the success of the most ambitious greenhouse gas mitigation plans.(1) Some regions could see an increase in the frequency and intensity of many weather extremes, which will accelerate weathering processes. Consequently, many buildings will need to be designed, maintained and operated to adequately withstand ever changing climatic loads.

Similar to global trends, the last decade in Canada was noted as the warmest in instrumented record. Canada has warmed, on average, at almost twice the rate of the global average increase, while the western Arctic is warming at a rate that is unprecedented over the past 400 years.(1) Mounting evidence from Arctic communities indicates that rapid changes to climate in the North have resulted in melting permafrost and impacts from other climate changes have affected nearly every type of built structure. Furthermore, analyses of Canadian precipitation data shows that many regions of the country have, on average, also been tending towards wetter conditions.(1) In the United States, where the density of climate monitoring stations is greater, a number of studies have found an unambiguous upward trend in the frequency of heavy to extreme precipitation events, with these increases coincident with a general upward trend in the total amount of precipitation. Climate change model results, based on an ensemble of global climate models worldwide, project that future climate warming rates will be greatest in higher latitude countries such as Canada.(2)

January Design Temperatures

A building and its heating system should be designed to maintain the inside temperature at some pre-determined level. To achieve this, it is necessary to know the most severe weather conditions under which the system will be expected to function satisfactorily. Failure to maintain the inside temperature at the pre-determined level will not usually be serious if the temperature drop is not great and if the duration is not long. The outside conditions used for design should, therefore, not be the most severe in many years, but should be the somewhat less severe conditions that are occasionally but not greatly exceeded.

The January design temperatures are based on an analysis of January air temperatures only. Wind and solar radiation also affect the inside temperature of most buildings and may need to be considered for energy-efficient design.

The January design temperature is defined as the lowest temperature at or below which only a certain small percentage of the hourly outside air temperatures in January occur. In the past, stations with records from all or part of the period 1951-1966 formed the basis for calculation of the 2.5 and 1% January temperatures. Where necessary, the data were adjusted for consistency. Since most of the temperatures were observed at airports, design values for the core areas of large cities could be 1° or 2°C milder, although the values for the fringe areas are probably about the same as for the airports. No adjustments were made for this urban heat island effect. The design values for the next 20 to 30 years will probably differ from these tabulated values due to year-to-year climate variability and global climate change resulting from the impact of human on atmospheric chemistry.

The design temperatures were reviewed and updated using hourly temperature observations from stations for a 25-year period up to 2006 with at least 8 years of complete data. These data are consistent with data shown for Canadian locations in the 2009 Handbook of Fundamentals(3) published by the American Society of Heating, Refrigerating, and Air-Conditioning Engineers (ASHRAE). The most recent 25 years of record were used to provide a balance between accounting for trends in the climate and the sampling variation owing to year-to-year variation. The 1% and 2.5% values used for the design conditions represent percentiles of the cumulative frequency distribution of hourly temperatures and correspond to January temperatures that are colder for 8 and 19 hours, respectively, on average over the long term.

The 2.5% January design temperature is the value ordinarily used in the design of heating systems. In special cases, when the control of inside temperature is more critical, the 1% value may be used. Other temperature-dependent climatic design parameters may be considered for future issues of this document.

July Design Temperatures

A building and its cooling and dehumidifying system should be designed to maintain the inside temperature and humidity at certain pre-determined levels. To achieve this, it is necessary to know the most severe weather conditions under which the system is expected to function satisfactorily. Failure to maintain the inside temperature and humidity at the pre-determined levels will usually not be serious if the increases in temperature and humidity are not great and the duration is not long. The outside conditions used for design should, therefore, not be the most severe in many years, but should be the somewhat less severe conditions that are occasionally but not greatly exceeded.

The summer design temperatures in this Supplementary Standard are based on an analysis of July air temperatures and humidities. Wind and solar radiation also affect the inside temperature of most buildings and may, in some cases, be more important than the outside air temperature. More complete summer and winter design information can be obtained from Environment Canada.

The July design dry-bulb and wet-bulb temperatures were reviewed and updated using hourly temperature observations from stations for a 25-year period up to 2006. These data are consistent with data shown for Canadian locations in the 2009 Handbook of Fundamentals[3] published by ASHRAE. As with January design temperatures, data from the most recent 25-year period were analyzed to reflect any recent climatic changes or variations. The 2.5% values used for the dry- and wet-bulb design conditions represent percentiles of the cumulative frequency distribution of hourly dry- and wet-bulb temperatures and correspond to July temperatures that are higher for 19 hours on average over the long term.

Heating Degree-Days

The rate of consumption of fuel or energy required to keep the interior of a small building at 21°C when the outside air temperature is below 18°C is roughly proportional to the difference between 18°C and the outside temperature. Wind speed, solar radiation, the extent to which the building is exposed to these elements and the internal heat sources also affect the heat required and may have to be considered for energy-efficient design. For average conditions of wind, radiation, exposure, and internal sources, however, the proportionality with the temperature difference generally still holds.

Since the fuel required is also proportional to the duration of the cold weather, a convenient method of combining these elements of temperature and time is to add the differences between 18°C and the mean temperature for every day in the year when the mean temperature is below 18°C. It is assumed that no heat is required when the mean outside air temperature for the day is 18°C or higher.

Although more sophisticated computer simulations using other forms of weather data have now almost completely replaced degree-day-based calculation methods for estimating annual heating energy consumption, degree-days remain a useful indicator of relative severity of climate and can form the basis for certain climate-related code requirements.

The degree-days below 18°C were compiled for stations for the 25-year period ending in 2006. This analysis period is consistent with the one used to derive the design temperatures described above and with the approach used by ASHRAE.[3]

A difference of only one Celsius degree in the mean annual temperature will cause a difference of 250 to 350 in the Celsius degree-days. Since differences of 0.5 of a Celsius degree in the mean annual temperature are quite likely to occur between two stations in the same town, heating degree-days cannot be relied on to an accuracy of less than about 100 degree-days.

Heating degree-day values for the core areas of larger cities can be 200 to 400 degree-days less (warmer) than for the surrounding fringe areas. The observed degree-days, which are based on daily temperature observations, are often most representative of rural settings or the fringe areas of cities.

Climatic Data for Energy Consumption Calculations

The climatic elements tabulated in this Supplementary Standard represent commonly used design values but do not include detailed climatic profiles, such as hourly weather data. Where hourly values of weather data are needed for the purpose of simulating the annual energy consumption of a building, they can be obtained from multiple sources, such as Environment Canada, Natural Resources Canada, the Regional Conservation Authority and other such public agencies that record this information. Hourly weather data are also available from public and private agencies that format this information for use with annual energy consumption simulation software; in some cases, these data have been incorporated into the software.

Snow Loads

The roof of a building should be able to support the greatest weight of snow that is likely to accumulate on it in many years. Some observations of snow on roofs have been made in Canada, but not enough to form the basis for estimating roof snow loads throughout the country. Similarly, observations of the weight, or water equivalent, of the snow on the ground have not been available in digital form in the past. The observations of roof loads and water equivalents are very useful, as noted below, but the measured depth of snow on the ground is used to provide the basic information for a consistent set of snow loads.

The estimation of the design snow load on a roof from snow depth observations involves the following steps:

1. The depth of snow on the ground, which has an annual probability of exceedance of 1-in-50, is computed.
2. The appropriate unit weight is selected and used to convert snow depth to loads, S_s.
3. The load, S_r, which is due to rain falling on the snow, is computed.
4. Because the accumulation of snow on roofs is often different from that on the ground, adjustments are applied to the ground snow load to provide a design snow load on a roof.

The annual maximum depth of snow on the ground has been assembled from stations for which data has been recorded by the Atmospheric Environment Service (AES). The period of record used varied from station to station, ranging from 7 to 38 years. These data were analyzed using a Gumbel extreme value distribution fitted using the method of moments[4] as reported by Newark et al.[5] The resulting values are the snow depths, which have a probability of 1-in-50 of being exceeded in any one year.

The specific weight of old snow generally ranges from 2 to 5 kN/m^3, and it is usually assumed in Canada that 1 kN/m^3 is the average for new snow. Average unit weights of the seasonal snow pack have been derived for different regions across the country[6] and an appropriate value has been assigned to each weather station. Typically, the values average 2.01 kN/m^3 east of the continental divide (except for 2.94 kN/m^3 north of the treeline), and range from 2.55 to 4.21 kN/m^3 west of the divide. The product of the 1-in-50 snow depth and the average unit weight of the seasonal snow pack at a station is converted to the snow load (SL) in units of kilopascals (kPa).

Except for the mountainous areas of western Canada, the values of the ground snow load at AES stations were normalized assuming a linear variation of the load above sea level in order to account for the effects of topography. They were then smoothed using an uncertainty-weighted moving-area average in order to minimize the uncertainty due to snow depth sampling errors and site-specific variations. Interpolation from analyzed maps of the normalized values yielded a value for each location in Table 2, which could then be converted to the listed code values (S_s) by means of an equation in the form:

$$S_s = \text{smooth normalized SL} + bZ$$

where b is the assumed rate of change of SL with elevation at the location and Z is the location's elevation above mean sea level (MSL). Although they are listed in Table 2 to the nearest tenth of a kilopascal, values of S_s typically have an uncertainty of about 20%. Areas of sparse data in northern Canada were an exception to this procedure. In these regions, an analysis was made of the basic SL values. The effects of topography, variations due to local climates, and smoothing were all subjectively assessed. The values derived in this fashion were used to modify those derived objectively.

Tabulated values cannot be expected to indicate all the local differences in S_s. For this reason, especially in complex terrain areas, values should not be interpolated from Table 2 for unlisted locations. The values of S_s in Table 2 apply for the elevation and the latitude and longitude of the location, as defined by the Gazetteer of Canada. Values at other locations can be obtained from Environment Canada.

The heaviest loads frequently occur when the snow is wetted by rain, thus the rain load, S_r, was estimated to the nearest 0.1 kPa and is provided in Table 2. When values of S_r, are added to S_s, this provides a 1-in-50-year estimate of the combined ground snow and rain load. The values of S_r are based on an analysis from weather station values of the 1-in-50-year one-day maximum rain amount. This return period is appropriate because the rain amounts correspond approximately to the joint frequency of occurrence of the one-day rain on maximum snow packs. For the purpose of estimating rain on snow, the individual observed one-day rain amounts were constrained to be less than or equal to the snow pack water equivalent, which was estimated by a snow pack accumulation model reported by Bruce and Clark.[7]

The results from surveys of snow loads on roofs indicate that average roof loads are generally less than loads on the ground. The conditions under which the design snow load on the roof may be taken as a percentage of the ground snow load are given in Subsection 4.1.6. of Division B of the Building Code. The Code also permits further decreases in design snow loads for steeply sloping roofs, but requires substantial increases for roofs where snow accumulation may be more rapid due to such factors as drifting. Recommended adjustments are given in the User's Guide - NBC 2015, Structural Commentaries (Part 4 of Division B).

The ground snow values, S_s, were updated for this edition of the Building Code using a similar approach to the one used for the ground snow load update in the 1990 edition. The Gumbel extreme value distribution was fitted to the annual maxima of daily snow depth observations made at weather stations, which were compiled from 1990 onward – to as recently as 2012 for some stations – to calculate the 50-year return period snow depth. The 50-year ground snow load was then calculated for each weather station by combining the 50-year snow pack with the assigned snow pack density. The S_s values for each location in Table 2 were compared with the updated weather station values and revised accordingly. As a result, S_s values remain unchanged for about 89% of the locations, have increased for 5.7% of the locations, and have decreased for 5.3% of the locations.

Annual Total Precipitation

Total precipitation is the sum in millimetres of the measured depth of rainwater and the estimated or measured water equivalent of the snow (typically estimated as 0.1 of the measured depth of snow, since the average density of fresh snow is about 0.1 that of water).

The average annual total precipitation amounts in Table 2 have been interpolated from an analysis of precipitation observations from stations for the 30-year period from 1961 to 1990.

Annual Rainfall

The total amount of rain that normally falls in one year is frequently used as a general indication of the wetness of a climate, and is therefore included in this Supplementary Standard.

Rainfall Intensity

Roof drainage systems are designed to carry off rainwater from the most intense rainfall that is likely to occur. A certain amount of time is required for the rainwater to flow across and down the roof before it enters the gutter or drainage system. This results in the smoothing out of the most rapid changes in rainfall intensity. The drainage system, therefore, need only cope with the flow of rainwater produced by the average rainfall intensity over a period of a few minutes, which can be called the concentration time.

In Canada, it has been customary to use the 15-minute rainfall that will probably be exceeded on an average of once in 10 years. The concentration time for small roofs is much less than 15 minutes and hence the design intensity will be exceeded more frequently than once in 10 years. The safety factors in Part 7 of Division B of the Building Code will probably reduce the frequency to a reasonable value and, in addition, the occasional failure of a roof drainage system will not be particularly serious in most cases.

The rainfall intensity values were updated for the 2012 edition of the Building Code using observations of annual maximum 15-minute rainfall amounts from stations with 10 or more years of record, including data up to 2007 for some stations. Ten-year return period values – the 15-minute rainfall having a probability of 1-in-10 of being exceeded in any year – were calculated by fitting the annual maximum values to the Gumbel extreme value distribution[4] using the method of moments. The updated values are compiled from the most recent short-duration rainfall intensity-duration-frequency (IDF) graphs and tables available from Environment Canada.

It is very difficult to estimate the pattern of rainfall intensity in mountainous areas, where precipitation is extremely variable and rainfall intensity can be much greater than in other types of areas. Many of the observations for these areas were taken at locations in valley bottoms or in extensive, fairly level areas.

One-Day Rainfall

If for any reason a roof drainage system becomes ineffective, the accumulation of rainwater may be great enough in some cases to cause a significant increase in the load on the roof. In the past, when the period during which rainwater could accumulate was unknown, it had been common practice to use the maximum one-day rainfall ever observed for estimating the additional load. Since the length of record for weather stations in Canada is quite variable, the maximum one-day rainfall amounts in previous editions often reflected the variable length of record at nearby stations as much as the climatology. As a result, the maximum values often differed greatly within relatively small areas where little difference should be expected. The current values have been standardized to represent the one-day rainfall amounts that have 1 chance in 50 of being exceeded in any one year or the 1-in-50-year return value one-day rainfalls.

The one-day rainfall values were updated using daily rainfall observations from stations with 10 years or more of record, including data up to 2008 for some stations. The 50-year return period values were calculated by fitting the annual maximum one-day rainfall observations to the Gumbel extreme value distribution using the method of moments.[4]

Rainfall frequency observations can vary considerably over time and space. This is especially true for mountainous areas, where elevation effects can be significant. In other areas, small scale intense storms or local influences can produce significant spatial variability in the data. As a result, the analysis incorporates some spatial smoothing.

Driving Rain Wind Pressure (DRWP)

The presence of rainwater on the face of a building, with or without wind, must be addressed in the design and construction of the building envelope so as to minimize the entry of water into the assembly. Wind pressure on the windward faces of a building will promote the flow of water through any open joints or cracks in the facade.

Driving rain wind pressure (DRWP) is the wind load that is coincident with rain, measured or calculated at a height of 10 m. The values provided in Table 2 represent the loads for which there is 1 chance in 5 of being reached or exceeded in any one year, or a probability of 20% within any one year. Approximate adjustments for height can be made using the values for C_e given in Sentence 4.1.7.3.(5) of Division B as a multiplier.

Because of inaccuracies in developing the DRWP values related to the averaging of extreme wind pressures, the actual heights of recording anemometers, and the use of estimated rather than measured rainfall values, the values are considered to be higher than actual loads.[8][9] Thus the actual probability of reaching or exceeding the DRWP in a particular location is less than 20% per year and these values can be considered to be conservative.

DRWP can be used to determine the height to which wind will drive rainwater up enclosed vertical conduits. This provides a conservative estimate of the height needed for fins in window extrusions and end dams on flashings to control water ingress. This height can be calculated as:

height of water, mm = DRWP / 10, Pa

Note that the pressure difference across the building envelope may be augmented by internal pressures induced in the building interior by the wind. These additional pressures can be estimated using the information provided in the Commentary entitled Wind Load and Effects of the User's Guide - NBC 2015, Structural Commentaries (Part 4 of Division B).

Wind Effects

All structures need to be designed to ensure that the main structural system and all secondary components, such as cladding and appurtenances, will withstand the pressures and suctions caused by the strongest wind likely to blow at that location in many years. Some flexible structures, such as tall buildings, slender towers and bridges, also need to be designed to minimize excessive wind-induced oscillations or vibrations.

At any time, the wind acting upon a structure can be treated as a mean or time-averaged component and as a gust or unsteady component. For a small structure, which is completely enveloped by wind gusts, it is only the peak gust velocity that needs to be considered. For a large structure, the wind gusts are not well correlated over its different parts and the effects of individual gusts become less significant. The User's Guide - NBC 2015, Structural Commentaries (Part 4 of Division B) evaluates the mean pressure acting on a structure, provide appropriate adjustments for building height and exposure and for the influence of the surrounding terrain and topography (including wind speed-up for hills), and then incorporate the effects of wind gusts by means of the gust factor, which varies according to the type of structure and the size of the area over which the pressure acts.

The wind speeds and corresponding velocity pressures used in the Code are regionally representative or reference values. The reference wind speeds are nominally one-hour averages of wind speeds representative of the 10 m height in flat open terrain corresponding to Exposure A or open terrain in the terminology of the User's Guide - NBC 2015, Structural Commentaries (Part 4 of Division B). The reference wind speeds and wind velocity pressures are based on long-term wind records observed at a large number of weather stations across Canada.

Reference wind velocity pressures in previous versions of the Code were based mostly on records of hourly averaged wind speeds (i.e, the number of miles of wind passing an anemometer in an hour) from stations across Canada with 10 to 22 years of observations ending in the 1950s. The wind pressure values derived from these measurements represented true hourly wind pressures.

The reference wind velocity pressures were reviewed and updated for the 2012 edition of the Building Code. The primary data set used for the analysis comprised wind records compiled from stations with hourly averaged wind speeds and from stations with aviation (one- or two-minute average) speeds or surface weather (ten-minute average) speeds observed once per hour at the top of the hour; the periods of record used ranged from 10 to 54 years. In addition, peak wind gust records from stations with periods of record ranging from 10 to 43 years were used. Peak wind gusts (gust durations of approximately 3 to 7 seconds) were used to supplement the primary once-per-hour observations in the analysis.

Several steps were involved in updating the reference wind values. Where needed, speeds were adjusted to represent the standard anemometer height above ground of 10 m. The data from years when the anemometer at a station was installed on the top of a lighthouse or building were eliminated from the analysis since it is impractical to adjust for the effects of wind flow over the structure. (Most anemometers were moved to 10 m towers by the 1960s.) Wind speeds of the various observation types-hourly averaged, aviation, surface weather and peak wind gust — were adjusted to account for different measure durations to represent a one-hour averaging period and to account for differences in the surface roughness of flat open terrain at observing stations.

The annual maximum wind speed data was fitted to the Gumbel distribution using the method of moments[4] to calculate hourly wind speeds having the annual probability of occurrence of 1-in-10 and 1-in-50 (10-year and 50-year return periods). The values were plotted on maps, then analyzed and abstracted for the locations in Table 2.

The wind velocity pressures, q, were calculated in Pascals using the following equation:

$$q = \tfrac{1}{2}\, \varrho V^2$$

where ϱ is an average air density for the windy months of the year and V is wind speed in metres per second. While air density depends on both air temperature and atmospheric pressure, the density of dry air at 0°C and standard atmospheric pressure of 1.2929 kg/m^3 was used as an average value for the wind pressure calculations. As explained by Boyd[10], this value is within 10% of the monthly average air densities for most of Canada in the windy part of the year.

As a result of the updating procedure, the 1-in-50 reference wind velocity pressures remain unchanged for most of the locations listed in Table 2; both increases and decreases were noted for the remaining locations. Many of the decreases resulted from the fact that anemometers at most of the stations used in the previous analysis were installed on lighthouses, airport hangers and other structures. Wind speeds on the tops of buildings are often much higher compared to those registered by a standard 10 m tower. Eliminating anemometer data recorded on the tops of buildings from the analysis resulted in lower values at several locations.

Hourly wind speeds that have 1 chance in 10 and 50[1] of being exceeded in any one year were analyzed using the Gumbel extreme value distribution fitted using the method of moments with correction for sample size. Values of the 1-in-30-year wind speeds for locations in Table 2 were estimated from a mapping analysis of wind speeds. The 1-in-10- and 1-in-50-year speeds were then computed from the 1-in-30-year speeds using a map of the dispersion parameter that occurs in the Gumbel analysis.[4]

Table 1 has been arranged to give pressures to the nearest one-hundredth of a kPa and their corresponding wind speeds. The value of "q" in kPa is assumed to be equal to 0.00064645 V^2, where V is given in m/s.

[1] Wind speeds that have a 1-in-"n"-year chance of being exceeded in any year can be computed from the 1-in-10 and 1-in-50 return values in Table 2 using the following equation:

$$V_{1/n} = \frac{1}{1.4565}\left\{ V_{1/50} + 0.4565\, V_{1/10} + \frac{V_{1/50} - V_{1/10}}{1.1339} \times \ln \frac{-0.0339}{\ln\,(1 - 1/n)} \right\}$$

Seismic Hazard

The parameters used to represent seismic hazard for specific geographical locations in Table 3 are the 5%-damped horizontal spectral acceleration values for 0.2, 0.5, 1.0, 2.0, 5.0 and 10.0 second periods, the horizontal Peak Ground Acceleration (PGA) and the horizontal Peak Ground Velocity (PGV) with all values given for a 2% probability of being exceeded in 50 years. The six spectral parameters are deemed sufficient to define spectra closely matching the shape of the Uniform Hazard Spectra (UHS). Hazard values are mean values based on a statistical analysis of the earthquakes that have been experienced in Canada and adjacent regions.(11) The seismic hazard values were updated for the January 1, 2020 amendments to the 2012 Building Code by updating the earthquake catalogue, revising the seismic hazard source zones, adding fault sources for the Cascadia subduction zone and other certain active faults, revising the Ground Motion Prediction Equations (GMPEs),(12) and using a probabilistic model to combine all inputs.

For most locations, the new GMPEs are the most significant reason for changes in the hazard results from the 2012 Building Code prior to the January 1, 2020 amendments. One exception is for areas of western Canada for which adding the Cascadia subduction source contribution to the model probabilistically causes the most significant change. In general, for locations in eastern Canada, the seismic hazard at long periods has increased while the seismic hazard at short periods has decreased– in some places significantly for areas affected by the Cascadia interface. For other areas, the explicit inclusion of fault sources, such as those in Haida Gwaii and the Yukon, has also affected the estimated hazard.

Further details regarding the representation of seismic hazard can be found in the Commentary on Design for Seismic Effects in the User's Guide - NBC 2015, Structural Commentaries (Part 4 of Division B).

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Table 1
Wind Speeds

q kPa	V m/s	q kPa	V m/s	q kPa	V m/s	q kPa	V m/s
0.15	15.2	0.53	28.6	0.91	37.5	1.29	44.7
0.16	15.7	0.54	28.9	0.92	37.7	1.30	44.8
0.17	16.2	0.55	29.2	0.93	37.9	1.31	45.0
0.18	16.7	0.56	29.4	0.94	38.1	1.32	45.2
0.19	17.1	0.57	29.7	0.95	38.3	1.33	45.4
0.20	17.6	0.58	30.0	0.96	38.5	1.34	45.5
0.21	18.0	0.59	30.2	0.97	38.7	1.35	45.7
0.22	18.4	0.60	30.5	0.98	38.9	1.36	45.9
0.23	18.9	0.61	30.7	0.99	39.1	1.37	46.0
0.24	19.3	0.62	31.0	1.00	39.3	1.38	46.2
0.25	19.7	0.63	31.2	1.01	39.5	1.39	46.4
0.26	20.1	0.64	31.5	1.02	39.7	1.40	46.5
0.27	20.4	0.65	31.7	1.03	39.9	1.41	46.7
0.28	20.8	0.66	32.0	1.04	40.1	1.42	46.9
0.29	21.2	0.67	32.2	1.05	40.3	1.43	47.0
0.30	21.5	0.68	32.4	1.06	40.5	1.44	47.2
0.31	21.9	0.69	32.7	1.07	40.7	1.45	47.4
0.32	22.2	0.70	32.9	1.08	40.9	1.46	47.5
0.33	22.6	0.71	33.1	1.09	41.1	1.47	47.7
0.34	22.9	0.72	33.4	1.10	41.3	1.48	47.8
0.35	23.3	0.73	33.6	1.11	41.4	1.49	48.0
0.36	23.6	0.74	33.8	1.12	41.6	1.50	48.2
0.37	23.9	0.75	34.1	1.13	41.8	1.51	48.3
0.38	24.2	0.76	34.3	1.14	42	1.52	48.5
0.39	24.6	0.77	34.5	1.15	42.2	1.53	48.6
0.40	24.9	0.78	34.7	1.16	42.4	1.54	48.8
0.41	25.2	0.79	35.0	1.17	42.5	1.55	49.0
0.42	25.5	0.80	35.2	1.18	42.7	1.56	49.1
0.43	25.8	0.81	35.4	1.19	42.9	1.57	49.3
0.44	26.1	0.82	35.6	1.20	43.1	1.58	49.4
0.45	26.4	0.83	35.8	1.21	43.3	1.59	49.6
0.46	26.7	0.84	36.0	1.22	43.4	1.60	49.7
0.47	27.0	0.85	36.3	1.23	43.6	1.61	49.9
0.48	27.2	0.86	36.5	1.24	43.8	1.62	50.1
0.49	27.5	0.87	36.7	1.25	44.0	1.63	50.2
0.50	27.8	0.88	36.9	1.26	44.1	1.64	50.4
0.51	28.1	0.89	37.1	1.27	44.3	1.65	50.5
0.52	28.4	0.90	37.3	1.28	44.5	1.66	50.7
Column 1	2	3	4	5	6	7	8

Table 2
Climatic Design Data

Location	Elevation, m	Design Temperature				Degree Days Below 18°C	15 Min Rainfall, mm	One Day Rainfall, 1/50, mm	Annual Rainfall, mm	Annual Total Precipitation, mm	Driving Rain Wind Pressures, Pa, 1/5	Snow Load, kPa, 1/50		Hourly Wind Pressures, kPa	
		January		July 2.5%										1/10	1/50
		2.5%, °C	1%, °C	Dry, °C	Wet, °C							S_s	S_r		
Ailsa Craig	230	-17	-19	30	23	3840	25	103	800	950	180	2.2	0.4	0.39	0.50
Ajax	95	-20	-22	30	23	3820	23	92	760	825	160	1.0	0.4	0.37	0.48
Alexandria	80	-24	-26	30	23	4600	25	103	800	975	160	2.4	0.4	0.31	0.40
Alliston	220	-23	-25	29	23	4200	28	113	690	875	120	2.0	0.4	0.28	0.36
Almonte	120	-26	-28	30	23	4620	25	97	730	800	140	2.5	0.4	0.32	0.41
Armstrong	340	-37	-40	28	21	6500	23	97	525	725	100	2.7	0.4	0.23	0.30
Arnprior	85	-27	-29	30	23	4680	23	86	630	775	140	2.5	0.4	0.29	0.37
Atikokan	400	-33	-35	29	22	5750	25	103	570	760	100	2.4	0.3	0.23	0.30
Attawapiskat	10	-37	-39	28	21	7100	18	81	450	650	160	2.8	0.3	0.32	0.41
Aurora	270	-21	-23	30	23	4210	28	108	700	800	140	2.0	0.4	0.34	0.44
Bancroft	365	-28	-31	29	23	4740	25	92	720	900	100	3.1	0.4	0.25	0.32
Barrie	245	-24	-26	29	23	4380	28	97	700	900	120	2.5	0.4	0.28	0.36
Barriefield	100	-22	-24	28	23	3990	23	108	780	950	160	2.1	0.4	0.36	0.47
Beaverton	240	-24	-26	30	23	4300	25	108	720	950	120	2.2	0.4	0.28	0.36
Belleville	90	-22	-24	29	23	3910	23	97	760	850	180	1.7	0.4	0.33	0.43
Belmont	260	-17	-19	30	24	3840	25	97	850	950	180	1.7	0.4	0.36	0.47
Big Trout Lake (Kitchenuhmaykoosib)	215	-38	-40	26	20	7450	18	92	400	600	150	3.2	0.2	0.33	0.42
CFB Borden	225	-23	-25	29	23	4300	28	103	690	875	120	2.2	0.4	0.28	0.36
Bracebridge	310	-26	-28	29	23	4800	25	103	830	1050	120	3.1	0.4	0.27	0.35
Bradford	240	-23	-25	30	23	4280	28	108	680	800	120	2.1	0.4	0.28	0.36
Brampton	215	-19	-21	30	23	4100	28	119	720	820	140	1.3	0.4	0.34	0.44
Brantford	205	-18	-20	30	23	3900	23	103	780	850	160	1.3	0.4	0.33	0.42
Brighton	95	-21	-23	29	23	4000	23	94	760	850	160	1.6	0.4	0.37	0.48
Brockville	85	-23	-25	29	23	4060	25	103	770	975	180	2.2	0.4	0.34	0.44
Burk's Falls	305	-26	-28	29	22	5020	25	97	810	1010	120	2.7	0.4	0.27	0.35
Burlington	80	-17	-19	31	23	3740	23	103	770	850	160	1.1	0.4	0.36	0.46
Cambridge	295	-18	-20	29	23	4100	25	113	800	890	160	1.6	0.4	0.28	0.36
Campbellford	150	-23	-26	30	23	4280	25	97	730	850	160	1.7	0.4	0.32	0.41
Cannington	255	-24	-26	30	23	4310	25	108	740	950	120	2.2	0.4	0.28	0.36
Carleton Place	135	-25	-27	30	23	4600	25	97	730	850	160	2.5	0.4	0.32	0.41
Cavan	200	-23	-25	30	23	4400	25	97	740	850	140	2.0	0.4	0.34	0.44
Centralia	260	-17	-19	30	23	3800	25	103	820	1000	180	2.3	0.4	0.38	0.49
Chapleau	425	-35	-38	27	21	5900	20	97	530	850	80	3.6	0.4	0.23	0.30
Chatham	180	-16	-18	31	24	3470	28	103	800	850	180	1.0	0.4	0.33	0.43
Chesley	275	-19	-21	29	22	4320	28	103	810	1125	140	2.8	0.4	0.37	0.48
Column 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16

Table 2 (Cont'd)
Climatic Design Data

Location	Elevation, m	Design Temperature				Degree Days Below 18°C	15 Min Rainfall, mm	One Day Rainfall, 1/50, mm	Annual Rainfall, mm	Annual Total Precipitation, mm	Driving Rain Wind Pressures, Pa, 1/5	Snow Load, kPa, 1/50		Hourly Wind Pressures, kPa	
		January		July 2.5%										1/10	1/50
		2.5%, °C	1%, °C	Dry, °C	Wet, °C							S_s	S_r		
Clinton	280	-17	-19	29	23	4150	25	103	810	1000	160	2.6	0.4	0.38	0.49
Coboconk	270	-25	-27	30	23	4500	25	108	740	950	120	2.5	0.4	0.27	0.35
Cobourg	90	-21	-23	29	23	3980	23	94	760	825	160	1.2	0.4	0.38	0.49
Cochrane	245	-34	-36	29	21	6200	20	92	575	875	80	2.8	0.3	0.27	0.35
Colborne	105	-21	-23	29	23	3980	23	94	760	850	160	1.6	0.4	0.38	0.49
Collingwood	190	-21	-23	29	23	4180	28	97	720	950	160	2.7	0.4	0.30	0.39
Cornwall	35	-23	-25	30	23	4250	25	103	780	960	180	2.2	0.4	0.32	0.41
Corunna	185	-16	-18	31	24	3600	25	100	760	800	180	1.0	0.4	0.36	0.47
Deep River	145	-29	-32	30	22	4900	23	92	650	850	100	2.5	0.4	0.27	0.35
Deseronto	85	-22	-24	29	23	4070	23	92	760	900	160	1.9	0.4	0.33	0.43
Dorchester	260	-18	-20	30	24	3900	28	103	850	950	180	1.9	0.4	0.36	0.47
Dorion	200	-33	-35	28	21	5950	20	103	550	725	160	2.8	0.4	0.30	0.39
Dresden	185	-16	-18	31	24	3750	28	97	760	820	180	1.0	0.4	0.33	0.43
Dryden	370	-34	-36	28	22	5850	25	97	550	700	120	2.4	0.3	0.23	0.30
Dundalk	525	-22	-24	29	22	4700	28	108	750	1080	150	3.2	0.4	0.33	0.42
Dunnville	175	-15	-17	30	24	3660	23	108	830	950	160	2.0	0.4	0.36	0.46
Durham	340	-20	-22	29	22	4340	28	103	815	1025	140	2.8	0.4	0.34	0.44
Dutton	225	-16	-18	31	24	3700	28	92	850	925	180	1.3	0.4	0.36	0.47
Earlton	245	-33	-36	29	22	5730	23	92	560	820	120	3.1	0.4	0.35	0.45
Edison	365	-34	-36	28	22	5740	25	108	510	680	120	2.4	0.3	0.24	0.31
Elliot Lake	380	-26	-28	29	21	4950	23	108	630	950	160	2.9	0.4	0.29	0.38
Elmvale	220	-24	-26	29	23	4200	28	97	720	950	140	2.6	0.4	0.28	0.36
Embro	310	-19	-21	30	23	3950	28	113	830	950	160	2.0	0.4	0.37	0.48
Englehart	205	-33	-36	29	22	5800	23	92	600	880	100	2.8	0.4	0.32	0.41
Espanola	220	-25	-27	29	21	4920	23	108	650	840	160	2.3	0.4	0.33	0.42
Exeter	265	-17	-19	30	23	3900	25	113	810	975	180	2.4	0.4	0.38	0.49
Fenelon Falls	260	-25	-27	30	23	4440	25	108	730	950	120	2.3	0.4	0.28	0.36
Fergus	400	-20	-22	29	23	4300	28	108	760	925	160	2.2	0.4	0.28	0.36
Forest	215	-16	-18	31	23	3740	25	103	810	875	160	2.0	0.4	0.37	0.48
Fort Erie	180	-15	-17	30	24	3650	23	108	860	1020	160	2.3	0.4	0.36	0.46
Fort Erie (Ridgeway)	190	-15	-17	30	24	3600	25	108	860	1000	160	2.3	0.4	0.36	0.46
Fort Frances	340	-33	-35	29	22	5440	25	108	570	725	120	2.3	0.3	0.24	0.31
Gananoque	80	-22	-24	28	23	4010	23	103	760	900	180	2.1	0.4	0.36	0.47
Geraldton	345	-36	-39	28	21	6450	20	86	550	725	100	2.9	0.4	0.23	0.30
Glencoe	215	-16	-18	31	24	3680	28	103	800	925	180	1.5	0.4	0.33	0.43
Goderich	185	-16	-18	29	23	4000	25	92	810	950	180	2.4	0.4	0.43	0.55
Column 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16

Table 2 (Cont'd)
Climatic Design Data

Location	Elevation, m	Design Temperature				Degree Days Below 18°C	15 Min Rainfall, mm	One Day Rainfall, 1/50, mm	Annual Rainfall, mm	Annual Total Precipitation, mm	Driving Rain Wind Pressures, Pa, 1/5	Snow Load, kPa, 1/50		Hourly Wind Pressures, kPa	
		January		July 2.5%										1/10	1/50
		2.5%, °C	1%, °C	Dry, °C	Wet, °C							S_s	S_r		
Gore Bay	205	-24	-26	28	22	4700	23	92	640	860	160	2.6	0.4	0.34	0.44
Graham	495	-35	-37	29	22	5940	23	97	570	750	140	2.6	0.3	0.23	0.30
Gravenhurst (Muskoka Airport)	255	-26	-28	29	23	4760	25	103	790	1050	120	2.7	0.4	0.28	0.36
Grimsby	85	-16	-18	30	23	3520	23	108	760	875	160	0.9	0.4	0.36	0.46
Guelph	340	-19	-21	29	23	4270	28	103	770	875	140	1.9	0.4	0.28	0.36
Guthrie	280	-24	-26	29	23	4300	28	103	700	950	120	2.5	0.4	0.28	0.36
Haileybury	210	-32	-35	30	22	5600	23	92	590	820	120	2.4	0.4	0.34	0.44
Haldimand (Caledonia)	190	-18	-20	30	23	3750	23	108	810	875	160	1.2	0.4	0.34	0.44
Haldimand (Hagersville)	215	-17	-19	30	23	3760	25	97	840	875	160	1.3	0.4	0.36	0.46
Haliburton	335	-27	-29	29	23	4840	25	92	780	980	100	2.9	0.4	0.27	0.35
Halton Hills (Georgetown)	255	-19	-21	30	23	4200	28	119	750	850	140	1.4	0.4	0.29	0.37
Hamilton															
Above Escarpment - West of John C. Munro Int'l Airport	240	-17	-19	31	23	3460	23	108	810	875	160	1.5	0.4	0.36	0.46
Above Escarpment - East of John C. Munro Int'l Airport	200	-17	-19	31	23	3460	23	108	810	875	160	1.3	0.4	0.36	0.46
Below Escarpment - West of Highway 403	90	-17	-19	31	23	3460	23	108	810	875	160	1.1	0.4	0.36	0.46
Below Escarpment - East of Highway 403	90	-17	-19	31	23	3460	23	108	810	875	160	1.1	0.4	0.36	0.46
Hanover	270	-19	-21	29	22	4300	28	103	790	1050	140	2.6	0.4	0.37	0.48
Hastings	200	-24	-26	30	23	4280	25	92	730	840	140	2.0	0.4	0.32	0.41
Hawkesbury	50	-25	-27	30	23	4610	23	103	800	925	160	2.3	0.4	0.32	0.41
Hearst	245	-35	-37	29	21	6450	20	86	520	825	80	2.8	0.3	0.23	0.30
Honey Harbour	180	-24	-26	29	23	4300	25	97	710	1050	160	2.7	0.4	0.30	0.39
Hornepayne	360	-37	-40	28	21	6340	20	93	420	750	80	3.3	0.4	0.23	0.30
Huntsville	335	-26	-29	29	22	4850	25	103	800	1000	120	2.9	0.4	0.27	0.35
Ingersoll	280	-18	-20	30	23	3920	28	108	840	950	180	1.7	0.4	0.37	0.48
Iroquois Falls	275	-33	-36	29	21	6100	20	86	575	825	100	2.9	0.3	0.29	0.37
Jellicoe	330	-36	-39	28	21	6400	20	86	550	750	100	2.7	0.4	0.23	0.30
Kapuskasing	245	-34	-36	29	21	6250	20	86	550	825	100	3.0	0.3	0.24	0.31
Kemptville	90	-25	-27	30	23	4540	25	92	750	925	160	2.3	0.4	0.32	0.41
Kenora	370	-33	-35	28	22	5630	25	113	515	630	120	2.5	0.3	0.24	0.31
Killaloe	185	-28	-31	30	22	4960	23	86	680	825	120	2.7	0.4	0.27	0.35
Kincardine	190	-17	-19	28	22	3890	25	92	800	950	180	2.6	0.4	0.43	0.55
Column 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16

Table 2 (Cont'd)
Climatic Design Data

Location	Elevation, m	Design Temperature				Degree Days Below 18°C	15 Min Rainfall, mm	One Day Rainfall, 1/50, mm	Annual Rainfall, mm	Annual Total Precipitation, mm	Driving Rain Wind Pressures, Pa, 1/5	Snow Load, kPa, 1/50		Hourly Wind Pressures, kPa	
		January		July 2.5%										1/10	1/50
		2.5%, °C	1%, °C	Dry, °C	Wet, °C							S_s	S_r		
Kingston	80	-22	-24	28	23	4000	23	108	780	950	180	2.1	0.4	0.36	0.47
Kinmount	295	-26	-28	29	23	4600	25	108	750	950	120	2.7	0.4	0.27	0.35
Kirkland Lake	325	-33	-36	29	22	6000	23	92	600	875	100	2.9	0.3	0.30	0.39
Kitchener	335	-19	-21	29	23	4200	28	119	780	925	140	2.0	0.4	0.29	0.37
Lakefield	240	-24	-26	30	23	4330	25	92	720	850	140	2.2	0.4	0.29	0.38
Lansdowne House	240	-38	-40	28	21	7150	23	92	500	680	140	3.0	0.2	0.25	0.32
Leamington	190	-15	-17	31	24	3400	28	113	800	875	180	0.8	0.4	0.36	0.47
Lindsay	265	-24	-26	30	23	4320	25	103	720	850	140	2.3	0.4	0.29	0.38
Lion's Head	185	-19	-21	27	22	4300	25	103	700	950	180	2.7	0.4	0.37	0.48
Listowel	380	-19	-21	29	23	4300	28	119	800	1000	160	2.6	0.4	0.36	0.47
London	245	-18	-20	30	24	3900	28	103	825	975	180	1.9	0.4	0.36	0.47
Lucan	300	-17	-19	30	23	3900	25	113	810	1000	180	2.3	0.4	0.39	0.50
Maitland	85	-23	-25	29	23	4080	25	103	770	975	180	2.2	0.4	0.34	0.44
Markdale	425	-20	-22	29	22	4500	28	103	820	1050	160	3.2	0.4	0.32	0.41
Markham	175	-21	-23	31	24	4000	25	86	720	825	140	1.3	0.4	0.34	0.44
Martin	485	-35	-37	29	22	5900	25	103	560	750	120	2.6	0.3	0.23	0.30
Matheson	265	-33	-36	29	21	6080	20	86	580	825	100	2.8	0.3	0.30	0.39
Mattawa	165	-29	-31	30	22	5050	23	86	700	875	100	2.1	0.4	0.25	0.32
Midland	190	-24	-26	29	23	4200	25	97	740	1060	160	2.7	0.4	0.30	0.39
Milton	200	-18	-20	30	23	3920	25	125	750	850	160	1.3	0.4	0.33	0.43
Milverton	370	-19	-21	29	23	4200	28	108	800	1050	160	2.4	0.4	0.33	0.43
Minden	270	-27	-29	29	23	4640	25	97	780	1010	100	2.7	0.4	0.27	0.35
Mississauga	160	-18	-20	30	23	3880	25	113	720	800	160	1.1	0.4	0.34	0.44
Mississauga (Lester B. Pearson International Airport)	170	-20	-22	31	24	3890	26	108	685	790	160	1.1	0.4	0.34	0.44
Mississauga (Port Credit)	75	-18	-20	29	23	3780	25	108	720	800	160	0.9	0.4	0.37	0.48
Mitchell	335	-18	-20	29	23	4100	28	113	810	1050	160	2.4	0.4	0.37	0.48
Moosonee	10	-36	-38	28	22	6800	18	81	500	700	160	2.7	0.3	0.27	0.35
Morrisburg	75	-23	-25	30	23	4370	25	103	800	950	180	2.3	0.4	0.32	0.41
Mount Forest	420	-21	-24	28	22	4700	28	103	740	940	140	2.7	0.4	0.32	0.41
Nakina	325	-36	-38	28	21	6500	20	86	540	750	100	2.8	0.4	0.23	0.30
Nanticoke (Jarvis)	205	-17	-18	30	23	3700	28	108	840	900	160	1.4	0.4	0.37	0.48
Nanticoke (Port Dover)	180	-15	-17	30	24	3600	25	108	860	950	140	1.2	0.4	0.37	0.48
Napanee	90	-22	-24	29	23	4140	23	92	770	900	160	1.9	0.4	0.33	0.43
New Liskeard	180	-32	-35	30	22	5570	23	92	570	810	100	2.6	0.4	0.33	0.43
Newcastle	115	-20	-22	30	23	3990	23	86	760	830	160	1.5	0.4	0.37	0.48
Column 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16

Table 2 (Cont'd)
Climatic Design Data

Location	Elevation, m	Design Temperature				Degree Days Below 18°C	15 Min Rainfall, mm	One Day Rainfall, 1/50, mm	Annual Rainfall, mm	Annual Total Precipitation, mm	Driving Rain Wind Pressures, Pa, 1/5	Snow Load, kPa, 1/50		Hourly Wind Pressures, kPa	
		January		July 2.5%										1/10	1/50
		2.5%, °C	1%, °C	Dry, °C	Wet, °C							S_s	S_r		
Newcastle (Bowmanville)	95	-20	-22	30	23	4000	23	86	760	830	160	1.4	0.4	0.37	0.48
Newmarket	185	-22	-24	30	23	4260	28	108	700	800	140	2.0	0.4	0.29	0.38
Niagara Falls	210	-16	-18	30	23	3600	23	96	810	950	160	1.8	0.4	0.33	0.43
North Bay	210	-28	-30	28	22	5150	25	95	775	975	120	2.2	0.4	0.27	0.34
Norwood	225	-24	-26	30	23	4320	25	92	720	850	120	2.1	0.4	0.32	0.41
Oakville	90	-18	-20	30	23	3760	23	97	750	850	160	1.1	0.4	0.36	0.47
Orangeville	430	-21	-23	29	23	4450	28	108	730	875	140	2.3	0.4	0.28	0.36
Orillia	230	-25	-27	29	23	4260	25	103	740	1000	120	2.4	0.4	0.28	0.36
Oshawa	110	-19	-21	30	23	3860	23	86	760	875	160	1.4	0.4	0.37	0.48
Ottawa (Metropolitan)															
Ottawa (City Hall)	70	-25	-27	30	23	4440	23	86	750	900	160	2.4	0.4	0.32	0.41
Ottawa (Barrhaven)	98	-25	-27	30	23	4500	25	92	750	900	160	2.4	0.4	0.32	0.41
Ottawa (Kanata)	98	-25	-27	30	23	4520	25	92	730	900	160	2.5	0.4	0.32	0.41
Ottawa (MacDonald-Cartier Int'l Airport)	125	-25	-27	30	23	4500	24	89	750	900	160	2.4	0.4	0.32	0.41
Ottawa (Orleans)	70	-26	-28	30	23	4500	23	91	750	900	160	2.4	0.4	0.32	0.41
Owen Sound	215	-19	-21	29	22	4030	28	113	760	1075	160	2.8	0.4	0.37	0.48
Pagwa River	185	-35	-37	28	21	6500	20	86	540	825	80	2.7	0.4	0.23	0.30
Paris	245	-18	-20	30	23	4000	23	96	790	925	160	1.4	0.4	0.33	0.42
Parkhill	205	-16	-18	31	23	3800	25	103	800	925	180	2.1	0.4	0.39	0.50
Parry Sound	215	-24	-26	28	22	4640	23	97	820	1050	160	2.8	0.4	0.30	0.39
Pelham (Fonthill)	230	-15	-17	30	23	3690	23	96	820	950	160	2.1	0.4	0.33	0.42
Pembroke	125	-28	-31	30	23	4980	23	105	640	825	100	2.5	0.4	0.27	0.35
Penetanguishene	220	-24	-26	29	23	4200	25	97	720	1050	160	2.8	0.4	0.30	0.39
Perth	130	-25	-27	30	23	4540	25	92	730	900	140	2.3	0.4	0.32	0.41
Petawawa	135	-29	-31	30	23	4980	23	92	640	825	100	2.6	0.4	0.27	0.35
Peterborough	200	-23	-25	30	23	4400	25	92	710	840	140	2.0	0.4	0.32	0.41
Petrolia	195	-16	-18	31	24	3640	25	108	810	920	180	1.3	0.4	0.36	0.47
Pickering (Dunbarton)	85	-19	-21	30	23	3800	23	92	730	825	140	1.0	0.4	0.37	0.48
Picton	95	-21	-23	29	23	3980	23	92	770	940	160	2.0	0.4	0.38	0.49
Plattsville	300	-19	-21	29	23	4150	28	103	820	950	140	1.9	0.4	0.33	0.42
Point Alexander	150	-29	-32	30	22	4960	23	92	650	850	100	2.5	0.4	0.27	0.35
Port Burwell	195	-15	-17	30	24	3800	25	92	930	1000	180	1.2	0.4	0.36	0.47
Port Colborne	180	-15	-17	30	24	3600	23	108	850	1000	160	2.1	0.4	0.36	0.46
Port Elgin	205	-17	-19	28	22	4100	25	92	790	850	180	2.8	0.4	0.43	0.55
Port Hope	100	-21	-23	29	23	3970	23	94	760	825	180	1.2	0.4	0.37	0.48
Column 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16

Table 2 (Cont'd)
Climatic Design Data

Location	Elevation, m	Design Temperature				Degree Days Below 18°C	15 Min Rainfall, mm	One Day Rainfall, 1/50, mm	Annual Rainfall, mm	Annual Total Precipitation, mm	Driving Rain Wind Pressures, Pa, 1/5	Snow Load, kPa, 1/50		Hourly Wind Pressures, kPa	
		January		July 2.5%										1/10	1/50
		2.5%, °C	1%, °C	Dry, °C	Wet, °C							S_s	S_r		
Port Perry	270	-22	-24	30	23	4260	25	97	720	850	140	2.4	0.4	0.34	0.44
Port Stanley	180	-15	-17	31	24	3850	25	92	940	975	180	1.2	0.4	0.36	0.47
Prescott	90	-23	-25	29	23	4120	25	103	770	975	180	2.2	0.4	0.34	0.44
Princeton	280	-18	-20	30	23	4000	25	97	810	925	160	1.5	0.4	0.33	0.42
Raith	475	-34	-37	28	22	5900	23	97	570	750	120	2.7	0.4	0.23	0.30
Rayside-Balfour (Chelmsford)	270	-28	-30	29	21	5200	25	92	650	850	180	2.5	0.4	0.35	0.45
Red Lake	360	-35	-37	28	21	6220	20	92	470	630	120	2.6	0.3	0.23	0.30
Renfrew	115	-27	-30	30	23	4900	23	97	620	810	140	2.5	0.4	0.27	0.35
Richmond Hill	230	-21	-23	31	24	4000	25	97	740	850	140	1.5	0.4	0.34	0.44
Rockland	50	-26	-28	30	23	4600	23	92	780	950	160	2.4	0.4	0.31	0.40
Sarnia	190	-16	-18	31	24	3750	25	100	750	825	180	1.1	0.4	0.36	0.47
Sault Ste. Marie	190	-25	-28	29	22	4960	23	97	660	950	200	3.1	0.4	0.34	0.44
Schreiber	310	-34	-36	27	21	5960	20	103	600	850	160	3.3	0.4	0.30	0.39
Seaforth	310	-17	-19	30	23	4100	25	108	810	1025	160	2.5	0.4	0.37	0.48
Shelburne	495	-22	-24	29	23	4700	28	108	740	900	150	3.1	0.4	0.31	0.40
Simcoe	210	-17	-19	30	24	3700	28	113	860	950	160	1.3	0.4	0.35	0.45
Sioux Lookout	375	-34	-36	28	22	5950	25	97	520	710	100	2.6	0.3	0.23	0.30
Smiths Falls	130	-25	-27	30	23	4540	25	92	730	850	140	2.3	0.4	0.32	0.41
Smithville	185	-16	-18	30	23	3650	23	108	800	900	160	1.5	0.4	0.33	0.42
Smooth Rock Falls	235	-34	-36	29	21	6250	20	92	560	850	80	2.7	0.3	0.25	0.32
South River	355	-27	-29	29	22	5090	25	103	830	975	120	2.8	0.4	0.27	0.35
Southampton	180	-17	-19	28	22	4100	25	92	800	830	180	2.7	0.4	0.41	0.53
St. Catharines	105	-16	-18	30	23	3540	23	92	770	850	160	1.0	0.4	0.36	0.46
St. Mary's	310	-18	-20	30	23	4000	28	108	820	1025	160	2.2	0.4	0.36	0.47
St. Thomas	225	-16	-18	31	24	3780	25	103	900	975	180	1.4	0.4	0.36	0.47
Stirling	120	-23	-25	30	23	4220	25	97	740	850	120	1.7	0.4	0.31	0.40
Stratford	360	-18	-20	29	23	4050	28	113	820	1050	160	2.3	0.4	0.35	0.45
Strathroy	225	-17	-19	31	24	3780	25	103	770	950	180	1.9	0.4	0.36	0.47
Sturgeon Falls	205	-28	-30	29	21	5200	25	95	700	910	140	2.4	0.4	0.27	0.35
Sudbury	275	-28	-30	29	21	5180	25	97	650	875	200	2.5	0.4	0.36	0.46
Sundridge	340	-27	-29	29	22	5080	25	97	840	975	120	2.8	0.4	0.27	0.35
Tavistock	340	-19	-21	29	23	4100	28	113	820	1010	160	2.1	0.4	0.35	0.45
Temagami	300	-30	-33	30	22	5420	23	92	650	875	120	2.6	0.4	0.29	0.37
Thamesford	280	-19	-21	30	23	3950	28	108	820	975	160	1.9	0.4	0.37	0.48
Column 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16

Table 2 (Cont'd)
Climatic Design Data

Location	Elevation, m	Design Temperature				Degree Days Below 18°C	15 Min Rainfall, mm	One Day Rainfall, 1/50, mm	Annual Rainfall, mm	Annual Total Precipitation, mm	Driving Rain Wind Pressures, Pa, 1/5	Snow Load, kPa, 1/50		Hourly Wind Pressures, kPa	
		January		July 2.5%										1/10	1/50
		2.5%, °C	1%, °C	Dry, °C	Wet, °C							S_s	S_r		
Thedford	205	-16	-18	31	23	3710	25	103	810	900	180	2.1	0.4	0.39	0.50
Thunder Bay	210	-31	-33	29	21	5650	23	108	560	710	160	2.9	0.4	0.30	0.39
Tillsonburg	215	-17	-19	30	24	3840	25	103	880	980	160	1.3	0.4	0.34	0.44
Timmins	300	-34	-36	29	21	5940	20	108	560	875	100	3.1	0.3	0.27	0.35
Timmins (Porcupine)	295	-34	-36	29	21	6000	20	103	560	875	100	2.9	0.3	0.29	0.37
Toronto Metropolitan Region															
Etobicoke	160	-20	-22	31	24	3800	26	108	720	800	160	1.1	0.4	0.34	0.44
North York	175	-20	-22	31	24	3760	25	108	730	850	150	1.2	0.4	0.34	0.44
Scarborough	180	-20	-22	31	24	3800	25	92	730	825	160	1.2	0.4	0.36	0.47
Toronto (City Hall)	90	-18	-20	31	23	3520	25	97	720	820	160	0.9	0.4	0.34	0.44
Trenton	80	-22	-24	29	23	4110	23	97	760	850	160	1.6	0.4	0.36	0.47
Trout Creek	330	-27	-29	29	22	5100	25	103	780	975	120	2.7	0.4	0.27	0.35
Uxbridge	275	-22	-24	30	23	4240	25	103	700	850	140	2.4	0.4	0.33	0.42
Vaughan (Woodbridge)	165	-20	-22	31	24	4100	26	113	700	800	140	1.1	0.4	0.34	0.44
Vittoria	215	-15	-17	30	24	3680	25	113	880	950	160	1.3	0.4	0.36	0.47
Walkerton	275	-18	-20	30	22	4300	28	103	790	1025	160	2.7	0.4	0.39	0.50
Wallaceburg	180	-16	-18	31	24	3600	28	97	760	825	180	0.9	0.4	0.35	0.45
Waterloo	330	-19	-21	29	23	4200	28	119	780	925	160	2.0	0.4	0.29	0.37
Watford	240	-17	-19	31	24	3740	25	108	790	950	160	1.9	0.4	0.36	0.47
Wawa	290	-34	-36	26	21	5840	20	93	725	950	160	3.4	0.4	0.30	0.39
Welland	180	-15	-17	30	23	3670	23	103	840	975	160	2.0	0.4	0.33	0.43
West Lorne	215	-16	-18	31	24	3700	28	103	840	900	180	1.3	0.4	0.36	0.47
Whitby	85	-20	-22	30	23	3820	23	86	760	850	160	1.2	0.4	0.37	0.48
Whitby (Brooklin)	160	-20	-22	30	23	4010	23	86	770	850	140	1.9	0.4	0.35	0.45
White River	375	-39	-42	28	21	6150	20	92	575	825	100	3.6	0.4	0.23	0.30
Wiarton	185	-19	-21	29	22	4300	25	103	740	1000	180	2.7	0.4	0.37	0.48
Windsor	185	-16	-18	32	24	3400	28	103	800	900	180	0.8	0.4	0.36	0.47
Wingham	310	-18	-20	30	23	4220	28	108	780	1050	160	2.6	0.4	0.39	0.50
Woodstock	300	-19	-21	30	23	3910	28	113	830	930	160	1.9	0.4	0.34	0.44
Wyoming	215	-16	-18	31	24	3700	25	103	815	900	180	1.6	0.4	0.36	0.47
Column 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16

Table 3
Seismic Data

Location	Seismic Data							
	$S_a(0.2)$	$S_a(0.5)$	$S_a(1.0)$	$S_a(2.0)$	$S_a(5.0)$	$S_a(10.0)$	PGA	PGV
Ailsa Craig	0.095	0.064	0.039	0.020	0.0049	0.0021	0.056	0.050
Ajax	0.210	0.114	0.060	0.029	0.0071	0.0028	0.134	0.091
Alexandria	0.589	0.309	0.148	0.068	0.0180	0.0062	0.376	0.255
Alliston	0.111	0.076	0.046	0.024	0.0059	0.0025	0.066	0.060
Almonte	0.337	0.188	0.098	0.048	0.0130	0.0049	0.215	0.157
Armstrong	0.064	0.037	0.019	0.0081	0.0018	0.0008	0.038	0.025
Arnprior	0.371	0.201	0.102	0.0490	0.0130	0.0049	0.238	0.168
Atikokan	0.069	0.038	0.018	0.0072	0.0015	0.0007	0.041	0.025
Attawapiskat	0.074	0.043	0.022	0.0092	0.0019	0.0010	0.045	0.030
Aurora	0.138	0.087	0.050	0.0260	0.0064	0.0027	0.085	0.068
Bancroft	0.151	0.105	0.063	0.0320	0.0084	0.0035	0.090	0.085
Barrie	0.108	0.077	0.047	0.0250	0.0061	0.0025	0.063	0.060
Barriefield	0.162	0.110	0.066	0.0340	0.0089	0.0038	0.098	0.091
Beaverton	0.117	0.082	0.050	0.0260	0.0065	0.0028	0.069	0.064
Belleville	0.162	0.105	0.061	0.0310	0.0080	0.0034	0.100	0.087
Belmont	0.116	0.073	0.042	0.0210	0.0053	0.0021	0.070	0.056
Big Trout Lake (Kitchenuhmaykoosib)	0.054	0.033	0.017	0.0072	0.0015	0.0008	0.032	0.023
CFB Borden	0.107	0.075	0.046	0.0240	0.0059	0.0025	0.063	0.059
Bracebridge	0.116	0.084	0.051	0.0270	0.0068	0.0028	0.068	0.067
Bradford	0.123	0.081	0.048	0.0250	0.0062	0.0027	0.074	0.063
Brampton	0.168	0.096	0.052	0.0260	0.0064	0.0025	0.106	0.074
Brantford	0.155	0.089	0.049	0.0240	0.0059	0.0024	0.097	0.068
Brighton	0.173	0.106	0.060	0.0300	0.0076	0.0032	0.108	0.087
Brockville	0.259	0.157	0.086	0.0430	0.0110	0.0046	0.164	0.131
Burk's Falls	0.143	0.096	0.057	0.0290	0.0074	0.0031	0.086	0.076
Burlington	0.266	0.131	0.062	0.0290	0.0068	0.0027	0.172	0.102
Cambridge	0.141	0.084	0.047	0.0240	0.0058	0.0024	0.088	0.066
Campbellford	0.144	0.097	0.058	0.0300	0.0076	0.0032	0.088	0.078
Cannington	0.122	0.084	0.051	0.0270	0.0067	0.0028	0.073	0.067
Carleton Place	0.302	0.175	0.093	0.0460	0.0120	0.0048	0.192	0.146
Cavan	0.140	0.092	0.055	0.0280	0.0071	0.0030	0.086	0.074
Centralia	0.092	0.064	0.039	0.0200	0.0050	0.0021	0.054	0.050
Chapleau	0.071	0.050	0.031	0.0160	0.0037	0.0017	0.041	0.039
Chatham	0.112	0.070	0.039	0.0190	0.0047	0.0020	0.068	0.054
Chesley	0.083	0.062	0.040	0.0210	0.0052	0.0022	0.047	0.050
Column 1	2	3	4	5	6	7	8	9

Table 3 (Cont'd)
Seismic Data

Location	Seismic Data							
	$S_a(0.2)$	$S_a(0.5)$	$S_a(1.0)$	$S_a(2.0)$	$S_a(5.0)$	$S_a(10.0)$	PGA	PGV
Clinton	0.084	0.061	0.038	0.0200	0.0049	0.0021	0.048	0.048
Coboconk	0.120	0.086	0.052	0.0270	0.0070	0.0030	0.070	0.068
Cobourg	0.179	0.106	0.059	0.0300	0.0074	0.0031	0.113	0.086
Cochrane	0.222	0.107	0.052	0.0240	0.0058	0.0022	0.145	0.083
Colborne	0.176	0.106	0.060	0.0300	0.0076	0.0031	0.111	0.087
Collingwood	0.096	0.070	0.044	0.0230	0.0058	0.0024	0.055	0.056
Cornwall	0.587	0.307	0.147	0.0670	0.0170	0.0060	0.375	0.254
Corunna	0.087	0.060	0.036	0.0180	0.0046	0.0020	0.050	0.047
Deep River	0.389	0.208	0.104	0.0490	0.0130	0.0048	0.250	0.172
Deseronto	0.158	0.106	0.062	0.0320	0.0081	0.0035	0.096	0.087
Dorchester	0.112	0.072	0.042	0.0210	0.0052	0.0021	0.067	0.056
Dorion	0.059	0.035	0.018	0.0076	0.0016	0.0008	0.035	0.024
Dresden	0.104	0.067	0.039	0.0190	0.0047	0.0020	0.062	0.051
Dryden	0.072	0.040	0.019	0.0076	0.0016	0.0008	0.043	0.027
Dundalk	0.097	0.069	0.043	0.0220	0.0056	0.0024	0.057	0.055
Dunnville	0.232	0.120	0.059	0.0280	0.0067	0.0027	0.149	0.093
Durham	0.088	0.065	0.041	0.0210	0.0053	0.0022	0.051	0.051
Dutton	0.116	0.072	0.041	0.0210	0.0050	0.0021	0.071	0.056
Earlton	0.182	0.108	0.059	0.0290	0.0074	0.0030	0.114	0.086
Edison	0.070	0.039	0.019	0.0075	0.0016	0.0008	0.042	0.027
Elliot Lake	0.074	0.054	0.035	0.0180	0.0046	0.0020	0.043	0.043
Elmvale	0.101	0.074	0.046	0.0240	0.0061	0.0025	0.059	0.059
Embro	0.111	0.072	0.042	0.0220	0.0053	0.0022	0.067	0.056
Englehart	0.175	0.104	0.057	0.0290	0.0073	0.0030	0.109	0.083
Espanola	0.086	0.063	0.039	0.0210	0.0052	0.0021	0.050	0.050
Exeter	0.090	0.063	0.039	0.0200	0.0049	0.0021	0.052	0.050
Fenelon Falls	0.121	0.086	0.052	0.0270	0.0068	0.0030	0.072	0.068
Fergus	0.115	0.075	0.045	0.0230	0.0056	0.0024	0.069	0.059
Forest	0.087	0.061	0.037	0.0190	0.0047	0.0020	0.051	0.047
Fort Erie	0.312	0.152	0.070	0.0320	0.0074	0.0028	0.202	0.117
Fort Erie (Ridgeway)	0.307	0.149	0.069	0.0310	0.0073	0.0028	0.198	0.115
Fort Frances	0.064	0.035	0.017	0.0069	0.0015	0.0007	0.039	0.024
Gananoque	0.180	0.119	0.070	0.0360	0.0095	0.0039	0.110	0.099
Geraldton	0.057	0.036	0.019	0.0082	0.0018	0.0010	0.033	0.024
Glencoe	0.107	0.068	0.040	0.0200	0.0049	0.0021	0.064	0.054
Column 1	2	3	4	5	6	7	8	9

Table 3 (Cont'd)
Seismic Data

Location	Seismic Data							
	$S_a(0.2)$	$S_a(0.5)$	$S_a(1.0)$	$S_a(2.0)$	$S_a(5.0)$	$S_a(10.0)$	PGA	PGV
Goderich	0.079	0.059	0.037	0.0190	0.0049	0.0020	0.045	0.047
Gore Bay	0.071	0.055	0.035	0.0180	0.0047	0.0020	0.040	0.044
Graham	0.071	0.039	0.020	0.0079	0.0016	0.0008	0.043	0.027
Gravenhurst (Muskoka Airport)	0.112	0.082	0.050	0.0260	0.0067	0.0028	0.065	0.064
Grimsby	0.301	0.146	0.068	0.0300	0.0073	0.0028	0.195	0.113
Guelph	0.133	0.082	0.047	0.0240	0.0058	0.0024	0.082	0.063
Guthrie	0.109	0.078	0.048	0.0250	0.0062	0.0027	0.064	0.062
Haileybury	0.219	0.127	0.067	0.0330	0.0083	0.0034	0.138	0.101
Haldimand (Caledonia)	0.215	0.112	0.056	0.0270	0.0064	0.0025	0.138	0.087
Haldimand (Hagersville)	0.172	0.096	0.051	0.0250	0.0061	0.0024	0.108	0.074
Haliburton	0.133	0.095	0.057	0.0300	0.0077	0.0032	0.079	0.076
Halton Hills (Georgetown)	0.155	0.090	0.050	0.0250	0.0062	0.0025	0.097	0.070
Hamilton	0.260	0.128	0.061	0.0280	0.0068	0.0027	0.168	0.101
Hanover	0.085	0.063	0.040	0.0210	0.0052	0.0022	0.049	0.050
Hastings	0.141	0.096	0.057	0.029	0.0074	0.0031	0.085	0.076
Hawkesbury	0.506	0.268	0.131	0.0620	0.0160	0.0058	0.326	0.224
Hearst	0.073	0.048	0.028	0.0130	0.0031	0.0014	0.043	0.035
Honey Harbour	0.103	0.076	0.047	0.0250	0.0062	0.0027	0.060	0.060
Hornepayne	0.063	0.043	0.025	0.0120	0.0028	0.0014	0.037	0.031
Huntsville	0.129	0.091	0.054	0.0280	0.0071	0.0031	0.077	0.072
Ingersoll	0.116	0.073	0.043	0.0220	0.0053	0.0022	0.070	0.058
Iroquois Falls	0.196	0.101	0.052	0.0250	0.0061	0.0024	0.127	0.079
Jellicoe	0.057	0.035	0.019	0.0081	0.0018	0.0010	0.033	0.024
Kapuskasing	0.112	0.064	0.035	0.0170	0.0040	0.0017	0.070	0.048
Kemptville	0.429	0.229	0.114	0.0540	0.0140	0.0052	0.275	0.189
Kenora	0.064	0.036	0.018	0.0072	0.0015	0.0007	0.038	0.024
Killaloe	0.264	0.154	0.083	0.0410	0.0110	0.0044	0.168	0.127
Kincardine	0.076	0.058	0.037	0.0190	0.0049	0.0021	0.043	0.046
Kingston	0.161	0.110	0.065	0.0340	0.0089	0.0038	0.098	0.091
Kinmount	0.123	0.089	0.054	0.0280	0.0071	0.0031	0.072	0.071
Kirkland Lake	0.159	0.095	0.053	0.0270	0.0067	0.0028	0.099	0.076
Kitchener	0.122	0.077	0.045	0.0230	0.0056	0.0024	0.074	0.060
Lakefield	0.130	0.091	0.055	0.0280	0.0073	0.0031	0.078	0.072
Lansdowne House	0.056	0.035	0.019	0.0078	0.0016	0.0008	0.033	0.024
Leamington	0.114	0.070	0.038	0.0180	0.0044	0.0018	0.069	0.052
Column 1	2	3	4	5	6	7	8	9

Table 3 (Cont'd)
Seismic Data

Location	Seismic Data							
	$S_a(0.2)$	$S_a(0.5)$	$S_a(1.0)$	$S_a(2.0)$	$S_a(5.0)$	$S_a(10.0)$	PGA	PGV
Lindsay	0.126	0.087	0.052	0.0270	0.0068	0.0030	0.076	0.068
Lion's Head	0.080	0.062	0.040	0.0210	0.0052	0.0022	0.045	0.050
Listowel	0.093	0.066	0.041	0.0210	0.0052	0.0022	0.054	0.052
London	0.108	0.070	0.041	0.0210	0.0052	0.0021	0.064	0.055
Lucan	0.097	0.065	0.039	0.0200	0.0050	0.0021	0.057	0.051
Maitland	0.282	0.167	0.090	0.0450	0.0120	0.0046	0.179	0.140
Markdale	0.089	0.066	0.042	0.0220	0.0055	0.0022	0.052	0.052
Markham	0.182	0.103	0.056	0.0280	0.0068	0.0028	0.115	0.080
Martin	0.072	0.039	0.019	0.0075	0.0015	0.0008	0.043	0.027
Matheson	0.160	0.091	0.050	0.0250	0.0062	0.0025	0.101	0.072
Mattawa	0.446	0.237	0.114	0.0520	0.0130	0.0046	0.285	0.191
Midland	0.101	0.075	0.046	0.0240	0.0061	0.0025	0.058	0.059
Milton	0.191	0.103	0.054	0.0260	0.0064	0.0025	0.122	0.080
Milverton	0.098	0.067	0.041	0.0210	0.0053	0.0022	0.058	0.052
Minden	0.124	0.089	0.054	0.0280	0.0071	0.0031	0.073	0.071
Mississauga	0.219	0.115	0.058	0.0280	0.0068	0.0027	0.141	0.090
Mississauga (Lester B. Pearson International Airport)	0.193	0.105	0.056	0.0270	0.0067	0.0027	0.123	0.082
Mississauga (Port Credit)	0.247	0.125	0.062	0.0290	0.0070	0.0027	0.159	0.098
Mitchell	0.093	0.065	0.040	0.0210	0.0052	0.0021	0.054	0.051
Moosonee	0.081	0.051	0.029	0.0140	0.0033	0.0015	0.049	0.038
Morrisburg	0.558	0.287	0.135	0.0620	0.0160	0.0056	0.358	0.236
Mount Forest	0.093	0.067	0.041	0.0220	0.0053	0.0022	0.054	0.052
Nakina	0.057	0.036	0.019	0.0082	0.0018	0.0010	0.033	0.024
Nanticoke (Jarvis)	0.156	0.090	0.049	0.0240	0.0059	0.0024	0.098	0.068
Nanticoke (Port Dover)	0.144	0.085	0.047	0.0230	0.0058	0.0024	0.089	0.066
Napanee	0.156	0.106	0.063	0.0330	0.0084	0.0037	0.095	0.087
New Liskeard	0.209	0.122	0.065	0.0320	0.0081	0.0032	0.132	0.097
Newcastle	0.186	0.107	0.058	0.0290	0.0071	0.0030	0.118	0.086
Newcastle (Bowmanville)	0.188	0.107	0.058	0.0290	0.0071	0.0030	0.119	0.086
Newmarket	0.132	0.085	0.050	0.0260	0.0064	0.0027	0.081	0.067
Niagara Falls	0.321	0.157	0.072	0.0320	0.0076	0.0030	0.207	0.121
North Bay	0.247	0.145	0.076	0.0370	0.0095	0.0037	0.155	0.114
Norwood	0.136	0.094	0.057	0.0290	0.0074	0.0031	0.082	0.075
Oakville	0.260	0.129	0.062	0.0290	0.0070	0.0027	0.167	0.101
Orangeville	0.115	0.076	0.046	0.0230	0.0058	0.0024	0.069	0.059
Column 1	2	3	4	5	6	7	8	9

Table 3 (Cont'd)
Seismic Data

Location	Seismic Data							
	$S_a(0.2)$	$S_a(0.5)$	$S_a(1.0)$	$S_a(2.0)$	$S_a(5.0)$	$S_a(10.0)$	PGA	PGV
Orillia	0.109	0.079	0.049	0.0260	0.0064	0.0027	0.064	0.063
Oshawa	0.192	0.108	0.058	0.0290	0.0071	0.0030	0.122	0.086
Ottawa (Metropolitan)								
Ottawa (City Hall)	0.439	0.237	0.118	0.0560	0.0150	0.0055	0.281	0.196
Ottawa (Barrhaven)	0.427	0.230	0.115	0.0550	0.0150	0.0053	0.273	0.191
Ottawa (Kanata)	0.401	0.218	0.110	0.0530	0.0140	0.0052	0.257	0.181
Ottawa (MacDonald-Cartier International Airport)	0.446	0.240	0.119	0.0560	0.0150	0.0055	0.285	0.199
Ottawa (Orleans)	0.474	0.252	0.124	0.0580	0.0150	0.0056	0.304	0.208
Owen Sound	0.083	0.064	0.041	0.0210	0.0053	0.0022	0.048	0.051
Pagwa River	0.060	0.040	0.023	0.0110	0.0024	0.0013	0.035	0.028
Paris	0.141	0.084	0.047	0.0230	0.0058	0.0024	0.088	0.066
Parkhill	0.092	0.063	0.038	0.0200	0.0049	0.0020	0.054	0.050
Parry Sound	0.110	0.079	0.048	0.0250	0.0064	0.0027	0.064	0.063
Pelham (Fonthill)	0.311	0.152	0.070	0.0310	0.0074	0.0028	0.201	0.117
Pembroke	0.379	0.203	0.101	0.0490	0.0130	0.0048	0.243	0.168
Penetanguishene	0.101	0.074	0.046	0.0240	0.0061	0.0025	0.058	0.059
Perth	0.225	0.142	0.080	0.0410	0.0110	0.0045	0.140	0.119
Petawawa	0.379	0.202	0.101	0.0480	0.0130	0.0048	0.243	0.166
Peterborough	0.135	0.092	0.055	0.0280	0.0071	0.0031	0.082	0.072
Petrolia	0.092	0.062	0.037	0.0190	0.0047	0.0020	0.054	0.048
Pickering (Dunbarton)	0.219	0.117	0.060	0.0290	0.0071	0.0028	0.140	0.094
Picton	0.159	0.104	0.061	0.0310	0.0078	0.0032	0.098	0.086
Plattsville	0.119	0.075	0.044	0.0220	0.0055	0.0022	0.072	0.059
Point Alexander	0.391	0.209	0.104	0.0490	0.0130	0.0048	0.251	0.172
Port Burwell	0.132	0.079	0.044	0.0220	0.0055	0.0022	0.081	0.062
Port Colborne	0.298	0.146	0.068	0.0310	0.0073	0.0028	0.192	0.113
Port Elgin	0.077	0.060	0.038	0.0200	0.0050	0.0021	0.044	0.048
Port Hope	0.181	0.106	0.059	0.0290	0.0073	0.0030	0.114	0.086
Port Perry	0.144	0.091	0.053	0.0270	0.0067	0.0028	0.089	0.071
Port Stanley	0.123	0.075	0.043	0.0210	0.0052	0.0021	0.075	0.058
Prescott	0.350	0.195	0.101	0.0490	0.0130	0.0049	0.224	0.162
Princeton	0.129	0.079	0.045	0.0230	0.0056	0.0022	0.079	0.062
Raith	0.067	0.038	0.019	0.0078	0.0016	0.0008	0.040	0.025
Rayside-Balfour (Chelmsford)	0.104	0.072	0.044	0.0230	0.0058	0.0024	0.061	0.056
Red Lake	0.068	0.038	0.019	0.0076	0.0016	0.0008	0.041	0.025
Renfrew	0.352	0.191	0.097	0.0470	0.0130	0.0048	0.226	0.160
Column 1	2	3	4	5	6	7	8	9

Table 3 (Cont'd)
Seismic Data

Location	Seismic Data							
	$S_a(0.2)$	$S_a(0.5)$	$S_a(1.0)$	$S_a(2.0)$	$S_a(5.0)$	$S_a(10.0)$	PGA	PGV
Richmond Hill	0.163	0.095	0.053	0.0270	0.0065	0.0027	0.102	0.074
Rockland	0.510	0.266	0.129	0.0600	0.0160	0.0056	0.328	0.221
Sarnia	0.085	0.059	0.036	0.0180	0.0046	0.0020	0.049	0.046
Sault Ste. Marie	0.062	0.044	0.028	0.0140	0.0033	0.0015	0.036	0.034
Schreiber	0.057	0.035	0.019	0.0079	0.0018	0.0010	0.033	0.024
Seaforth	0.087	0.062	0.039	0.0200	0.0050	0.0021	0.050	0.048
Shelburne	0.104	0.072	0.044	0.0230	0.0058	0.0024	0.062	0.056
Simcoe	0.141	0.084	0.047	0.0230	0.0058	0.0024	0.087	0.064
Sioux Lookout	0.073	0.040	0.020	0.0078	0.0016	0.0008	0.044	0.028
Smiths Falls	0.256	0.156	0.086	0.0440	0.0120	0.0046	0.161	0.131
Smithville	0.296	0.144	0.067	0.0300	0.0071	0.0027	0.191	0.111
Smooth Rock Falls	0.200	0.098	0.047	0.0210	0.0050	0.0020	0.130	0.074
South River	0.164	0.106	0.061	0.0310	0.0080	0.0034	0.100	0.085
Southampton	0.077	0.060	0.038	0.0200	0.0050	0.0021	0.044	0.048
St. Catharines	0.319	0.155	0.071	0.0320	0.0076	0.0028	0.206	0.121
St. Mary's	0.101	0.068	0.041	0.0210	0.0052	0.0021	0.060	0.052
St. Thomas	0.117	0.073	0.042	0.0210	0.0052	0.0021	0.071	0.056
Stirling	0.149	0.100	0.060	0.0310	0.0078	0.0034	0.091	0.082
Stratford	0.103	0.069	0.041	0.0210	0.0053	0.0022	0.061	0.054
Strathroy	0.100	0.066	0.039	0.0200	0.0049	0.0021	0.059	0.051
Sturgeon Falls	0.183	0.113	0.062	0.0310	0.0080	0.0032	0.113	0.089
Sudbury	0.110	0.076	0.046	0.0240	0.0059	0.0025	0.065	0.059
Sundridge	0.157	0.103	0.059	0.0300	0.0078	0.0032	0.095	0.082
Tavistock	0.108	0.071	0.042	0.0220	0.0053	0.0022	0.065	0.055
Temagami	0.239	0.138	0.072	0.0350	0.0089	0.0035	0.151	0.109
Thamesford	0.111	0.071	0.042	0.0210	0.0053	0.0022	0.066	0.056
Thedford	0.089	0.062	0.038	0.0190	0.0047	0.0020	0.052	0.048
Thunder Bay	0.061	0.035	0.018	0.0075	0.0016	0.0008	0.036	0.024
Tillsonburg	0.126	0.077	0.044	0.0220	0.0055	0.0022	0.076	0.060
Timmins	0.125	0.075	0.043	0.0210	0.0053	0.0022	0.078	0.058
Timmins (Porcupine)	0.140	0.081	0.045	0.0220	0.0055	0.0022	0.088	0.063
Toronto Metropolitan Region								
Etobicoke	0.193	0.106	0.056	0.0270	0.0067	0.0027	0.124	0.082
North York	0.195	0.107	0.056	0.0280	0.0067	0.0027	0.125	0.083
Scarborough	0.219	0.116	0.060	0.0290	0.0070	0.0028	0.140	0.093
Toronto (City Hall)	0.249	0.126	0.063	0.0290	0.0071	0.0028	0.160	0.099
Column 1	2	3	4	5	6	7	8	9

Table 3 (Cont'd)
Seismic Data

Location	Seismic Data							
	$S_a(0.2)$	$S_a(0.5)$	$S_a(1.0)$	$S_a(2.0)$	$S_a(5.0)$	$S_a(10.0)$	PGA	PGV
Trenton	0.167	0.105	0.060	0.0300	0.0077	0.0032	0.104	0.086
Trout Creek	0.186	0.116	0.065	0.0330	0.0084	0.0035	0.115	0.093
Uxbridge	0.139	0.089	0.052	0.0270	0.0067	0.0028	0.086	0.070
Vaughan (Woodbridge)	0.167	0.096	0.053	0.0260	0.0065	0.0027	0.105	0.074
Vittoria	0.139	0.083	0.046	0.0230	0.0056	0.0024	0.086	0.064
Walkerton	0.083	0.062	0.039	0.0210	0.0052	0.0021	0.048	0.050
Wallaceburg	0.098	0.064	0.037	0.0180	0.0044	0.0018	0.058	0.048
Waterloo	0.118	0.075	0.044	0.0230	0.0056	0.0022	0.072	0.059
Watford	0.095	0.064	0.038	0.0190	0.0049	0.0020	0.056	0.050
Wawa	0.062	0.043	0.026	0.0130	0.0030	0.0014	0.036	0.031
Welland	0.308	0.150	0.069	0.0310	0.0074	0.0028	0.199	0.115
West Lorne	0.118	0.072	0.041	0.0210	0.0050	0.0021	0.072	0.056
Whitby	0.203	0.112	0.059	0.0290	0.0071	0.0028	0.130	0.089
Whitby (Brooklin)	0.176	0.102	0.056	0.0280	0.0070	0.0028	0.111	0.080
White River	0.060	0.041	0.024	0.0110	0.0025	0.0013	0.035	0.030
Wiarton	0.080	0.062	0.040	0.0210	0.0052	0.0022	0.046	0.050
Windsor	0.096	0.063	0.035	0.0170	0.0041	0.0017	0.057	0.048
Wingham	0.083	0.061	0.039	0.0200	0.0050	0.0021	0.048	0.048
Woodstock	0.118	0.075	0.043	0.0220	0.0055	0.0022	0.071	0.058
Wyoming	0.090	0.061	0.037	0.0190	0.0047	0.0020	0.053	0.048
Column 1	2	3	4	5	6	7	8	9

MMAH Supplementary Standard SB-2

Fire Performance Ratings

January 15, 2019 update

Effective Date: January 1, 2020

Issued July 26, 2019

COMMENCEMENT

MMAH Supplementary Standard SB-2 comes into force on the 1st day of January, 2014.

r5 SB-2 as amended by Ontario Regulation 191/14 comes into force on the 1st day of January, 2015.
r11.1 SB-2 as amended by Ontario Regulation 88/19 comes into force on the 1st day of January, 2020.

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r11.1 SB-2 Fire-Performance Ratings

Section 1 General

This Supplementary Standard is based in large measure on Appendix D of the model National Building Code of Canada 2015. The content of Appendix D was prepared on the recommendations of the Standing Committee on Fire Performance Ratings, which was established by the Canadian Commission on Building and Fire Codes (CCBFC) for this purpose.

1.1. Introduction

1.1.1. Scope

(1) This fire-performance information is presented in a form closely linked to the performance requirements and the minimum materials specifications of the 2012 Building Code.

(2) The ratings have been assigned only after careful consideration of all available literature on assemblies of common building materials, where they are adequately identified by description. The assigned values based on this information will, in most instances, be conservative when compared to the ratings determined on the basis of actual tests on individual assemblies.

(3) The fire-performance information set out in this Supplementary Standard applies to materials and assemblies of materials which comply in all essential details with the minimum structural design standards described in Part 4 of Division B in the 2012 Building Code. Additional requirements, where appropriate, are described in other Sections of this Supplementary Standard.

(4) Section 2 of this Supplementary Standard assigns fire-resistance ratings for walls, floors, roofs, columns and beams related to CAN/ULC-S101, "Fire Endurance Tests of Building Construction and Materials", and describes methods for determining these ratings.

(5) Section 3 assigns flame-spread ratings and smoke developed classifications for surface materials related to CAN/ULC-S102, "Test for Surface Burning Characteristics of Building Materials and Assemblies" and CAN/ULC-S102.2, "Test for Surface Burning Characteristics of Flooring, Floor Coverings, and Miscellaneous Materials and Assemblies".

(6) Section 4 describes noncombustibility in building materials when tested in accordance with CAN/ULC-S114, "Test for Determination of Non-Combustibility in Building Materials".

(7) Section 5 contains requirements for the installation of fire doors and fire dampers in fire-rated stud wall assemblies.

(8) Section 6 contains background information regarding fire test reports, obsolete materials and assemblies, assessment of archaic assemblies and the development of the component additive method.

1.1.2. Referenced Documents

(1) Where documents are referenced in this Supplementary Standard, they shall be the editions designated in Table 1.1.2.

Table 1.1.2.
Documents Referenced in SB-2 Fire-Performance Ratings

Issuing Agency	Document Number	Title of Document	Reference
ANSI	A208.1-2009	Particleboard	Table 3.1.1.A.
ASTM	C330 / C330M-13	Lightweight Aggregates for Structural Concrete	1.4.3.(2)
ASTM	C840-13	Application and Finishing of Gypsum Board	2.3.9.(1)
ASTM	C1396 / C1396M-14	Gypsum Board	1.5.1.(1); 1.5.1.(2) Table 3.1.1.A.
CCBFC	NRCC 30629	Supplement to the National Building Code of Canada 1990	6.2.; 6.3.; 6.4.
CGSB	4-GP-36M-1978	Carpet Underlay, Fibre Type	Table 3.1.1.B.
CGSB	CAN/CGSB-4.129-97	Carpets for Commercial Use	Table 3.1.1.B.
CGSB	CAN/CGSB-11.3-M87	Hardboard	Table 3.1.1.A.
CGSB	CAN/CGSB-92.2-M90	Trowel or Spray Applied Acoustical Material	2.3.4.(5)
CSA	A23.1-14 / A23.2-14	Concrete Materials and Methods of Concrete Construction / Test Methods and Standard Practices for Concrete	1.4.3.(1)
CSA	A23.3-14	Design of Concrete Structures	2.1.5.(2); 2.6.6.(1) Table 2.6.6.B. 2.8.2.(1); Table 2.8.2.
CSA	CAN/CSA-A82-14	Fired Masonry Brick Made from Clay or Shale	Table 2.6.1.A.
CSA	A82.22-M1977	Gypsum Plasters	Table 3.1.1.A.
CSA	CAN/CSA-A82.27-M91	Gypsum Board	1.5.1.(1); 1.5.1.(2) Table 3.1.1.A.
CSA	A82.30-M1980	Interior Furring, Lathing and Gypsum Plastering	1.7.2.(1); 2.3.9.(1) Table 2.5.1.
CSA	A165.1-14	Concrete Block Masonry Units	Table 2.1.1.
CSA	O86-14	Engineering Design in Wood	2.11.2.(1); 2.11.2.(2)
CSA	O112.10-08	Evaluation of Adhesives for Structural Wood Products (Limited Moisture Exposure)	2.3.6.(4)
CSA	O121-08	Douglas Fir Plywood	Table 3.1.1.A.
CSA	O141-05	Softwood Lumber	2.3.6.(2); Table 2.4.1.
CSA	O151-09	Canadian Softwood Plywood	Table 3.1.1.A.
CSA	O153-13	Poplar Plywood	Table 3.1.1.A.
CSA	O325-07	Construction Sheathing	Table 3.1.1.A.
CSA	O437.0-93	OSB and Waferboard	Table 3.1.1.A.
CSA	S16-14	Design of Steel Structures	2.6.6.(1); 2.6.6.(3) Table 2.6.6.B.
Column 1	2	3	4

Table 1.1.2. (Cont'd)
Documents Referenced in SB-2 Fire-Performance Ratings

Issuing Agency	Document Number	Title of Document	Code Reference
NFPA	80-2013	Fire Doors and Other Opening Protectives	5.2.1.(1); 5.2.1.(2)
ULC	CAN/ULC-S101-14	Fire Endurance Tests of Building Construction and Materials	1.1.1.(4); 1.12.1. 2.3.2.
ULC	CAN/ULC-S102-10	Test for Surface Burning Characteristics of Building Materials and Assemblies	1.1.1.(5)
ULC	CAN/ULC-S102.2-10	Test for Surface Burning Characteristics of Flooring, Floor Coverings, and Miscellaneous Materials and Assemblies	1.1.1.(5) Table 3.1.1.B.
ULC	CAN/ULC-S112.2-07	Fire Test of Ceiling Firestop Flap Assemblies	2.3.10.; 2.3.11.
ULC	CAN/ULC-S114–05	Test for Determination of Non-Combustibility in Building Materials	1.1.1.(6) 4.1.1.; 4.2.1.
ULC	CAN/ULC-S702-14	Mineral Fibre Thermal Insulation for Buildings	Table 2.3.4.A. Table 2.3.4.D. 2.3.5.(2); 2.3.5.(4) Table 2.6.1.E.; 6.4.
ULC	CAN/ULC-S703-09	Cellulose Fibre Insulation for Buildings	2.3.4.(5)
ULC	CAN/ULC-S706.1-16	Wood Fibre Thermal Insulation for Buildings	Table 3.1.1.A.
Column 1	2	3	4

Notes to Table 1.3.1.2.:
(1) Some titles have been abridged to omit superfluous wording.

1.1.3. Applicability of Ratings

(1) The ratings shown in this document apply if more specific test values are not available. The construction of an assembly that is the subject of an individual test report must be followed in all essential details if the fire-resistance rating reported is to be applied for use with the Building Code.

1.1.4. Higher Ratings

(1) The authority having jurisdiction may allow higher fire-resistance ratings than those derived from this Supplementary Standard, where supporting evidence justifies a higher rating. Additional information is provided in summaries of published test information and the reports of fire tests carried out by NRC, which are included in Section 6, Background Information.

1.1.5. Additional Information on Fire Rated Assemblies

(1) Assemblies containing materials for which there is no nationally recognized standard are not included in this Supplementary Standard. Many such assemblies have been rated by Underwriters Laboratories (UL), Underwriters' Laboratories of Canada (ULC) or Intertek Testing Services NA Ltd. (ITS).

1.2. Interpretation of Test Results

1.2.1. Limitations

(1) The fire-performance ratings set out in this Supplementary Standard are based on those that would be obtained from the standard methods of test described in the Building Code. The test methods are essentially a means of comparing the performance of one building component or assembly with another in relation to its performance in fire.

(2) Since it is not practicable to measure the fire resistance of constructions in situ, they must be evaluated under some agreed test conditions. A specified fire-resistance rating is not necessarily the actual time that the assembly would endure in situ in a building fire, but is that which the particular construction must meet under the specified methods of test.

(3) Considerations arising from departures in use from the conditions established in the standard test methods may, in some circumstances, have to be taken into account by the designer and the authority having jurisdiction. Some of these conditions are covered at present by the provisions of the Building Code.

(4) For walls and partitions, the stud spacing previously specified as 16 and 24 inch on centre have been converted to 406 and 610 mm respectively to represent actual stud spacing used in the field to accommodate modular sheathing panel dimensions. These metric dimensions are deemed to comply with test results based on reported stud spacing of 400 mm or 600 mm on centre.

1.3. Concrete

1.3.1. Aggregates in Concrete

(1) Low density aggregate concretes generally exhibit better fire performance than natural stone aggregate concretes. A series of tests on concrete masonry walls, combined with mathematical analysis of the test results, has allowed further distinctions between certain low density aggregates to be made.

1.4. Types of Concrete

1.4.1. Description

(1) For purposes of this Supplementary Standard, concretes are described as Types S, N, L, L_1, L_2, L40S, $L_1$20S or $L_2$20S as described in Sentences (2) to (8).

(2) Type S concrete is the type in which the coarse aggregate is granite, quartzite, siliceous gravel or other dense materials containing at least 30% quartz, chert or flint.

(3) Type N concrete is the type in which the coarse aggregate is cinders, broken brick, blast furnace slag, limestone, calcareous gravel, trap rock, sandstone or similar dense material containing not more than 30% of quartz, chert or flint.

(4) Type L concrete is the type in which all the aggregate is expanded slag, expanded clay, expanded shale or pumice.

(5) Type L_1 concrete is the type in which all the aggregate is expanded shale.

(6) Type L_2 concrete is the type in which all the aggregate is expanded slag, expanded clay or pumice.

(7) Type L40S concrete is the type in which the fine portion of the aggregate is sand and low density aggregate in which the sand does not exceed 40% of the total volume of all aggregates in the concrete.

(8) Type $L_1$20S and Type $L_2$20S concretes are the types in which the fine portion of the aggregate is sand and low density aggregate in which the sand does not exceed 20% of the total volume of all aggregates in the concrete.

1.4.2. Determination of Ratings

(1) Where concretes are described as being of Type S, N, L, L_1 or L_2, the rating applies to the concrete containing the aggregate in the group that provides the least fire resistance. If the nature of an aggregate cannot be determined accurately enough to place it in one of the groups, the aggregate shall be considered as being in the group that requires a greater thickness of concrete for the required fire resistance.

1.4.3. Description of Aggregates

(1) The descriptions of the aggregates in Type S and Type N concretes apply to the coarse aggregates only. Coarse aggregate for this purpose means that retained on a 5 mm sieve using the method of grading aggregates described in CSA A23.1 / A23.2, "Concrete Materials and Methods of Concrete Construction / Test Methods and Standard Practices for Concrete".

(2) Increasing the proportion of sand as fine aggregate in low density concretes requires increased thicknesses of material to produce equivalent fire-resistance ratings. Low density aggregates for Type L and Types L-S concretes used in loadbearing components shall conform to ASTM C330 / C330M, "Lightweight Aggregates for Structural Concrete".

(3) Non-loadbearing low density components of vermiculite and perlite concrete, in the absence of other test evidence, shall be rated on the basis of the values shown for Type L concrete.

1.5. Gypsum Board

1.5.1. Types of Gypsum Board

(1) Where the term “gypsum board” is used in this Supplementary Standard, it is intended to include, in addition to gypsum board, gypsum backing board and gypsum base for veneer plaster as described in
(a) CAN/CSA-A82.27-M, "Gypsum Board", or
(b) ASTM C1396 / C1396M, "Gypsum Board".

(2) Where the term “Type X gypsum board” is used in this Supplementary Standard, it applies to special fire-resistant gypsum board as described in
(a) CAN/CSA-A82.27-M, "Gypsum Board", or
(b) ASTM C1396 / C1396M, "Gypsum Board".

1.6. Equivalent Thickness

1.6.1. Method of Calculating

(1) The thickness of solid-unit masonry and concrete described in this Supplementary Standard shall be the thickness of solid material in the unit or component thickness. For units that contain cores or voids, the Tables refer to the equivalent thickness determined in conformance with Sentences (2) to (10).

(2) Where a plaster finish is used, the equivalent thickness of a wall, floor, column or beam protection shall be equal to the sum of the equivalent thicknesses of the concrete or masonry units and the plaster finish measured at the point that will give the least value of equivalent thickness.

(3) Except as provided in Sentence (5), the equivalent thickness of a hollow masonry unit shall be calculated as equal to the actual overall thickness of a unit in millimetres multiplied by a factor equal to the net volume of the unit and divided by its gross volume.

(4) Net volume shall be determined using a volume displacement method that is not influenced by the porous nature of the units.

(5) Gross volume of a masonry unit shall be equal to the actual length of the unit multiplied by the actual height of the unit multiplied by the actual thickness of the unit.

(6) Where all the core spaces in a wall of hollow concrete masonry or hollow-core precast concrete units are filled with grout, mortar, or loose fill materials such as expanded slag, burned clay or shale (rotary kiln process), vermiculite or perlite, the equivalent thickness rating of the wall shall be considered to be the same as that of a wall of solid units, or a solid wall of the same concrete type and the same overall thickness.

(7) The equivalent thickness of hollow-core concrete slabs and panels having a uniform thickness and cores of constant cross section throughout their length shall be obtained by dividing the net cross-sectional area of the slab or panel by its width.

(8) The equivalent thickness of concrete panels with tapered cross sections shall be the cross section determined at a distance of 2 t or 150 mm, whichever is less, from the point of minimum thickness, where t is the minimum thickness.

(9) Except as permitted in Sentence (10), the equivalent thickness of concrete panels with ribbed or undulating surfaces shall be

(a) t_a for s less than or equal to 2 t,

(b) $t + (4\ t/s - 1)(t_a - t)$ for s less than 4 t and greater than 2 t, and

(c) t for s greater than or equal to 4 t

where

t = minimum thickness of panel,

t_a = average thickness of panel (unit cross-sectional area divided by unit width), and

s = centre to centre spacing of ribs or undulations.

(10) Where the total thickness of a panel described in Sentence (9), exceeds 2 t, only that portion of the panel which is less than 2 t from the non-ribbed surface shall be considered for the purpose of the calculations in Sentence (9).

1.7. Contribution of Plaster or Gypsum Board Finish to Fire Resistance of Masonry or Concrete

1.7.1. Determination of Contribution

(1) Except as provided in Sentences (2) to (5), the contribution of a plaster or gypsum board finish to the fire resistance of a masonry or concrete wall, floor or roof assembly shall be determined by multiplying the actual thickness of the finish by the factor shown in Table 1.7.1., depending on the type of masonry or concrete to which it is applied. This corrected thickness shall then be included in the equivalent thickness as described in Subsection 1.6.

(2) Where a plaster or gypsum board finish is applied to a concrete or masonry wall, the calculated fire-resistance rating of the assembly shall not exceed twice the fire-resistance rating provided by the masonry or concrete because structural collapse may occur before the limiting temperature is reached on the surface of the non-fire-exposed side of the assembly.

(3) Where a plaster or gypsum board finish is applied only on the non-fire-exposed side of a hollow clay tile wall, no increase in fire resistance is permitted because structural collapse may occur before the limiting temperature is reached on the surface of the non-fire-exposed side of the assembly.

(4) The contribution to fire resistance of a plaster or gypsum board finish applied to the non-fire-exposed side of a monolithic concrete or unit masonry wall shall be determined in conformance with Sentence (1), but shall not exceed 0.5 times the contribution of the concrete or masonry wall.

(5) When applied to the fire-exposed side, the contribution of a gypsum lath and plaster or gypsum board finish to the fire resistance of masonry or concrete wall, floor or roof assemblies shall be determined from Table 2.3.4.A. or 2.3.4.B.

Table 1.7.1.
Multiplying Factors for Masonry or Concrete Construction

Type of Surface Protection	Type of Masonry or Concrete			
	Solid Clay Brick, Unit Masonry and Monolithic Concrete, Type N or S	Cored Clay Brick, Clay Tile, Monolithic Concrete, Type L40S and Unit Masonry, Type $L_1$20S	Concrete Unit Masonry, Type L_1 or L_2 20S and Monolithic Concrete, Type L	Concrete Unit Masonry, Type L_2
Portland cement-sand plaster or lime sand plaster	1.00	0.75	0.75	0.50
Gypsum-sand plaster, wood fibred gypsum plaster or gypsum board	1.25	1.00	1.00	1.00
Vermiculite or perlite aggregate plaster	1.75	1.50	1.25	1.25
Column 1	2	3	4	5

1.7.2. Plaster

(1) Gypsum plastering shall conform to CSA A82.30-M, "Interior Furring, Lathing and Gypsum Plastering".

(2) Portland cement-sand plaster shall be applied in 2 coats: the first coat containing 1 part Portland cement to 2 parts sand by volume, and the second coat containing 1 part Portland cement to 3 parts sand by volume.

(3) Plaster finish shall be securely bonded to the wall or ceiling.

(4) The thickness of plaster finish applied directly to monolithic concrete without metal lath shall not exceed 10 mm on ceilings and 16 mm on walls.

(5) Where the thickness of plaster finish on masonry or concrete exceeds 38 mm, wire mesh with 1.57 mm diam wire and openings not exceeding 50 mm by 50 mm shall be embedded midway in the plaster.

1.7.3. Attachment of Gypsum Board and Lath

(1) Gypsum board and gypsum lath finishes applied to masonry or concrete walls shall be secured to wood or steel furring members in conformance with Article 2.3.9.

1.7.4. Sample Calculations

(1) The following examples are included as a guide to the method of calculating the fire resistance of concrete or hollow masonry walls with plaster or gypsum board protection:

Example (1)

A 3 h fire-resistance rating is required for a monolithic concrete wall of Type S aggregate with a 20 mm gypsum-sand plaster finish on metal lath on each face.

(a) The minimum equivalent thickness of Type S monolithic concrete needed to give a 3 h fire-resistance rating = 158 mm (Table 2.1.1.).
(b) Since the gypsum-sand plaster finish is applied on metal lath, Sentence 1.7.1.(5) does not apply. Therefore, the contribution to the equivalent thickness of the wall of 20 mm gypsum-sand plaster on each face of the concrete is 20 × 1.25 = 25 mm (see Sentences 1.7.1.(1) to (4)).
(c) The total contribution of the plaster finishes is 2 × 25 = 50 mm.
(d) The minimum equivalent thickness of concrete required is 158 mm - 50 mm = 108 mm.
(e) From Table 2.1.1., the 108 mm equivalent thickness of monolithic concrete gives a contribution of less than 1.5 h. This is less than half the rating of the assembly so that the conditions in Sentence 1.7.1.(2) are not met. Thus the equivalent thickness of monolithic concrete must be increased to 112 mm to give 1.5 h contribution.
(f) The total equivalent thickness of the plaster finishes can then be reduced to 158 mm – 112 mm = 46 mm.
(g) The total actual thickness of the plaster finishes required is therefore 46 mm ÷ 1.25 = 37 mm (Sentences 1.7.1.(1) to (4)) or 18.5 mm on each face.
(h) Since the thickness of the plaster finish on each face exceeds 16 mm, metal lath is still required (Sentence 1.7.2.(4)).
(i) Since this wall is symmetrical with plaster on both faces, the contribution to fire resistance of the plaster finish on either face is limited to one-quarter of the wall rating by virtue of Sentence 1.7.1.(2). Under these circumstances, the conditions in Sentence 1.7.1.(4) are automatically met.

Example (2)

A 2 h fire-resistance rating is required for a hollow masonry wall of Type N concrete with a 12.7 mm Type X gypsum board finish on each face.

(a) Since gypsum board is used, Sentence 1.7.1.(5) applies. The 12.7 mm gypsum board finish on the fire-exposed side is, therefore, assigned 25 min by using Table 2.3.4.A.
(b) The fire resistance required of the balance of the assembly is 120 min – 25 min = 95 min.
(c) Interpolating between 1.5 h and 2 h in Table 2.1.1. for 95 min fire resistance, the equivalent thickness for hollow masonry units required is 95 mm + (18 mm × 5/30) = 95 mm + 3 mm = 98 mm.
(d) The contribution to the equivalent thickness of the wall of the 12.7 mm gypsum board finish on the non-fire-exposed side using Table 1.7.1. = 12.7 × 1.25 = 16 mm.
(e) Equivalent thickness required of concrete masonry unit = 98 – 16 = 82 mm.
(f) The fire-resistance rating of a concrete masonry wall having an equivalent thickness of 82 mm = 1 h for 73 mm + (9 mm × 30/22) = 1 h 12 min. As this is more than 1 h, the conditions of Sentence 1.7.1.(2) are met and the rating of 2 h is justified.

Example (3)

A 2 h fire-resistance rating is required for a hollow masonry exterior wall of Type $L_2$20S concrete with a 15.9 mm Type X gypsum board finish on the non-fire-exposed side only.

(a) According to Table 2.1.1., the minimum equivalent thickness for Type $L_2$20S concrete masonry units needed to achieve a 2 h rating is 94 mm.
(b) Since gypsum board is not used on the fire-exposed side, Sentence 1.7.1.(5) does not apply. The contribution to the equivalent thickness of the wall by the 15.9 mm Type X gypsum board finish applied on the non-fire-exposed side is 15.9 × 1 ≈ 16 mm (see Sentence 1.7.1.(1) and Table 1.7.1.).
(c) Therefore, the equivalent thickness required of the concrete masonry unit is 94 – 16 = 78 mm.
(d) The contribution to fire resistance of a 78 mm $L_2$20S concrete hollow masonry unit is 85 min. The contribution of the Type X gypsum board finish is 120 – 85 = 35 min, which does not exceed half the 85 min contribution of the masonry unit or 42.5 min, so that the conditions in Sentence 1.7.1.(4) are met.
(e) The rating of the wall (120 min) is less than twice the contribution of the masonry unit (170 min) so that the conditions in Sentence 1.7.1.(2) are also met.

1.8. Tests on Floors and Roofs

1.8.1. Exposure to Fire

(1) All tests relate to the performance of a floor assembly or floor-ceiling or roof-ceiling assembly above a fire. It has been assumed on the basis of experience that fire on top will take a longer time to penetrate the floor than one below, and that the fire resistance in such a situation will be at least equal to that obtained from below in the standard test.

1.9. Moisture Content

1.9.1. Effect of Moisture

(1) The moisture content of building materials at the time of fire test may have a significant influence on the measured fire resistance. In general, an increase in the moisture content should result in an increase in the fire resistance, though in some materials the presence of moisture may produce disruptive effects and early collapse of the assembly.

(2) Moisture content is now controlled in standard fire test methods and is generally recorded in the test reports. In earlier tests, moisture content was not always properly determined.

1.10. Permanence and Durability

1.10.1. Test Conditions

(1) The ratings in this Supplementary Standard relate to tested assemblies and do not take into account possible changes or deterioration in use of the materials. The standard fire test measures the fire resistance of a sample building assembly erected for the test. No judgment as to the permanence or durability of the assembly is made in the test.

1.11. Steel Structural Members

1.11.1. Thermal Protection

(1) Since the ability of a steel structural member to sustain the loading for which it was designed may be impaired because of elevated temperatures, measures shall be taken to provide thermal protection. The fire-resistance ratings, as established by the provisions of this Supplementary Standard, indicate the time periods during which the effects of heat on protected steel structural members are considered to be within acceptable limits.

1.12. Restraint Effects

1.12.1. Effect on Fire-Resistance Ratings

(1) In fire tests of floors, roofs and beams, it is necessary to state whether the rating applies to a thermally restrained or thermally unrestrained assembly. Edge restraint of a floor or roof, structural continuity, or end restraint of a beam can significantly extend the time before collapse in a standard test. A restrained condition is one in which expansion or rotation at the supports of a load-carrying element resulting from the effects of fire is resisted by forces or moments external to the element. An unrestrained condition is one in which the load-carrying element is free to thermally expand and rotate at its supports.

Whether an assembly or structural member can be considered thermally restrained or thermally unrestrained depends on the type of construction and location in a building. Guidance on this subject can be found in Appendix A of CAN/ULC-S101, "Fire Endurance Tests of Building Construction and Materials". Different acceptance criteria also apply to thermally unrestrained and thermally restrained assemblies. These are described in CAN/ULC-S101.

The ratings for floors, roofs, and beams in this Supplementary Standard meet the conditions of CAN/ULC-S101, "Fire Endurance Tests of Building Construction and Materials" for thermally unrestrained specimens. In a thermally restrained condition, the structural element or assembly would probably have greater fire resistance, but the extent of this increase can be determined only by reference to behavior in a standard test.

Section 2 Fire-Resistance Ratings

2.1. Masonry and Concrete Walls

2.1.1. Minimum Equivalent Thickness for Fire-Resistance Rating

(1) The minimum thicknesses of unit masonry and monolithic concrete walls are shown in Table 2.1.1. Hollow masonry units and hollow-core concrete panels shall be rated on the basis of equivalent thickness as described in Subsection 1.6.

Table 2.1.1.
Minimum Equivalent Thicknesses(1) of Unit Masonry and Monolithic Concrete Walls Loadbearing and Non-Loadbearing, mm

Type of Wall	Fire-Resistance Rating						
	30 min	45 min	1 h	1.5 h	2 h	3 h	4 h
Solid brick units (80% solid and over), actual overall thickness	63	76	90	108	128	152	178
Cored brick units and hollow tile units (less than 80% solid), equivalent thickness	50	60	72	86	102	122	142
Solid and hollow concrete masonry units, equivalent thickness							
Type S or N concrete(2)	44	59	73	95	113	142	167
Type $L_1$20S concrete	42	54	66	87	102	129	152
Type L_1 concrete	42	54	64	82	97	122	143
Type $L_2$20S concrete	42	54	64	81	94	116	134
Type L_2 concrete	42	54	63	79	91	111	127
Monolithic concrete and concrete panels, equivalent thickness							
Type S concrete	60	77	90	112	130	158	180
Type N concrete	59	74	87	108	124	150	171
Type L40S or Type L concrete	49	62	72	89	103	124	140
Column 1	2	3	4	5	6	7	8

Notes to Table 2.1.1.:
(1) See definition of equivalent thickness in Subsection 1.6.
(2) Hollow concrete masonry units made with Type S or N concrete shall have a minimum compressive strength of 15 MPa based on net area, as defined in CSA A165.1, "Concrete Block Masonry Units".

2.1.2. Applicability of Ratings

(1) Ratings obtained as described in Article 2.1.1. apply to either loadbearing or non-loadbearing walls, except for walls described in Sentences (2) to (6).

(2) Ratings for walls with a thickness less than the minimum thickness prescribed for loadbearing walls in this Supplementary Standard apply to non-loadbearing walls only.

(3) Masonry cavity walls (consisting of 2 wythes of masonry with an air space between) that are loaded to a maximum allowable compressive stress of 380 kPa have a fire resistance at least as great as that of a solid wall of a thickness equal to the sum of the equivalent thicknesses of the 2 wythes.

(4) Masonry cavity walls that are loaded to a compressive stress exceeding 380 kPa are not considered to be within the scope of this Supplementary Standard.

(5) A masonry wall consisting of 2 types of masonry units, either bonded together or in the form of a cavity wall, shall be considered to have a fire-resistance rating equal to that which would apply if the whole of the wall were of the material that gives the lesser rating.

(6) A non-loadbearing cavity wall made up of 2 precast concrete panels with an air space or insulation in the cavity between them shall be considered to have a fire-resistance rating as great as that of a solid wall of a thickness equal to the sum of the thicknesses of the 2 panels.

2.1.3. Framed Beams and Joists

(1) Beams and joists that are framed into a masonry or concrete fire separation shall not reduce the thickness of the fire separation to less than the equivalent thickness required for the fire separation.

2.1.4. Credit for Plaster Thickness

(1) On monolithic walls and walls of unit masonry, the full plaster finish on one or both faces multiplied by the factor shown in Table 1.7.1. shall be included in the wall thickness shown in Table 2.1.1., under the conditions and using the methods described in Subsection 1.7.

2.1.5. Walls Exposed to Fire on Both Sides

(1) Except as permitted in Sentence (2), portions of loadbearing reinforced concrete walls, which do not form a complete fire separation and thus may be exposed to fire on both sides simultaneously, shall have minimum dimensions and minimum cover to steel reinforcement in conformance with Articles 2.8.2. to 2.8.5.

(2) A concrete wall exposed to fire from both sides as described in Sentence (1) has a fire-resistance rating of 2 h if the following conditions are met:

(a) its equivalent thickness is not less than 200 mm,
(b) its aspect ratio (width/thickness) is not less than 4.0,
(c) the minimum thickness of concrete cover over the steel reinforcement specified in Clause (d) is not less than 50 mm,
(d) each face of the wall is reinforced with both vertical and horizontal steel reinforcement in conformance with either Clause 10 or Clause 14 of CSA A23.3, "Design of Concrete Structures",
(e) the structural design of the wall is governed by the minimum eccentricity (15 + 0.03h) specified in Clause 10.15.3.1. of CSA A23.3, "Design of Concrete Structures", and
(f) the effective length of the wall, kl_u, is not more than 3.7 m

where

k = effective length factor obtained from CSA A23.3, "Design of Concrete Structures",

l_u = unsupported length of the wall in metres.

2.2. Reinforced and Prestressed Concrete Floor and Roof Slabs

2.2.1. Assignment of Rating

(1) Floors and roofs in a fire test are assigned a fire-resistance rating which relates to the time that an average temperature rise of 140°C or a maximum temperature rise of 180°C at any location is recorded on the unexposed side, or the time required for collapse to occur, whichever is the lesser. The thickness of concrete shown in Table 2.2.1.A. shall be required to resist the transfer of heat during the fire resistance period shown.

(2) The concrete cover over the reinforcement and steel tendons shown in Table 2.2.1.B. shall be required to maintain the integrity of the structure and prevent collapse during the same period.

Table 2.2.1.A.
Minimum Thickness of Reinforced and Prestressed Concrete Floor or Roof Slabs, mm

Type of Concrete	Fire-Resistance Rating						
	30 min	45 min	1 h	1.5 h	2 h	3 h	4 h
Type S concrete	60	77	90	112	130	158	180
Type N concrete	59	74	87	108	124	150	171
Type L40S or Type L concrete	49	62	72	89	103	124	140
Column 1	2	3	4	5	6	7	8

Table 2.2.1.B.
Minimum Concrete Cover Over Reinforcement in Concrete Slabs, mm

Type of Concrete	Fire-Resistance Rating						
	30 min	45 min	1 h	1.5 h	2 h	3 h	4 h
Type S, N, L40S or L concrete	20	20	20	20	25	32	39
Prestressed concrete slabs Type S, N, L40S or L Concrete	20	25	25	32	39	50	64
Column 1	2	3	4	5	6	7	8

2.2.2. Floors With Hollow Units

(1) The fire resistance of floors containing hollow units may be determined on the basis of equivalent thickness as described in Subsection 1.6.

2.2.3. Composite Slabs

(1) For composite concrete floor and roof slabs consisting of one layer of Type S or N concrete and another layer of Type L40S or L concrete in which the minimum thickness of both the top and bottom layers is not less than 25 mm, the combined fire-resistance rating may be determined using the following expressions:

(a) when the base layer consists of Type S or N concrete,

$$R = 0.00018t^2 - 0.00009dt + \frac{8.7}{t}$$

(b) when the base layer consists of Type L40S or L concrete,

$$R = 0.0001t^2 + 0.0002dt - 0.0001d^2 + \frac{6.4}{t}$$

where

R = fire resistance of slab, h,

t = total thickness of slab, mm, and

d = thickness of base layer, mm.

(2) If the base course described in Sentence (1) is covered by a top layer of material other than Type S, N, L40S or L concrete, the top course thickness may be converted to an equivalent concrete thickness by multiplying the actual thickness by the appropriate factor listed in Table 2.2.3.A. This equivalent concrete thickness may be added to the thickness of the base course and the fire-resistance rating calculated using Table 2.2.1.A.

(3) The minimum concrete cover under the main reinforcement for composite concrete floor and roof slabs with base slabs less than 100 mm thick shall conform to Table 2.2.3.B. For base slabs 100 mm or more thick, the minimum cover thickness requirements of Table 2.2.1.B. shall apply.

(4) Where the top layer of a 2-layer slab is less than 25 mm thick, the fire-resistance rating for the slab shall be calculated as though the entire slab were made up of the type of concrete with the lesser fire resistance.

Table 2.2.3.A.
Multiplying Factors for Equivalent Thickness

Top Course Material	Base Slab Normal Density Concrete (Type S or N)	Base Slab Low Density Concrete (Type L40S or L)
Gypsum board	3.00	2.25
Cellular concrete (mass density 400 - 560 kg/m^3)	2.00	1.50
Vermiculite and perlite concrete (mass density 560 kg/m^3 or less)	1.75	1.50
Portland cement with sand aggregate	1.00	0.75
Terrazzo	1.00	0.75
Column 1	2	3

Table 2.2.3.B.
Minimum Concrete Cover Under Bottom Reinforcement in Composite Concrete Slabs, mm

Base Slab Concrete Type	Fire-Resistance Rating						
	30 min	45 min	1 h	1.5 h	2 h	3 h	4 h
Reinforced concrete							
Type S, N, L40S or L	15	15	20	25	30	40	55
Prestressed concrete							
Type S	20	25	30	40	50	65	75
Type N	20	20	25	35	45	60	70
Type L40S or L	20	20	25	30	40	50	60
Column 1	2	3	4	5	6	7	8

2.2.4. Contribution of Plaster Finish

(1) The contribution of plaster finish securely fastened to the underside of concrete may be taken into account in floor or roof slabs under the conditions and using the methods described in Subsection 1.7.

(2) Plaster finish on the underside of concrete floors or roofs may be used in lieu of concrete cover referred to in Sentence 2.2.1.(2) under the conditions and using the methods described in Subsection 1.7.

2.2.5. Concrete Cover

(1) In prestressed concrete slab construction, the concrete cover over an individual tendon shall be the minimum thickness of concrete between the surface of the tendon and the fire-exposed surface of the slab, except that for ungrouted ducts the assumed cover thickness shall be the minimum thickness of concrete between the surface of the duct and the bottom of the slab. For slabs in which several tendons are used, the cover is assumed to be the average of those of individual tendons, except that the cover for any individual tendon shall be not less than half of the value given in Table 2.2.1.B. nor less than 20 mm.

(2) Except as provided in Sentence (3), in post-tensioned prestressed concrete slabs, the concrete cover to the tendon at the anchor shall be not less than 15 mm greater than the minimum cover required by Sentence (1). The minimum concrete cover to the anchorage bearing plate and to the end of the tendon, if it projects beyond the bearing plate, shall be 20 mm.

(3) The requirements of Sentence (2) do not apply to those portions of slabs not likely to be exposed to fire, such as the ends and tops.

2.2.6. Minimum Dimensions for Cover

(1) Minimum dimensions and cover to steel tendons of prestressed concrete beams shall conform to Subsection 2.10.

2.3. Wood and Steel Framed Walls, Floors and Roofs

2.3.1. Maximum Fire-Resistance Rating

(1) The fire-resistance rating of walls constructed of wood studs or cold-formed-steel studs, of floors constructed of wood joists, wood I-joists, pre-manufactured wood trusses, cold-formed-steel joists or open web steel joists, and of roofs constructed of wood joists, pre-manufactured metal-plate-connected wood trusses or open web steel joists, can be determined for ratings of not more than 90 min from the information in this Subsection.

2.3.2. Loadbearing Conditions

(1) The fire-resistance ratings derived from the information in this Subsection apply to loadbearing and non-loadbearing wood-framed and cold-formed-steel-framed walls, and to loadbearing floors and roofs, as specifically described in this Subsection.

(2) Loadbearing conditions shall be as defined in CAN/ULC-S101, "Fire Endurance Tests of Building Construction and Materials".

2.3.3. Limitations of Component Additive Method

(See Section 6 Background Information.)

(1) The fire-resistance rating of a framed assembly depends primarily on the time during which the membrane on the fire-exposed side remains in place.

(2) The assigned times in Sentences 2.3.4.(2) to (4) are not intended to be construed as the fire-resistance ratings of the individual components of an assembly, nor are they intended to be construed as times that are applicable or acceptable for use beyond the method and systems described in this Subsection. These assigned times are the individual contributions of each component to the overall fire-resistance rating of an assembly, which are permitted to be derived using the component additive method described in this Subsection..

(3) The fire-resistance rating calculated by the component additive method cannot be increased by installing membranes in multiple layers, other than as specified in Tables 2.3.4.A., 2.3.4.B. and 2.3.4.C.

2.3.4. Method of Calculation

(1) In the component additive method, the fire-resistance rating of a framed assembly is calculated by adding the time assigned in Sentence (2) for the membrane on the fire-exposed side to the time assigned in Sentence (3) for the framing members and then adding any time assigned in Sentence (4) for additional protective measures, such as the inclusion of insulation or of reinforcement of a membrane. For loadbearing walls where resilient metal channels are installed with a single layer of gypsum board membrane in accordance with Table 2.3.4.A, the fire-resistance rating determined using this method of calculation must be reduced by 10 min.

(2) The times to be used in the component additive method that have been assigned to membranes on the fire-exposed side of the assembly, which are partly based on their ability to remain in place during fire tests, are listed in Tables 2.3.4.A., 2.3.4.B., 2.3.4.C. and 2.3.4.D. (This is not to be confused with the fire-resistance rating of the membrane, which also takes into account the rise in temperature on the unexposed side of the membrane. [See Sentence 2.3.3.(2).])

(3) The times to be used in the component additive method that have been assigned to wall framing members and to floor and roof framing members are listed in Tables 2.3.4.E. and 2.3.4.F. respectively.

(4) Preformed insulation of glass, rock or slag fibre and cellulose fibre insulation provide additional protection to wood studs by shielding the studs from exposure to the fire and thus delaying the time of collapse. The use of preformed glass fibre, preformed rock or slag fibre and dry-blown cellulose insulation material does not decrease the rating of wall assemblies with the membranes identified in Table 2.3.4.A. Similarly, the use of preformed glass fibre, preformed rock or slag fibre and cellulose insulation material does not decrease the rating of floors joists constructed with wood joists, wood trusses, wood I-joists and cold-formed-steel floor joists (C-shaped joists), provided the insulation is not in direct contact with the members identified in Table 2.3.4.B. The use of reinforcement in the membrane exposed to fire also adds to the fire resistance by extending the time to failure. Table 2.3.4.G. shows the time increments that may be added to the fire resistance if these features are incorporated in the assembly.

(5) Cellulose fibre insulation conforming to CAN/ULC-S703, "Cellulose Fibre Insulation for Buildings", applied in conformance with CAN/CGSB-92.2-M, "Trowel or Spray Applied Acoustical Material", does not affect the fire-resistance rating of a non-loadbearing cold-formed-steel stud wall assembly, provided that it is sprayed to either face of the wall cavity.

Table 2.3.4.A.
Time Assigned to Protective Membranes on Fire-Exposed Side of Wood-Framed and Cold-Formed-Steel-Framed Walls

Description of Finish	Time, min	
	Loadbearing Walls	Non-Loadbearing Walls
11.0 mm Douglas Fir plywood phenolic bonded	—	10(1)
14.0 mm Douglas Fir plywood phenolic bonded	—	15(1)
12.7 mm Type X gypsum board	25(2)	25
15.9 mm Type X gypsum board	40(2)	40(3)
Double 12.7 mm Type X gypsum board(4)	50	80
Column 1	2	3

Notes to Table 2.3.4.A.:
(1) Applies to stud cavities filled with mineral wool conforming to CAN/ULC-S702, "Mineral Fibre Thermal Insulation for Buildings", and having a mass per unit area of not less than 2 kg/m^2, with no additional credit for insulation according to Table 2.3.4.G.
(2) Applies only to wood-framed walls.
(3) Applies only to steel-framed walls.
(4) Resilient metal channels are permitted to be installed at a spacing of 406 mm o.c. with no effect on the rating of the wall assembly.

Table 2.3.4.B.
Time Assigned to Gypsum Board Membranes on Fire-Exposed Side of Floors

Description of Finish	Resilient Metal Channels(1)	Time, min	
		Floors with Wood or Steel Joists	Floors with Open-Web Steel Joists
12.7 mm Type X gypsum board	Spaced ≤ 406 mm o.c.(2)	25(3)	–
15.9 mm Type X gypsum board		40	–
12.7 mm Type X gypsum board	—	25(4)	25
15.9 mm Type X gypsum board		40(4)	40
Double 12.7 mm Type X gypsum board	Spaced ≤ 406 mm o.c.(5)	50(3)	—
Double 12.7 mm Type X gypsum board	Spaced at 610 mm o.c.(6)	45(3)	—
Double 15.9 mm Type X gypsum board	Spaced ≤ 610 mm o.c.(6)	60(3)	—
Column 1	2	3	4

Notes to Table 2.3.4.B.:
(1) See Figures 1, 2 and 4 in MMAH Supplementary Standard SB-3, “Fire and Sound Resistance of Building Assemblies” for the attachment of single and double layers of gypsum board to resilient metal channels.
(2) Resilient metal channels must be installed to achieve the stated rating.
(3) Applies to wood joists, wood trusses, wood I-joists and cold-formed steel joists (C-shaped joists).
(4) Applies to wood joists and pre-fabricated metal-plate-connected wood trusses.
(5) Resilient metal channels must be installed or gypsum board must be applied directly to the structural members, which must be spaced not more than 406 mm o.c.
(6) Resilient metal channels are permitted to be installed with no effect on the rating of the floor assembly. Gypsum board is also permitted to be applied directly to the structural members.

Table 2.3.4.C.
Time Assigned to Gypsum Board Membranes on Fire-Exposed Side of Roofs

Description of Finish	Time, min(1)
12.7 mm Type X gypsum board	25
15.9 mm Type X gypsum board	40
Column 1	2

Notes to Table 2.3.4.C.:
(1) Applies to wood joists, pre-fabricated metal-plate-connected wood trusses and open-web steel joists with ceiling supports spaced not more than 406 mm o.c.

Table 2.3.4.D.
Time Assigned for Contribution of Lath and Plaster Protection on Fire-Exposed Side

Type of Lath	Plaster Thickness, mm	Type of Plaster Finish		
		Portland Cement and Sand(1) or Lime and Sand	Gypsum and Sand or Gypsum Wood Fibre	Gypsum and Perlite or Gypsum and Vermiculite
		Time, min(2)		
9.5 mm gypsum	13	—	35	55
	16	—	40	65
	19	—	50	80(3)
Metal	19	20	50	80(3)
	23	25	65	80(3)
	26	30	80	80(3)
Column 1	2	3	4	5

Notes to Table 2.3.4.D.:
(1) For mixture of Portland cement-sand plaster, see Sentence 1.7.2.(2).
(2) Applies to loadbearing and non-loadbearing wood studs or non-loadbearing cold-formed-steel studs, to floors constructed of wood joists or open-web steel joists, and to roofs constructed of wood joists, pre-manufactured metal-plate-connected wood trusses or open-web steel joists.
(3) Values shown for these membranes have been limited to 80 min because the fire-resistance ratings of framed assemblies derived from these Tables must not exceed 1.5 h.

Table 2.3.4.E.
Time Assigned for Contribution of Wood-Framed or Cold-Formed-Steel-Framed Walls

Description of Frame	Time, min	
	Loadbearing Walls	Non-Loadbearing Walls
Wood studs spaced ≤ 406 mm o.c.	20	20
Wood studs spaced ≤ 610 mm o.c.	15	15
Cold-formed-steel studs spaced ≤ 406 mm o.c.	10	10
Cold-formed-steel studs spaced ≤ 610 mm o.c.	10	—
Column 1	2	3

Table 2.3.4.F.
Time Assigned for Contribution of Wood or Steel Frame of Floors and Roofs

Description of Frame		Time, min
Type of Assembly	Structural Members	
Floor(1)	Wood joists, wood I-joists, wood trusses and cold-formed-steel joists spaced ≤ 610 mm o.c.	10(2)
	Open-web steel joists with ceiling supports spaced ≤ 406 mm o.c.	
Roof	Wood joists spaced ≤ 406 mm o.c.	10
	Open-web steel joists with ceiling supports spaced ≤ 406 mm o.c.	10
	Wood truss assemblies (metal-plate-connected) spaced ≤ 610 mm o.c.	5
Column 1	2	3

Notes to Table 2.3.4.F.:
(1) Resilient metal channels are permitted to be installed with no effect on the rating of the floor assembly.
(2) Applies only to floor structural members that are protected by a membrane.

Table 2.3.4.G.
Time Assigned for Additional Protection

Description of Additional Protection	Time, min
Add to the fire-resistance rating of wood stud walls, sheathed with gypsum board or lath and plaster, if the spaces between the studs are filled with preformed insulation of rock or slag fibres conforming to CAN/ULC-S702, "Mineral Fibre Thermal Insulation for Buildings", and with a mass per unit area of not less than 1.22 kg/m^2 of wall surface	15(1)
Add to the fire-resistance rating of non-loadbearing wood stud walls, sheathed with gypsum board or lath and plaster, if the spaces between the studs are filled with preformed insulation of glass fibres conforming to CAN/ULC- S702, "Mineral Fibre Thermal Insulation for Buildings", and having a mass per unit area of not less than 0.6 kg/m^2 of wall surface	5(2)
Add to the fire-resistance rating of loadbearing wood stud walls, sheathed with gypsum board if the spaces between the studs are filled with of cellulose fibres conforming to CAN/ULC-S703, "Cellulose Fibre Insulation for Buildings", and having a density of not less than 50 kg/m^3	10
Add to the fire-resistance rating of plaster on gypsum lath ceilings if 0.76 mm diam wire mesh with 25 mm by 25 mm openings or 1.57 mm diam diagonal wire reinforcing at 250 mm o.c. is placed between lath and plaster	30
Add to the fire-resistance rating of plaster on gypsum lath ceilings if 76 mm wide metal lath strips are placed over joints between lath and plaster	10
Add to the fire-resistance rating of plaster on 9.5 mm thick gypsum lath ceilings (Table 2.3.4.D.) if supports for lath are 305 mm o.c.	10
Add to the fire-resistance rating of floor assemblies if the spaces between the structural member are filled with preformed insulation of rock or slag fibres conforming to CAN/ULC-S702, "Mineral Fibre Thermal Insulation for Buildings", and having a mass per unit area of not less than 1.22 kg/m^2 of floor surface	5(2)
Add to the fire-resistance rating of floor assemblies if the spaces between the structural members studs are filled with wet-blown cellulose fibres conforming to CAN/ULC-S703, "Cellulose Fibre Insulation for Buildings", and having a density of not less than 50 kg/m^3	5(2)(3)
Add to the fire-resistance rating of floor assemblies where the floor topping on the unexposed side of the floor assemblies consists of concrete not less than 38 mm thick	5(2)
Column 1	2

Notes to Table 2.3.4.G.:

(1) Applies to wood-framed walls only.

(2) Applies to wood joists, wood trusses, wood I-joists and cold-formed-steel joists (C-shaped joists).

(3) Applies to cellulose fibre:

(i) for wood joists, wood I-joist and wood trusses − that is sprayed-applied with a minimum density of 50 kg/m^3, a minimum depth of 90 mm on the underside of the subfloor, and of 90 mm on the sides of the structural members.

(ii) for cold-formed-steel joists – that is spray-applied with a minimum density of 50 kg/m^3 and a minimum thickness of 90 mm on the underside of the subfloor, of 90 mm on the sides of the structural members, and of 13 mm on the underside of the bottom flange other than at resilient metal channel locations.

2.3.5. Considerations for Various Types of Assemblies

(1) Interior vertical fire separations are to be rated for exposure to fire on each side (See Sentence 3.1.3.7.(2) of Division B of the 2012 Building Code). The method described in this Subsection applies when a membrane is provided on both sides of the assembly. However, in the calculation of the fire-resistance rating of such an assembly using this method, no additional contribution to fire-resistance is to be assigned for a membrane on the non-fire-exposed side, since its contribution is already accounted for in the values assigned to the other components of the assembly.

(2) Exterior wall assemblies required to have a fire-resistance rating are required to be rated for exposure to fire from the interior side only (See Sentence 3.1.3.7.(3) of Division B of the 2012 Building Code). When deriving a fire-resistance rating for such wall assemblies using the method described in this Subsection, only wood studs with a single layer of gypsum board or non-loadbearing cold-formed-steel studs conforming to Table 2.3.4.E. may be used. Such walls must have a membrane on the exterior side of the stud consisting of plywood, oriented strandboard or gypsum sheathing and exterior cladding. Additional materials are also permitted between the required sheathing and cladding. The spaces between the studs are to be filled with insulation conforming to CAN/ULC-S702, "Mineral Fibre Thermal Insulation for Buildings", and having a mass per unit area of not less than 1.22 kg/m^2 of wall surface. However, in the calculation of the fire-resistance rating of such an assembly, no additional contribution to fire resistance is to be assigned for a membrane on the non-fire-exposed side, since its contribution is already accounted for in the values assigned to the other components of the assembly.

(3) In the case of a floor or roof assembly, the Building Code only requires testing for fire exposure from below. Floors or roofs must have an upper flooring or roofing membrane in accordance with Table 2.3.5.

(4) Insulation used in the cavities of a wood joist or metal-plate-connected wood truss floor assembly with a single layer of gypsum board will not reduce the assigned fire-resistance rating of the assembly provided:

(a) the insulation is preformed of rock, slag or glass fibre conforming to CAN/ULC-S702, "Mineral Fibre Thermal Insulation for Buildings", and having a mass per unit area of not more than 1.1 kg/m^2 and is installed adjacent to the bottom edge of the framing member, directly above steel furring channels,

(b) the gypsum board ceiling membrane is attached to

(i) wood trusses in conformance with Sentence 2.3.9.(2) by way of steel furring channels spaced not more than 406 mm o.c., and the channels are secured to each bottom truss member with a double strand of 1.2 mm galvanized steel wire, or

(ii) wood joists by way of resilient metal or steel furring channels spaced not more than 406 mm o.c. in conformance with Sentences 2.3.9.(2) and (3), and

(c) a steel furring channel is installed midway between each furring channel mentioned in Clause (b) to provide additional support for the insulation.

(5) Except as required in Sentence 2.3.5.(4), resilient metal or steel furring channels may be used to attach a gypsum board ceiling membrane to a floor assembly using wood joists, metal-plate-connected wood trusses and open-web steel joists, or to a roof assembly. The channels must be made of galvanized steel not less than 0.5 mm thick spaced not more than 610 mm o.c. perpendicular to the framing membranes, with an overlap of not less than 100 mm at splices and a minimum end clearance between the channels and walls of 15 mm.

Table 2.3.5.
Flooring of Roofing Membranes

Type of Assembly	Structural Members	Subfloor or Roof Deck	Finish Flooring or Roofing
Floor	Wood or open-web steel joists(1) and metal-plate-connected wood trusses(1)	12.5 mm plywood or 15.5 mm oriented strandboard or 17 mm T & G softwood, or 14 mm phenolic-bonded Douglas Fir plywood (no finished flooring required)	Hardwood or softwood flooring on building paper Resilient flooring, parquet floor, felted synthetic fibre floor coverings, carpeting, or ceramic tile on 8 mm thick panel-type underlay Ceramic tile on 30 mm mortar bed
	Open-web steel joists(1)	50 mm reinforced concrete or 50 mm concrete on metal lath or formed steel sheet, or 40 mm reinforced gypsum-fibre concrete on 12.7 mm gypsum board	Finish flooring
	Wood joists, wood I-joists, wood trusses and cold-formed-steel joists	Minimum 15.5 mm T&G plywood or Minimum 15.5 mm oriented strandboard	No requirement
Roof	Wood or open-web steel joists(1) and wood trusses(1)	12.5 mm plywood or 15.5 mm oriented strandboard or 17 mm T & G softwood, or 14 mm phenolic-bonded Douglas Fir plywood (no finished flooring required)	Finish roofing material with or without insulation
	Open-web steel joists(1)	50 mm reinforced concrete or 50 mm concrete on metal lath or formed steel sheet or 40 mm reinforced gypsum-fibre concrete on 12.7 mm gypsum board	Finish roofing material with or without insulation
Column 1	2	3	4

Notes to Table 2.3.5.:
(1) Applies to single layer of gypsum board membrane, and lath and plaster.

2.3.6. Framing Members

(1) The values shown in Tables 2.3.4.A., 2.3.4.B., 2.3.4.D. and 2.3.12. apply to membranes supported on framing members installed in their conventional orientation and spaced in conformance with Tables 2.3.4.E. and 2.3.4.F.

(2) Wood studs and wood roof framing members are to be not less than 38 mm by 89 mm. Wood floor joists are to be not less than 38 mm by 184 mm, except where they are used in an assembly from Table 2.3.4.D. or from Table 2.3.5. that uses a single layer of gypsum board as the lower (ceiling) membrane, in which case, wood floor joists are to be not less than 38 mm by 89 mm.

(3) Wood roof trusses are to consist of wood chord and web framing members not less than 38 mm by 89 mm and metal connector plates fabricated from galvanized steel not less than 1 mm in nominal thickness with projecting teeth not less than 8 mm long.

(4) Wood floor trusses are to consist of:

(a) metal-plate-connected wood trusses that are not less than 305 mm deep with wood chord and web framing members not less than 38 mm by 64 mm and metal connector plates fabricated from galvanized steel not less than 1 mm in nominal thickness with projecting teeth not less than 8 mm long,

(b) metal-web wood trusses that are not less than 286 mm deep with wood chords not less than 38 mm by 64 mm and V-shaped webs made from galvanized steel not less than 1 mm in nominal thickness with plate areas having projecting teeth not less than 8 mm long, or.

(c) fingerjoined wood trusses that are not less than 330 mm deep with fingerjoined connections, chord members not less than 38 mm by 64 mm, and web members not less than 38 mm by 38 mm glued together with a R-14 phenol-resorcinol resin conforming to CSA O112.10, "Evaluation of Adhesives for Structural Wood Products (Limited Moisture Exposure)".

(5) Wood I-joists are to be not less than 241 mm deep with flanges that are not less than 38 mm by 38 mm and an oriented strandboard or plywood web that is not less than 9.5 mm thick.

(6) The dimensions for dressed lumber given in CSA O141, "Softwood Lumber", are to be used for wood studs, joists, I-joists and trusses.

(7) Cold-formed-steel studs for non-loadbearing walls are to consist of galvanized steel that is not less than 0.5 mm thick and not less than 63 mm wide, and have a flange width that is not less than 31 mm wide.

(8) Cold-formed-steel studs in non-loadbearing wall assemblies are to be installed with not less than a 12 mm clearance between the top of the stud and the top of the runner to allow for expansion in the event of a fire. Where the studs are required to be attached for alignment purposes during erection, they must be attached to the bottom runners only.

(9) Cold-formed-steel studs for loadbearing walls are to consist of galvanized steel that is not less than 0.912 mm thick but not greater than 1.52 mm thick, with a C-shaped cross-section not less than 92 mm deep by 41 mm wide and 12.7 mm stiffening lips.

(10) Cold-formed-steel studs in loadbearing wall assemblies are to be installed with diagonal cross-bracing.

(11) Cold-formed-steel floor joists (C-shaped joists) are to be not less than 41 mm wide by 203 mm deep by 1.22 mm material thickness.

(12) The allowable spans for wood joists listed in the Span Tables in Part 9 of Division B of the Building Code are provided for floors supporting specific occupancies.

2.3.7. Plaster Finish

(1) The thickness of plaster finish shall be measured from the face of gypsum or metal lath.

2.3.8. Edge Support for Gypsum Board in Wall Assembly

(1) Gypsum board installed over framing or furring in a wall assembly shall be installed so that all edges are supported, except that 15.9 mm Type X gypsum board may be installed horizontally with the horizontal joints unsupported when framing members are at 406 mm o.c. maximum.

2.3.9. Membrane Fastening

(1) Except as provided in Sentences (2) to (5), Table 2.3.4.B. and Sentence 2.3.5.(5), the application of lath and plaster finish shall conform to CSA A82.30-M, "Interior Furring, Lathing and Gypsum Plastering", and of gypsum board finish shall conform to ASTM C840, “Application and Finishing of Gypsum Board".

(2) Where a membrane referred to in Table 2.3.4.A., 2.3.4.B., 2.3.4.C., 2.3.4.D. or 2.3.12. is applied to steel framing or furring, fasteners shall penetrate not less than 10 mm through the metal.

(3) Except as provided in Sentence (4), where a membrane referred to in Table 2.3.4.A., 2.3.4.B., 2.3.4.C., 2.3.4.D. or 2.3.12. is applied to wood framing or furring, minimum fastener penetrations into wood members shall conform to Table 2.3.9. for the time assigned to the membrane.

(4) Where a membrane is applied in 2 layers, the fastener penetrations described in Table 2.3.9. shall apply to the base layer. Fasteners for the face layer shall penetrate not less than 20 mm into wood supports.

(5) In a double layer application of gypsum board on wood supports, fastener spacing shall conform to ASTM C840, "Application and Finishing of Gypsum Board".

Table 2.3.9.
Membrane Fastening

Type of Membrane	Minimum Penetration of Fasteners for Membrane Protection on Wood Framing, mm					
	5 – 25	30 – 35	40	50	55 – 70	80
	Time,(1) min					
Single layer	20	29	32	—	—	—
Double layer	20	20	20	29	35	44
Gypsum lath	20	20	23	23	29	29
Column 1	2	3	4	5	6	7

Notes to Table 2.3.9.:
(1) Assigned contributions of membranes to fire resistance are listed in Tables 2.3.4.A., 2.3.4.B., 2.3.4.C., 2.3.4.D. and 2.3.12.

2.3.10. Ceiling Membrane Openings - Combustible Construction

(1) Except as permitted in Article 2.3.12., where a floor or roof assembly of combustible construction is assigned a fire-resistance rating on the basis of this Subsection and incorporates a ceiling membrane described in Table 2.3.4.B., 2.3.4.C. or 2.3.4.D., the ceiling membrane may be penetrated by openings leading to ducts within concealed spaces above the membrane provided:
(a) the assembly is not required to have a fire-resistance rating in excess of 1 h,
(b) the area of any openings does not exceed 930 cm^2 (see Sentence (2)),
(c) the aggregate area of openings does not exceed 1% of the ceiling area of the fire compartment,
(d) the depth of the concealed space above the ceiling is not less than 230 mm,
(e) no dimension of any opening exceeds 310 mm,
(f) supports are provided for openings with any dimension exceeding 150 mm where framing members are spaced greater than 406 mm o.c.,
(g) individual openings are spaced not less than 2 m apart,
(h) the ducts above the membrane are sheet steel and are supported by steel strapping firmly attached to the framing members, and
(i) the clearance between the top surface of the membrane and the bottom surface of the ducts is not less than 100 mm.

(2) Where an individual opening permitted in Sentence (1) exceeds 130 cm^2 in area, it shall be protected by
(a) a fire stop flap conforming to CAN/ULC-S112.2, "Fire Test of Ceiling Firestop Flap Assemblies", that activates at a temperature approximately 30°C above the normal maximum temperature that occurs in the ducts, whether the air duct system is operating or shut down, or
(b) thermal protection above the duct consisting of the same materials as used for the ceiling membrane, mechanically fastened to the ductwork and extending 200 mm beyond the opening on all sides (see Figure 2.3.10.).

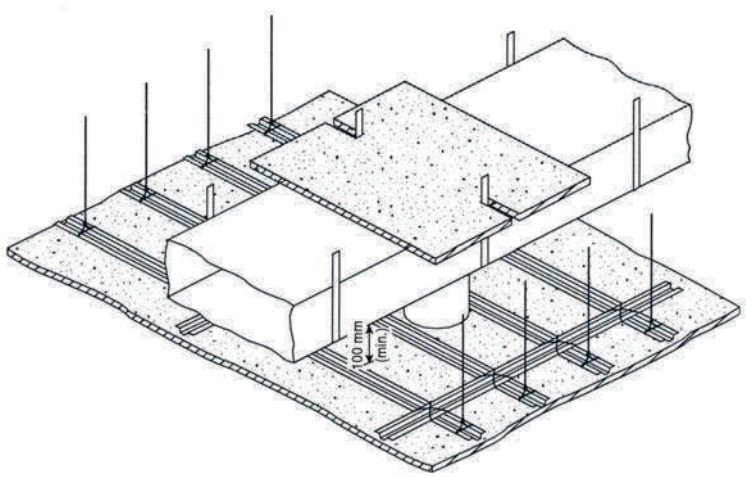


Figure 2.3.10.
Thermal Protection Above a Duct

2.3.11. Ceiling Membrane Openings - Noncombustible Construction

(1) Except as permitted in Article 2.3.12., where a floor or roof assembly of noncombustible construction is assigned a fire-resistance rating on the basis of this Subsection and incorporates a ceiling membrane described in Table 2.3.4.B., 2.3.4.C. or 2.3.4.D. the ceiling membrane may be penetrated by openings leading to ducts located within concealed spaces provided:

(a) the area of any opening does not exceed 930 cm^2 (see Sentence (2)),
(b) the aggregate area of openings does not exceed 2% of the ceiling area of the fire compartment,
(c) no dimension of any opening exceeds 400 mm,
(d) individual openings are spaced not less than 2 m apart,
(e) openings are located not less than 200 mm from major structural members such as beams, columns or joists,
(f) the ducts above the membrane are sheet steel and are supported by steel strapping firmly attached to the framing members, and
(g) the clearance between the top surface of the membrane and the bottom surface of the duct is not less than 100 mm.

(2) Where an individual opening permitted in Sentence (1) exceeds 130 cm^2 in area, it shall be protected by

(a) a fire stop flap conforming to CAN/ULC-S112.2, "Fire Test of Ceiling Firestop Flap Assemblies", that activates at a temperature approximately 30°C above the normal maximum temperature that occurs in the ducts, whether the air duct system is operating or shut down, or
(b) thermal protection above the duct consisting of the same materials as used for the ceiling membrane, mechanically fastened to the ductwork and extending 200 mm beyond the opening on all sides (see Figure 2.3.10.).

2.3.12. Ceiling Membrane Rating

(1) Where the fire-resistance rating of a ceiling assembly is to be determined on the basis of the membrane only and not of the complete assembly, the ratings may be determined from Table 2.3.12., provided no openings described in Articles 2.3.10. and 2.3.11. are located within the ceiling membrane.

Table 2.3.12.
Fire-Resistance Rating for Ceiling Membranes

Description of Membrane	Fire-Resistance Rating, min
15.9 mm Type X gypsum board with ≥ 75 mm mineral wool batt insulation above board	30
19 mm gypsum-sand plaster on metal lath	30
Double 14.0 mm Douglas Fir plywood phenolic bonded	30
Double 12.7 mm Type X gypsum board	45
25 mm gypsum-sand plaster on metal lath	45
Double 15.9 mm Type X gypsum board	60
32 mm gypsum-sand plaster on metal lath	60
Column 1	2

2.3.13. Membrane Penetrations in Combustible and Noncombustible Construction

(1) Where a wall, floor or roof assembly is assigned a fire-resistance rating on the basis of this Subsection and includes a membrane or membranes described in Table 2.3.4.A., 2.3.4.B., 2.3.4.C., 2.3.4.D. or 2.3.12., penetrations of the membrane or membranes must be fire stopped in conformance with the applicable requirements in Article 3.1.9.1. or Sentence 9.10.9.6.(1) of Division B of the Building Code.

2.3.14. Beams

(1) Where a steel beam is included with an open-web steel joist and is protected by the same continuous ceiling, the beam is assumed to have a fire-resistance rating equal to that assigned to the rest of the assembly.

(2) The ratings in this Subsection assume that the construction to which the beam is related is a normal one and does not carry unusual loads from the floor or slab above.

2.3.15. Wired Glass Assembly Support

(1) Openings in a vertical fire separation having a fire-resistance rating of not more than 1 h are allowed to be protected by wired glass assemblies, provided the wired glass is

(a) not less than 6 mm thick,
(b) reinforced by a steel wire mesh in the form of diamonds, squares or hexagons having dimensions of
  (i) approximately 25 mm across the flats, using wire of not less than 0.45 mm diameter, or
  (ii) approximately 13 mm across the flats, using wire of not less than 0.40 mm diameter, the wire to be centrally embedded during manufacture and welded or intertwined at each intersection,
(c) set in fixed steel frames with metal not less than 1.35 mm thick and providing a glazing stop of not less than 20 mm on each side of the glass, and
(d) limited in area so that
  (i) individual panes are not more than 0.84 m^2, with neither height nor width more than 1.4 m, and
  (ii) the area not structurally supported by mullions is not more than 7.5 m^2.

(2) It is intended that the structural mullions referred to in Subclause (1)(d)(ii) will not distort or be displaced to the extent that there would be a failure of the wired glass closure during the period for which a closure in the fire separation would be expected to function. Hollow structural steel tubing not less than 100 mm square filled with a Portland cement-based grout will satisfy the intent of the Subclause.

2.4. Solid Wood Walls, Floors and Roofs

2.4.1. Minimum Thickness

(1) The minimum thickness of solid wood walls, floors and roofs for fire-resistance ratings from 30 min to 1.5 h is shown in Table 2.4.1.

Table 2.4.1.
Minimum Thickness of Solid Wood Walls, Roofs and Floors,(1)(2) mm

Type of Construction	Fire-Resistance Rating			
	30 min	45 min	1 h	1.5 h
Solid wood floor with building paper and finish flooring on top(3)	89	114	165	235
Solid wood, splined or tongued and grooved floor with building paper and finish flooring on top(4)	64	76	—	—
Solid wood walls of loadbearing vertical plank(3)	89	114	140	184
Solid wood walls of non-loadbearing horizontal plank(3)	89	89	89	140
Column 1	2	3	4	5

Notes to Table 2.4.1.:
(1) See CSA O141, "Softwood Lumber", for sizes.
(2) The fire-resistance ratings and minimum dimensions for floors also apply to solid wood roof decks of comparable thickness with finish roofing material.
(3) The assembly shall consist of 38 mm thick members on edge fastened together with 101 mm common wire nails spaced not more than 406 mm o.c. and staggered in the direction of the grain.
(4) The floor shall consist of 64 mm by 184 mm wide planks either tongued and grooved or with 19 mm by 38 mm splines set in grooves and fastened together with 88 mm common nails spaced not more than 406 mm o.c.

2.4.2. Increased Fire-Resistance Rating

(1) The fire-resistance rating of the assemblies described in Table 2.4.1. may be increased by 15 min if one of the following finishes is applied on the fire-exposed side:
(a) 12.7 mm thick gypsum board,
(b) 20 mm thick gypsum-sand plaster on metal lath, or
(c) 13 mm thick gypsum-sand plaster on 9.5 mm gypsum lath.

(2) Fastening of the plaster to the wood structure shall conform to Subsection 2.3.

2.4.3. Supplementary Ratings

(1) Supplementary ratings based on tests are included in Table 2.4.3. The ratings given shall apply to construction that conform in all details with the descriptions given.

Table 2.4.3.
Fire-Resistance Rating of Non-Loadbearing Built-up Solid Wood Partitions(1)

Construction Details	Actual Overall Thickness, mm	Fire-Resistance Rating
Solid panels of wood boards 64 mm to 140 mm wide grooved and joined with wood splines, nailed together, boards placed vertically with staggered joints, 3 boards thick	58	30 min
Solid panels with 4 mm plywood facings(2) glued to 46 mm solid wood core of glued, tongued and grooved construction for both sides and ends of core pieces with tongued and grooved rails in the core about 760 mm apart	54	1 h
Column 1	2	3

Notes to Table 2.4.3.:
(1) The ratings and notes are taken from "Fire Resistance Classifications of Building Constructions", Building Materials and Structures Report BMS 92, National Bureau of Standards, Washington, 1942.
(2) Ratings for plywood faced panel are based on phenolic resin glue being used for gluing facings to wood frames. If other types of glue are used for this purpose, the ratings apply if the facings are nailed to the frames in addition to being glued.

2.5. Solid Plaster Partitions

2.5.1. Minimum Thickness

(1) The minimum thickness of solid plaster partitions for fire-resistance ratings from 30 min to 4 h is shown in Table 2.5.1.

Table 2.5.1.
Minimum Thickness of Non-Loadbearing Solid Plaster Partitions, mm

Type of Plaster on Metal Lath(1)	Fire-Resistance Rating						
	30 min	45 min	1 h	1.5 h	2 h	3 h	4 h
Portland cement-sand(2) or Portland cement-lime-sand	50(3)	—	—	—	—	—	—
Gypsum-sand	50(3)	50(3)	64	—	—	—	—
Gypsum-vermiculite, gypsum-perlite, Portland cement-vermiculite or Portland cement-perlite	50(3)	50(3)	50(3)	58	64	83	102
Column 1	2	3	4	5	6	7	8

Notes to Table 2.5.1.:
(1) Metal lath shall be expanded metal lath or welded woven wire fabric supported on 19 mm vertical light steel studs spaced not more than 610 mm o.c. Plaster shall be applied to both sides of the lath.
(2) For mixture of Portland cement-sand plaster, see Sentence 1.7.2.(2).
(3) CSA A82.30-M, "Interior Furring, Lathing and Gypsum Plastering", does not permit solid plaster partitions less than 50 mm thick.

2.6. Protected Steel Columns

2.6.1. Minimum Thickness of Protective Covering

(1) The minimum thickness of protective covering to steel columns is shown in Tables 2.6.1.A. to 2.6.1.F. for fire-resistance ratings from 30 min to 4 h.

Table 2.6.1.A.
Minimum Thickness of Concrete or Masonry Protection to Steel Columns, mm

Description of Cover	Fire-Resistance Rating						
	30 min	45 min	1 h	1.5 h	2 h	3 h	4 h
Monolithic concrete							
Type S concrete[1] (column spaces filled)[2]	25	25	25	25	39	64	89
Type N or L concrete[1] (column spaces filled)[2]	25	25	25	25	32	50	77
Concrete masonry units[3] or precast reinforced concrete units							
Type S concrete (column spaces not filled)	50	50	50	50	64	89	115
Type N or L concrete (column spaces not filled)	50	50	50	50	50	77	102
Clay or shale brick[4] (column spaces filled)[2]	50	50	50	50	50	64	77
Clay or shale brick[4] (column spaces not filled)	50	50	50	50	50	77	102
Hollow clay tile[5] (column spaces filled)[2]	50[6]	50[6]	50[6]	50[6]	[7]	[7]	[7]
Hollow clay tile[5] (column spaces not filled)	50[6]	50[6]	50[6]	—	—	—	—
Column 1	2	3	4	5	6	7	8

Notes to Table 2.6.1.A.:

(1) Applies to cast-in-place concrete reinforced with 5.21 mm diam wire wrapped around column spirally 200 mm o.c., or 1.57 mm diam wire mesh with 100 mm by 100 mm openings.
(2) The space between the protective covering and the web or flange of the column shall be filled with concrete, cement mortar or a mixture of cement mortar and broken bricks.
(3) Concrete masonry shall be reinforced with 5.21 mm diam wire or wire mesh with 1.19 mm diam wire and 10 mm by 10 mm openings, laid in every second course.
(4) Brick cover 77 mm thick or less shall be reinforced with 2.34 mm diam wire or 1.19 mm diam wire mesh with 10 mm by 10 mm openings, laid in every second course.
(5) Hollow clay tiles and masonry mortar shall be reinforced with 1.19 mm diam wire mesh with 10 mm by 10 mm openings, laid in every horizontal joint and lapped at corners.
(6) Hollow clay tiles shall conform to CAN/CSA-A82, “Fired Masonry Brick Made from Clay or Shale".
(7) 50 mm nominal hollow clay tile, reinforced with 1.19 mm diam wire mesh with 10 mm by 10 mm openings laid in every horizontal joint and covered with 19 mm gypsum-sand plaster and with limestone concrete fill in column spaces, has a 4 h fire-resistance rating.

Table 2.6.1.B.
Minimum Thickness of Plaster Protection to Steel Columns, mm

Description	Fire-Resistance Rating[1][2]						
	30 min	45 min	1 h	1.5 h	2 h	3 h	4 h
Gypsum-sand plaster on 9.5 mm gypsum lath[3]	13	13	13	20	—	—	—
Gypsum-perlite or vermiculite plaster on 9.5 mm gypsum lath[3]	13	13	13	20	25	—	—
Gypsum perlite or vermiculite plaster on 12.7 mm gypsum lath[3]	13	13	13	20	25	32	50
Gypsum perlite or vermiculite plaster on double 12.7 mm gypsum lath[3]	13	13	13	20	25	25	32
Portland cement-sand plaster on metal lath[4][5]	25	25	25	—	—	—	—
Column 1	2	3	4	5	6	7	8

Notes to Table 2.6.1.B.:

(1) Fire-resistance ratings of 30 min and 45 min apply to columns whose M/D ratio is 30 or greater. Fire-resistance ratings greater than 45 min apply to columns whose M/D ratio is greater than 60. Where the M/D ratio is between 30 and 60 and the required fire-resistance rating is greater than 45 min, the total thickness of protection specified in the Table shall be increased by 50%. (To determine M/D, refer to Article 2.6.4.)

(2) Where the thickness of plaster over gypsum lath is 25 mm or more, wire mesh with 1.57 mm diam wire and openings not exceeding 50 mm by 50 mm shall be placed midway in the plaster.

(3) Lath held in place by 1.19 mm diam wire wrapped around lath 450 mm o.c.

(4) Expanded metal lath 1.36 kg/m^2 fastened to 9.5 mm by 19 mm steel channels held in vertical position around column by 1.19 mm diam wire ties.

(5) For mixture of Portland cement-sand plaster, see Sentence 1.7.2.(2).

Table 2.6.1.C.
Minimum Thickness of Gypsum-Sand Plaster on Metal Lath Protection to Steel Columns, mm

M/D[1]	Fire-Resistance Rating					
	30 min	45 min	1 h	1.5 h	2 h	3 h
30 to 60	16	16	32	—	—	—
over 60 to 90	16	16	16	32	—	—
over 90 to 120	16	16	16	25	39	—
over 120 to 180	16	16	16	16	25	—
over 180	16	16	16	16	25	39
Column 1	2	3	4	5	6	7

Notes to Table 2.6.1.C.:

(1) To determine the M/D ratio, refer to Article 2.6.4.

Table 2.6.1.D.
Minimum Thickness of Gypsum-Perlite or Gypsum-Vermiculite Plaster on Metal Lath Protection to Steel Columns, mm

M/D(1)	Fire-Resistance Rating						
	30 min	45 min	1 h	1.5 h	2 h	3 h	4 h
30 to 60	16	16	20	32	35	—	—
over 60 to 90	16	16	16	20	26	35	45
over 90 to 120	16	16	16	16	26	35	45
over 120 to 180	16	16	16	16	20	32	35
over 180	16	16	16	16	16	26	35
Column 1	2	3	4	5	6	7	8

Notes to Table 2.6.1.D.:
(1) To determine the M/D ratio, refer to Article 2.6.4.

Table 2.6.1.E.
Steel Columns with Sheet-Steel Membrane and Insulation as Shown in Figures 2.6.1.A. and 2.6.1.B.

Type of Protection	Steel Thickness,(1) mm	Fastening(2)	Insulation	Fire-Resistance Rating
See Figure 2.6.1.A.	0.51	No. 8 sheet-metal screws 9.5 mm long, 200 mm o.c.	50 mm mineral wool batts(3)	45 min
See Figure 2.6.1.B.	0.64	Self-threading screws or No. 8 sheet-metal screws, 600 mm o.c.	2 layers 12.7 mm gypsum board	1.5 h
See Figure 2.6.1.A.	0.64	No. 8 sheet-metal screws, 9.5 mm long, 200 mm o.c.	75 mm mineral wool batts,(3) 12.7 mm gypsum board	2 h
See Figure 2.6.1.B.	0.76	Crimped joint or No. 8 sheet-metal screws, 300 mm o.c.	2 layers 15.9 mm gypsum board	2 h
Column 1	2	3	4	5

Notes to Table 2.6.1.E.:
(1) Minimum thickness, galvanized or wiped-zinc-coated sheet-steel.
(2) Sheet-steel shall be securely fastened to the floor and superstructure, or where sheet-steel cover does not extend floor to floor, fire stopping shall be provided at the level where sheet-steel protection ends. In the latter case, an alternate type of fire protection shall be applied between the fire stopping and the superstructure.
(3) Conforming to CAN/ULC-S702, "Mineral Fibre Thermal Insulation for Buildings", Type 1A, minimum density 30 kg/m^3: column section and batts wrapped with 25 mm mesh chicken wire.

Table 2.6.1.F.
Minimum M/D Ratio for Steel Columns Covered With Type X Gypsum Board Protection(1)

Minimum Thickness of Type X Gypsum Board Protection(2), mm	Fire-Resistance Rating			
	1 h	1.5 h	2 h	3 h
12.7	75	—	—	—
15.9	55	—	—	—
25.4	35	60	—	—
28.6	35	50	—	—
31.8	35	40	75	—
38.1	35	35	55	—
41.3	35	35	45	—
44.5	35	35	35	—
47.6	35	35	35	—
50.8	35	35	35	75
63.5	35	35	35	45
Column 1	2	3	4	5

Notes to Table 2.6.1.F.:
(1) To determine the M/D ratio, refer to Article 2.6.4.
(2) See Article 2.6.5.

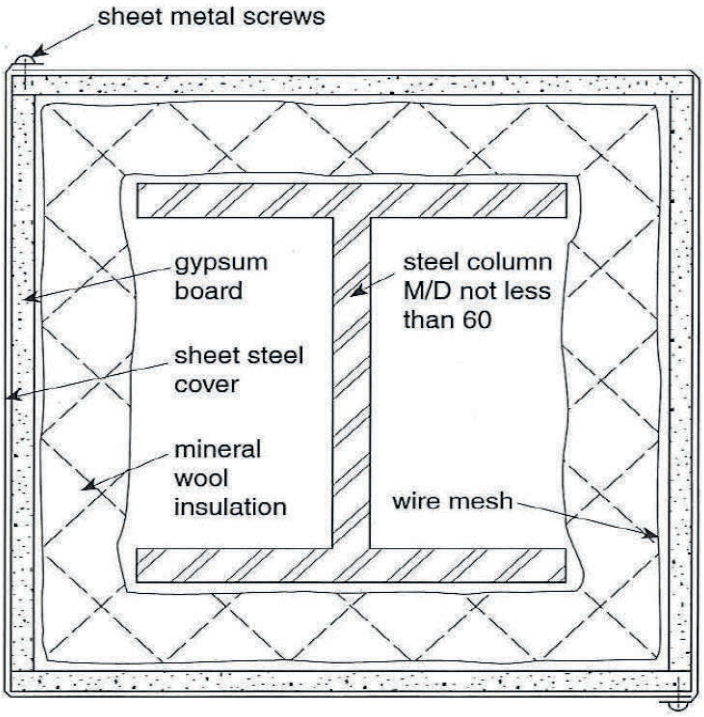


Figure 2.6.1.A.
Column Protected by Sheet-Steel Membrane, Gypsum Board and Mineral-Wool Insulation

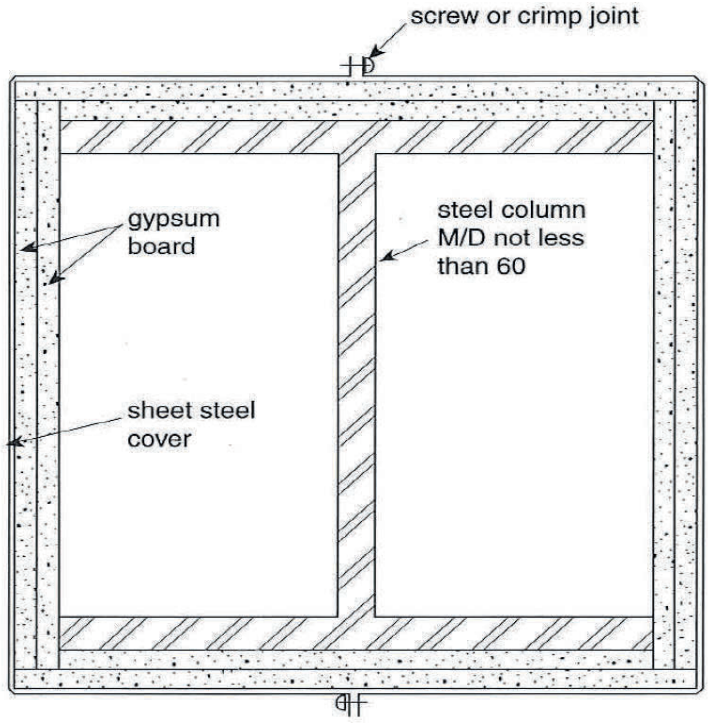


Figure 2.6.1.B.
Column Protected by Sheet-Steel Membrane and Gypsum Board

2.6.2. Hollow Unit Masonry Columns

(1) For hollow-unit masonry column protection, the thickness shown in Tables 2.6.1.A. to 2.6.1.D. is the equivalent thickness as described in Subsection 1.6.

2.6.3. Effect of Plaster

(1) The effect on fire-resistance ratings of the addition of plaster to masonry and monolithic concrete column protection is described in Subsection 1.7.

2.6.4. Determination of M/D Ratio

(1) The ratio M/D to which reference is made in Tables 2.6.1.B., 2.6.1.C., 2.6.1.D. and 2.6.1.F. shall be found by dividing "M," the mass of the column in kilograms per metre by "D," the heated perimeter of the steel column section in metres.

(2) The heated perimeter "D" of steel columns, shown as the dashed line in Figure 2.6.4.A., shall be equal to 2 (B+H) in Examples (1) and (2), and 3.14B in Example (3). In Figure 2.6.4.B., the heated perimeter "D" shall be equal to 2 (B+H).

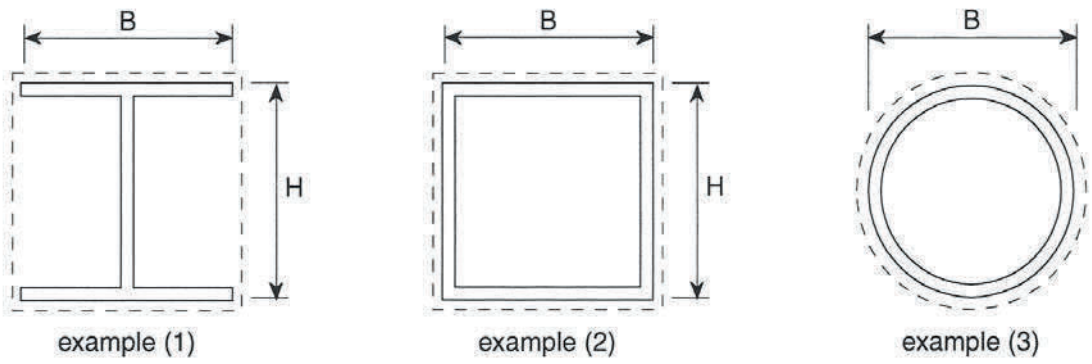
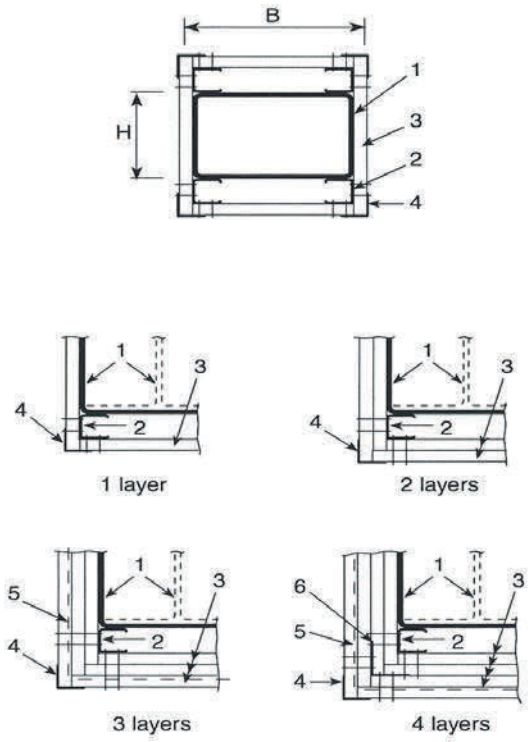


Figure 2.6.4.A.
Example (1), Standard or Wide-Flange Beam,
Example (2), Hollow Structural Section (Rectangular or Square),
Example (3), Hollow Structural Section (Round)



1. structural member
2. steel studs
3. gypsum board (Type X)
4. steel corner bead
5. tie wire
6. sheet metal angle

Figure 2.6.4.B.
Columns Protected by Type X Gypsum Board Without Sheet-Steel Membrane

2.6.5. Attachment of Gypsum Board

(1) Where Type X gypsum board is used to protect a steel column without an outside sheet-steel membrane, the method of gypsum board attachment to the column shall be as shown in Figure 2.6.4.B. and shall meet the construction details described in Sentences (2) to (7).

(2) The Type X gypsum board shall be applied vertically without horizontal joints.

(3) The first layer of gypsum board shall be attached to steel studs with screws spaced not more than 610 mm o.c. and other layers of gypsum board shall be attached to steel studs and steel corner beads with screws spaced at a maximum of 305 mm o.c. Where a single layer of gypsum board is used, attachment screws shall be spaced not more than 305 mm o.c.

(4) Steel tie wires spaced at a maximum of 610 mm o.c. shall be used to secure the second last layer of gypsum board in 3- and 4-layer systems.

(5) Studs shall be fabricated of galvanized steel not less than 0.53 mm thick and not less than 41.3 mm wide, with legs not less than 33.3 mm long and shall be 12.7 mm less than the assembly height.

(6) Corner beads shall
(a) be fabricated of galvanized steel that is not less than 0.41 mm thick,

(b) have legs not less than 31 mm long,
(c) be attached to the gypsum board or stud with 25.4 mm screws spaced not more than 305 mm o.c., and
(d) have the attaching fasteners penetrate either another corner bead in multiple layer assemblies or the steel stud member.

(7) In a 4-layer system, metal angles shall be fabricated of galvanized steel and shall be not less than 0.46 mm thick with legs not less than 51 mm long.

2.6.6. Concrete Filled Hollow Steel Columns

(1) A fire-resistance rating, R, is permitted to be assigned to concentrically loaded hollow steel columns that are filled with plain concrete, steel-fibre reinforced concrete or bar-reinforced concrete, that are fabricated and erected within the tolerances stipulated in CSA S16, " Design of Steel Structures", and that comply with Sentences (2) and (3), provided:

$$C \leq C_{max}$$

where

C = axial compressive force due to dead and live loads without load factors, kN,

$$C_{max} = \left(\frac{a\,(f_c' + 20)\,D^{2.5}}{R\,(KL - 1000)}\right)^2$$

but shall not exceed

1.0 C_r' for plain concrete filling (PC),
1.1 C_r' for steel-fibre reinforced concrete filling (FC), and
1.7 C_r' for bar-reinforced concrete filling (RC),

where

$$C_r' = 0.85\phi_c f_c' A_c \lambda_c^{-2}\left[\sqrt{1 + 0.25\lambda_c^{-4}} - 0.5\lambda_c^{-2}\right]$$

where

a = constant obtained from Table 2.6.6.A.,

f_c' = specified compressive strength of concrete in accordance with CSA A23.3, "Design of Concrete Structures", MPa,

r_c = radius of gyration of the concrete area,

A_c = area of concrete, mm^2,

D = outside diameter of a round column or outside width of a square column, mm,

E_c = initial elastic modulus for concrete, considering the effects of long-term load for normal-weight concrete = $\left(1 + \frac{S}{T}\right) 2500\sqrt{f_c'}$, where f_c' is expressed in MPa, S is the short-term load, and T is the total load on the column,

R = specified fire-resistance rating, min,

KL = effective length of column as defined in CSA S16, "Design of Steel Structures", mm,

$\lambda_c = \frac{KL}{r_c}\sqrt{\frac{f_c'}{\pi^2 E_c}}$, and

ϕ_c = 0.60

subject to the validity limits specified in Table 2.6.6.B.

(2) A pair of steam vent holes shall be provided at each end of the hollow steel column and at each intermediate floor level, and the holes shall be
(a) not less than 13 mm in diameter,
(b) located on opposite faces, 150 mm above or below a base plate, cap plate or concrete slab,
(c) orientated so that adjacent pairs are perpendicular, and
(d) not obstructed by other building elements.

(3) Load application and reaction shall be through end bearing in accordance with CSA S16, "Design of Steel Structures".

Table 2.6.6.A.
Values of Constant "a"

Filling Type	Concrete Type(1)	Steel Reinforcement	Circular Columns	Square Columns
PC	S	n/a	0.070	0.060
FC	S	≈ 2%	0.075	0.065
RC	S	1.5% – 3%	0.080	0.070
RC	S	3% – 5%	0.085	0.075
PC	N	n/a	0.080	0.070
FC	N	≈ 2%	0.085	0.075
RC	N	1.5% – 3%	0.090	0.080
RC	N	3% – 5%	0.095	0.085
Column 1	2	3	4	5

Notes to Table 2.6.6.A.:
(1) See Subsection 1.4.

Table 2.6.6.B.
Validity Limits

Parameter	Type of Concrete Filling		
	PC	FC	RC
f_c' (MPa)	20 to 40	20 to 55	20 to 55
D (round) (mm)	140 to 410	120 to 410	165 to 410
D (square) (mm)	140 to 305	102 to 305	175 to 305
Reinforcement (%)	n/a	≈ 2% of the concrete mix by mass	1.5% to 5% of cross-sectional area(1)
Concrete Cover (mm)	n/a	n/a	≥ 25
R (min)	≤ 120	≤ 180	≤ 180
KL (mm)	2 000 to 4 000	2 000 to 4 500	2 000 to 4 500
Class(2)	1, 2 or 3	1, 2 or 3	1, 2 or 3
Column 1	2	3	4

Notes to Table 2.6.6.B.:
(1) Limits on size, number and spacing of bars and ties in accordance with CSA A23.3, "Design of Concrete Structures".
(2) Classification of sections in accordance with CSA S16, "Design of Steel Structures".

2.7. Individually Protected Steel Beams

2.7.1. Minimum Thickness of Protective Covering

(1) The minimum thickness of protective covering on steel beams exposed to fire on 3 sides for fire-resistance ratings from 30 min to 4 h is shown in Table 2.7.1.

Table 2.7.1.
Minimum Thickness of Cover to Individual Protected Steel Beams,(1) mm

Description of Cover	Fire-Resistance Rating						
	30 min	45 min	1 h	1.5	2 h	3 h	4 h
Type S concrete(2) (beam spaces filled solid)	25	25	25	25	32	50	64
Type N or L concrete(2) (beam spaces filled solid)	25	25	25	25	25	39	50
Gypsum-sand plaster on 9.5 mm gypsum lath(3)	13	13	13	20	—	—	—
Gypsum-perlite or vermiculite plaster on 9.5 mm gypsum lath(3)	13	13	13	13	25	—	—
Gypsum-perlite or gypsum-vermiculite on 12.7 mm gypsum lath(3)	13	13	13	20	25	39	50
Gypsum-perlite or vermiculite plaster on double 12.7 mm gypsum lath(3)	13	13	13	20	25	25	39
Portland cement-sand on metal lath(4)	23	23	23	—	—	—	—
Gypsum-sand on metal lath(4) (plaster in contact with lower flange)	16	20	25	39	—	—	—
Gypsum-sand on metal lath with air gap between plaster and lower flange(4)	16	16	16	25	25	—	—
Gypsum-perlite or gypsum-vermiculite on metal lath(4)	16	16	16	23	23	35	48(5)
Column 1	2	3	4	5	6	7	8

Notes to Table 2.7.1.:
(1) Where the thickness of plaster finish applied over gypsum lath is 26 mm or more, the plaster shall be reinforced with wire mesh with 1.57 mm diam wire and 50 mm by 50 mm openings placed midway in the plaster.
(2) Applies to cast-in-place concrete reinforced by 5.21 mm diam wire spaced 200 mm o.c. or 1.57 mm diam wire mesh with 100 mm by 100 mm openings.
(3) Lath held in place by 1.18 mm diam wire wrapped around the gypsum lath 450 mm o.c.
(4) Expanded metal lath 1.63 kg/m^2 fastened to 9.5 mm by 19 mm steel channels held in position by 1.19 mm diam wire.
(5) Plaster finish shall be reinforced with wire mesh with 1.57 mm diam wire and 50 mm by 50 mm openings placed midway in the plaster.

2.7.2. Types of Concrete

(1) Concrete is referred to as Type S, N or L, depending on the nature of the aggregate used. This is described in Article 1.4.1.

2.7.3. Effect of Plaster

(1) The effect on fire-resistance ratings of the addition of plaster finish to concrete or masonry beam protection is described in Article 1.7.1.

2.7.4. Exceptions

(1) The fire resistance of protected steel beams depends on the means used to hold the protection in place. Because of the importance of this factor, no rating has been assigned in Table 2.7.1. to masonry units used as protective cover to steel beams. These ratings, however, may be determined on the basis of comparison with column protection at the discretion of the authority having jurisdiction, if satisfactory means of fastening are provided.

2.7.5. Beam Protected by a Membrane

(1) A steel beam or steel joist assembly that is entirely above a horizontal ceiling membrane will be protected from fire below the membrane and will resist structural collapse for a period equal to the fire-resistance rating determined in conformance with Subsection 2.3. The support for this membrane shall be equivalent to that described in Subsection 2.3. The rating on this basis shall not exceed 1.5 h.

2.8. Reinforced Concrete Columns

2.8.1. Minimum Dimensions

(1) Minimum dimensions for reinforced concrete columns and minimum concrete cover for vertical steel reinforcement are obtained from Articles 2.8.2. to 2.8.5., taking into account the type of concrete, the effective length of the column and the area of the vertical reinforcement.

2.8.2. Method

(1) The minimum dimension, t, in millimetres, of a rectangular reinforced concrete column shall be equal to

(a) 75 f (R + 1) for all Types L and L40S concrete,

(b) 80 f (R + 1) for Type S concrete when the design condition of the concrete column is defined in the second and fourth columns of Table 2.8.2.,

(c) 80 f (R + 0.75) for Type N concrete when the design condition of the concrete column is defined in the second and fourth columns of Table 2.8.2., and

(d) 100 f (R + 1) for Types S and N concrete when the design condition of the concrete column is defined in the third column of Table 2.8.2.

where

f = the value shown in Table 2.8.2.,

R = the required fire-resistance rating in hours,

k = the effective length factor obtained from CSA A23.3, "Design of Concrete Structures",

h = the unsupported length of the column in metres, and

p = the area of vertical reinforcement in the column as a percentage of the column area.

(2) The diameter of a round column shall be not less than 1.2 times the value "t" determined in Sentence (1) for a rectangular column.

Table 2.8.2.
Values of Factor "f"(1)

Overdesign Factor(2)	Values of Factor f to be Used in Applying Article 2.8.2.		
	Where kh is not more than 3.7 m	Where kh is more than 3.7 m but not more than 7.3 m	
		t is not more than 300 mm, p is not more than 3%(3)	All other cases(4)
1.00	1.00	1.20	1.00
1.25	0.90	1.10	0.90
1.50	0.83	1.00	0.83
Column 1	2	3	4

Notes to Table 2.8.2.:
(1) For conditions that do not fall within the limits described in Table 2.8.2., further information may be obtained from Reference (7) in Subsection 6.1.
(2) Overdesign factor is the ratio of the calculated load carrying capacity of the column to the column strength required to carry the specified loads determined in conformance with CSA A23.3, "Design of Concrete Structures".
(3) Where the factor "f" results in a "t" greater than 300 mm, the appropriate factor "f" for "All other cases" shall be applicable.
(4) Where "p" is equal to or less than 3% and the factor "f" results in a "t" less than 300 mm, the minimum thickness shall be 300 mm.

2.8.3. Minimum Thickness of Concrete Cover

(1) Where the required fire-resistance rating of a concrete column is 3 h or less, the minimum thickness in millimetres of concrete cover over vertical steel reinforcement shall be equal to 25 times the number of hours of fire resistance required or 50 mm, whichever is less.

(2) Where the required fire-resistance rating of a concrete column is greater than 3 h, the minimum thickness in millimetres of concrete cover over vertical steel reinforcement shall be equal to 50 plus 12.5 times the required number of hours of fire resistance in excess of 3 h.

(3) Where the concrete cover over vertical steel required in Sentence (2) exceeds 62.5 mm, wire mesh reinforcement with 1.57 mm diameter wire and 100 mm openings shall be incorporated midway in the concrete cover to retain the concrete in position.

2.8.4. Minimum Requirements

(1) The structural design standards may require minimum column dimensions or concrete cover over vertical steel reinforcement differing from those obtained in Sentences 2.8.2.(1) and (2). Where a difference occurs, the greater dimension shall govern.

2.8.5. Addition of Plaster

(1) The addition of plaster finish to the concrete column may be taken into account in determining the cover over vertical steel reinforcement by applying the multiplying factors described in Subsection 1.7. The addition of plaster shall not, however, justify any decrease in the minimum column sizes shown.

2.8.6. Built-in Columns

(1) The fire-resistance rating of a reinforced concrete column that is built into a masonry or concrete wall so that not more than one face may be exposed to the possibility of fire at one time may be determined on the basis of cover to vertical reinforcing steel alone. In order to meet this condition, the wall shall conform to Subsection 2.1. for the fire-resistance rating required.

2.9. Reinforced Concrete Beams

2.9.1. Minimum Cover Thickness

(1) The minimum thickness of cover over principal steel reinforcement in reinforced concrete beams is shown in Table 2.9.1. for fire-resistance ratings from 30 min to 4 h where the width of the beam or joist is at least 100 mm.

Table 2.9.1.
Minimum Cover to Principal Steel Reinforcement in Reinforced Concrete Beams, mm

Type of Concrete	Fire-Resistance Rating						
	30 min	45 min	1 h	1.5 h	2 h	3 h	4 h
Type S, N or L	20	20	20	25	25	39	50
Column 1	2	3	4	5	6	7	8

2.9.2. Maximum Rating

(1) No rating over 2 h may be assigned on the basis of Table 2.9.1. to a beam or joist where the average width of the part that projects below the slab is less than 140 mm, and no rating over 3 h may be assigned where the average width of the part that projects below the slab is less than 165 mm.

2.9.3. Beam Integrated in Floor or Roof Slab

(1) For the purposes of these ratings, a beam may be either independent of or integral with a floor or roof slab assembly.

2.9.4. Minimum Thickness

(1) Where the upper extension or top flange of a joist or T-beam in a floor assembly contributes wholly or partly to the thickness of the slab above, the total thickness at any point shall be not less than the minimum thickness described in Table 2.2.1.A. for the fire-resistance rating required.

2.9.5. Effect of Plaster

(1) The addition of plaster finish to a reinforced concrete beam may be taken into account in determining the cover over principal reinforcing steel by applying the multiplying factors described in Subsection 1.7.

2.10. Prestressed Concrete Beams

2.10.1. Minimum Cross-Sectional Area and Thickness of Cover

(1) The minimum cross-sectional area and thickness of concrete cover over steel tendons in prestressed concrete beams for fire-resistance ratings from 30 min to 4 h are shown in Table 2.10.1.

Table 2.10.1.
Minimum Thickness of Concrete Cover Over Steel Tendons in Prestressed Concrete Beams,(1) mm

Type of Concrete	Area of Beam, cm^2	Fire-Resistance Rating						
		30 min	45 min	1 h	1.5 h	2 h	3 h	4 h
Type S or N	260 to 970	25	39	50	64	—	—	—
	Over 970 to 1 940	25	26	39	45	64	—	—
	Over 1 940	25	26	39	39	50	77	102
Type L	Over 970	25	25	25	39	50	77	102
Column 1	2	3	4	5	6	7	8	9

Notes to Table 2.10.1.:

(1) Where the thickness of concrete cover over the tendons exceeds 64 mm, a wire mesh reinforcement with 1.57 mm diam wire and 100 mm by 100 mm openings shall be incorporated in the beams to retain the concrete in position around the tendons. The mesh reinforcement shall be located midway in the cover.

2.10.2. Minimum Cover Thickness

(1) The cover for an individual tendon shall be the minimum thickness of concrete between the surface of the tendon and the fire-exposed surface of the beam, except that for ungrouted ducts the assumed cover thickness shall be the minimum thickness of concrete between the surface of the duct and the surface of the beam. For beams in which several tendons are used, the cover is assumed to be the average of the minimum cover of the individual tendons. The cover for any individual tendon shall be not less than half the value given in Table 2.10.1. nor less than 25 mm.

2.10.3. Applicability of Ratings

(1) The ratings in Table 2.10.1. apply to a beam that is either independent of or integral with a floor or roof slab assembly. Minimum thickness of slab and minimum cover to steel tendons in prestressed concrete slabs are contained in Subsection 2.2.

2.10.4. Effect of Plaster

(1) The addition of plaster finish to a prestressed concrete beam may be taken into account in determining the cover over steel tendons by applying the multiplying factors described in Subsection 1.7.

2.10.5. Minimum Cover

(1) Except as provided in Sentence (2), in unbonded post- tensioned prestressed concrete beams, the concrete cover to the tendon at the anchor shall be not less than 15 mm greater than the minimum required away from the anchor. The concrete cover to the anchorage bearing plate and to the end of the tendon, if it projects beyond the bearing plate, shall be not less than 25 mm.

(2) The requirements in Sentence (1) do not apply to those portions of beams not likely to be exposed to fire (such as the ends and the tops of flanges of beams immediately below slabs).

2.11. Glued-Laminated Timber Beams and Columns

2.11.1. Applicability of Information

(1) The information in Subsection 2.11. applies to glued-laminated timber beams and columns required to have fire-resistance ratings greater than those afforded under the provisions of Article 3.1.4.6. of Division B of the Building Code.

2.11.2. Method of Calculation

(1) The fire-resistance rating of glued-laminated timber beams and columns in minutes shall be equal to
(a) 0.1 fB [4 - 2(B/D)] for beams which may be exposed to fire on 4 sides,
(b) 0.1 fB [4 - (B/D)] for beams which may be exposed to fire on 3 sides,
(c) 0.1 fB [3 - (B/D)] for columns which may be exposed to fire on 4 sides, and
(d) 0.1 fB [3 - (B/2D)] for columns which may be exposed to fire on 3 sides,

where

f = the load factor shown in Figure 2.11.2.A.,

B = the full dimension of the smaller side of a beam or column in millimetres before exposure to fire (see Figure 2.11.2.B.),

D = the full dimension of the larger side of a beam or column in millimetres before exposure to fire (see Figure 2.11.2.B.),

k = the effective length factor obtained from CSA O86, "Engineering Design in Wood",

L = the unsupported length of a column in millimetres.

(2) The factored resistance of a beam or column shall be determined by using the specified strengths in CSA O86, "Engineering Design in Wood".

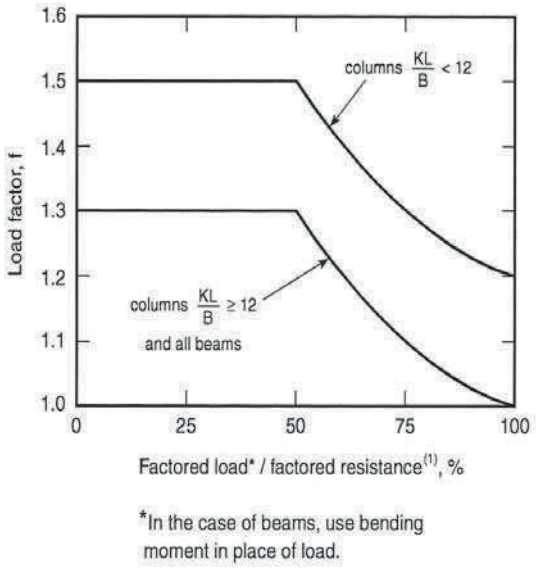


Figure 2.11.2.A.
Factors to Compensate for Partially Loaded Columns and Beams

Note to Figure 2.11.2.A.:
(1) See Sentence 2.11.2.(2).

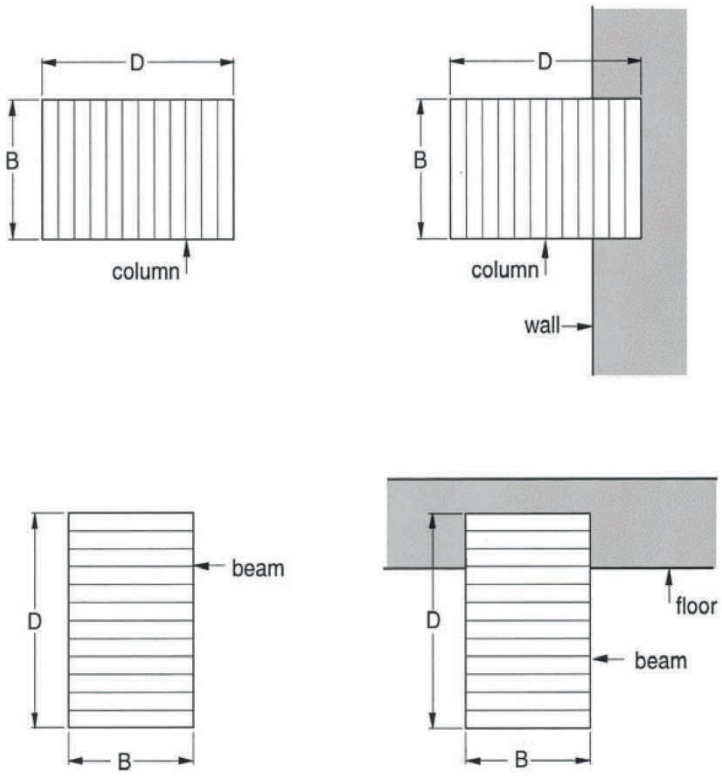


Figure 2.11.2.B.
Full Dimensions of Glued-Laminated Beams and Columns

Section 3 Flame-Spread Ratings and Smoke Developed Classifications

3.1. Interior Finish Materials

3.1.1. Scope of Information

(1) Tables 3.1.1.A. and 3.1.1.B. show flame-spread ratings and smoke developed classifications for combinations of some common interior finish materials. The values are based on all the evidence available at present. Many materials have not been included because of lack of test evidence or because of inability to classify or describe the material in generic terms for the purpose of assigning ratings.

Table 3.1.1.A.
Assigned Flame-Spread Ratings and Smoke Developed Classifications for Combinations of Wall and Ceiling Finish Materials and Surface Coatings(1)

Materials	Applicable Material Standard	Minimum Thickness, mm	Surface Coating	
			Unfinished	Paint or Varnish not more than 1.3 mm Thick, Cellulosic Wallpaper not more than One Layer(2)(3)
Brick, concrete, tile	None	None	0/0	25/50
Steel, copper, aluminum	None	0.33		
Gypsum plaster	CSA A82.22-M	None		
Gypsum board	CAN/CSA-A82.27-M ASTM C1396 / C1396M	9.5	25/50	25/50
Lumber	None	16	150/300	150/300
Douglas Fir plywood(4)	CSA O121	11	150/100	150/300
Poplar plywood(4)	CSA O153			
Plywood with Spruce face veneer(4)	CSA O151			
Douglas Fir plywood(4)	CSA O121	6	150/100	150/100
Fiberboard low density	CAN/ULC-S706	11	X/100	150/100
Hardboard				
Type 1	CAN/CGSB-11.3-M	9	150/X	(5)
Standard		6	150/300	150/300
Particleboard	ANSI A208.1	12.7	150/300	(5)
Waferboard, OSB	CSA O325	—	(5)	(5)
	CSA O437.0	—	(5)	(5)
Column 1	2	3	4	5

Notes to Table 3.1.1.A.:
(1) See Sentence 1.1.1.(5) for standards used to assign flame-spread ratings and smoke developed classifications.
(2) Flame-spread ratings and smoke developed classifications for paints and varnish are not applicable to shellac and lacquer.
(3) Flame-spread ratings and smoke developed classifications for paints apply only to alkyd and latex paints.
(4) The flame-spread ratings and smoke developed classifications shown are for those plywoods without a cellulose resin overlay.
(5) Insufficient test information available.

Table 3.1.1.B.
Flame-Spread Ratings and Smoke Developed Classifications
for Combinations of Common Floor Finish Materials and Surface Coatings(1)

Materials	Applicable Standard	FSR/SDC(2)
Hardwood or softwood flooring either unfinished or finished with a spar or urethane varnish coating	None	300/300
Wool carpet (woven), pile weight not less than 1120 g/m^2, applied with or without felt underlay(3)	CAN/CGSB-4.129	300/300
Nylon carpet, pile weight not less than 610 g/m^2 and not more than 800 g/m^2, applied with or without felt underlay(3)	CAN/CGSB-4.129	300/500
Nylon carpet, pile weight not less than 610 g/m^2 and not more than 1355 g/m^2, glued down to concrete	CAN/CGSB-4.129	300/500
Wool/nylon blend carpet (woven) with not more than 20% nylon and pile weight not less than 1120 g/m^2	CAN/CGSB-4.129	300/500
Nylon/wool blend carpet (woven) with not more than 50% wool, pile weight not less than 610 g/m^2 and not more than 800 g/m^2	CAN/CGSB-4.129	300/500
Polypropylene carpet, pile weight not less than 500 g/m^2 and not more than 1200 g/m^2, glued down to concrete	CAN/CGSB-4.129	300/500
Column 1	2	3

Notes to Table 3.1.1.B.:
(1) Tested on the floor of the tunnel in conformance with provisions of CAN/ULC-S102.2, "Test for Surface Burning Characteristics of Flooring, Floor Coverings, and Miscellaneous Materials and Assemblies".
(2) Flame-Spread Rating/Smoke Developed Classification
(3) Type 1 or 2 underlay as described in CGSB 4-GP-36M, "Carpet Underlay, Fiber Type".

3.1.2. Ratings

(1) The ratings shown in Tables 3.1.1.A. and 3.1.1.B. are arranged in groups corresponding to the provisions of this Code. The ratings apply to materials falling within the general categories indicated.

3.1.3. Table Entries

(1) In Tables 3.1.1.A. and 3.1.1.B., the first number of each entry relates to flame spread and the second number to smoke developed limit. For example:

25/50 represents a flame-spread rating of 0 to 25 and a smoke developed classification of 0 to 50.

150/300 represents a flame-spread rating of 75 to 150 and a smoke developed classification of 100 to 300.

X/X applied to walls and ceilings means a flame-spread rating over 150 and a smoke developed classification over 300.

3.1.4. Effect of Surface Coatings

(1) Thin surface coatings can modify flame-spread characteristics either upward or downward. Table 3.1.1.A. includes a number of thin coatings that increase the flame-spread rating of the base material, so that these may be considered where more precise control over flame spread hazard is desired.

3.1.5. Proprietary Materials

(1) Information on flame-spread rating of proprietary materials and fire-retardant treatments that cannot be described in sufficient detail to ensure reproducibility is available through the listing and labelling services of Underwriters' Laboratories of Canada, Intertek Testing Services NA Ltd. or other recognized testing laboratory.

(2) A summary of flame-spread test results published prior to 1965 has been prepared by NRC (see Item (1) in Subsection 6.1.).

3.1.6. Limitations and Conditions

(1) The propagation of flame along a surface in the standard test involves some finite depth of the material or materials behind the surface, and this involvement extends to the depth to which temperature variations are to be found during the course of the test; for many commonly used lining materials, such as wood, the depth involved is about 25 mm.

(2) For all the combustible materials described in Table 3.1.1.A., a minimum dimension is shown, and this represents the thickness of the test samples on which the rating has been based; when used in greater thicknesses than that shown, these materials may have a slightly lower flame-spread rating, and thinner specimens may have higher flame-spread ratings.

(3) No rating has been included for foamed plastic materials because it is not possible at this time to identify these products with sufficient accuracy on a generic basis. Materials of this type which melt when exposed to the test flame generally show an increase in flame-spread rating as the thickness of the test specimen increases.

3.1.7. Referenced Standards

In Tables 3.1.1.A. and 3.1.1.B., the standards applicable to the materials described are noted because the ratings depend on conformance with these specifications.

Section 4 Noncombustibility

4.1. Test Method

4.1.1. Determination of Noncombustibility

(1) Noncombustibility is required of certain components of buildings by the provisions of this Code, which specifies noncombustibility by reference to CAN/ULC-S114, "Test for Determination of Non-Combustibility in Building Materials".

(2) The test to which reference is made in Sentence (1) is severe, and it may be assumed that any building material containing even a small proportion of combustibles will itself be classified as combustible. The specimen, 38 mm by 51 mm, is exposed to a temperature of 750°C in a small furnace. The essential criteria for noncombustibility are that the specimen does not flame or contribute to temperature rise.

4.2. Materials Classified as Combustible

4.2.1. Combustible Materials

(1) Most materials from animal or vegetable sources will be classed as combustible by CAN/ULC-S114, "Test for Determination of Non-Combustibility in Building Materials", and wood, wood fibreboard, paper, felt made from animal or vegetable fibres, cork, plastics, asphalt and pitch would therefore be classed as combustible.

4.2.2. Composite Materials

(1) Materials that consist of combustible and noncombustible elements in combination will in many cases also be classed as combustible, unless the proportion of combustibles is very small. Some mineral wool insulations with combustible binder, cinder concrete, cement and wood chips and wood-fibred gypsum plaster would also be classed as combustible.

4.2.3. Effect of Chemical Additives

(1) The addition of a fire-retardant chemical is not sufficient to change a combustible product to a noncombustible product.

4.3. Materials Classified as Noncombustible

4.3.1. Typical Examples

(1) Noncombustible materials include brick, ceramic tile, concrete made from Portland cement with noncombustible aggregate, plaster made from gypsum with noncombustible aggregate, metals commonly used in buildings, glass, granite, sandstone, slate, limestone and marble.

Section 5 Protection of Openings in Fire-Rated Assemblies

5.1. Scope

5.1.1. Installation Information

(1) The information in this Section specifies requirements for the installation of fire doors and fire dampers in gypsum-board-protected stud wall assemblies.

5.2. Installation of Fire Doors and Fire Dampers

5.2.1. References

(1) Fire doors and fire dampers in gypsum-board-protected steel stud non-loadbearing walls required to have a fire-resistance rating shall be installed in conformance with Section 9.24. of Division B of the Building Code and the applicable requirements of NFPA 80, "Fire Doors and Other Opening Protectives".

(2) Fire doors and fire dampers in gypsum-board-protected wood stud walls required to have a fire-resistance rating shall be installed in conformance with Section 9.23. of Division B of the Building Code and the applicable requirements of NFPA 80, "Fire Doors and Other Opening Protectives".

Section 6 Background Information

6.1. Fire Test Reports

Summaries of available fire test information have been published by NRC as follows:

(1) M. Galbreath, Flame Spread Performance of Common Building Materials. Technical Paper No. 170, Division of Building Research, National Research Council Canada, Ottawa, April 1964. NRCC 7820.

(2) M. Galbreath and W.W. Stanzak, Fire Endurance of Protected Steel Columns and Beams. Technical Paper No. 194, Division of Building Research, National Research Council Canada, Ottawa, April 1965. NRCC 8379.

(3) T.Z. Harmathy and W.W. Stanzak, Elevated-Temperature Tensile and Creep Properties of Some Structural and Prestressing Steels. American Society for Testing and Materials, Special Technical Publication 464, 1970, p. 186 (DBR Research Paper No. 424) NRCC 11163.

(4) T.Z. Harmathy, Thermal Performance of Concrete Masonry Walls in Fire. American Society for Testing and Materials, Special Technical Publication 464, 1970, p. 209 (DBR Research Paper No. 423) NRCC 11161.

(5) L.W. Allen, Fire Endurance of Selected Non-Loadbearing Concrete Masonry Walls. DBR Fire Study No. 25, Division of Building Research, National Research Council Canada, Ottawa, March 1970. NRCC 11275.

(6) A. Rose, Comparison of Flame Spread Ratings by Radiant Panel, Tunnel Furnace, and Pittsburgh-Corning Apparatus. DBR Fire Study No. 22, Division of Building Research, National Research Council Canada, Ottawa, June 1969. NRCC 10788.

(7) T.T. Lie and D.E. Allen, Calculation of the Fire Resistance of Reinforced Concrete Columns. DBR Technical Paper No. 378, Division of Building Research, National Research Council Canada, Ottawa, August 1972. NRCC 12797.

(8) W.W. Stanzak, Column Covers: A Practical Application of Sheet Steel as a Protective Membrane. DBR Fire Study No. 27, Division of Building Research, National Research Council Canada, Ottawa, February 1972. NRCC 12483.

(9) W.W. Stanzak, Sheet Steel as a Protective Membrane for Steel Beams and Columns. DBR Fire Study No. 23, Division of Building Research, National Research Council Canada, Ottawa, November 1969. NRCC 10865.

(10) W.W. Stanzak and T.T. Lie, Fire Tests on Protected Steel Columns with Different Cross-Sections. DBR Fire Study No. 30, Division of Building Research, National Research Council Canada, Ottawa, February 1973. NRCC 13072.

(11) G. Williams-Leir and L.W. Allen, Prediction of Fire Endurance of Concrete Masonry Walls. DBR Technical Paper No. 399, Division of Building Research, National Research Council Canada, Ottawa, November 1973. NRCC 13560.

(12) G. Williams-Leir, Prediction of Fire Endurance of Concrete Slabs. DBR Technical Paper No. 398, Division of Building Research, National Research Council Canada, Ottawa, November 1973. NRCC 13559.

(13) A. Rose, Flammability of Fibreboard Interior Finish Materials. Building Research Note No. 68, Division of Building Research, National Research Council Canada, Ottawa, October 1969.

(14) L.W. Allen, Effect of Sand Replacement on the Fire Endurance of Lightweight Aggregate Masonry Units. DBR Fire Study No. 26, Division of Building Research, National Research Council Canada, Ottawa, September 1971. NRCC 12112.

(15) L.W. Allen, W.W. Stanzak and M. Galbreath, Fire Endurance Tests on Unit Masonry Walls with Gypsum Board. DBR Fire Study No. 32, Division of Building Research, National Research Council Canada, Ottawa, February 1974, NRCC 13901.

(16) W.W. Stanzak and T.T. Lie, Fire Resistance of Unprotected Steel Columns. Journal of Structural Division, Proc., Am. Soc. Civ. Eng., Vol. 99, No. ST5 Proc. Paper 9719, May 1973 (DBR Research Paper No. 577) NRCC 13589.

(17) T.T. Lie and T.Z. Harmathy, Fire Endurance of Concrete-Protected Steel Columns. A.C.I. Journal, January 1974, Title No. 71-4 (DBR Technical Paper No. 597) NRCC 13876.

(18) T.T. Lie, A Method for Assessing the Fire Resistance of Laminated Timber Beams and Columns. Can. J. Civ. Eng., Vol. 4, No. 2, June 1977 (DBR Technical Paper No. 718) NRCC 15946.

(19) T.T. Lie, Calculation of the Fire Resistance of Composite Concrete Floor and Roof Slabs. Fire Technology, Vol. 14, No. 1, February 1978 (DBR Technical Paper No. 772) NRCC 16658.

(20) M.A. Sultan, Y.P Séguin and P. Leroux. Results of Fire Resistance Tests on Full-Scale Floor Assemblies, Institute for Research in Construction, National Research Council of Canada, Ottawa, May 1998, IRC-IR-764.

(21) M.A. Sultan, J.C. Latour, P. Leroux, R.C. Monette, Y.P Séguin and J.P. Henrie, Results of Fire Resistance Tests on Full-Scale Floor Assemblies – Phase II, Institute for Research in Construction, National Research Council of Canada, Ottawa, March 2005, RR-184.

(22) M.A. Sultan and G.D. Lougheed, Results of Fire Resistance Tests on Full-Scale Gypsum Board Wall Assemblies, Institute for Research in Construction, National Research Council of Canada, Ottawa, August 2002, IRC-IR-833.

(23) V.K.R. Kodur, M.A. Sultan, J.C. Latour, P. Leroux, R.C. Monette, Experimental Studies on the Fire Resistance of Load-Bearing Steel Stud Walls, Research Report, National Research Council of Canada, Ottawa, August 2013, RR-343.

6.2. Obsolete Materials and Assemblies

Building materials, components and structural members and assemblies in buildings constructed before 1995 may have been assigned ratings based on earlier editions of The Supplement to the National Building Code of Canada or older reports of fire tests. To assist users in determining the ratings of these obsolete assemblies and structural members, the following list of reference documents has been prepared. Although some of these publications are out of print, reference copies are available through NRC.

(1) M. Galbreath, Fire Endurance of Unit Masonry Walls. Technical Paper No. 207, Division of Building Research, National Research Council Canada, Ottawa, October 1965. NRCC 8740.

(2) M. Galbreath, Fire Endurance of Light Framed and Miscellaneous Assemblies. Technical Paper No. 222, Division of Building Research, National Research Council Canada, Ottawa, June 1966. NRCC 9085.

(3) M. Galbreath, Fire Endurance of Concrete Assemblies. Technical Paper No. 235, Division of Building Research, National Research Council Canada, Ottawa, November 1966. NRCC 9279.

(4) Guideline on Fire Ratings of Archaic Materials and Assemblies. Rehabilitation Guideline #8, U.S. Department of Housing and Urban Development, Germantown, Maryland 20767, October 1980.

(5) T.Z. Harmathy, Fire Test of a Plank Wall Construction. Fire Study No. 2, Division of Building Research, National Research Council Canada, Ottawa, July 1960. NRCC 5760.

(6) T.Z. Harmathy, Fire Test of a Wood Partition. Fire Study No. 3, Division of Building Research, National Research Council Canada, Ottawa, October 1960. NRCC 5769.

6.3. Assessment of Archaic Assemblies

Information in this document applies to new construction. Please refer to early editions of the Supplement to the National Building Code of Canada for the assessment or evaluation of assemblies that do not conform to the information in this edition of the Building Code. As with other documents, this Code is revised according to the information presented to the standing committee responsible for its content, and with each update new material may be added and material that is not relevant may be deleted.

6.4. Development of the Component Additive Method

The component additive method was developed based upon the following observations and conclusions drawn from published as well as unpublished test information.

Study of the test data showed that structural failure preceded failure by other criteria (transmission of heat or hot gases) in most of the tests of loadbearing wood-framed assemblies. The major contributor to fire resistance was the membrane on the fire-exposed side.

Fire tests of wood joist floors without protective ceilings resulted in structural failure between 8 and 10 min. Calculation of the time for wood joists to approach breaking stress, based upon the charring rate of natural woods, suggested a time of 10 min for structural failure. This time was subtracted from the fire-resistance test results of wood joist floors and the remainder considered to be the contribution of the membrane.

The figures obtained for the contribution of membranes were then applied to the test results for open web steel joist floors and wood and steel stud walls and values of 20 min for the contribution of wood stud framing and 10 min for steel framing were derived.

The fire-resistance rating has been limited to 1.5 h as this method of developing ratings for framed assemblies was new and untried. Although this is the subject of current review, no decision has been made to extend the ratings beyond 1.5 h.

(1) M. Galbreath, G. C. Gosselin, and R. B. Chauhan, Historical Guide to Chapter 2 of the Supplement to the National Building Code of Canada, Committee Paper FPR 1-3, Prepared for the Standing Committee on Fire Performance Ratings, May 1987.

Example showing fire-resistance rating of a typical membrane assembly, calculated using the component additive method.

1 Hour Gypsum Board/Wood Stud Interior Partition

A 1 h fire-resistance rating is required for an interior wood framed partition, using 12.7 mm Type X gypsum board.

(a) Since gypsum board is used (Sentence 2.3.4.(2) and Table 2.3.4.A.) time assigned to 12.7 mm Type X gypsum board membrane on the fire-exposed side of the partition = 25 min
(b) Time assigned to wood framing members at 406 mm o.c. (Sentence 2.3.4.(3) and Table 2.3.4.E.) = 20 min
(c) Time assigned to insulation, if the spaces between the studs are filled with preformed insulation of rock or slag fibres conforming to CAN/ULC-S702, "Mineral Fibre Thermal Insulation for Buildings", (Sentence 2.3.4.(4) and Table 2.3.4.G.) = 15 min
(d) Time assigned to the membrane on the non-fire-exposed side (Sentence 2.3.5.(1)) = 0 min
Fire-resistance rating = 25 + 20 + 15 = 60 min

MMAH Supplementary Standard SB-3

Fire and Sound Resistance of Building Assemblies

January 15, 2019 update

Effective Date: January 1, 2020

Issued July 26, 2019

COMMENCEMENT

MMAH Supplementary Standard SB-3 comes into force on the 1st day of January, 2014.

r5 SB-3 as amended by Ontario Regulation 191/14 comes into force on the 1st day of January, 2015.
r11.1 SB-3 as amended by Ontario Regulation 88/19 comes into force on the 1st day of January, 2020.

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r11.1 SB-3 Fire and Sound Resistance of Building Assemblies

(This Standard is based in large measure on the Fire and Sound Resistance Tables of the model National Building Code of Canada 2015)

The following Tables may be used to select building assemblies for compliance with Articles 5.8.1.3., 9.10.3.1., 9.10.5.1., 9.11.1.3., 9.11.1.4. and 9.29.5.9. of Division B of the 2012 Building Code.

Tables 1 and 2 have been developed from information gathered from tests. While a large number of the assemblies listed were tested, the fire-resistance and acoustical ratings for others were assigned on the basis of extrapolation of information from tests of similar assemblies. Where there was enough confidence relative to the fire performance of an assembly, the fire-resistance ratings were assigned relative to the commonly used minimum ratings of 30 min, 45 min and 1 h, including a designation of "< 30 min" for assemblies that are known not to meet the minimum 30-minute rating. Where there was not enough comparative information on an assembly to assign to it a rating with confidence, its value in the Tables has been left blank (hyphen), indicating that its rating remains to be assessed through another means

These Tables are provided only for the convenience of Code users and do not limit the number of assemblies permitted to those in the Tables. Assemblies not listed or not given a rating in these Tables are equally acceptable provided their fire and sound resistance can be demonstrated to meet the above-noted requirements either on the basis of tests referred to in Article 9.10.3.1. and Subsection 9.11.1. or by using the data in MMAH Supplementary Standard SB-2, “Fire-Performance Ratings”. It should be noted, however, that Tables 1 and 2 of this Supplementary Standard are not based on the same assumptions as those used in MMAH Supplementary Standard SB-2. Assemblies in Tables 1 and 2 are described through their generic descriptions and variants and include details given in the notes to the Tables. Assumptions for MMAH Supplementary Standard SB-2 include different construction details that must be followed rigorously for the calculated ratings to be expected. These are two different methods of choosing assemblies that meet required fire ratings.

Table 2 presents fire-resistance and acoustical ratings for floor, ceiling and roof assemblies. The fire-resistance ratings are appropriate for all assemblies conforming to the construction specifications given in Table 2, including applicable Table notes. Acoustical ratings for assemblies decrease with decreasing depth and decreasing separation of the structural members; the values listed for sound transmission class and impact insulation class are suitable for the minimum depth of structural members identified in the description, including applicable Table notes, and for structural member spacing of 305 mm o.c., unless other values are explicitly listed for the assembly. Adjustments to the acoustical ratings to allow for the benefit of deeper or more widely spaced structural members are given in Table Notes (9) and (10).

Section 1 Fire and Sound Resistance of Walls

Table 1
Fire and Sound Resistance of Walls(1)

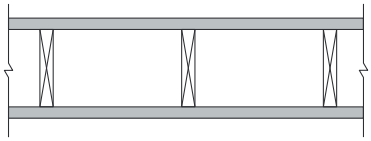
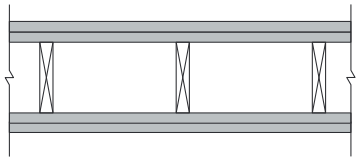
Type of Wall	Wall Number	Description	Fire-Resistance Rating(2)(3)		Typical Sound Transmission Class(2)(4)(5) (STC)
			Loadbearing	Non-Loadbearing	
• Wood Studs • Single Row • Loadbearing or Non-Loadbearing	**W1**	• 38 mm x 89 mm wood studs spaced 406 mm or 610 mm o.c. • with or without absorptive material • 1 layer of gypsum board on each side			
	W1a	W1 with • 89 mm thick absorptive material(6) • 15.9 mm Type X gypsum board(7)	1 h	1 h	36
	W1b	W1 with • 89 mm thick absorptive material(6) • 12.7 mm Type X gypsum board(7)	45 min [1 h](8)	45 min [1 h](8)	34
	W1c	W1 with • 89 mm thick absorptive material(6) • 12.7 mm regular gypsum board(7)(9)	30 min	30 min [45 min](8)	32
	W1d	W1 with • no absorptive material • 15.9 mm Type X gypsum board(7)	1 h	1 h	32
	W1e	W1 with • no absorptive material • 12.7 mm Type X gypsum board(7)	45 min	45 min	32
	W2	• 38 mm x 89 mm wood studs spaced 406 mm or 610 mm o.c. • with or without absorptive material • 2 layers of gypsum board on each side			
	W2a	W2 with • 89 mm thick absorptive material(6) • 15.9 mm Type X gypsum board(7)	1.5 h	2 h	38
	W2b	W2 with • 89 mm thick absorptive material(6) • 12.7 mm Type X gypsum board(7)	1 h	1.5 h	38
	W2c	W2 with • 89 mm thick absorptive material(6) • 12.7 mm regular gypsum board(7)	45 min	1 h	36
	W2d	W2 with • no absorptive material • 15.9 mm Type X gypsum board(7)	1.5 h	2 h	36
Column 1	2	3	4	5	6

Table 1 (Cont'd)
Fire and Sound Resistance of Walls[1]

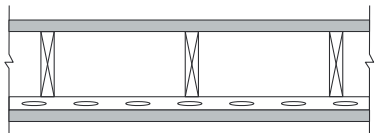
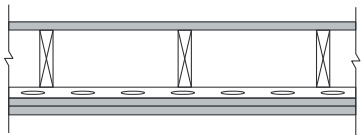
Type of Wall	Wall Number	Description	Fire-Resistance Rating[2][3]		Typical Sound Transmission Class[2][4][5] (STC)
			Loadbearing	Non-Loadbearing	
• Wood Studs • Single Row • Loadbearing or Non-Loadbearing	W2e	W2 with • no absorptive material • 12.7 mm Type X gypsum board[7]	1 h	1.5 h	35
	W2f	W2 with • no absorptive material • 12.7 mm regular gypsum board[7]	45 min	1 h	34
	W3	• 38 mm x 89 mm wood studs spaced 406 mm or 610 mm o.c. • 89 mm thick absorptive material[6] • resilient metal channels on one side spaced 406 mm or 610 mm o.c. • 1 layer of gypsum board on each side			
	W3a	W3 with • studs spaced 406 mm o.c. • 15.9 mm Type X gypsum board[7]	45 min	1 h	45
	W3b	W3 with • studs spaced 610 mm o.c. • 15.9 mm Type X gypsum board[7]	45 min	1 h	48
	W3c	W3 with • studs spaced 406 mm or 610 mm o.c. • 12.7 mm Type X gypsum board[7]	45 min	45 min	43
	W4	• 38 mm x 89 mm wood studs spaced 406 mm or 610 mm o.c. • 89 mm thick absorptive material[6] • resilient metal channels on one side spaced 406 mm or 610 mm o.c. • 2 layers of gypsum board on resilient metal channel side • 1 layer of gypsum board on other side			
	W4a	W4 with • studs spaced 406 mm o.c. • 15.9 mm Type X gypsum board[7]	1 h	1 h [1.5 h][8]	51
	W4b	W4 with • studs spaced 610 mm o.c. • 15.9 mm Type X gypsum board[7]	1 h	1 h [1.5 h][8]	54
	W4c	W4 with • studs spaced 406 mm o.c. • 12.7 mm Type X gypsum board[7]	45 min [1 h][8]	1 h	49
	W4d	W4 with • studs spaced 610 mm o.c. • 12.7 mm Type X gypsum board[7]	45 min [1 h][8]	1 h	53
Column 1	2	3	4	5	6

Table 1 (Cont'd)
Fire and Sound Resistance of Walls(1)

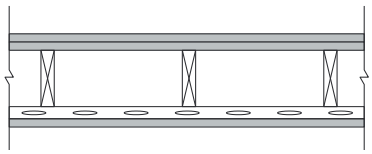
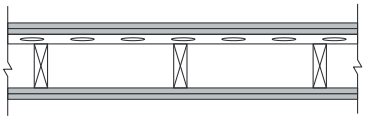
Type of Wall	Wall Number	Description	Fire-Resistance Rating(2)(3)		Typical Sound Transmission Class(2)(4)(5) (STC)
			Loadbearing	Non-Loadbearing	
• Wood Studs • Single Row • Loadbearing or Non-Loadbearing	**W5**	• 38 mm x 89 mm wood studs spaced 406 mm or 610 mm o.c. • 89 mm thick absorptive material(6) • resilient metal channels on one side spaced 406 mm or 610 mm o.c. • 1 layer of gypsum board on resilient metal channel side • 2 layers of gypsum board on other side			
	W5a	W5 with • studs spaced 406 mm o.c. • 15.9 mm Type X gypsum board(7)	45 min	1 h	51
	W5b	W5 with • studs spaced 610 mm o.c. • 15.9 mm Type X gypsum board(7)	45 min	1 h	54
	W5c	W5 with • studs spaced 406 mm o.c. • 12.7 mm Type X gypsum board(7)	45 min	1 h	49
	W5d	W5 with • studs spaced 610 mm o.c. • 12.7 mm Type X gypsum board(7)	45 min	1 h	53
	W6	• 38 mm x 89 mm wood studs spaced 406 mm or 610 mm o.c. • with or without absorptive material • resilient metal channels on one side • 2 layers of gypsum board on each side			
	W6a	W6 with • studs spaced 406 mm or 610 mm o.c. • 89 mm thick absorptive material(6) • resilient metal channels spaced 406 mm o.c. • 15.9 mm Type X gypsum board(7)	1.5 h	2 h	55
	W6b	W6 with • studs spaced 406 mm or 610 mm o.c. • 89 mm thick absorptive material(6) • resilient metal channels spaced 610 mm o.c. • 15.9 mm Type X gypsum board(7)	1.5 h	2 h	58
	W6c	W6 with • studs spaced 406 mm o.c. • 89 mm thick absorptive material(6) • resilient metal channels spaced 406 mm o.c. • 12.7 mm Type X gypsum board(7)	1 h	1.5 h	53
Column 1	2	3	4	5	6

Table 1 (Cont'd)
Fire and Sound Resistance of Walls[1]

Type of Wall	Wall Number	Description	Fire-Resistance Rating[2][3]		Typical Sound Transmission Class[2][4][5] (STC)
			Loadbearing	Non-Loadbearing	
• Wood Studs • Single Row • Loadbearing or Non-Loadbearing	W6d	W6 with • studs spaced 406 mm o.c. • 89 mm thick absorptive material[6] • resilient metal channels spaced 610 mm o.c. • 12.7 mm Type X gypsum board[7]	1 h	1.5 h	55
	W6e	W6 with • studs spaced 610 mm o.c. • 89 mm thick absorptive material[6] • resilient metal channels spaced 406 mm o.c. • 12.7 mm Type X gypsum board[7]	1 h	1.5 h	55
	W6f	W6 with • studs spaced 610 mm o.c. • 89 mm thick absorptive material[6] • resilient metal channels spaced 610 mm o.c. • 12.7 mm Type X gypsum board[7]	1 h	1.5 h	58
	W6g	W6 with • studs spaced 406 mm or 610 mm o.c. • 89 mm thick absorptive material[6] • resilient metal channels spaced 406 mm o.c. • 12.7 mm regular gypsum board[7]	45 min	1 h	50
	W6h	W6 with • studs spaced 406 mm or 610 mm o.c. • 89 mm thick absorptive material[6] • resilient metal channels spaced 610 mm o.c. • 12.7 mm regular gypsum board[7]	45 min	1 h	52
	W6i	W6 with • studs spaced 406 mm or 610 mm o.c. • no absorptive material • resilient metal channels spaced 406 mm or 610 mm o.c. • 15.9 mm Type X gypsum board[7]	1.5 h	2 h	47
	W6j	W6 with • studs spaced 406 mm or 610 mm o.c. • no absorptive material • resilient metal channels spaced 406 mm or 610 mm o.c. • 12.7 mm Type X gypsum board[7]	1 h	1.5 h	46
Column 1	2	3	4	5	6

Table 1 (Cont'd)
Fire and Sound Resistance of Walls(1)

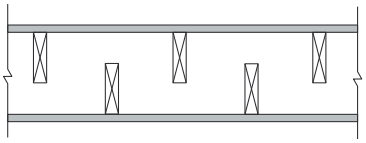
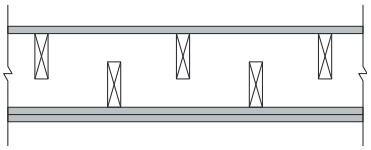
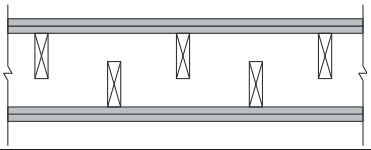
Type of Wall	Wall Number	Description	Fire-Resistance Rating(2)(3)		Typical Sound Transmission Class(2)(4)(5) (STC)
			Loadbearing	Non-Loadbearing	
• Wood Studs • Two Rows Staggered on 38 mm x 140 mm plate • Loadbearing or Non-Loadbearing	**W7**	• two rows 38 mm x 89 mm wood studs each spaced 406 mm or 610 mm o.c. staggered on common 38 mm x 140 mm plate • 89 mm thick absorptive material on one side or 65 mm thick on each side(6) • 1 layer of gypsum board on each side			
	W7a	W7 with • 15.9 mm Type X gypsum board(7)	1 h	1 h	47
	W7b	• W7 with • 12.7 mm Type X gypsum board(7)	45 min [1 h](8)	45 min [1 h](8)	45
	W7c	W7 with • 12.7 mm regular gypsum board(7)(9)	30 min	30 min [45 min](8)	42
	W8	• two rows 38 mm x 89 mm wood studs each spaced 406 mm or 610 mm o.c. staggered on common 38 mm x 140 mm plate • 89 mm thick absorptive material on one side or 65 mm thick on each side(6) • 2 layers of gypsum board on one side • 1 layer of gypsum board on other side			
	W8a	W8 with • 15.9 mm Type X gypsum board(7)	1 h	1.5 h	52
	W8b	W8 with • 12.7 mm Type X gypsum board(7)	45 min	1 h	50
	W9	• two rows 38 mm x 89 mm wood studs each spaced 406 mm or 610 mm o.c. staggered on common 38 mm x 140 mm plate • with or without absorptive material • 2 layers of gypsum board on each side			
	W9a	W9 with • 89 mm thick absorptive material on one side or 65 mm thick on each side(6) • 15.9 mm Type X gypsum board(7)	1.5 h	2 h	56
	W9b	W9 with • 89 mm thick absorptive material on one side or 65 mm thick on each side(6) • 12.7 mm Type X gypsum board(7)	1 h	1.5 h	55
	W9c	W9 with • 89 mm thick absorptive material on one side or 65 mm thick on each side(6) • 12.7 mm regular gypsum board(7)	45 min	1 h	53
Column 1	2	3	4	5	6

Table 1 (Cont'd)
Fire and Sound Resistance of Walls[1]

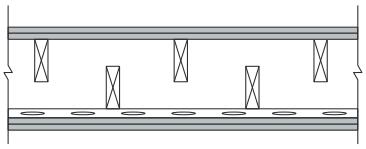
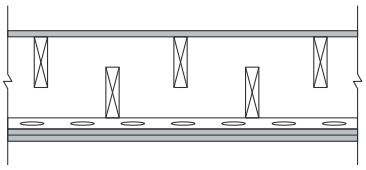
Type of Wall	Wall Number	Description	Fire-Resistance Rating[2][3]		Typical Sound Transmission Class[2][4][5] (STC)
			Loadbearing	Non-Loadbearing	
• Wood Studs • Two Rows Staggered on 38 mm x 140 mm plate • Loadbearing or Non-Loadbearing	W9d	W9 with • no absorptive material • 15.9 mm Type X gypsum board[7]	1.5 h	2 h	48
	W10	• two rows 38 mm x 89 mm wood studs each spaced 406 mm or 610 mm o.c. staggered on common 38 mm x 140 mm plate • with or without absorptive material • resilient metal channels on one side spaced 406 mm or 610 mm o.c. • 2 layers of gypsum board on each side			
	W10a	W10 with • 89 mm thick absorptive material on one side or 65 mm thick on each side[6] • 15.9 mm Type X gypsum board[7]	1.5 h	2 h	62
	W10b	W10 with • 89 mm thick absorptive material on one side or 65 mm thick on each side[6] • 12.7 mm Type X gypsum board[7]	1 h	1.5 h	60
	W10c	W10 with • no absorptive material • 15.9 mm Type X gypsum board[7]	1.5 h	2 h	50
	W10d	W10 with • no absorptive material • 12.7 mm Type X gypsum board[7]	1 h	1.5 h	48
	W11	• two rows 38 mm x 89 mm wood studs each spaced 406 mm or 610 mm o.c. staggered on common 38 mm x 140 mm plate • 89 mm thick absorptive material on one side or 65 mm thick on each side[6] • resilient metal channels on one side spaced 406 mm or 610 mm o.c. • 2 layers of gypsum board on resilient channel side • 1 layer of gypsum board on other side			
	W11a	W11 with • 15.9 mm Type X gypsum board[7]	1 h	1 h	56
	W11b	W11 with • 12.7 mm Type X gypsum board[7]	45 min [1 h][8]	1 h	54
Column 1	2	3	4	5	6

Table 1 (Cont'd)
Fire and Sound Resistance of Walls(1)

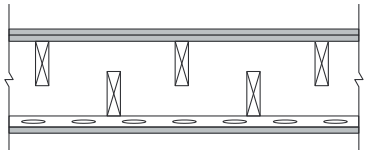
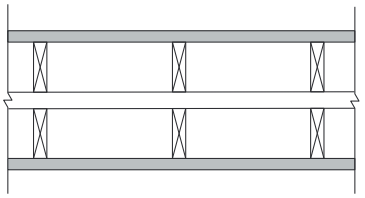
Type of Wall	Wall Number	Description	Fire-Resistance Rating(2)(3)		Typical Sound Transmission Class(2)(4)(5) (STC)
			Loadbearing	Non-Loadbearing	
• Wood Studs • Two Rows Staggered on 38 mm x 140 mm plate • Loadbearing or Non-Loadbearing	**W12**	• two rows 38 mm x 89 mm wood studs each spaced 406 mm or 610 mm o.c. staggered on common 38 mm x 140 mm plate • 89 mm thick absorptive material on one side or 65 mm thick on each side(6) • resilient metal channels on one side spaced 406 mm or 610 mm o.c. • 1 layer of gypsum board on resilient metal channel side • 2 layers of gypsum board on other side			
	W12a	W12 with • 15.9 mm Type X gypsum board(7)	45 min	1 h	56
	W12b	W12 with • 12.7 mm Type X gypsum board(7)	45 min	1 h	54
• Wood Studs • Two Rows on Separate Plates • Loadbearing or Non-Loadbearing	**W13**	• two rows 38 mm x 89 mm wood studs each spaced 406 mm or 610 mm o.c. on separate 38 mm x 89 mm plates set 25 mm apart • with or without absorptive material • 1 layer of gypsum board on each side			
	W13a	W13 with • 89 mm thick absorptive material on each side(6)(10) • 15.9 mm Type X gypsum board(7)	1 h	1 h	57
	W13b	W13 with • 89 mm thick absorptive material on each side(6)(10) • 12.7 mm Type X gypsum board(7)	45 min [1 h](8)	45 min [1 h](8)	57
	W13c	W13 with • 89 mm thick absorptive material on one side only(6)(10) • 15.9 mm Type X gypsum board(7)	1 h	1 h	54
	W13d	W13 with • 89 mm thick absorptive material on one side only(6)(10) • 12.7 mm Type X gypsum board(7)	45 min	45 min	53
	W13e	W13 with • no absorptive material • 15.9 mm Type X gypsum board(7)	1 h	1 h	45
	W13f	W13 with • no absorptive material • 12.7 mm Type X gypsum board(7)	45 min	45 min	45
Column 1	2	3	4	5	6

Table 1 (Cont'd)
Fire and Sound Resistance of Walls[1]

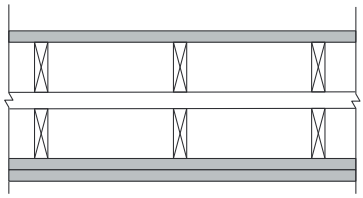
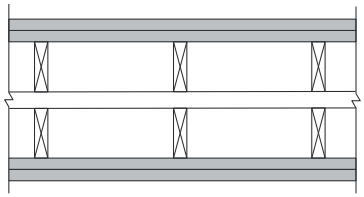
Type of Wall	Wall Number	Description	Fire-Resistance Rating[2][3]		Typical Sound Transmission Class[2][4][5] (STC)
			Loadbearing	Non-Loadbearing	
• Wood Studs • Two Rows on Separate Plates • Loadbearing or Non-Loadbearing	**W14**	• two rows 38 mm x 89 mm wood studs each spaced 406 mm or 610 mm o.c. on separate 38 mm x 89 mm plates set 25 mm apart • with or without absorptive material • 2 layers of gypsum board on one side • 1 layer of gypsum board on other side			
	W14a	W14 with • 89 mm thick absorptive material on each side[6][10] • 15.9 Type X gypsum board[7]	1 h	1 h [1.5 h][8]	61
	W14b	W14 with • 89 mm thick absorptive material on each side[6][10] • 12.7 Type X gypsum board[7]	45 min	1 h	61
	W14c	W14 with • 89 mm thick absorptive material on one side only[6][10] • 15.9 Type X gypsum board[7]	1 h	1 h	57
	W14d	W14 with • 89 mm thick absorptive material on one side only[6][10] • 12.7 Type X gypsum board[7]	45 min	1 h	57
	W14e	W14 with • no absorptive material • 15.9 Type X gypsum board[7]	1 h	1 h	51
	W14f	W14 with • no absorptive material • 12.7 Type X gypsum board[7]	45 min	1 h	51
	W15	• two rows 38 mm x 89 mm wood studs each spaced 406 mm or 610 mm o.c. on separate 38 mm x 89 mm plates set 25 mm apart • with or without absorptive material • 2 layers of gypsum board on each side			
	W15a	W15 with • 89 mm thick absorptive material on each side[6][10] • 15.9 mm Type X gypsum board[7]	1.5 h	2 h	66
	W15b	W6 with • 89 mm thick absorptive material on each side[6][10] • 12.7 mm Type X gypsum board[7]	1 h	1.5 h	65
	W15c	W15 with • 89 mm thick absorptive material on each side[6][10] • 12.7 mm regular gypsum board[7]	45 min	1 h	61
Column 1	2	3	4	5	6

Table 1 (Cont'd)
Fire and Sound Resistance of Walls[1]

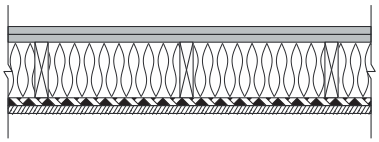
Type of Wall	Wall Number	Description	Fire-Resistance Rating[2][3]		Typical Sound Transmission Class[2][4][5] (STC)
			Loadbearing	Non-Loadbearing	
• Wood Studs • Two Rows on Separate Plates • Loadbearing or Non-Loadbearing	W15d	W15 with • 89 mm thick absorptive material on one side only[6][10] • 15.9 mm Type X gypsum board[7]	1.5 h	2 h	62
	W15e	W15 with • 89 mm thick absorptive material on one side only[6][10] • 12.7 mm Type X gypsum board[7]	1 h	1.5 h	60
	W15f	W15 with • 89 mm thick absorptive material on one side only[6][10] • 12.7 mm regular gypsum board[7]	45 min	1 h	57
	W15g	W15 with • no absorptive material • 15.9 mm Type X gypsum board[7]	1.5 h	2 h	56
	W15h	W15 with • no absorptive material • 12.7 mm Type X gypsum board[7]	1 h	1.5 h	55
	W15i	W15 with • no absorptive material • 12.7 mm regular gypsum board[7]	45 min	1 h	51
• Exterior Wood Studs • Single Row • Loadbearing and Non-Loadbearing	**EW1**	• 38 mm x 89 mm wood studs spaced 406 mm or 610 mm o.c. • 89 mm thick absorptive material[8] • 1 or 2 layers of gypsum board on inside			
	EW1a	EW1 with • 15.9 mm Type X gypsum board[7][11] • exterior sheathing and cladding[12]	1 h	1 h	N/A
	EW1b	EW1 with • 12.7 mm Type X gypsum board[7][11] • exterior sheathing and cladding[12]	45 min	45 min	N/A
	EW1c	EW1 with • 2 layers of 12.7 mm regular gypsum board[7][11] • exterior sheathing and cladding[12]	45 min	45 min	N/A
	EW1d	EW1 with • 1 layer of 12.7 mm regular gypsum board[7][11] • exterior sheathing[13] • masonry veneer cladding	45 min	45 min	N/A
Column 1	2	3	4	5	6

Table 1 (Cont'd)
Fire and Sound Resistance of Walls[1]

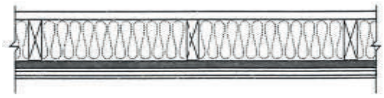
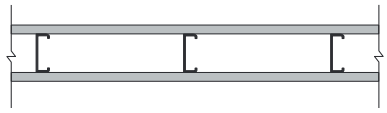
Type of Wall	Wall Number	Description	Fire-Resistance Rating[2][3]		Typical Sound Transmission Class[2][4][5] (STC)
			Loadbearing	Non-Loadbearing	
• Exterior Wood Studs • Single Row • Loadbearing and Non-Loadbearing	**EW2**	• 38 mm x 89 mm or 38 mm x 140 mm wood studs spaced 406 mm or 610 mm o.c. • 89 mm thick glass fiber insulation[14] • 1 layer of gypsum board on inside			
	EW2a	EW2 with • 38 mm x 89 mm studs spaced not more than 406 mm o.c. • 15.9 mm Type X gypsum board[7][11] • exterior sheathing and cladding[12]	1 h	1 h	N/A
	EW2b	EW2 with • 38 mm x 89 mm studs spaced not more than 406 mm o.c. • 12.7 mm Type X gypsum board[7][11] • exterior sheathing[13] • masonry veneer cladding	45 min	45 min	N/A
	EW2c	EW2 with • 38 mm x 140 mm studs spaced not more than 610 mm o.c. • 15.9 mm Type X gypsum board[7][11] • exterior sheathing and cladding[12]	45 min	45 min	N/A
• Non-Loadbearing Steel Studs • 0.46 mm (25 Gauge)	**S1**	• 31 mm x 64 mm steel studs spaced 406 mm or 610 mm o.c. • with or without absorptive material • 1 layer of gypsum board on each side			
	S1a	S1 with • studs spaced 610 mm o.c. • 65 mm thick absorptive material[6] • 15.9 mm Type X gypsum board[7]	—	45 min [1 h][8]	43
	S1b	S1 with • studs spaced 406 mm o.c. • 65 mm thick absorptive material[6] • 15.9 mm Type X gypsum board[7]	—	45 min [1 h][8]	39
	S1c	S1 with • studs spaced 406 mm or 610 mm o.c. • no absorptive material • 15.9 mm Type X gypsum board[7]	—	45 min	35
Column 1	2	3	4	5	6

Table 1 (Cont'd)
Fire and Sound Resistance of Walls(1)

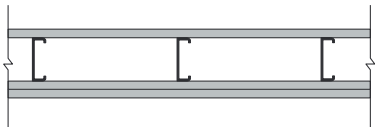
Type of Wall	Wall Number	Description	Fire-Resistance Rating(2)(3)		Typical Sound Transmission Class(2)(4)(5) (STC)
			Loadbearing	Non-Loadbearing	
• Non-Loadbearing Steel Studs • 0.46 mm (25 Gauge)	**S2**	• 31 mm x 64 mm steel studs spaced 406 mm or 610 mm o.c. • with or without absorptive material • 1 layer of gypsum board on one side • 2 layers of gypsum board on other side			
	S2a	S2 with • studs spaced 610 mm o.c. • 65 mm thick absorptive material(6) • 15.9 mm Type X gypsum board(7)	—	1 h	50
	S2b	S2 with • studs spaced 406 mm o.c. • 65 mm thick absorptive material(6) • 15.9 mm Type X gypsum board(7)	—	1 h	44
	S2c	S2 with • studs spaced 610 mm o.c. • 65 mm thick absorptive material(6) • 12.7 mm Type X gypsum board(7)	—	1 h	50
	S2d	S2 with • studs spaced 406 mm o.c. • 65 mm thick absorptive material(6) • 12.7 mm Type X gypsum board(7)	—	1 h	42
	S2e	S2 with • studs spaced 610 mm o.c. • no absorptive material • 15.9 mm Type X gypsum board(7)	—	1 h	41
	S2f	S2 with • studs spaced 406 mm o.c. • no absorptive material • 15.9 mm Type X gypsum board(7)	—	1 h	37
	S2g	S2 with • studs spaced 610 mm o.c. • no absorptive material • 12.7 mm Type X gypsum board(7)	—	1 h	40
	S2h	S2 with • studs spaced 406 mm o.c. • no absorptive material • 12.7 mm Type X gypsum board(7)	—	1 h	35
Column 1	2	3	4	5	6

Table 1 (Cont'd)
Fire and Sound Resistance of Walls[1]

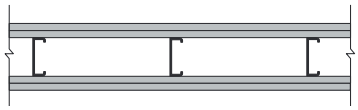
Type of Wall	Wall Number	Description	Fire-Resistance Rating[2][3]		Typical Sound Transmission Class[2][4][5] (STC)
			Loadbearing	Non-Loadbearing	
• Non-Loadbearing Steel Studs • 0.46 mm (25 Gauge)	**S3**	• 31 mm x 64 mm steel studs spaced 406 mm or 610 mm o.c. • with or without absorptive material • 2 layers of gypsum board on each side			
	S3a	S3 with • studs spaced 610 mm o.c. • 65 mm thick absorptive material[6] • 15.9 mm Type X gypsum board[7]	—	2 h	54
	S3b	S3 with • studs spaced 406 mm o.c. • 65 mm thick absorptive material[6] • 15.9 mm Type X gypsum board[7]	—	2 h	51
	S3c	S3 with • studs spaced 610 mm o.c. • 65 mm thick absorptive material[6] • 12.7 mm Type X gypsum board[7]	—	1.5 h	53
	S3d	S3 with • studs spaced 406 mm o.c. • 65 mm thick absorptive material[6] • 12.7 mm Type X gypsum board[7]	—	1.5 h	47
	S3e	S3 with • studs spaced 610 mm o.c. • 65 mm thick absorptive material[6] • 12.7 mm regular gypsum board[7]	—	1 h	49
	S3f	S3 with • studs spaced 406 mm o.c. • 65 mm thick absorptive material[6] • 12.7 mm regular gypsum board[7]	—	1 h	41
	S3g	S3 with • studs spaced 610 mm o.c. • no absorptive material • 15.9 mm Type X gypsum board[7]	—	2 h	45
	S3h	S3 with • studs spaced 406 mm o.c. • no absorptive material • 15.9 mm Type X gypsum board[7]	—	2 h	42
	S3i	S3 with • studs spaced 610 mm o.c. • no absorptive material • 12.7 mm Type X gypsum board[7]	—	1.5 h	44
	S3j	S3 with • studs spaced 406 mm o.c. • no absorptive material • 12.7 mm Type X gypsum board[7]	—	1.5 h	39
Column 1	2	3	4	5	6

Table 1 (Cont'd)
Fire and Sound Resistance of Walls(1)

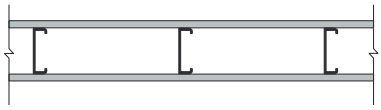
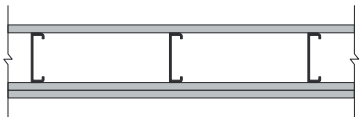
Type of Wall	Wall Number	Description	Fire-Resistance Rating(2)(3)		Typical Sound Transmission Class(2)(4)(5) (STC)
			Loadbearing	Non-Loadbearing	
• Non-Loadbearing Steel Studs • 0.46 mm (25 Gauge)	S3k	S3 with • studs spaced 610 mm o.c. • no absorptive material • 12.7 mm regular gypsum board(7)	—	1 h	40
	S3l	S3 with • studs spaced 406 mm o.c. • no absorptive material • 12.7 mm regular gypsum board(7)	—	1 h	37
	S4	• 31 mm x 92 mm steel studs spaced 406 mm or 610 mm o.c. • with or without absorptive material • 1 layer of gypsum board on each side			
	S4a	S4 with • studs spaced 610 mm o.c. • 89 mm thick absorptive material(6) • 15.9 mm Type X gypsum board(7)	—	45 min [1 h](8)	48
	S4b	S4 with • studs spaced 406 mm o.c. • 89 mm thick absorptive material(6) • 15.9 mm Type X gypsum board(7)	—	45 min [1 h](8)	47
	S4c	S4 with • studs spaced 610 mm o.c. • no absorptive material • 15.9 mm Type X gypsum board(7)	—	45 min	38
	S4d	S4 with • studs spaced 406 mm o.c. • no absorptive material • 15.9 mm Type X gypsum board(7)	—	45 min	38
	S5	• 31 mm x 92 mm steel studs spaced 406 mm or 610 mm o.c. • with or without absorptive material • 1 layer of gypsum board on one side • 2 layers of gypsum board on other side			
	S5a	S5 with • studs spaced 610 mm o.c. • 89 mm thick absorptive material(6) • 15.9 mm Type X gypsum board(7)	—	1 h [1.5 h](8)	53
	S5b	S5 with • studs spaced 406 mm o.c. • 89 mm thick absorptive material(6) • 15.9 mm Type X gypsum board(7)	—	1 h [1.5 h](8)	52
Column 1	2	3	4	5	6

Table 1 (Cont'd)
Fire and Sound Resistance of Walls[1]

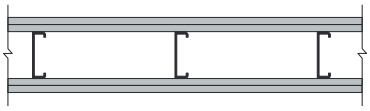
Type of Wall	Wall Number	Description	Fire-Resistance Rating[2][3]		Typical Sound Transmission Class[2][4][5] (STC)
			Loadbearing	Non-Loadbearing	
• Non-Loadbearing Steel Studs • 0.46 mm (25 Gauge)	S5c	S5 with • studs spaced 610 mm o.c. • 89 mm thick absorptive material[6] • 12.7 mm Type X gypsum board[7]	—	1 h [1.5 h][8]	51
	S5d	S5 with • studs spaced 406 mm o.c. • 89 mm thick absorptive material[6] • 12.7 mm Type X gypsum board[7]	—	1 h [1.5 h][8]	50
	S5e	S5 with • studs spaced 610 mm o.c. • no absorptive material • 15.9 mm Type X gypsum board[7]	—	1 h	43
	S5f	S5 with • studs spaced 406 mm o.c. • no absorptive material • 15.9 mm Type X gypsum board[7]	—	1 h	42
	S5g	S5 with • studs spaced 610 mm o.c. • no absorptive material • 12.7 mm Type X gypsum board[7]	—	1 h	41
	S5h	S5 with • studs spaced 406 mm o.c. • no absorptive material • 12.7 mm Type X gypsum board[7]	—	1 h	40
	S6	• 31 mm x 92 mm steel studs spaced 406 mm or 610 mm o.c. • with or without absorptive material • 2 layers of gypsum board on each side			
	S6a	S6 with • studs spaced 610 mm o.c. • 89 mm thick absorptive material[6] • 15.9 mm Type X gypsum board[7]	—	2 h	56
	S6b	S6 with • studs spaced 406 mm o.c. • 89 mm thick absorptive material[6] • 15.9 mm Type X gypsum board[7]	—	2 h	55
Column 1	2	3	4	5	6

Table 1 (Cont'd)
Fire and Sound Resistance of Walls[1]

Type of Wall	Wall Number	Description	Fire-Resistance Rating[2][3]		Typical Sound Transmission Class[2][4][5] (STC)
			Loadbearing	Non-Loadbearing	
• Non-Loadbearing Steel Studs • 0.46 mm (25 Gauge)	S6c	S6 with • studs spaced 610 mm o.c. • 89 mm thick absorptive material[6] • 12.7 mm Type X gypsum board[7]	—	1.5 h	55
	S6d	S6 with • studs spaced 406 mm o.c. • 89 mm thick absorptive material[6] • 12.7 mm Type X gypsum board[7]	—	1.5 h	54
	S6e	S6 with • studs spaced 610 mm o.c. • 89 mm thick absorptive material[6] • 12.7 mm regular gypsum board[7]	—	1 h	50
	S6f	S6 with • studs spaced 406 mm o.c. • 89 mm thick absorptive material[6] • 12.7 mm regular gypsum board[7]	—	1 h	48
	S6g	S6 with • studs spaced 610 mm o.c. • no absorptive material • 15.9 mm Type X gypsum board[7]	—	2 h	47
	S6h	S6 with • studs spaced 406 mm o.c. • no absorptive material • 15.9 mm Type X gypsum board[7]	—	2 h	45
	S6i	S6 with • studs spaced 610 mm o.c. • no absorptive material • 12.7 mm Type X gypsum board[7]	—	1.5 h	45
	S6j	S6 with • studs spaced 406 mm o.c. • no absorptive material • 12.7 mm Type X gypsum board[7]	—	1.5 h	44
	S6k	S6 with • studs spaced 610 mm o.c. • no absorptive material • 12.7 mm regular gypsum board[7]	—	1 h	41
	S6l	S6 with • studs spaced 406 mm o.c. • no absorptive material • 12.7 mm regular gypsum board[7]	—	1 h	39
Column 1	2	3	4	5	6

Table 1 (Cont'd)
Fire and Sound Resistance of Walls[1]

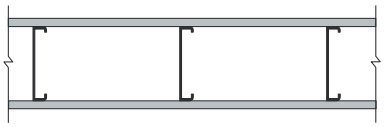
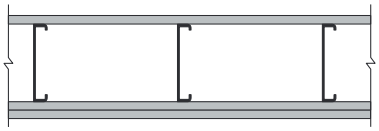
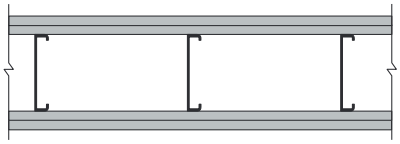
Type of Wall	Wall Number	Description	Fire-Resistance Rating[2][3]		Typical Sound Transmission Class[2][4][5] (STC)
			Loadbearing	Non-Loadbearing	
• Non-Loadbearing Steel Studs • 0.46 mm (25 Gauge)	**S7**	• 31 mm x 152 mm steel studs spaced 406 mm or 610 mm o.c. • with or without absorptive material • 1 layer of gypsum board on each side			
	S7a	S7 with • 150 mm thick absorptive material[6] • 15.9 mm Type X gypsum board[7]	—	45 min [1 h][8]	51
	S7b	S7 with • no absorptive material • 15.9 mm Type X gypsum board[7]	—	45 min	41
	S8	• 31 mm x 152 mm steel studs spaced 406 mm or 610 mm o.c. • with or without absorptive material • 1 layer of gypsum board on one side • 2 layers of gypsum board on other side			
	S8a	S8 with • 150 mm thick absorptive material[6] • 15.9 mm Type X gypsum board[7]	—	1 h [1.5 h][8]	55
	S8b	S8 with • 150 mm thick absorptive material[6] • 12.7 mm Type X gypsum board[7]	—	1 h [1.5 h][8]	54
	S8c	S8 with • no absorptive material • 15.9 mm Type X gypsum board[7]	—	1 h	45
	S8d	S8 with • no absorptive material • 12.7 mm Type X gypsum board[7]	—	1 h	44
	S9	• 31 mm x 152 mm steel studs spaced 406 mm or 610 mm o.c. • with or without absorptive material • 2 layers of gypsum board on each side			
	S9a	S9 with • 150 mm thick absorptive material[6] • 15.9 mm Type X gypsum board[7]	—	2 h	59
	S9b	S9 with • 150 mm thick absorptive material[6] • 12.7 mm Type X gypsum board[7]	—	1.5 h	57
Column 1	2	3	4	5	6

Table 1 (Cont'd)
Fire and Sound Resistance of Walls(1)

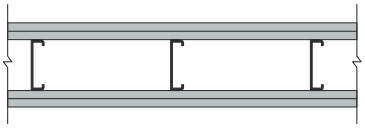
Type of Wall	Wall Number	Description	Fire-Resistance Rating(2)(3)		Typical Sound Transmission Class(2)(4)(5) (STC)
			Loadbearing	Non-Loadbearing	
• Non-Loadbearing Steel Studs • 0.46 mm (25 Gauge)	S9c	S9 with • 150 mm thick absorptive material(6) • 12.7 mm regular gypsum board(7)	—	1 h	53
	S9d	S9 with • no absorptive material • 15.9 mm Type X gypsum board(7)	—	2 h	49
	S9e	S9 with • no absorptive material • 12.7 mm Type X gypsum board(7)	—	1.5 h	47
	S9f	S9 with • no absorptive material • 12.7 mm regular gypsum board(7)	—	1 h	43
• Loadbearing Steel Studs • 0.84 mm to 1.52 mm thickness	**S10**	• 41 mm x 92 mm loadbearing steel studs spaced 406 mm or 610 mm o.c. • with or without cross-bracing on one side • with or without absorptive material • 2 layers of gypsum board on each side			
	S10a	S10 with • 89 mm thick absorptive material(6) • 15.9 mm Type X gypsum board(7)	1 h	—	38
	S10b	S10 with • 89 mm thick absorptive material(6) • 12.7 mm Type X gypsum board(7)	45 min [1 h](8)	—	38
	S10c	S10 with • 89 mm thick absorptive material(6) • 12.7 mm regular gypsum board(7)	—	—	36
	S10d	S10 with • no absorptive material • 15.9 mm Type X gypsum board(7)	1 h	—	36
	S10e	S10 with • no absorptive material • 12.7 mm Type X gypsum board(7)	1 h	—	35
	S10f	S10 with • no absorptive material • 12.7 mm regular gypsum board(7)	—	—	34
Column 1	2	3	4	5	6

Table 1 (Cont'd)
Fire and Sound Resistance of Walls[1]

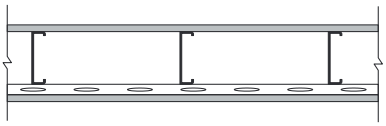
Type of Wall	Wall Number	Description	Fire-Resistance Rating[2][3]		Typical Sound Transmission Class[2][4][5] (STC)
			Loadbearing	Non-Loadbearing	
• Loadbearing Steel Studs • 0.84 mm to 1.52 mm thickness	**S11**	• 41 mm x 92 mm loadbearing steel studs spaced 406 mm or 610 mm o.c. • with or without cross-bracing on one side • with or without absorptive material • resilient metal channels on one side • 1 layer of gypsum board on each side			
	S11a	S11 with • 89 mm thick absorptive material[6] • resilient metal channels spaced at 610 mm o.c. • 15.9 mm Type X gypsum board[7]	—	—	50
	S11b	S11 with • 89 mm thick absorptive material[6] • resilient metal channels spaced at 406 mm o.c. • 15.9 mm Type X gypsum board[7]	—	—	47
	S11c	S11 with • no absorptive material • resilient metal channels spaced at 610 mm o.c. • 15.9 mm Type X gypsum board[7]	—	—	41
	S11d	S11 with • no absorptive material • resilient metal channels spaced at 406 mm o.c. • 15.9 mm Type X gypsum board[7]	—	—	39
	S11e	S11 with • 89 mm thick absorptive material[6] • resilient metal channels spaced at 610 mm o.c. • 12.7 mm Type X gypsum board[7]	—	—	47
	S11f	S11 with • 89 mm thick absorptive material[6] • resilient metal channels spaced at 406 mm o.c. • 12.7 mm Type X gypsum board[7]	—	—	45
	S11g	S11 with • no absorptive material • resilient metal channels spaced at 610 mm o.c. • 12.7 mm Type X gypsum board[7]	—	—	38
	S11h	S11 with • no absorptive material • resilient metal channels spaced at 406 mm o.c. • 12.7 mm Type X gypsum board[7]	—	—	36
Column 1	2	3	4	5	6

Table 1 (Cont'd)
Fire and Sound Resistance of Walls[1]

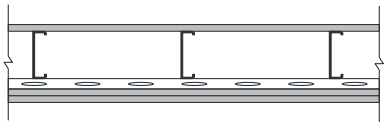
Type of Wall	Wall Number	Description	Fire-Resistance Rating[2][3]		Typical Sound Transmission Class[2][4][5] (STC)
			Loadbearing	Non-Loadbearing	
• Loadbearing Steel Studs • 0.84 mm to 1.52 mm thickness	**S12**	• 41 mm x 92 mm loadbearing steel studs spaced 406 mm or 610 mm o.c. • with or without cross-bracing on one side • with or without absorptive material • resilient metal channels on one side • 2 layers of gypsum board on resilient channel side • 1 layer of gypsum board on other side			
	S12a	S12 with • 89 mm thick absorptive material[6] • resilient metal channels spaced at 610 mm o.c. • 15.9 mm Type X gypsum board[7]	—	—	54
	S12b	S12 with • 89 mm thick absorptive material[6] • resilient metal channels spaced at 406 mm o.c. • 15.9 mm Type X gypsum board[7]	—	—	52
	S12c	S12 with • no absorptive material • resilient metal channels spaced at 610 mm o.c. • 15.9 mm Type X gypsum board[7]	—	—	46
	S12d	S12 with • no absorptive material • resilient metal channels spaced at 406 mm o.c. • 15.9 mm Type X gypsum board[7]	—	—	43
	S12e	S12 with • 89 mm thick absorptive material[6] • resilient metal channels spaced at 610 mm o.c. • 12.7 mm Type X gypsum board[7]	—	—	52
	S12f	S12 with • 89 mm thick absorptive material[6] • resilient metal channels spaced at 406 mm o.c. • 12.7 mm Type X gypsum board[7]	—	—	50
	S12g	S12 with • no absorptive material • resilient metal channels spaced at 610 mm o.c. • 12.7 mm Type X gypsum board[7]	—	—	43
	S12h	S12 with • no absorptive material • resilient metal channels spaced at 406 mm o.c. • 12.7 mm Type X gypsum board[7]	—	—	41
Column 1	2	3	4	5	6

Table 1 (Cont'd)
Fire and Sound Resistance of Walls[1]

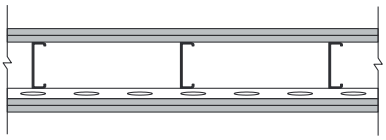
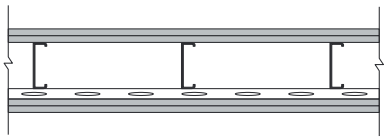
Type of Wall	Wall Number	Description	Fire-Resistance Rating[2][3]		Typical Sound Transmission Class[2][4][5] (STC)
			Loadbearing	Non-Loadbearing	
• Loadbearing Steel Studs • 0.84 mm to 1.52 mm thickness	**S13**	• 41 mm x 92 mm loadbearing steel studs spaced 406 mm or 610 mm o.c. • with or without absorptive material • resilient metal channels on one side spaced at 406 mm o.c. • 2 layers of gypsum board on resilient channel side • 1 layer shear membrane and 1 layer gypsum board on other side			
	S13a	S13 with • 89 mm thick absorptive material[6] • 12.7 mm OSB shear membrane • 12.7 mm Type X gypsum board[7]	30 min	—	57
	S14	• 41 mm x 92 mm loadbearing steel studs spaced 406 mm or 610 mm o.c. • with or without absorptive material • resilient metal channels on one side • 2 layers of gypsum board on each side			
	S14a	S14 with • 89 mm thick absorptive material[6] • resilient metal channels spaced at 610 mm o.c. • 15.9 mm Type X gypsum board[7]	1 h	—	60
	S14b	S14 with • 89 mm thick absorptive material[6] • resilient metal channels spaced at 610 mm o.c. • 12.7 mm Type X gypsum board[7]	45 min [1 h][8]	—	57
	S14c	S14 with • 89 mm thick absorptive material[6] • resilient metal channels spaced at 610 mm o.c. • 12.7 mm regular gypsum board[7]	—	—	54
	S14d	S14 with • 89 mm thick absorptive material • resilient metal channels spaced at 406 mm o.c. • 12.7 mm Type X gypsum board[7]	45 min [1 h][8]	—	55
	S14e	S14 with • no absorptive material • resilient metal channels spaced at 610 mm o.c. • 15.9 mm Type X gypsum board[7]	1 h	—	51
	S14f	S14 with • no absorptive material • resilient metal channels spaced at 610 mm o.c. • 12.7 mm regular gypsum board[7]	—	—	45
Column 1	2	3	4	5	6

Table 1 (Cont'd)
Fire and Sound Resistance of Walls[1]

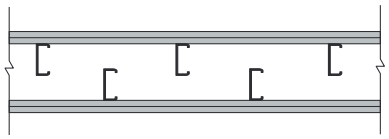
Type of Wall	Wall Number	Description	Fire-Resistance Rating[2][3]		Typical Sound Transmission Class[2][4][5] (STC)
			Loadbearing	Non-Loadbearing	
• Loadbearing Steel Studs • 0.84 mm to 1.52 mm thickness	S14g	S14 with • no absorptive material • resilient metal channels spaced at 406 mm o.c. • 12.7 mm Type X gypsum board[7]	1 h	—	47
	S14h	S14 with • studs at 610 mm o.c. • 89 mm thick absorptive material • resilient metal channels spaced at 406 mm o.c. • 15.9 mm Type X gypsum board[7]	1 h	—	60
	S14i	S14 with • studs at 406 mm o.c. • 89 mm thick absorptive material • resilient metal channels spaced at 406 mm o.c. • 15.9 mm Type X gypsum board[7]	1 h	—	58
	S14j	S14 with • studs at 610 mm o.c. • no absorptive material • resilient metal channels spaced at 406 mm o.c. • 15.9 mm Type X gypsum board[7]	1 h	—	51
	S14k	S14 with • studs at 406 mm o.c. • no absorptive material • resilient metal channels spaced at 406 mm o.c. • 15.9 mm Type X gypsum board[7]	1 h	—	49
	S14l	S14 with • studs at 406 mm o.c. • no absorptive material • resilient metal channels spaced at 610 mm o.c. • 12.7 mm Type X gypsum board[7]	1 h	—	49
	S14m	S14 with • studs at 610 mm o.c. • no absorptive material • resilient metal channels spaced at 610 mm o.c. • 12.7 mm regular gypsum board[7]	1 h	—	50
	S15	• 2 rows of 41 mm x 92 mm loadbearing steel studs spaced 406 mm or 610 mm o.c. staggered on 152 mm common plate • with cross-bracing • with or without absorptive material • 2 layers of gypsum board on each side			
Column 1	2	3	4	5	6

Table 1 (Cont'd)
Fire and Sound Resistance of Walls(1)

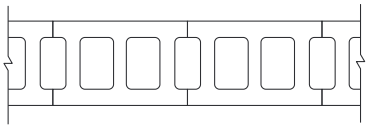
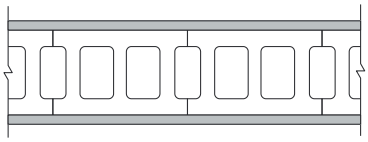
Type of Wall	Wall Number	Description	Fire-Resistance Rating(2)(3)		Typical Sound Transmission Class(2)(4)(5) (STC)
			Loadbearing	Non-Loadbearing	
• Loadbearing Steel Studs • 0.84 mm to 1.52 mm thickness	S15a	S15 with • 89 mm thick absorptive material in each cavity • 15.9 mm Type X gypsum board(7)	1 h	—	68
	S15b	S15 with • 89 mm thick absorptive material in each cavity • 12.7 mm Type X gypsum board(7)	1 h	—	68
	S15c	S15 with • no absorptive material • 15.9 mm Type X gypsum board(7)	1.5 h	—	52
	S15d	S15 with • no absorptive material • 12.7 mm Type X gypsum board(7)	1 h	—	52
• Hollow Concrete Block (Normal Weight Aggregate)	**B1**	• 140 mm or 190 mm concrete block			
	B1a	• 140 mm bare concrete block(5)	1 h	1 h	48
	B1b	• 190 mm bare concrete block(5)	1.5 h	1.5 h	50
	B2	• 140 mm or 190 mm concrete block • no absorptive material • 1 layer of gypsum-sand plaster or gypsum board on each side			
	B2a	B2 with • 140 mm concrete block • 12.7 mm gypsum-sand plaster	2 h	2 h	50
	B2b	B2 with • 140 mm concrete block • 12.7 mm Type X gypsum board or 15.9 mm Type X gypsum board(7)	2 h	2 h	47
	B2c	B2 with • 140 mm concrete block • 12.7 mm regular gypsum board(7)	1.5 h	1.5 h	46
	B2d	B2 with • 190 mm concrete block • 12.7 mm gypsum-sand plaster	2.5 h	2.5 h	51
	B2e	B2 with • 190 mm concrete block • 15.9 mm Type X gypsum board(7)	3 h	3 h	50
Column 1	2	3	4	5	6

Table 1 (Cont'd)
Fire and Sound Resistance of Walls(1)

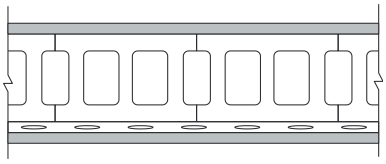
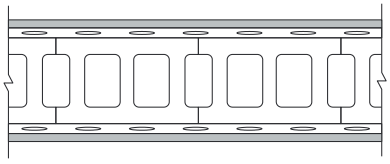
Type of Wall	Wall Number	Description	Fire-Resistance Rating(2)(3)		Typical Sound Transmission Class(2)(4)(5) (STC)
			Loadbearing	Non-Loadbearing	
• Hollow Concrete Block (Normal Weight Aggregate)	B2f	B2 with • 190 mm concrete block • 12.7 mm Type X gypsum board(7)	2.5 h	2.5 h	49
	B2g	B2 with • 190 mm concrete block • 12.7 mm regular gypsum board(7)	2 h	2 h	48
	B3	• 140 mm or 190 mm concrete block • resilient metal channels on one side spaced at 406 mm or 610 mm o.c. • absorptive material filling resilient metal channel space(6) • 1 layer of gypsum board on each side			
	B3a	B3 with • 140 mm concrete block • 12.7 mm Type X gypsum board or 15.9 mm Type X gypsum board(7)	2 h	2 h	51
	B3b	B3 with • 140 mm concrete block • 12.7 mm regular gypsum board(7)(9)	1.5 h	1.5 h	48
	B3c	B3 with • 190 mm concrete block • 15.9 mm Type X gypsum board(7)	3 h	3 h	54
	B3d	B3 with • 190 mm concrete block • 12.7 mm Type X gypsum board(7)	2.5 h	2.5 h	53
	B3e	B3 with • 190 mm concrete block • 12.7 mm regular gypsum board(7)(9)	2 h	2 h	51
	B4	• 140 mm or 190 mm concrete block • resilient metal channels on each side spaced at 406 mm or 610 mm o.c. • with or without absorptive material • 1 layer of gypsum board on each side			
	B4a	B4 with • 140 mm concrete block • 12.7 mm Type X gypsum board or 15.9 mm Type X gypsum board(7)	2 h	2 h	47
	B4b	B4 with • 140 mm concrete block • 12.7 mm regular gypsum board(7)(9)	1.5 h	1.5 h	42
Column 1	2	3	4	5	6

Table 1 (Cont'd)
Fire and Sound Resistance of Walls[1]

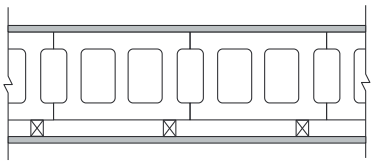
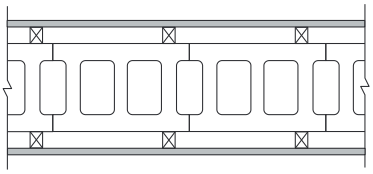
Type of Wall	Wall Number	Description	Fire-Resistance Rating[2][3]		Typical Sound Transmission Class[2][4][5] (STC)
			Loadbearing	Non-Loadbearing	
• Hollow Concrete Block (Normal Weight Aggregate)	B4c	B4 with • 190 mm concrete block • 15.9 mm Type X gypsum board[7]	3 h	3 h	50
	B4d	B4 with • 190 mm concrete block • 12.7 mm Type X gypsum board[7]	2.5 h	2.5 h	49
	B4e	B4 with • 190 mm concrete block • 12.7 mm regular gypsum board[7][9]	2 h	2 h	45
	B5	• 190 mm concrete block • 38 mm x 38 mm horizontal or vertical wood strapping on one side spaced at 610 mm o.c. • with or without absorptive material • 1 layer of gypsum board on each side			
	B5a	B5 with • 15.9 mm Type X gypsum board[7]	3 h	3 h	54
	B5b	B5 with • 12.7 mm Type X gypsum board[7]	2.5 h	2.5 h	53
	B5c	B5 with • 12.7 mm regular gypsum board[7][9]	2 h	2 h	51
	B6	• 140 mm or 190 mm concrete block • 38 mm x 38 mm horizontal or vertical wood strapping on each side spaced at 610 mm o.c. • absorptive material filling strapping space on each side[6] • 1 layer of gypsum board on each side			
	B6a	B6 with • 140 mm concrete block • 12.7 mm Type X gypsum board or 15.9 mm Type X gypsum board[7]	2 h	2 h	57
	B6b	B6 with • 140 mm concrete block • 12.7 mm regular gypsum board[7][9]	1.5 h	1.5 h	56
	B6c	B6 with • 190 mm concrete block • 15.9 mm Type X gypsum board[7]	3 h	3 h	60
	B6d	B6 with • 190 mm concrete block • 12.7 mm Type X gypsum board[7]	2.5 h	2.5 h	59
Column 1	2	3	4	5	6

Table 1 (Cont'd)
Fire and Sound Resistance of Walls[1]

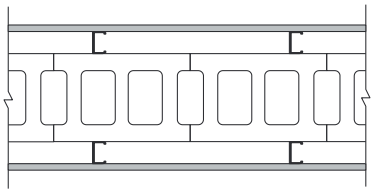
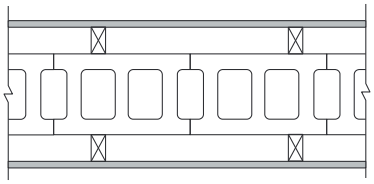
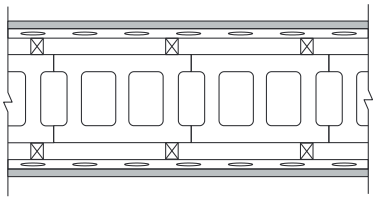
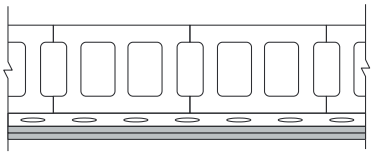
Type of Wall	Wall Number	Description	Fire-Resistance Rating[2][3]		Typical Sound Transmission Class[2][4][5] (STC)
			Loadbearing	Non-Loadbearing	
• Hollow Concrete Block (Normal Weight Aggregate)	B6e	B6 with • 190 mm concrete block • 12.7 mm regular gypsum board[7][9]	2 h	2 h	57
	B7	• 190 mm concrete block • 65 mm steel studs each side spaced at 610 mm o.c. • absorptive material filling stud space on each side[6] • 1 layer of gypsum board on each side			
	B7a	B7 with • 15.9 mm Type X gypsum board[7]	3 h	3 h	71
	B7b	B7 with • 12.7 mm Type X gypsum board[7]	2.5 h	2.5 h	70
	B7c	B7 with • 12.7 mm regular gypsum board[7][9]	2 h	2 h	69
	B8	• 190 mm concrete block • 38 mm x 64 mm wood studs on each side spaced at 610 mm o.c. • absorptive material filling stud space on each side[6] • 1 layer of gypsum board on each side			
	B8a	B8 with • 15.9 mm Type X gypsum board[7]	3 h	3 h	71
	B8b	B8 with • 12.7 mm Type X gypsum board[7]	2.5 h	2.5 h	70
	B8c	B8 with • 12.7 mm regular gypsum board[7][9]	2 h	2 h	69
	B9	• 190 mm concrete block • 50 mm metal Z-bars on each side spaced at 610 mm o.c. (or 38 mm x 38 mm horizontal or vertical wood strapping plus resilient metal channels) • absorptive material filling Z-bar space on each side[6] • 1 layer of gypsum board on each side			
	B9a	B9 with • 15.9 mm Type X gypsum board[7]	3 h	3 h	65
	B9b	B9 with • 12.7 mm Type X gypsum board[7]	2.5 h	2.5 h	64
	B9c	B9 with • 12.7 mm regular gypsum board[7][9]	2 h	2 h	63
Column 1	2	3	4	5	6

Table 1 (Cont'd)
Fire and Sound Resistance of Walls[1]

Type of Wall	Wall Number	Description	Fire-Resistance Rating[2][3]		Typical Sound Transmission Class[2][4][5] (STC)
			Loadbearing	Non-Loadbearing	
	B10	• 190 mm concrete block • resilient metal channels on one side spaced at 610 mm o.c. • absorptive material filling resilient metal channel space[6] • 2 layers of gypsum board on one side only			
	B10a	B10 with • 15.9 mm Type X gypsum board[7]	3 h	3 h	56
	B10b	B10 with • 12.7 mm Type X gypsum board[7]	2.5 h	2.5 h	55
	B10c	B10 with • 12.7 mm regular gypsum board[7]	2 h	2 h	54
Column 1	2	3	4	5	6

Notes to Table 1:

(1) See Figure 1 for butt joint detail of single layer gypsum board application, Figure 2 for butt joint detail of double layer gypsum board application, Figure 3 for example of steel furring channel and Figure 4 for example of resilient metal channel.

(2) Fire-resistance ratings and STC ratings of wood frame construction were evaluated only for solid sawn 38 mm x 89 mm lumber. However, the fire-resistance ratings and STC ratings provided for 38 mm x 89 mm wood frame construction may be applied to 38 mm x 140 mm wood frame construction with solid sawn 38 mm x 140 mm lumber; in some cases the ratings may be conservative. Where 38 mm x 140 mm framing is used and absorptive material is called for, the absorptive material must be 140 mm thick. (See 1.2.1.(2) in MMAH Supplementary Standard SB-2 for the significance of fire-resistance ratings).

The STC ratings may also be applied to fingerjoined lumber. The fire-resistance ratings are applicable to wall assemblies using fingerjoined lumber that has been manufactured with a heat-resistant adhesive (HRA) in accordance with NLGA special product standard SPS-1-2013, "Fingerjoined Structural Lumber", or SPS-3-2013, "Fingerjoined 'Vertical Stud Use Only' Lumber". (See also Appendix Note A-9.23.10.4.(1) under Division B in Appendix A of the Building Code).

(3) For all fire-resistance ratings, the given spacing for framing is a maximum value.

(4) Sound ratings listed are based on the most reliable laboratory test data available for specimens conforming to installation details required by CSA A82.31-M1980, "Gypsum Board Application". Results of specific tests may differ slightly because of measurement precision and minor variations in construction details. These results should only be used where the actual construction details, including spacing or fasteners and supporting framing, correspond exactly to the details of the test specimens on which the ratings are based. Assemblies with sound transmission class ratings of 50 or more require acoustical sealant applied around electrical boxes and other openings, and at the junction of intersecting walls and floors, except intersection of walls constructed of concrete or solid masonry units where the masonry joints at the intersection are mortared.

(5) Sound ratings are only valid where there are no discernible cracks or voids in the visible surfaces. For concrete block walls, surfaces must be sealed by at least 2 coats of paint or other surface finish described in Section 9.29. of Division B of the Building Code to prevent sound leakage.

(6) Sound absorptive material includes fibre processed from rock, slag, glass or cellulose fibre. It must fill at least 90% of the cavity thickness for the wall to provide the listed STC value. The absorptive material should not overfill the cavity to the point of producing significant outward pressure on the finishes; such an assembly will not achieve the STC rating. Where the absorptive material used with steel stud assemblies is in batt form, "steel stud batts", which are wide enough to fill the cavity from the web of one stud to the web of the adjacent studs, must be used.

(7) The complete descriptions of indicated finishes are as follows:
- 12.7 mm regular gypsum board — 12.7 mm regular gypsum board conforming to Article 9.29.5.2. of Division B of the Building Code.
- 12.7 mm Type X gypsum board — 12.7 mm special fire-resistant Type X gypsum board conforming to Article 9.29.5.2. of Division B of the Building Code.
- 15.9 mm Type X gypsum board — 15.9 mm special fire-resistant Type X gypsum board conforming to Article 9.29.5.2. of Division B of the Building Code.
- Except for exterior walls (see Note 11), the outer layer of finish on both sides of the wall must have its joints taped and finished.
- Fastener types and spacing must conform to CSA A82.31-M1980, "Gypsum Board Application".

(8) Absorptive material required for the higher fire-resistance rating is mineral fibre processed from rock or slag with a mass of at least 4.8 kg/m² for 150 mm thickness, 2.8 kg/m² for 89 mm thickness and 2.0 kg/m² for 65 mm thickness and completely filling the wall cavity. For assemblies with double wood studs on separate plates, absorptive material is required in the stud cavities on both sides.

(9) Regular gypsum board used in single layer assemblies must be installed so all edges are supported.

(10) Where bracing material, such as diagonal lumber or plywood, OSB, gypsum board or fibreboard sheathing is installed on the inner face of one row of studs in double stud assemblies, the STC rating will be reduced by 3 for any assemblies containing absorptive material in both rows of studs or in the row of studs opposite to that which the bracing material is attached. Attaching such layers on both inner faces of the studs may drastically reduce the STC value but enough data to permit assignment of STC ratings for this situation is not available. The fire-resistance rating is not affected by the inclusion of such bracing.

(11) For exterior walls, the finish joints must be taped and finished for the outer layer of the interior side only. The gypsum board on the exterior side may be replaced with gypsum sheathing of the same thickness and type (regular or Type X).

(12) Includes any exterior wall sheathing and cladding combination allowed under Part 9 other than foamed plastic sheathing. The cladding portion can include foamed plastic outboard of noncombustible, structural wood-based or gypsum-based sheathing conforming to the minimum thicknesses listed in Table 9.23.16.2.A. of Division B of the Building Code.

(13) Includes any exterior wall sheathing listed in Table 9.23.16.2.A. of Division B of the Building Code and masonry veneer cladding conforming to Section 9.20. of Division B of the Building Code. Foamed plastic sheathing is permitted in EW1d and EW2b walls without the use of other sheathing, provided it is directly attached to the framing.

(14) The glass fibre insulation filling the cavity shall have a mass per unit area of not less than 1.0 kg/m^2 of wall surface.

Section 2 Fire and Sound Resistance of Floors, Ceilings and Roofs

Table 2
Fire and Sound Resistance of Floors, Ceilings and Roofs(1)

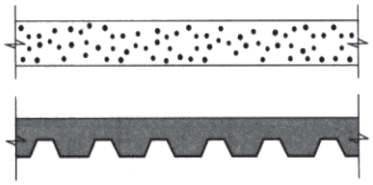
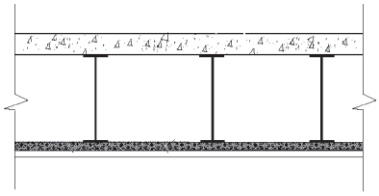
Type of Assembly	Assembly Number	Description(2)(3)(4)	Fire-Resistance Rating(5)(6)(7)(8)	Typical Sound Transmission Class(5)(6)(9)(10) (STC)	Typical Impact Insulation Class(5)(9)(11) (IIC)
Floors and Ceilings					
Concrete Slabs	**F1**	• concrete floors			
	F1a	• 90 mm reinforced concrete with 20 mm minimum cover over reinforcing steel	1 h	47	23
	F1b	• 130 mm reinforced concrete with 25 mm minimum cover over reinforcing steel	2 h	52	27
	F1c	• pre-stressed hollow core slab 200 mm deep with 25 mm minimum cover over reinforcing steel	1 h	50	28
	F1d	• 150 mm composite slab on 75 mm steel deck with 152 x 152 x MW3.8 x MW3.8 wire mesh	—	51	21
	F1e	• 150 mm composite slab on 75 mm steel deck with 152 x 152 x MW3.8 x MW3.8 wire mesh • resilient metal channels spaced 406 mm or 610 mm o.c. • 2 layers of 12.7 mm Type X gypsum board or 2 layers of 15.9 mm Type X gypsum board	1.5 h	57	36
Open Web Steel Joists	**F2**	• open web steel joists with concrete floor			
	F2a	• 50 mm thick concrete deck • on open web steel joists spaced 406 mm o.c. • steel furring channels spaced not more than 610 mm o.c. wired to underside of joists • 1 layer of 15.9 mm Type X gypsum board on ceiling side	45 min	53	27
Column 1	2	3	4	5	6

Table 2 (Cont'd)
Fire and Sound Resistance of Floors, Ceilings and Roofs(1)

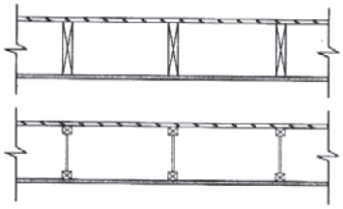
Type of Assembly	Assembly Number	Description(2)(3)(4)	Fire-Resistance Rating(5)(6)(7)(8)	Typical Sound Transmission Class(5)(6)(9)(10) (STC)	Typical Impact Insulation Class(5)(9)(11) (IIC)
Floors and Ceilings					
Open Web Steel Joists	F2b	• 65 mm regular concrete minimum 155 kg/m^2 • on composite steel joists spaced 1250 mm o.c. • steel furring channels spaced not more than 610 mm o.c. wired to underside of joists • 1 layer of 12.7 mm Type X gypsum board or 15.9 mm Type X gypsum board on ceiling side	1.5 h	53	28
Wood Floor Joists(12)	**F3**(13)	• subfloor of 15.5 mm plywood, OSB or waferboard, or 17 mm tongue and groove lumber • on wood joists or wood I-joists spaced not more than 610 mm o.c. • with or without absorptive material in cavity • 1 layer of gypsum board on ceiling side			
	F3a	F3 with • no absorptive material in cavity • 15.9 mm Type X gypsum board	—	29	27
	F3b	F3 with • absorptive material in cavity • 15.9 mm Type X gypsum board	—	31	30
	F3c	F3 with • no absorptive material in cavity • 12.7 mm Type X gypsum board	—	27	26
	F3d	F3 with • absorptive material in cavity • 12.7 mm Type X gypsum board	—	29	29
	F3e	F3 with • no absorptive material in cavity • 12.7 mm regular gypsum board	—	27	25
	F3f	F3 with • absorptive material in cavity • 12.7 mm regular gypsum board	—	29	28
Column 1	2	3	4	5	6

Table 2 (Cont'd)
Fire and Sound Resistance of Floors, Ceilings and Roofs[1]

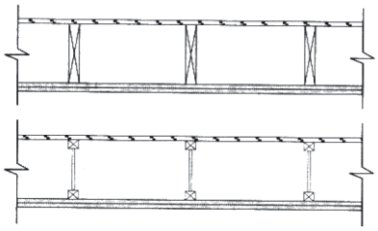
Type of Assembly	Assembly Number	Description[2][3][4]	Fire-Resistance Rating[5][6][7][8]	Typical Sound Transmission Class[5][6][9][10] (STC)	Typical Impact Insulation Class[5][9][11] (IIC)
Floors and Ceilings					
Wood Floor Joists[12]	**F4**[13]	• subfloor of 15.5 mm plywood, OSB or waferboard, or 17 mm tongue and groove lumber • on wood joists or wood I-joists spaced not more than 610 mm o.c. • with or without absorptive material in cavity • 2 layers of gypsum board on ceiling side			
	F4a	F4 with • wood joists or wood I-joists spaced 406 mm o.c. • no absorptive material in cavity • 15.9 mm Type X gypsum board	1 h	33	31
	F4b	F4 with • wood joists or wood I-joists spaced 610 mm o.c. • no absorptive material in cavity • 15.9 mm Type X gypsum board	1 h	34	31
	F4c	F4 with • wood joists or wood I-joists spaced 406 mm o.c. • absorptive material in cavity • 15.9 mm Type X gypsum board	45 min [1 h][14]	35	34
	F4d	F4 with • wood joists or wood I-joists spaced 610 mm o.c. • absorptive material in cavity • 15.9 mm Type X gypsum board	45 min	38	34
	F4e	F4 with • wood joists or wood I-joists spaced 406 mm o.c. • no absorptive material in cavity • 12.7 mm Type X gypsum board	1 h	32	30
	F4f	F4 with • wood joists or wood I-joists spaced 610 mm o.c. • no absorptive material in cavity • 12.7 mm Type X gypsum board	45 min	33	30
	F4g	F4 with • wood joists or wood I-joists spaced 406 mm o.c. • absorptive material in cavity • 12.7 mm Type X gypsum board	45 min	34	33
	F4h	F4 with • wood joists or wood I-joists spaced 610 mm o.c. • absorptive material in cavity • 12.7 mm Type X gypsum board	—	35	33
Column 1	2	3	4	5	6

Table 2 (Cont'd)
Fire and Sound Resistance of Floors, Ceilings and Roofs[1]

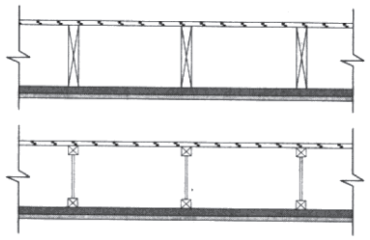
Type of Assembly	Assembly Number	Description[2][3][4]	Fire-Resistance Rating[5][6][7][8]	Typical Sound Transmission Class[5][6][9][10] (STC)	Typical Impact Insulation Class[5][9][11] (IIC)
Floors and Ceilings					
Wood Floor Joists[12]	F4i	F4 with • no absorptive material in cavity • 12.7 mm regular gypsum board	—	31	30
	F4j	F4 with • absorptive material in cavity • 12.7 mm regular gypsum board	—	33	33
	F5[13]	• subfloor of 15.5 mm plywood, OSB or waferboard, or 17 mm tongue and groove lumber • on wood joists or wood I-joists spaced not more than 610 mm o.c. • with or without absorptive material in cavity • steel furring channels spaced 406 mm or 610 mm o.c. • 1 layer of gypsum board on ceiling side			
	F5a	F5 with • no absorptive material in cavity • steel furring channels spaced 406 mm o.c. • 15.9 mm Type X gypsum board	30 min	35	37
	F5b	F5 with • no absorptive material in cavity • steel furring channels spaced 610 mm o.c • 15.9 mm Type X gypsum board	30 min	37	30
	F5c	F5 with • absorptive material in cavity • steel furring channels spaced 406 mm o.c. • 15.9 mm Type X gypsum board	30 min [45 min][15]	38	30
	F5d	F5 with • absorptive material in cavity • steel furring channels spaced 610 mm o.c. • 15.9 mm Type X gypsum board	30 min	40	33
	F5e	F5 with • no absorptive material in cavity • steel furring channels spaced 406 mm o.c. • 12.7 mm Type X gypsum board	30 min	33	26
	F5f	F5 with • no absorptive material in cavity • steel furring channels spaced 610 mm o.c. • 12.7 mm Type X gypsum board	30 min	35	29
Column 1	2	3	4	5	6

Table 2 (Cont'd)
Fire and Sound Resistance of Floors, Ceilings and Roofs[1]

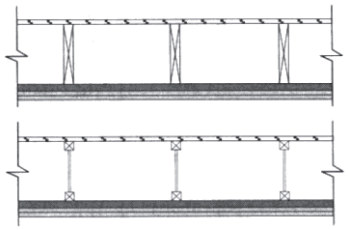
Type of Assembly	Assembly Number	Description[2][3][4]	Fire-Resistance Rating[5][6][7][8]	Typical Sound Transmission Class[5][6][9][10] (STC)	Typical Impact Insulation Class[5][9][11] (IIC)
Floors and Ceilings					
Wood Floor Joists[12]	F5g	F5 with • absorptive material in cavity • steel furring channels spaced 406 mm o.c. • 12.7 mm Type X gypsum board	30 min [45 min][15]	36	29
	F5h	F5 with • absorptive material in cavity • steel furring channels spaced 610 mm o.c. • 12.7 mm Type X gypsum board	30 min	38	32
	F5i	F5 with • no absorptive material in cavity • steel furring channels spaced 406 mm o.c. • 12.7 mm regular gypsum board	< 30 min	33	25
	F5j	F5 with • no absorptive material in cavity • steel furring channels spaced 610 mm o.c. • 12.7 mm regular gypsum board	< 30 min	35	28
	F5k	F5 with • absorptive material in cavity • steel furring channels spaced 406 mm o.c. • 12.7 mm regular gypsum board	< 30 min	36	28
	F5l	F5 with • absorptive material in cavity • steel furring channels spaced 610 mm o.c. • 12.7 mm regular gypsum board	< 30 min	38	33
	F6[13]	• subfloor of 15.5 mm plywood, OSB or waferboard, or 17 mm tongue and groove lumber • on wood joists or wood I-joists spaced not more than 610 mm o.c. • with or without absorptive material in cavity • steel furring channels spaced 406 mm or 610 mm o.c. • 2 layers of gypsum board on ceiling side			
	F6a[16]	F6 with • no absorptive material in cavity • steel furring channels spaced 406 mm o.c. • 15.9 mm Type X gypsum board	1 h	39	32
	F6b[16]	F6 with • no absorptive material in cavity • steel furring channels spaced 610 mm o.c. • 15.9 mm Type X gypsum board	1 h	41	32
Column 1	2	3	4	5	6

Table 2 (Cont'd)
Fire and Sound Resistance of Floors, Ceilings and Roofs[1]

Type of Assembly	Assembly Number	Description[2][3][4]	Fire-Resistance Rating[5][6][7][8]	Typical Sound Transmission Class[5][6][9][10] (STC)	Typical Impact Insulation Class[5][9][11] (IIC)
Floors and Ceilings					
Wood Floor Joists[12]	F6c[16]	F6 with • absorptive material in cavity • steel furring channels spaced 406 mm o.c. • 15.9 mm Type X gypsum board	1 h	42	35
	F6d[16]	F6 with • absorptive material in cavity • steel furring channels spaced 610 mm o.c. • 15.9 mm Type X gypsum board	1 h	44	37
	F6e[16]	F6 with • no absorptive material in cavity • steel furring channels spaced 406 mm o.c. • 12.7 mm Type X gypsum board	1 h	38	30
	F6f[16]	F6 with • no absorptive material in cavity • steel furring channels spaced 610 mm o.c. • 12.7 mm Type X gypsum board	1 h	40	33
	F6g[16]	F6 with • absorptive material in cavity • steel furring channels spaced 406 mm o.c. • 12.7 mm Type X gypsum board	1 h	41	33
	F6h[16]	F6 with • absorptive material in cavity • steel furring channels spaced 610 mm o.c. • 12.7 mm Type X gypsum board	45 min [1 h][17]	43	36
	F6i	F6 with • no absorptive material in cavity • steel furring channels spaced 406 mm o.c. • 12.7 mm regular gypsum board	—	37	30
	F6j	F6 with • no absorptive material in cavity • steel furring channels spaced 610 mm o.c. • 12.7 mm regular gypsum board	—	39	33
	F6k	F6 with • absorptive material in cavity • steel furring channels spaced 406 mm o.c. • 12.7 mm regular gypsum board	—	40	33
	F6l	F6 with • absorptive material in cavity • steel furring channels spaced 610 mm o.c. • 12.7 mm regular gypsum board	—	42	36
Column 1	2	3	4	5	6

Table 2 (Cont'd)
Fire and Sound Resistance of Floors, Ceilings and Roofs[1]

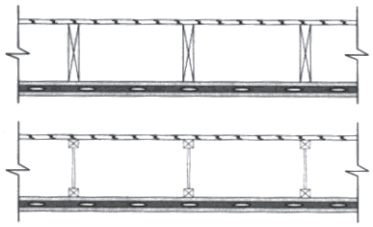
Type of Assembly	Assembly Number	Description[2][3][4]	Fire-Resistance Rating[5][6][7][8]	Typical Sound Transmission Class[5][6][9][10] (STC)	Typical Impact Insulation Class[5][9][11] (IIC)
Floors and Ceilings					
Wood Floor Joists[12]	**F7**[13]	• subfloor of 15.5 mm plywood, OSB or waferboard, or 17 mm tongue and groove lumber • on wood joists or wood I-joists spaced not more than 610 mm o.c. • with or without absorptive material in cavity • 1 layer of gypsum board attached directly to joists on ceiling side • resilient metal channels spaced 406 mm or 610 mm o.c. attached to joists through gypsum board • 1 layer of gypsum board attached to resilient channels			
	F7a[16]	F7 with • no absorptive material in cavity • 15.9 mm Type X gypsum board • resilient metal channels • 15.9 mm Type X gypsum board	1 h	35	27
	F7b[16]	F7 with • absorptive material in cavity • 15.9 mm Type X gypsum board • resilient metal channels • 15.9 mm Type X gypsum board	1 h	37	30
	F7c[16]	F7 with • no absorptive material in cavity • 12.7 mm Type X gypsum board • resilient metal channels • 12.7 mm Type X gypsum board	1 h	35	27
	F7d[16]	F7 with • absorptive material in cavity • 12.7 mm Type X gypsum board • resilient metal channels • 12.7 mm Type X gypsum board	1 h	37	30
	F7e	F7 with • no absorptive material in cavity • 12.7 mm regular gypsum board • resilient metal channels • 12.7 mm regular gypsum board	—	32	26
	F7f	F7 with • absorptive material in cavity • 12.7 mm regular gypsum board • resilient metal channels • 12.7 mm regular gypsum board	—	35	28
Column 1	2	3	4	5	6

Table 2 (Cont'd)
Fire and Sound Resistance of Floors, Ceilings and Roofs[1]

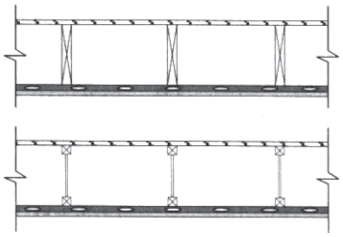
Type of Assembly	Assembly Number	Description[2][3][4]	Fire-Resistance Rating[5][6][7][8]	Typical Sound Transmission Class[5][6][9][10] (STC)	Typical Impact Insulation Class[5][9][11] (IIC)
Floors and Ceilings					
Wood Floor Joists[12]	**F8**[13]	• subfloor of 15.5 mm plywood, OSB or waferboard, or 17 mm tongue and groove lumber • on wood joists or wood I-joists spaced not more than 610 mm o.c. • with or without absorptive material in cavity • resilient metal channels spaced 406 mm or 610 mm o.c. • 1 layer of gypsum board on ceiling side			
	F8a	F8 with • no absorptive material in cavity • resilient metal channels spaced 406 mm o.c. • 15.9 mm Type X gypsum board	30 min	41	33
	F8b	F8 with • no absorptive material in cavity • resilient metal channels spaced 610 mm o.c. • 15.9 mm Type X gypsum board	30 min	43	36
	F8c	F8 with • absorptive material in cavity • resilient metal channels spaced 406 mm o.c. • 15.9 mm Type X gypsum board	30 min [45 min][15]	48	41
	F8d	F8 with • absorptive material in cavity • resilient metal channels spaced 610 mm o.c. • 15.9 mm Type X gypsum board	30 min	50	44
	F8e	F8 with • no absorptive material in cavity • resilient metal channels spaced 406 mm o.c. • 12.7 mm Type X gypsum board	30 min	39	32
	F8f	F8 with • no absorptive material in cavity • resilient metal channels spaced 610 mm o.c. • 12.7 mm Type X gypsum board	30 min	41	35
	F8g	F8 with • absorptive material in cavity • resilient metal channels spaced 406 mm o.c. • 12.7 mm Type X gypsum board	30 min [45 min][15]	46	40
Column 1	2	3	4	5	6

Table 2 (Cont'd)
Fire and Sound Resistance of Floors, Ceilings and Roofs[1]

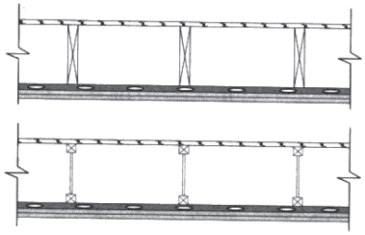
Type of Assembly	Assembly Number	Description[2][3][4]	Fire-Resistance Rating[5][6][7][8]	Typical Sound Transmission Class[5][6][9][10] (STC)	Typical Impact Insulation Class[5][9][11] (IIC)
Floors and Ceilings					
Wood Floor Joists[12]	F8h	F8 with • absorptive material in cavity • resilient metal channels spaced 610 mm o.c. • 12.7 mm Type X gypsum board	30 min	48	43
	F8i	F8 with • no absorptive material in cavity • resilient metal channels spaced 406 mm o.c. • 12.7 mm regular gypsum board	< 30 min	41	31
	F8j	F8 with • no absorptive material in cavity • resilient metal channels spaced 610 mm o.c. • 12.7 mm regular gypsum board	< 30 min	41	34
	F8k	F8 with • absorptive material in cavity • resilient metal channels spaced 406 mm o.c. • 12.7 mm regular gypsum board	< 30 min	46	39
	F8l	F8 with • absorptive material in cavity • resilient metal channels spaced 610 mm o.c. • 12.7 mm regular gypsum board	< 30 min	48	42
	F9[13]	• subfloor of 15.5 mm plywood, OSB or waferboard, or 17 mm tongue and groove lumber • on wood joists or wood I-joists spaced not more than 610 mm o.c. • with or without absorptive material in cavity • resilient metal channels spaced 406 mm or 610 mm o.c. • 2 layers of gypsum board on ceiling side			
	F9a[16]	F9 with • no absorptive material in cavity • resilient metal channels spaced 406 mm o.c. • 15.9 mm Type X gypsum board	1 h	45	38
	F9b[16]	F9 with • no absorptive material in cavity • resilient metal channels spaced 610 mm o.c • 15.9 mm Type X gypsum board	1 h	47	40
Column 1	2	3	4	5	6

Table 2 (Cont'd)
Fire and Sound Resistance of Floors, Ceilings and Roofs[1]

Type of Assembly	Assembly Number	Description[2][3][4]	Fire-Resistance Rating[5][6][7][8]	Typical Sound Transmission Class[5][6][9][10] (STC)	Typical Impact Insulation Class[5][9][11] (IIC)
Floors and Ceilings					
Wood Floor Joists[12]	F9c[16]	F9 with • absorptive material in cavity • resilient metal channels spaced 406 mm o.c. • 15.9 mm Type X gypsum board	1 h [1.5 h][18]	52 [54][18]	46
	F9d[16]	F9 with • absorptive material in cavity • resilient metal channels spaced 610 mm o.c. • 15.9 mm Type X gypsum board	1 h [1.5 h][18]	54 [56][18]	48
	F9e[16]	F9 with • no absorptive material in cavity • resilient metal channels spaced 406 mm o.c. • 12.7 mm Type X gypsum board	1 h	44	36
	F9f[16]	F9 with • no absorptive material in cavity • resilient metal channels spaced 610 mm o.c. • 12.7 mm Type X gypsum board	1 h	46	39
	F9g[16]	F9 with • absorptive material in cavity • resilient metal channels spaced 406 mm o.c. • 12.7 mm Type X gypsum board	1 h [1.5 h][18]	51 [53][18]	44
	F9h[16]	F9 with • absorptive material in cavity • resilient metal channels spaced 610 mm o.c. • 12.7 mm Type X gypsum board	45 min [1 h][17]	53	47
	F9i	F9 with • no absorptive material in cavity • resilient metal channels spaced 406 mm o.c. • 12.7 mm regular gypsum board	—	43	36
	F9j	F9 with • no absorptive material in cavity • resilient metal channels spaced 610 mm o.c. • 12.7 mm regular gypsum board	—	45	39
	F9k	F9 with • absorptive material in cavity • resilient metal channels spaced 406 mm o.c. • 12.7 mm regular gypsum board	—	50	44
	F9l	F9 with • absorptive material in cavity • resilient metal channels spaced 610 mm o.c. • 12.7 mm regular gypsum board	—	52	47
Column 1	2	3	4	5	6

Table 2 (Cont'd)
Fire and Sound Resistance of Floors, Ceilings and Roofs[1]

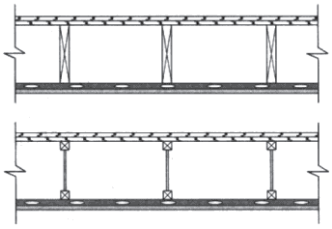
Type of Assembly	Assembly Number	Description[2][3][4]	Fire-Resistance Rating[5][6][7][8]	Typical Sound Transmission Class[5][6][9][10] (STC)	Typical Impact Insulation Class[5][9][11] (IIC)
Floors and Ceilings					
Wood Floor Joists[12]	**F10**[13]	• one subfloor layer of 11 mm sanded plywood, or OSB or waferboard • one subfloor layer of 15.5 mm plywood, OSB or waferboard, or 17 mm tongue and groove lumber • on wood joists or wood I-joists spaced not more than 610 mm o.c. • with or without absorptive material in cavity • resilient metal channels spaced 305 mm, 406 mm or 610 mm o.c. • 1 layer of gypsum board on ceiling side			
	F10a	F10 with • no absorptive material in cavity • resilient metal channels spaced 406 mm o.c. • 15.9 mm Type X gypsum board	30 min	44	34
	F10b	F10 with • no absorptive material in cavity • resilient metal channels spaced 610 mm o.c • 15.9 mm Type X gypsum board	30 min	46	37
	F10c	F10 with • absorptive material in cavity • resilient metal channels spaced 406 mm o.c. • 15.9 mm Type X gypsum board	30 min [45 min][17]	51	42
	F10d	F10 with • absorptive material in cavity • resilient metal channels spaced 610 mm o.c. • 15.9 mm Type X gypsum board	30 min [45 min][15]	53	45
	F10e	F10 with • wood joists spaced 406 mm o.c. • absorptive material in cavity • resilient metal channels spaced 406 mm o.c. • 15.9 mm Type X gypsum board	1 h[19]	53[19]	44
	F10f[20]	F10 with • wood I-joists spaced 406 mm o.c. • absorptive material in cavity • resilient metal channels spaced 305 mm o.c. • 15.9 mm Type X gypsum board	1 h[19]	52[19]	43
	F10g	F10 with • no absorptive material in cavity • resilient metal channels spaced 406 mm o.c. • 12.7 mm Type X gypsum board	30 min	42	33
Column 1	2	3	4	5	6

Table 2 (Cont'd)
Fire and Sound Resistance of Floors, Ceilings and Roofs[1]

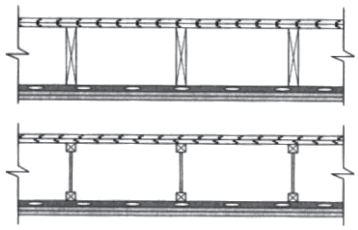
Type of Assembly	Assembly Number	Description[2][3][4]	Fire-Resistance Rating[5][6][7][8]	Typical Sound Transmission Class[5][6][9][10] (STC)	Typical Impact Insulation Class[5][9][11] (IIC)
Floors and Ceilings					
Wood Floor Joists[12]	F10h	F10 with • no absorptive material in cavity • resilient metal channels spaced 610 mm o.c. • 12.7 mm Type X gypsum board	30 min	44	36
	F10i	F10 with • absorptive material in cavity • resilient metal channels spaced 406 mm o.c. • 12.7 mm Type X gypsum board	30 min [45 min][17]	49	41
	F10j	F10 with • absorptive material in cavity • resilient metal channels spaced 610 mm o.c. • 12.7 mm Type X gypsum board	30 min [45 min][15]	51	44
	F10k	F10 with • no absorptive material in cavity • resilient metal channels spaced 406 mm o.c. • 12.7 mm regular gypsum board	—	42	33
	F10l	F10 with • no absorptive material in cavity • resilient metal channels spaced 610 mm o.c. • 12.7 mm regular gypsum board	—	44	35
	F10m	F10 with • absorptive material in cavity • resilient metal channels spaced 406 mm o.c. • 12.7 mm regular gypsum board	—	49	41
	F10n	F10 with • absorptive material in cavity • resilient metal channels spaced 610 mm o.c. • 12.7 mm regular gypsum board	—	51	43
	F11[13]	• one subfloor layer of 11 mm sanded plywood, or OSB or waferboard • one subfloor layer of 15.5 mm plywood, OSB or waferboard, or 17 mm tongue and groove lumber • on wood joists or wood I-joists spaced not more than 610 mm o.c. • with or without absorptive material in cavity • resilient metal channels spaced 406 mm or 610 mm o.c. • 2 layers of gypsum board on ceiling side			
Column 1	2	3	4	5	6

Table 2 (Cont'd)
Fire and Sound Resistance of Floors, Ceilings and Roofs[1]

Type of Assembly	Assembly Number	Description[2][3][4]	Fire-Resistance Rating[5][6][7][8]	Typical Sound Transmission Class[5][6][9][10] (STC)	Typical Impact Insulation Class[5][9][11] (IIC)
Floors and Ceilings					
Wood Floor Joists[12]	F11a[16]	F11 with • no absorptive material in cavity • resilient metal channels spaced 406 mm o.c. • 15.9 mm Type X gypsum board	1 h	48	39
	F11b[16]	F11 with • no absorptive material in cavity • resilient metal channels spaced 610 mm o.c • 15.9 mm Type X gypsum board	1 h	50	42
	F11c[16]	F11 with • absorptive material in cavity • resilient metal channels spaced 406 mm o.c. • 15.9 mm Type X gypsum board	1 h [1.5 h][18]	55 [56][18]	47
	F11d[16]	F11 with • absorptive material in cavity • resilient metal channels spaced 610 mm o.c. • 15.9 mm Type X gypsum board	1 h [1.5 h][18]	57 [58][18]	50
	F11e[16]	F11 with • wood joists spaced 406 mm o.c. • absorptive material in cavity • resilient metal channels spaced 406 mm o.c. • 15.9 mm Type X gypsum board	1.5 h[21]	56[21]	47
	F11f[20]	F11 with • wood I-joists spaced 406 mm o.c. • absorptive material in cavity • resilient metal channels spaced 305 mm o.c. • 15.9 mm Type X gypsum board	1.5 h[21]	56[21]	46
	F11g[16]	F11 with • no absorptive material in cavity • resilient metal channels spaced 406 mm o.c. • 12.7 mm Type X gypsum board	1 h	47	38
	F11h[16]	F11 with • no absorptive material in cavity • resilient metal channels spaced 610 mm o.c. • 12.7 mm Type X gypsum board	1 h	49	40
	F11i[16]	F11 with • absorptive material in cavity • resilient metal channels spaced 406 mm o.c. • 12.7 mm Type X gypsum board	1 h [1.5 h][18]	54 [55][18]	46
Column 1	2	3	4	5	6

Table 2 (Cont'd)
Fire and Sound Resistance of Floors, Ceilings and Roofs[1]

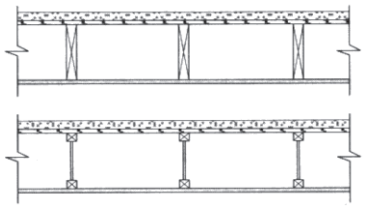
Type of Assembly	Assembly Number	Description[2][3][4]	Fire-Resistance Rating[5][6][7][8]	Typical Sound Transmission Class[5][6][9][10] (STC)	Typical Impact Insulation Class[5][9][11] (IIC)
Floors and Ceilings					
Wood Floor Joists[12]	F11j[16]	F11 with • absorptive material in cavity • resilient metal channels spaced 610 mm o.c. • 12.7 mm Type X gypsum board	45 min [1 h][17]	56	48
	F11k	F11 with • no absorptive material in cavity • resilient metal channels spaced 406 mm o.c. • 12.7 mm regular gypsum board	—	46	37
	F11l	F11 with • no absorptive material in cavity • resilient metal channels spaced 610 mm o.c. • 12.7 mm regular gypsum board	—	48	40
	F11m	F11 with • absorptive material in cavity • resilient metal channels spaced 406 mm o.c. • 12.7 mm regular gypsum board	—	53	45
	F11n	F11 with • absorptive material in cavity • resilient metal channels spaced 610 mm o.c. • 12.7 mm regular gypsum board	—	55	48
	F12[13]	• 25 mm gypsum-concrete topping (at least 44 kg/m^2) • subfloor of 15.5 mm plywood, OSB or waferboard, or 17 mm tongue and groove lumber • on wood joists or wood I-joists spaced not more than 610 mm o.c. • with or without absorptive material in cavity • 1 layer of gypsum board on ceiling side			
	F12a	F12 with • no absorptive material in cavity • 15.9 mm Type X gypsum board	—	41	13
	F12b	F12 with • absorptive material in cavity • 15.9 mm Type X gypsum board	—	43	16
	F12c	F12 with • no absorptive material in cavity • 12.7 mm Type X gypsum board	—	39	12
	F12d	F12 with • absorptive material in cavity • 12.7 mm Type X gypsum board	—	41	15
Column 1	2	3	4	5	6

Table 2 (Cont'd)
Fire and Sound Resistance of Floors, Ceilings and Roofs[1]

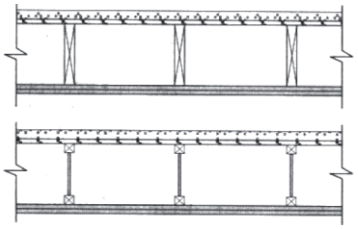
Type of Assembly	Assembly Number	Description[2][3][4]	Fire-Resistance Rating[5][6][7][8]	Typical Sound Transmission Class[5][6][9][10] (STC)	Typical Impact Insulation Class[5][9][11] (IIC)
Floors and Ceilings					
Wood Floor Joists[12]	F12e	F12 with • no absorptive material in cavity • 12.7 mm regular gypsum board	—	39	12
	F12f	F12 with • absorptive material in cavity • 12.7 mm regular gypsum board	—	41	15
	F13[13]	• 25 mm gypsum-concrete topping (at least 44 kg/m^2) • subfloor of 15.5 mm plywood, OSB or waferboard, or 17 mm tongue and groove lumber • on wood joists or wood I-joists spaced not more than 610 mm o.c. • with or without absorptive material in cavity • 2 layers of gypsum board on ceiling side			
	F13a	F13 with • wood joists or wood I-joists spaced 406 mm o.c. • no absorptive material in cavity • 15.9 mm Type X gypsum board	1 h	43	16
	F13b	F13 with • wood joists or wood I-joists spaced 610 mm o.c. • no absorptive material in cavity • 15.9 mm Type X gypsum board	1 h	45	16
	F13c	F13 with • wood joists or wood I-joists spaced 406 mm o.c. • absorptive material in cavity • 15.9 mm Type X gypsum board	45 min [1 h][14]	45	19
	F13d	F13 with • wood joists or wood I-joists spaced 610 mm o.c. • absorptive material in cavity • 15.9 mm Type X gypsum board	45 min	47	19
	F13e	F13 with • wood joists or wood I-joists spaced 406 mm o.c. • no absorptive material in cavity • 12.7 mm Type X gypsum board	1 h	42	15
Column 1	2	3	4	5	6

Table 2 (Cont'd)
Fire and Sound Resistance of Floors, Ceilings and Roofs[1]

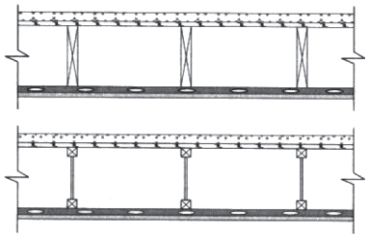
Type of Assembly	Assembly Number	Description[2][3][4]	Fire-Resistance Rating[5][6][7][8]	Typical Sound Transmission Class[5][6][9][10] (STC)	Typical Impact Insulation Class[5][9][11] (IIC)
Floors and Ceilings					
Wood Floor Joists[12]	F13f	F13 with • wood joists or wood I-joists spaced 610 mm o.c. • no absorptive material in cavity • 12.7 mm Type X gypsum board	45 min	44	15
	F13g	F13 with • wood joists or wood I-joists spaced 406 mm o.c. • absorptive material in cavity • 12.7 mm Type X gypsum board	45 min	44	18
	F13h	F13 with • wood joists or wood I-joists spaced 610 mm o.c. • absorptive material in cavity • 12.7 mm Type X gypsum board	—	46	18
	F13i	F13 with • no absorptive material in cavity • 12.7 mm regular gypsum board	—	41	14
	F13j	F13 with • absorptive material in cavity • 12.7 mm regular gypsum board	—	45	14
	F14[13]	• 25 mm gypsum-concrete topping (at least 44 kg/m^2) • subfloor of 15.5 mm plywood, OSB or waferboard, or 17 mm tongue and groove lumber • on wood joists or wood I-joists spaced not more than 610 mm o.c. • with or without absorptive material in cavity • resilient metal channels spaced 305 mm, 406 mm or 610 mm o.c. • 1 layer of gypsum board on ceiling side			
	F14a	F14 with • no absorptive material in cavity • resilient metal channels spaced 406 mm o.c. • 15.9 mm Type X gypsum board	—	53	22
	F14b	F14 with • no absorptive material in cavity • resilient metal channels spaced 610 mm o.c • 15.9 mm Type X gypsum board	—	55	22
	F14c	F14 with • absorptive material in cavity • resilient metal channels spaced 406 mm o.c. • 15.9 mm Type X gypsum board	30 min [45 min][17]	60	30
Column 1	2	3	4	5	6

Table 2 (Cont'd)
Fire and Sound Resistance of Floors, Ceilings and Roofs[1]

Type of Assembly	Assembly Number	Description[2][3][4]	Fire-Resistance Rating[5][6][7][8]	Typical Sound Transmission Class[5][6][9][10] (STC)	Typical Impact Insulation Class[5][9][11] (IIC)
Floors and Ceilings					
Wood Floor Joists[12]	F14d	F14 with • absorptive material in cavity • resilient metal channels spaced 610 mm o.c. • 15.9 mm Type X gypsum board	—	62	30
	F14e	F14 with • wood joists spaced 406 mm o.c. • absorptive material in cavity • resilient metal channels spaced 406 mm o.c. • 15.9 mm Type X gypsum board	1 h[19]	60[19]	31
	F14f[20]	F14 with • wood I-joists spaced 406 mm o.c. • absorptive material in cavity • resilient metal channels spaced 305 mm o.c. • 15.9 mm Type X gypsum board	1 h[19]	61[19]	31
	F14g	F14 with • no absorptive material in cavity • resilient metal channels spaced 406 mm o.c. • 12.7 mm Type X gypsum board	—	51	21
	F14h	F14 with • no absorptive material in cavity • resilient metal channels spaced 610 mm o.c. • 12.7 mm Type X gypsum board	—	53	21
	F14i	F14 with • absorptive material in cavity • resilient metal channels spaced 406 mm o.c. • 12.7 mm Type X gypsum board	—	58	29
	F14j	F14 with • absorptive material in cavity • resilient metal channels spaced 610 mm o.c. • 12.7 mm Type X gypsum board	—	60	29
	F14k	F14 with • no absorptive material in cavity • resilient metal channels spaced 406 mm o.c. • 12.7 mm regular gypsum board	—	51	21
	F14l	F14 with • no absorptive material in cavity • resilient metal channels spaced 610 mm o.c. • 12.7 mm regular gypsum board	—	53	21
Column 1	2	3	4	5	6

Table 2 (Cont'd)
Fire and Sound Resistance of Floors, Ceilings and Roofs(1)

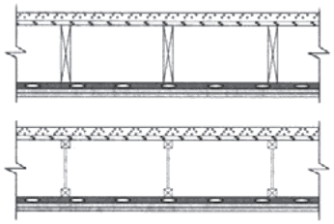
Type of Assembly	Assembly Number	Description(2)(3)(4)	Fire-Resistance Rating(5)(6)(7)(8)	Typical Sound Transmission Class(5)(6)(9)(10) (STC)	Typical Impact Insulation Class(5)(9)(11) (IIC)
Floors and Ceilings					
Wood Floor Joists(12)	F14m	F14 with • absorptive material in cavity • resilient metal channels spaced 406 mm o.c. • 12.7 mm regular gypsum board	—	58	29
	F14n	F14 with • absorptive material in cavity • resilient metal channels spaced 610 mm o.c. • 12.7 mm regular gypsum board	—	60	29
	F15(13)	• 25 mm gypsum-concrete topping (at least 44 kg/m^2) • subfloor of 15.5 mm plywood, OSB or waferboard, or 17 mm tongue and groove lumber • on wood joists or wood I-joists spaced not more than 610 mm o.c. • with or without absorptive material in cavity • resilient metal channels spaced 406 mm or 610 mm o.c. • 2 layers of gypsum board on ceiling side			
	F15a(16)	F15 with • no absorptive material in cavity • resilient metal channels spaced 406 mm o.c. • 15.9 mm Type X gypsum board	1 h(22)	57	25
	F15b(16)	F15 with • no absorptive material in cavity • resilient metal channels spaced 610 mm o.c • 15.9 mm Type X gypsum board	1 h	59	25
	F15c(16)	F15 with • absorptive material in cavity • resilient metal channels spaced 406 mm o.c. • 15.9 mm Type X gypsum board	1 h [1.5 h](18)	64 [65](18)	33
	F15d(16)	F15 with • absorptive material in cavity • resilient metal channels spaced 610 mm o.c. • 15.9 mm Type X gypsum board	1 h [1.5 h](18)	66 [67](18)	33
	F15e(16)	F15 with • wood joists spaced 406 mm o.c. • absorptive material in cavity • resilient metal channels spaced 406 mm o.c. • 15.9 mm Type X gypsum board	1.5 h(21)	65(21)	33
Column 1	2	3	4	5	6

Table 2 (Cont'd)
Fire and Sound Resistance of Floors, Ceilings and Roofs[1]

Type of Assembly	Assembly Number	Description[2][3][4]	Fire-Resistance Rating[5][6][7][8]	Typical Sound Transmission Class[5][6][9][10] (STC)	Typical Impact Insulation Class[5][9][11] (IIC)
Floors and Ceilings					
Wood Floor Joists[12]	F15f[20]	F15 with • wood I-joists spaced 406 mm o.c. • absorptive material in cavity • resilient metal channels spaced 305 mm o.c. • 15.9 mm Type X gypsum board	1.5 h[21]	64[21]	33
	F15g[16]	F15 with • no absorptive material in cavity • resilient metal channels spaced 406 mm o.c. • 12.7 mm Type X gypsum board	1 h	56	24
	F15h[16]	F15 with • no absorptive material in cavity • resilient metal channels spaced 610 mm o.c. • 12.7 mm Type X gypsum board	1 h	58	24
	F15i[16]	F15 with • absorptive material in cavity • resilient metal channels spaced 406 mm o.c. • 12.7 mm Type X gypsum board	1 h [1.5 h][18]	63 [64][18]	32
	F15j[16]	F15 with • absorptive material in cavity • resilient metal channels spaced 610 mm o.c. • 12.7 mm Type X gypsum board	45 min [1 h][17]	65	32
	F15k	F15 with • no absorptive material in cavity • resilient metal channels spaced 406 mm o.c. • 12.7 mm regular gypsum board	—	55	23
	F15l	F15 with • no absorptive material in cavity • resilient metal channels spaced 610 mm o.c. • 12.7 mm regular gypsum board	—	57	23
	F15m	F15 with • absorptive material in cavity • resilient metal channels spaced 406 mm o.c. • 12.7 mm regular gypsum board	—	62	31
	F15n	F15 with • absorptive material in cavity • resilient metal channels spaced 610 mm o.c. • 12.7 mm regular gypsum board	—	64	31
Column 1	2	3	4	5	6

Table 2 (Cont'd)
Fire and Sound Resistance of Floors, Ceilings and Roofs[1]

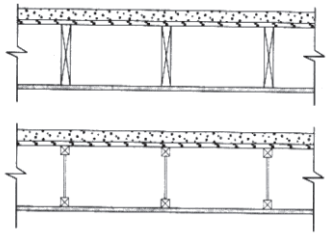
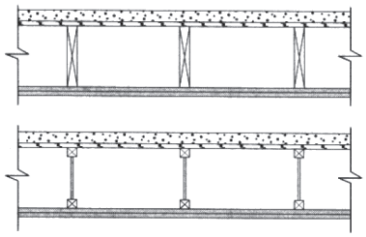
Type of Assembly	Assembly Number	Description[2][3][4]	Fire-Resistance Rating[5][6][7][8]	Typical Sound Transmission Class[5][6][9][10] (STC)	Typical Impact Insulation Class[5][9][11] (IIC)
Floors and Ceilings					
Wood Floor Joists[12]	**F16**[13]	• 38 mm concrete topping (at least 70 kg/ m^2) • subfloor of 15.5 mm plywood, OSB or waferboard, or 17 mm tongue and groove lumber • on wood joists or wood I-joists spaced not more than 610 mm o.c. • with or without absorptive material in cavity • 1 layer of gypsum board on ceiling side			
	F16a	F16 with • no absorptive material in cavity • 15.9 mm Type X gypsum board	—	44	22
	F16b	F16 with • absorptive material in cavity • 15.9 mm Type X gypsum board	—	46	25
	F16c	F16 with • no absorptive material in cavity • 12.7 mm Type X gypsum board	—	43	21
	F16d	F16 with • absorptive material in cavity • 12.7 mm Type X gypsum board	—	45	24
	F16e	F16 with • no absorptive material in cavity • 12.7 mm regular gypsum board	—	42	21
	F16f	F16 with • absorptive material in cavity • 12.7 mm regular gypsum board	—	44	24
	F17[13]	• 38 mm concrete topping (at least 70 kg/m^2) • subfloor of 15.5 mm plywood, OSB or waferboard, or 17 mm tongue and groove lumber • on wood joists or wood I-joists spaced not more than 610 mm o.c. • with or without absorptive material in cavity • 2 layers of gypsum board on ceiling side			
Column 1	2	3	4	5	6

Table 2 (Cont'd)
Fire and Sound Resistance of Floors, Ceilings and Roofs[1]

Type of Assembly	Assembly Number	Description[2][3][4]	Fire-Resistance Rating[5][6][7][8]	Typical Sound Transmission Class[5][6][9][10] (STC)	Typical Impact Insulation Class[5][9][11] (IIC)
Floors and Ceilings					
Wood Floor Joists[12]	F17a	F17 with • wood joists or wood I-joists spaced 406 mm o.c. • no absorptive material in cavity • 15.9 mm Type X gypsum board	1 h	48	24
	F17b	F17 with • wood joists or wood I-joists spaced 610 mm o.c. • no absorptive material in cavity • 15.9 mm Type X gypsum board	1 h	51	24
	F17c	F17 with • wood joists or wood I-joists spaced 406 mm o.c. • absorptive material in cavity • 15.9 mm Type X gypsum board	45 min [1 h][14]	48	27
	F17d	F17 with • wood joists or wood I-joists spaced 610 mm o.c. • absorptive material in cavity • 15.9 mm Type X gypsum board	45 min	51	27
	F17e	F17 with • wood joists or wood I-joists spaced 406 mm o.c. • no absorptive material in cavity • 12.7 mm Type X gypsum board	1 h	47	23
	F17f	F17 with • wood joists or wood I-joists spaced 610 mm o.c. • no absorptive material in cavity • 12.7 mm Type X gypsum board	45 min	48	23
	F17g	F17 with • wood joists or wood I-joists spaced 406 mm o.c. • absorptive material in cavity • 12.7 mm Type X gypsum board	45 min	49	26
	F17h	F17 with • wood joists or wood I-joists spaced 610 mm o.c. • absorptive material in cavity • 12.7 mm Type X gypsum board	—	50	26
	F17i	F17 with • no absorptive material in cavity • 12.7 mm regular gypsum board	—	47	23
	F17j	F17 with • absorptive material in cavity • 12.7 mm regular gypsum board	—	49	26
Column 1	2	3	4	5	6

Table 2 (Cont'd)
Fire and Sound Resistance of Floors, Ceilings and Roofs[1]

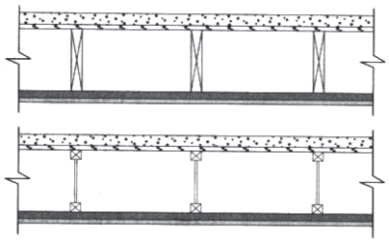
Type of Assembly	Assembly Number	Description[2][3][4]	Fire-Resistance Rating[5][6][7][8]	Typical Sound Transmission Class[5][6][9][10] (STC)	Typical Impact Insulation Class[5][9][11] (IIC)
Floors and Ceilings					
Wood Floor Joists[12]	**F18**[13]	• 38 mm concrete topping (at least 70 kg/m^2) • subfloor of 15.5 mm plywood, OSB or waferboard, or 17 mm tongue and groove lumber • on wood joists or wood I-joists spaced not more than 610 mm o.c. • with or without absorptive material in cavity • steel furring channels spaced 406 mm or 610 mm o.c. • 1 layer of gypsum board on ceiling side			
	F18a	F18 with • no absorptive material in cavity • steel furring channels spaced 406 mm o.c. • 15.9 mm Type X gypsum board	—	50	25
	F18b	F18 with • no absorptive material in cavity • steel furring channels spaced 610 mm o.c • 15.9 mm Type X gypsum board	—	52	25
	F18c	F18 with • absorptive material in cavity • steel furring channels spaced 406 mm o.c. • 15.9 mm Type X gypsum board	—	53	28
	F18d	F18 with • absorptive material in cavity • steel furring channels spaced 610 mm o.c. • 15.9 mm Type X gypsum board	—	55	28
	F18e	F18 with • no absorptive material in cavity • steel furring channels spaced 406 mm o.c. • 12.7 mm Type X gypsum board	—	49	24
	F18f	F18 with • no absorptive material in cavity • steel furring channels spaced 610 mm o.c. • 12.7 mm Type X gypsum board	—	51	24
	F18g	F18 with • absorptive material in cavity • steel furring channels spaced 406 mm o.c. • 12.7 mm Type X gypsum board	—	52	27
Column 1	2	3	4	5	6

Table 2 (Cont'd)
Fire and Sound Resistance of Floors, Ceilings and Roofs[1]

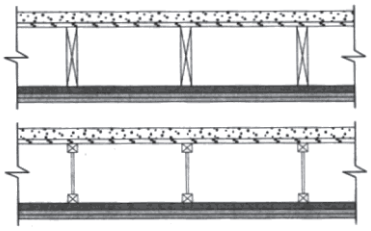
Type of Assembly	Assembly Number	Description[2][3][4]	Fire-Resistance Rating[5][6][7][8]	Typical Sound Transmission Class[5][6][9][10] (STC)	Typical Impact Insulation Class[5][9][11] (IIC)
Floors and Ceilings					
Wood Floor Joists[12]	F18h	F18 with • absorptive material in cavity • steel furring channels spaced 610 mm o.c. • 12.7 mm Type X gypsum board	—	54	27
	F18i	F18 with • no absorptive material in cavity • steel furring channels spaced 406 mm o.c. • 12.7 mm regular gypsum board	—	48	24
	F18j	F18 with • no absorptive material in cavity • steel furring channels spaced 610 mm o.c. • 12.7 mm regular gypsum board	—	50	24
	F18k	F18 with • absorptive material in cavity • steel furring channels spaced 406 mm o.c. • 12.7 mm regular gypsum board	—	51	27
	F18l	F18 with • absorptive material in cavity • steel furring channels spaced 610 mm o.c. • 12.7 mm regular gypsum board	—	53	27
	F19[13]	• 38 mm concrete topping (at least 70 kg/m^2) • subfloor of 15.5 mm plywood, OSB or waferboard, or 17 mm tongue and groove lumber • on wood joists or wood I-joists spaced not more than 610 mm o.c. • with or without absorptive material in cavity • steel furring channels spaced 406 mm or 610 mm o.c. • 2 layers of gypsum board on ceiling side			
	F19a[16]	F19 with • no absorptive material in cavity • steel furring channels spaced 406 mm o.c. • 15.9 mm Type X gypsum board	1 h	54	27
	F19b[16]	F19 with • no absorptive material in cavity • steel furring channels spaced 610 mm o.c • 15.9 mm Type X gypsum board	1 h	56	27
Column 1	2	3	4	5	6

Table 2 (Cont'd)
Fire and Sound Resistance of Floors, Ceilings and Roofs[1]

Type of Assembly	Assembly Number	Description[2][3][4]	Fire-Resistance Rating[5][6][7][8]	Typical Sound Transmission Class[5][6][9][10] (STC)	Typical Impact Insulation Class[5][9][11] (IIC)
Floors and Ceilings					
Wood Floor Joists[12]	F19c[16]	F19 with • absorptive material in cavity • steel furring channels spaced 406 mm o.c. • 15.9 mm Type X gypsum board	1 h	57	30
	F19d[16]	F19 with • absorptive material in cavity • steel furring channels spaced 610 mm o.c. • 15.9 mm Type X gypsum board	1 h	59	30
	F19e[16]	F19 with • no absorptive material in cavity • steel furring channels spaced 406 mm o.c. • 12.7 mm Type X gypsum board	1 h	53	26
	F19f[16]	F19 with • no absorptive material in cavity • steel furring channels spaced 610 mm o.c. • 12.7 mm Type X gypsum board	1 h	55	26
	F19g[16]	F19 with • absorptive material in cavity • steel furring channels spaced 406 mm o.c. • 12.7 mm Type X gypsum board	1 h	56	29
	F19h[16]	F19 with • absorptive material in cavity • steel furring channels spaced 610 mm o.c. • 12.7 mm Type X gypsum board	1 h	58	29
	F19i	F19 with • no absorptive material in cavity • steel furring channels spaced 406 mm o.c. • 12.7 mm regular gypsum board	—	53	26
	F19j	F19 with • no absorptive material in cavity • steel furring channels spaced 610 mm o.c. • 12.7 mm regular gypsum board	—	55	26
	F19k	F19 with • absorptive material in cavity • steel furring channels spaced 406 mm o.c. • 12.7 mm regular gypsum board	—	56	29
	F19l	F19 with • absorptive material in cavity • steel furring channels spaced 610 mm o.c. • 12.7 mm regular gypsum board	—	58	29
Column 1	2	3	4	5	6

Table 2 (Cont'd)
Fire and Sound Resistance of Floors, Ceilings and Roofs[1]

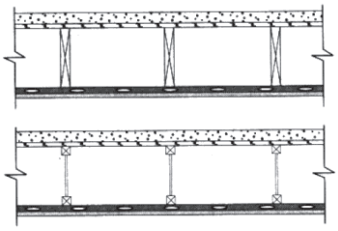
Type of Assembly	Assembly Number	Description[2][3][4]	Fire-Resistance Rating[5][6][7][8]	Typical Sound Transmission Class[5][6][9][10] (STC)	Typical Impact Insulation Class[5][9][11] (IIC)
Floors and Ceilings					
Wood Floor Joists[12]	**F20**[13]	• 38 mm concrete topping (at least 70 kg/m^2) • subfloor of 15.5 mm plywood, OSB or waferboard, or 17 mm tongue and groove lumber • on wood joists or wood I-joists spaced not more than 610 mm o.c. • with or without absorptive material in cavity • resilient metal channels spaced 305 mm, 406 mm or 610 mm o.c. • 1 layer of gypsum board on ceiling side			
	F20a	F20 with • no absorptive material in cavity • resilient metal channels spaced 406 mm o.c. • 15.9 mm Type X gypsum board	[45 min][22]	56	31
	F20b	F20 with • no absorptive material in cavity • resilient metal channels spaced 610 mm o.c • 15.9 mm Type X gypsum board	—	58	31
	F20c	F20 with • absorptive material in cavity • resilient metal channels spaced 406 mm o.c. • 15.9 mm Type X gypsum board	30 min [45 min][17][22]	63	39
	F20d	F20 with • absorptive material in cavity • resilient metal channels spaced 610 mm o.c. • 15.9 mm Type X gypsum board	—	65	39
	F20e	F20 with • wood joists spaced 406 mm o.c. • absorptive material in cavity • resilient metal channels spaced 406 mm o.c. • 15.9 mm Type X gypsum board	1 h[19]	64[19]	40
	F20f[20]	F20 with • wood I-joists spaced 406 mm o.c. • absorptive material in cavity • resilient metal channels spaced 305 mm o.c. • 15.9 mm Type X gypsum board	1 h[19]	65[19]	40
	F20g	F20 with • no absorptive material in cavity • resilient metal channels spaced 406 mm o.c. • 12.7 mm Type X gypsum board	—	55	30
Column 1	2	3	4	5	6

Table 2 (Cont'd)
Fire and Sound Resistance of Floors, Ceilings and Roofs[1]

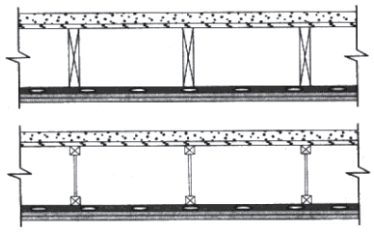
Type of Assembly	Assembly Number	Description[2][3][4]	Fire-Resistance Rating[5][6][7][8]	Typical Sound Transmission Class[5][6][9][10] (STC)	Typical Impact Insulation Class[5][9][11] (IIC)
Floors and Ceilings					
Wood Floor Joists[12]	F20h	F20 with • no absorptive material in cavity • resilient metal channels spaced 610 mm o.c. • 12.7 mm Type X gypsum board	—	57	30
	F20i	F20 with • absorptive material in cavity • resilient metal channels spaced 406 mm o.c. • 12.7 mm Type X gypsum board	—	62	38
	F20j	F20 with • absorptive material in cavity • resilient metal channels spaced 610 mm o.c. • 12.7 mm Type X gypsum board	—	64	38
	F20k	F20 with • no absorptive material in cavity • resilient metal channels spaced 406 mm o.c. • 12.7 mm regular gypsum board	—	54	30
	F20l	F20 with • no absorptive material in cavity • resilient metal channels spaced 610 mm o.c. • 12.7 mm regular gypsum board	—	56	30
	F20m	F20 with • absorptive material in cavity • resilient metal channels spaced 406 mm o.c. • 12.7 mm regular gypsum board	—	61	38
	F20n	F20 with • absorptive material in cavity • resilient metal channels spaced 610 mm o.c. • 12.7 mm regular gypsum board	—	63	38
	F21[13]	• 38 mm concrete topping (at least 70 kg/m^2) • subfloor of 15.5 mm plywood, OSB or waferboard, or 17 mm tongue and groove lumber • on wood joists or wood I-joists spaced not more than 610 mm o.c. • with or without absorptive material in cavity • resilient metal channels spaced 305 mm, 406 mm or 610 mm o.c. • 2 layers of gypsum board on ceiling side			
Column 1	2	3	4	5	6

Table 2 (Cont'd)
Fire and Sound Resistance of Floors, Ceilings and Roofs[1]

Type of Assembly	Assembly Number	Description[2][3][4]	Fire-Resistance Rating[5][6][7][8]	Typical Sound Transmission Class[5][6][9][10] (STC)	Typical Impact Insulation Class[5][9][11] (IIC)
Floors and Ceilings					
Wood Floor Joists[12]	F21a[16]	F21 with • no absorptive material in cavity • resilient metal channels spaced 406 mm o.c. • 15.9 mm Type X gypsum board	1 h	60	33
	F21b[16]	F21 with • no absorptive material in cavity • resilient metal channels spaced 610 mm o.c • 15.9 mm Type X gypsum board	1 h	62	33
	F21c[16]	F21 with • absorptive material in cavity • resilient metal channels spaced 406 mm o.c. • 15.9 mm Type X gypsum board	1 h [1.5 h][18]	67 [68][18]	41 [42][18]
	F21d[16]	F21 with • absorptive material in cavity • resilient metal channels spaced 610 mm o.c. • 15.9 mm Type X gypsum board	1 h [1.5 h][18]	69 [70][18]	41 [42][18]
	F21e[16]	F21 with • wood joists spaced 406 mm o.c. • absorptive material in cavity • resilient metal channels spaced 406 mm o.c. • 15.9 mm Type X gypsum board	[1.5 h][21]	68[21]	42
	F21f[20]	F21 with • wood I-joists spaced 406 mm o.c. • absorptive material in cavity • resilient metal channels spaced 305 mm o.c. • 15.9 mm Type X gypsum board	[1.5 h][21]	68[21]	42
	F21g[16]	F21 with • no absorptive material in cavity • resilient metal channels spaced 406 mm o.c. • 12.7 mm Type X gypsum board	1 h	59	32
	F21h[16]	F21 with • no absorptive material in cavity • resilient metal channels spaced 610 mm o.c. • 12.7 mm Type X gypsum board	1 h	61	32
	F21i[16]	F21 with • absorptive material in cavity • resilient metal channels spaced 406 mm o.c. • 12.7 mm Type X gypsum board	1 h [1.5 h][18]	66 [67][18]	40
Column 1	2	3	4	5	6

Table 2 (Cont'd)
Fire and Sound Resistance of Floors, Ceilings and Roofs[1]

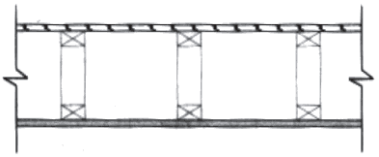
Type of Assembly	Assembly Number	Description[2][3][4]	Fire-Resistance Rating[5][6][7][8]	Typical Sound Transmission Class[5][6][9][10] (STC)	Typical Impact Insulation Class[5][9][11] (IIC)
Floors and Ceilings					
Wood Floor Joists[12]	F21j[16]	F21 with • absorptive material in cavity • resilient metal channels spaced 610 mm o.c. • 12.7 mm Type X gypsum board	1 h	68	40
	F21k	F21 with • no absorptive material in cavity • resilient metal channels spaced 406 mm o.c. • 12.7 mm regular gypsum board	—	59	32
	F21l	F21 with • no absorptive material in cavity • resilient metal channels spaced 610 mm o.c. • 12.7 mm regular gypsum board	—	61	32
	F21m	F21 with • absorptive material in cavity • resilient metal channels spaced 406 mm o.c. • 12.7 mm regular gypsum board	—	66	40
	F21n	F21 with • absorptive material in cavity • resilient metal channels spaced 610 mm o.c. • 12.7 mm regular gypsum board	—	68	40
Wood Floor Trusses[23]	**F22**	• subfloor of 15.5 mm plywood, OSB or waferboard, or 17 mm tongue and groove lumber • on wood trusses spaced not more than 610 mm o.c. • with or without absorptive material in cavity • 1 layer of gypsum board on ceiling side			
	F22a	F22 with • no absorptive material in cavity • 15.9 mm Type X gypsum board	—	29	27
	F22b	F22 with • absorptive material in cavity • 15.9 mm Type X gypsum board	—	31	30
	F22c	F22 with • no absorptive material in cavity • 12.7 mm Type X gypsum board	—	28	26
	F22d	F22 with • absorptive material in cavity • 12.7 mm Type X gypsum board	—	30	29
Column 1	2	3	4	5	6

Table 2 (Cont'd)
Fire and Sound Resistance of Floors, Ceilings and Roofs[1]

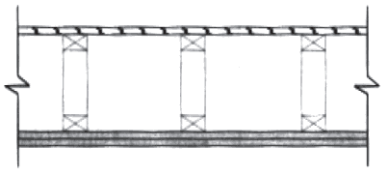
Type of Assembly	Assembly Number	Description[2][3][4]	Fire-Resistance Rating[5][6][7][8]	Typical Sound Transmission Class[5][6][9][10] (STC)	Typical Impact Insulation Class[5][9][11] (IIC)
Floors and Ceilings					
Wood Floor Trusses[23]	F22e	F22 with • no absorptive material in cavity • 12.7 mm regular gypsum board	—	27	25
	F22f	F22 with • absorptive material in cavity • 12.7 mm regular gypsum board	—	31	28
	F23	• subfloor of 15.5 mm plywood, OSB or waferboard, or 17 mm tongue and groove lumber • on wood trusses spaced not more than 610 mm o.c. • with or without absorptive material in cavity • 2 layers of gypsum board on ceiling side			
	F23a	F23 with • wood trusses spaced 406 mm o.c. • no absorptive material in cavity • 15.9 mm Type X gypsum board	1 h	34	31
	F23b	F23 with • wood trusses spaced 610 mm o.c. • no absorptive material in cavity • 15.9 mm Type X gypsum board	1 h	35	31
	F23c	F23 with • wood trusses spaced 406 mm o.c. • absorptive material in cavity • 15.9 mm Type X gypsum board	45 min [1 h][14]	36	34
	F23d	F23 with • wood trusses spaced 610 mm o.c. • absorptive material in cavity • 15.9 mm Type X gypsum board	45 min	37	34
	F23e	F23 with • wood trusses spaced 406 mm o.c. • no absorptive material in cavity • 12.7 mm Type X gypsum board	1 h	32	30
	F23f	F23 with • wood trusses spaced 610 mm o.c. • no absorptive material in cavity • 12.7 mm Type X gypsum board	45 min	33	30
	F23g	F23 with • absorptive material in cavity • 12.7 mm Type X gypsum board	—	34	33
Column 1	2	3	4	5	6

Table 2 (Cont'd)
Fire and Sound Resistance of Floors, Ceilings and Roofs[1]

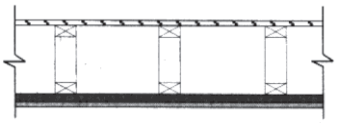
Type of Assembly	Assembly Number	Description[2][3][4]	Fire-Resistance Rating[5][6][7][8]	Typical Sound Transmission Class[5][6][9][10] (STC)	Typical Impact Insulation Class[5][9][11] (IIC)
Floors and Ceilings					
Wood Floor Trusses[23]	F23h	F23 with • no absorptive material in cavity • 12.7 mm regular gypsum board	—	32	30
	F23i	F23 with • absorptive material in cavity • 12.7 mm regular gypsum board	—	34	33
	F24	• subfloor of 15.5 mm plywood, OSB or waferboard, or 17 mm tongue and groove lumber • on wood trusses spaced not more than 610 mm o.c. • with or without absorptive material in cavity • steel furring channels spaced 406 mm or 610 mm o.c. • 1 layer of gypsum board on ceiling side			
	F24a	F24 with • no absorptive material in cavity • steel furring channels spaced 406 mm o.c. • 15.9 mm Type X gypsum board	—	35	27
	F24b	F24 with • no absorptive material in cavity • steel furring channels spaced 610 mm o.c. • 15.9 mm Type X gypsum board	—	37	30
	F24c	F24 with • absorptive material in cavity • steel furring channels spaced 406 mm o.c. • 15.9 mm Type X gypsum board	—	38	30
	F24d	F24 with • absorptive material in cavity • steel furring channels spaced 610 mm o.c. • 15.9 mm Type X gypsum board	—	40	33
	F24e	F24 with • no absorptive material in cavity • steel furring channels spaced 406 mm o.c. • 12.7 mm Type X gypsum board	—	33	26
	F24f	F24 with • no absorptive material in cavity • steel furring channels spaced 610 mm o.c. • 12.7 mm Type X gypsum board	—	36	29
Column 1	2	3	4	5	6

Table 2 (Cont'd)
Fire and Sound Resistance of Floors, Ceilings and Roofs[1]

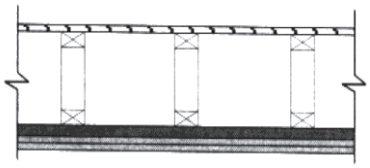
Type of Assembly	Assembly Number	Description[2][3][4]	Fire-Resistance Rating[5][6][7][8]	Typical Sound Transmission Class[5][6][9][10] (STC)	Typical Impact Insulation Class[5][9][11] (IIC)
Floors and Ceilings					
Wood Floor Trusses[23]	F24g	F24 with • absorptive material in cavity • steel furring channels spaced 406 mm o.c. • 12.7 mm Type X gypsum board	—	37	29
	F24h	F24 with • absorptive material in cavity • steel furring channels spaced 610 mm o.c. • 12.7 mm Type X gypsum board	—	39	32
	F24i	F24 with • no absorptive material in cavity • steel furring channels spaced 406 mm • 12.7 mm regular gypsum board	—	33	25
	F24j	F24 with • no absorptive material in cavity • steel furring channels spaced 610 mm • 12.7 mm regular gypsum board	—	35	28
	F24k	F24 with • absorptive material in cavity • steel furring channels spaced 406 mm • 12.7 mm regular gypsum board	—	36	28
	F24l	F24 with • absorptive material in cavity • steel furring channels spaced 610 mm • 12.7 mm regular gypsum board	—	38	31
	F25	• subfloor of 15.5 mm plywood, OSB or waferboard, or 17 mm tongue and groove lumber • on wood trusses spaced not more than 610 mm o.c. • with or without absorptive material in cavity • steel furring channels spaced 406 mm or 610 mm o.c. • 2 layers of gypsum board on ceiling side			
	F25a	F25 with • no absorptive material in cavity • steel furring channels spaced 406 mm o.c. • 15.9 mm Type X gypsum board	1 h	40	32
	F25b	F25 with • no absorptive material in cavity • steel furring channels spaced 610 mm o.c • 15.9 mm Type X gypsum board	1 h	42	34
Column 1	2	3	4	5	6

Table 2 (Cont'd)
Fire and Sound Resistance of Floors, Ceilings and Roofs[1]

Type of Assembly	Assembly Number	Description[2][3][4]	Fire-Resistance Rating[5][6][7][8]	Typical Sound Transmission Class[5][6][9][10] (STC)	Typical Impact Insulation Class[5][9][11] (IIC)
Floors and Ceilings					
Wood Floor Trusses[23]	F25c	F25 with • absorptive material in cavity • steel furring channels spaced 406 mm o.c. • 15.9 mm Type X gypsum board	1 h	43	35
	F25d	F25 with • absorptive material in cavity • steel furring channels spaced 610 mm o.c. • 15.9 mm Type X gypsum board	45 min [1 h][17]	45	37
	F25e	F25 with • no absorptive material in cavity • steel furring channels spaced 406 mm o.c. • 12.7 mm Type X gypsum board	1 h	38	30
	F25f	F25 with • no absorptive material in cavity • steel furring channels spaced 610 mm o.c. • 12.7 mm Type X gypsum board	1 h	40	33
	F25g	F25 with • absorptive material in cavity • steel furring channels spaced 406 mm o.c. • 12.7 mm Type X gypsum board	1 h	41	33
	F25h	F25 with • absorptive material in cavity • steel furring channels spaced 610 mm o.c. • 12.7 mm Type X gypsum board	45 min [1 h][17]	43	36
	F25i	F25 with • no absorptive material in cavity • steel furring channels spaced 406 mm o.c. • 12.7 mm regular gypsum board	—	38	30
	F25j	F25 with • no absorptive material in cavity • steel furring channels spaced 610 mm o.c. • 12.7 mm regular gypsum board	—	40	33
	F25k	F25 with • absorptive material in cavity • steel furring channels spaced 406 mm o.c. • 12.7 mm regular gypsum board	—	41	33
	F25l	F25 with • no absorptive material in cavity • steel furring channels spaced 610 mm o.c. • 12.7 mm regular gypsum board	—	43	36
Column 1	2	3	4	5	6

Table 2 (Cont'd)
Fire and Sound Resistance of Floors, Ceilings and Roofs[1]

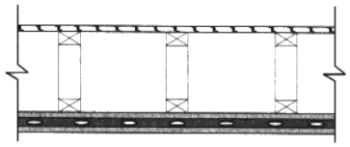
Type of Assembly	Assembly Number	Description[2][3][4]	Fire-Resistance Rating[5][6][7][8]	Typical Sound Transmission Class[5][6][9][10] (STC)	Typical Impact Insulation Class[5][9][11] (IIC)
Floors and Ceilings					
Wood Floor Trusses[23]	**F26**	• subfloor of 15.5 mm plywood, OSB or waferboard, or 17 mm tongue and groove lumber • on wood trusses spaced not more than 610 mm o.c. • with or without absorptive material in cavity • 1 layer of gypsum board attached directly to trusses on ceiling side • resilient metal channels spaced 406 mm or 610 mm o.c. attached to trusses through the gypsum board • 1 layer of gypsum board attached to resilient metal channels			
	F26a	F26 with • no absorptive material in cavity • 15.9 mm Type X gypsum board • resilient metal channels • 15.9 mm Type X gypsum board	—	35	27
	F26b	F26 with • absorptive material in cavity • 15.9 mm Type X gypsum board • resilient metal channels • 15.9 mm Type X gypsum board	—	37	30
	F26c	F26 with • no absorptive material in cavity • 12.7 mm Type X gypsum board • resilient metal channels • 12.7 mm Type X gypsum board	—	35	27
	F26d	F26 with • absorptive material in cavity • 12.7 mm Type X gypsum board • resilient metal channels • 12.7 mm Type X gypsum board	—	37	30
	F26e	F26 with • no absorptive material in cavity • 12.7 mm regular gypsum board • resilient metal channels • 12.7 mm regular gypsum board	—	32	26
	F26f	F26 with • absorptive material in cavity • 12.7 mm regular gypsum board • resilient metal channels • 12.7 mm regular gypsum board	—	35	28
Column 1	2	3	4	5	6

Table 2 (Cont'd)
Fire and Sound Resistance of Floors, Ceilings and Roofs[1]

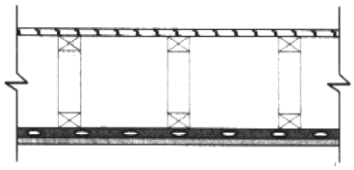
Type of Assembly	Assembly Number	Description[2][3][4]	Fire-Resistance Rating[5][6][7][8]	Typical Sound Transmission Class[5][6][9][10] (STC)	Typical Impact Insulation Class[5][9][11] (IIC)
Floors and Ceilings					
Wood Floor Trusses[23]	**F27**	• subfloor of 15.5 mm plywood, OSB or waferboard, or 17 mm tongue and groove lumber • on wood trusses spaced not more than 610 mm o.c. • with or without absorptive material in cavity • resilient metal channels spaced 406 mm or 610 mm o.c. • 1 layer of gypsum board on ceiling side			
	F27a	F27 with • no absorptive material in cavity • resilient metal channels spaced 406 mm o.c. • 15.9 mm Type X gypsum board	—	41	33
	F27b	F27 with • no absorptive material in cavity • resilient metal channels spaced 610 mm o.c • 15.9 mm Type X gypsum board	—	43	36
	F27c	F27 with • absorptive material in cavity • resilient metal channels spaced 406 mm o.c. • 15.9 mm Type X gypsum board	30 min [45 min][24]	48	41
	F27d	F27 with • absorptive material in cavity • resilient metal channels spaced 610 mm o.c. • 15.9 mm Type X gypsum board	—	50	44
	F27e	F27 with • no absorptive material in cavity • resilient metal channels spaced 406 mm o.c. • 12.7 mm Type X gypsum board	—	40	32
	F27f	F27 with • no absorptive material in cavity • resilient metal channels spaced 610 mm o.c. • 12.7 mm Type X gypsum board	—	42	35
	F27g	F27 with • absorptive material in cavity • resilient metal channels spaced 406 mm o.c. • 12.7 mm Type X gypsum board	—	47	40
	F27h	F27 with • absorptive material in cavity • resilient metal channels spaced 610 mm o.c. • 12.7 mm Type X gypsum board	—	49	43
Column 1	2	3	4	5	6

Table 2 (Cont'd)
Fire and Sound Resistance of Floors, Ceilings and Roofs[1]

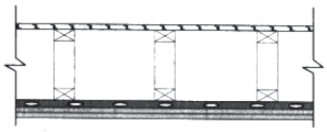
Type of Assembly	Assembly Number	Description[2][3][4]	Fire-Resistance Rating[5][6][7][8]	Typical Sound Transmission Class[5][6][9][10] (STC)	Typical Impact Insulation Class[5][9][11] (IIC)
Floors and Ceilings					
Wood Floor Trusses[23]	F27i	F27 with • no absorptive material in cavity • resilient metal channels spaced 406 mm o.c. • 12.7 mm regular gypsum board	—	39	31
	F27j	F27 with • no absorptive material in cavity • resilient metal channels spaced 610 mm o.c. • 12.7 mm regular gypsum board	—	41	34
	F27k	F27 with • absorptive material in cavity • resilient metal channels spaced 406 mm o.c. • 12.7 mm regular gypsum board	—	46	39
	F27l	F27 with • absorptive material in cavity • resilient metal channels spaced 610 mm o.c. • 12.7 mm regular gypsum board	—	48	42
	F28	• subfloor of 15.5 mm plywood, OSB or waferboard, or 17 mm tongue and groove lumber • on wood trusses spaced not more than 610 mm o.c. • with or without absorptive material in cavity • resilient metal channels spaced 406 mm or 610 mm o.c. • 2 layers of gypsum board on ceiling side			
	F28a	F28 with • no absorptive material in cavity • resilient metal channels spaced 406 mm o.c. • 15.9 mm Type X gypsum board	1 h	46	38
	F28b	F28 with • no absorptive material in cavity • resilient metal channels spaced 610 mm o.c • 15.9 mm Type X gypsum board	1 h	48	40
	F28c	F28 with • absorptive material in cavity • resilient metal channels spaced 406 mm o.c. • 15.9 mm Type X gypsum board	1 h	54	46
	F28d	F28 with • absorptive material in cavity • resilient metal channels spaced 610 mm o.c. • 15.9 mm Type X gypsum board	45 min [1 h][17]	55	48
Column 1	2	3	4	5	6

Table 2 (Cont'd)
Fire and Sound Resistance of Floors, Ceilings and Roofs[1]

Type of Assembly	Assembly Number	Description[2][3][4]	Fire-Resistance Rating[5][6][7][8]	Typical Sound Transmission Class[5][6][9][10] (STC)	Typical Impact Insulation Class[5][9][11] (IIC)
Floors and Ceilings					
Wood Floor Trusses[23]	F28e	F28 with • no absorptive material in cavity • resilient metal channels spaced 406 mm o.c. • 12.7 mm Type X gypsum board	1 h	44	36
	F28f	F28 with • no absorptive material in cavity • resilient metal channels spaced 610 mm o.c. • 12.7 mm Type X gypsum board	1 h	46	39
	F28g	F28 with • absorptive material in cavity • resilient metal channels spaced 406 mm o.c. • 12.7 mm Type X gypsum board	1 h	51	44
	F28h	F28 with • absorptive material in cavity • resilient metal channels spaced 610 mm o.c. • 12.7 mm Type X gypsum board	45 min [1 h][17]	53	47
	F28i	F28 with • no absorptive material in cavity • resilient metal channels spaced 406 mm o.c. • 12.7 mm regular gypsum board	—	44	36
	F28j	F28 with • no absorptive material in cavity • resilient metal channels spaced 610 mm o.c. • 12.7 mm regular gypsum board	—	46	39
	F28k	F28 with • absorptive material in cavity • resilient metal channels spaced 406 mm o.c. • 12.7 mm regular gypsum board	—	51	44
	F28l	F28 with • absorptive material in cavity • resilient metal channels spaced 610 mm o.c. • 12.7 mm regular gypsum board	—	53	47
Column 1	2	3	4	5	6

Table 2 (Cont'd)
Fire and Sound Resistance of Floors, Ceilings and Roofs[1]

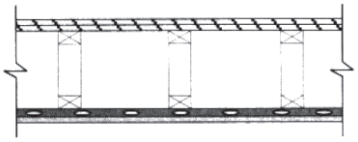
Type of Assembly	Assembly Number	Description[2][3][4]	Fire-Resistance Rating[5][6][7][8]	Typical Sound Transmission Class[5][6][9][10] (STC)	Typical Impact Insulation Class[5][9][11] (IIC)
Floors and Ceilings					
Wood Floor Trusses[23]	**F29**	• one subfloor layer 11 mm sanded plywood, or OSB or waferboard • one subfloor layer of 15.5 mm plywood, OSB or waferboard, or 17 mm tongue and groove lumber • on wood trusses spaced not more than 610 mm o.c. • with or without absorptive material in cavity • resilient metal channels spaced 406 mm or 610 mm o.c. • 1 layer of gypsum board on ceiling side			
	F29a	F29 with • no absorptive material in cavity • resilient metal channels spaced 406 mm o.c. • 15.9 mm Type X gypsum board	—	44	35
	F29b	F29 with • no absorptive material in cavity • resilient metal channels spaced 610 mm o.c • 15.9 mm Type X gypsum board	—	46	37
	F29c	F29 with • absorptive material in cavity • resilient metal channels spaced 406 mm o.c. • 15.9 mm Type X gypsum board	30 min [45 min][24]	51	43
	F29d	F29 with • absorptive material in cavity • resilient metal channels spaced 610 mm o.c. • 15.9 mm Type X gypsum board	—	53	45
	F29e	F29 with • no absorptive material in cavity • resilient metal channels spaced 406 mm o.c. • 12.7 mm Type X gypsum board	—	43	33
	F29f	F29 with • no absorptive material in cavity • resilient metal channels spaced 610 mm o.c. • 12.7 mm Type X gypsum board	—	45	36
	F29g	F29 with • absorptive material in cavity • resilient metal channels spaced 406 mm o.c. • 12.7 mm Type X gypsum board	—	50	41
	F29h	F29 with • absorptive material in cavity • resilient metal channels spaced 610 mm o.c. • 12.7 mm Type X gypsum board	—	52	44
Column 1	2	3	4	5	6

Table 2 (Cont'd)
Fire and Sound Resistance of Floors, Ceilings and Roofs[1]

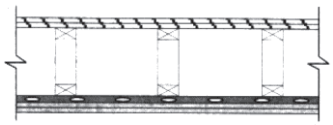
Type of Assembly	Assembly Number	Description[2][3][4]	Fire-Resistance Rating[5][6][7][8]	Typical Sound Transmission Class[5][6][9][10] (STC)	Typical Impact Insulation Class[5][9][11] (IIC)
Floors and Ceilings					
Wood Floor Trusses[23]	F29i	F29 with • no absorptive material in cavity • resilient metal channels spaced 406 mm o.c. • 12.7 mm regular gypsum board	—	42	34
	F29j	F29 with • no absorptive material in cavity • resilient metal channels spaced 610 mm o.c. • 12.7 mm regular gypsum board	—	44	36
	F29k	F29 with • absorptive material in cavity • resilient metal channels spaced 406 mm o.c. • 12.7 mm regular gypsum board	—	49	41
	F29l	F29 with • absorptive material in cavity • resilient metal channels spaced 610 mm o.c. • 12.7 mm regular gypsum board	—	51	44
	F30	• one subfloor layer 11 mm sanded plywood, or OSB or waferboard • one subfloor layer of 15.5 mm plywood, OSB or waferboard, or 17 mm tongue and groove lumber • on wood trusses spaced not more than 610 mm o.c. • with or without absorptive material in cavity • resilient metal channels spaced 406 mm or 610 mm o.c. • 2 layers of gypsum board on ceiling side			
	F30a	F30 with • no absorptive material in cavity • resilient metal channels spaced 406 mm o.c. • 15.9 mm Type X gypsum board	1 h	49	39
	F30b	F30 with • no absorptive material in cavity • resilient metal channels spaced 610 mm o.c • 15.9 mm Type X gypsum board	1 h	51	42
	F30c	F30 with • absorptive material in cavity • resilient metal channels spaced 406 mm o.c. • 15.9 mm Type X gypsum board	1 h [1.5 h][25]	56 [58][25]	47 [50][25]
	F30d	F30 with • absorptive material in cavity • resilient metal channels spaced 610 mm o.c. • 15.9 mm Type X gypsum board	45 min [1 h][17]	58	50
Column 1	2	3	4	5	6

Table 2 (Cont'd)
Fire and Sound Resistance of Floors, Ceilings and Roofs[1]

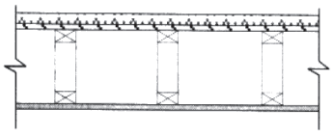
Type of Assembly	Assembly Number	Description[2][3][4]	Fire-Resistance Rating[5][6][7][8]	Typical Sound Transmission Class[5][6][9][10] (STC)	Typical Impact Insulation Class[5][9][11] (IIC)
Floors and Ceilings					
Wood Floor Trusses[23]	F30e	F30 with • no absorptive material in cavity • resilient metal channels spaced 406 mm o.c. • 12.7 mm Type X gypsum board	1 h	47	38
	F30f	F30 with • no absorptive material in cavity • resilient metal channels spaced 610 mm o.c. • 12.7 mm Type X gypsum board	1 h	49	40
	F30g	F30 with • absorptive material in cavity • resilient metal channels spaced 406 mm o.c. • 12.7 mm Type X gypsum board	1 h	54	46
	F30h	F30 with • absorptive material in cavity • resilient metal channels spaced 610 mm o.c. • 12.7 mm Type X gypsum board	45 min [1 h][17]	56	48
	F30i	F30 with • no absorptive material in cavity • resilient metal channels spaced 406 mm o.c. • 12.7 mm regular gypsum board	—	47	37
	F30j	F30 with • no absorptive material in cavity • resilient metal channels spaced 610 mm o.c. • 12.7 mm regular gypsum board	—	49	40
	F30k	F30 with • absorptive material in cavity • resilient metal channels spaced 406 mm o.c. • 12.7 mm regular gypsum board	—	54	45
	F30l	F30 with • absorptive material in cavity • resilient metal channels spaced 610 mm o.c. • 12.7 mm regular gypsum board	—	56	48
	F31	• 25 mm gypsum-concrete topping (at least 44 kg/m^2) • subfloor of 15.5 mm plywood, OSB or waferboard, or 17 mm tongue and groove lumber • on wood trusses spaced not more than 610 mm o.c. • with or without absorptive material in cavity • 1 layer of gypsum board on ceiling side			
Column 1	2	3	4	5	6

Table 2 (Cont'd)
Fire and Sound Resistance of Floors, Ceilings and Roofs[1]

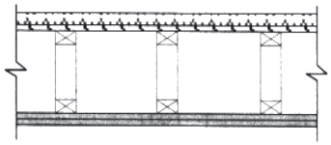
Type of Assembly	Assembly Number	Description[2][3][4]	Fire-Resistance Rating[5][6][7][8]	Typical Sound Transmission Class[5][6][9][10] (STC)	Typical Impact Insulation Class[5][9][11] (IIC)
Floors and Ceilings					
Wood Floor Trusses[23]	F31a	F31 with • no absorptive material in cavity • 15.9 mm Type X gypsum board	—	41	17
	F31b	F31 with • absorptive material in cavity • 15.9 mm Type X gypsum board	—	43	20
	F31c	F31 with • no absorptive material in cavity • 12.7 mm Type X gypsum board	—	40	17
	F31d	F31 with • absorptive material in cavity • 12.7 mm Type X gypsum board	—	42	20
	F31e	F31 with • no absorptive material in cavity • 12.7 mm regular gypsum board	—	39	16
	F31f	F31 with • absorptive material in cavity • 12.7 mm regular gypsum board	—	41	19
	F32	• 25 mm gypsum-concrete topping (at least 44 kg/m^2) • subfloor of 15.5 mm plywood, OSB or waferboard, or 17 mm tongue and groove lumber • on wood trusses spaced not more than 610 mm o.c. • with or without absorptive material in cavity • 2 layers of gypsum board on ceiling side			
	F32a	F32 with • wood trusses spaced 406 mm o.c. • no absorptive material in cavity • 15.9 mm Type X gypsum board	1 h	46	20
	F32b	F32 with • wood trusses spaced 610 mm o.c. • no absorptive material in cavity • 15.9 mm Type X gypsum board	1 h	47	20
	F32c	F32 with • wood trusses spaced 406 mm o.c. • absorptive material in cavity • 15.9 mm Type X gypsum board	45 min [1 h][14]	48	23
Column 1	2	3	4	5	6

Table 2 (Cont'd)
Fire and Sound Resistance of Floors, Ceilings and Roofs[1]

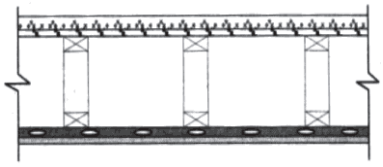
Type of Assembly	Assembly Number	Description[2][3][4]	Fire-Resistance Rating[5][6][7][8]	Typical Sound Transmission Class[5][6][9][10] (STC)	Typical Impact Insulation Class[5][9][11] (IIC)
Floors and Ceilings					
Wood Floor Trusses[23]	F32d	F32 with • wood trusses spaced 610 mm o.c. • absorptive material in cavity • 15.9 mm Type X gypsum board	45 min	49	23
	F32e	F32 with • wood trusses spaced 406 mm o.c. • no absorptive material in cavity • 12.7 mm Type X gypsum board	1 h	44	19
	F32f	F32 with • wood trusses spaced 610 mm o.c. • no absorptive material in cavity • 12.7 mm Type X gypsum board	45 min	45	19
	F32g	F32 with • absorptive material in cavity • 12.7 mm Type X gypsum board	—	46	19
	F32h	F32 with • no absorptive material in cavity • 12.7 mm regular gypsum board	—	44	19
	F32i	F32 with • absorptive material in cavity • 12.7 mm regular gypsum board	—	46	22
	F33	• 25 mm gypsum-concrete topping (at least 44 kg/m^2) • subfloor of 15.5 mm plywood, OSB or waferboard, or 17 mm tongue and groove lumber • on wood trusses spaced not more than 610 mm o.c. • with or without absorptive material in cavity • resilient metal channels spaced 406 mm or 610 mm o.c. • 1 layer of gypsum board on ceiling side			
	F33a	F33 with • no absorptive material in cavity • resilient metal channels spaced 406 mm o.c. • 15.9 mm Type X gypsum board	—	53	26
	F33b	F33 with • no absorptive material in cavity • resilient metal channels spaced 610 mm o.c • 15.9 mm Type X gypsum board	—	55	26
Column 1	2	3	4	5	6

Table 2 (Cont'd)
Fire and Sound Resistance of Floors, Ceilings and Roofs[1]

Type of Assembly	Assembly Number	Description[2][3][4]	Fire-Resistance Rating[5][6][7][8]	Typical Sound Transmission Class[5][6][9][10] (STC)	Typical Impact Insulation Class[5][9][11] (IIC)
Floors and Ceilings					
Wood Floor Trusses[23]	F33c	F33 with • absorptive material in cavity • resilient metal channels spaced 406 mm o.c. • 15.9 mm Type X gypsum board	30 min [45 min][24]	60	34
	F33d	F33 with • absorptive material in cavity • resilient metal channels spaced 610 mm o.c. • 15.9 mm Type X gypsum board	—	62	34
	F33e	F33 with • no absorptive material in cavity • resilient metal channels spaced 406 mm o.c. • 12.7 mm Type X gypsum board	—	52	26
	F33f	F33 with • no absorptive material in cavity • resilient metal channels spaced 610 mm o.c. • 12.7 mm Type X gypsum board	—	54	26
	F33g	F33 with • absorptive material in cavity • resilient metal channels spaced 406 mm o.c. • 12.7 mm Type X gypsum board	—	59	34
	F33h	F33 with • absorptive material in cavity • resilient metal channels spaced 610 mm o.c. • 12.7 mm Type X gypsum board	—	61	34
	F33i	F33 with • no absorptive material in cavity • resilient metal channels spaced 406 mm o.c. • 12.7 mm regular gypsum board	—	51	25
	F33j	F33 with • no absorptive material in cavity • resilient metal channels spaced 610 mm o.c. • 12.7 mm regular gypsum board	—	53	25
	F33k	F33 with • absorptive material in cavity • resilient metal channels spaced 406 mm o.c. • 12.7 mm regular gypsum board	—	58	33
	F33l	F33 with • absorptive material in cavity • resilient metal channels spaced 610 mm o.c. • 12.7 mm regular gypsum board	—	60	33
Column 1	2	3	4	5	6

Table 2 (Cont'd)
Fire and Sound Resistance of Floors, Ceilings and Roofs[1]

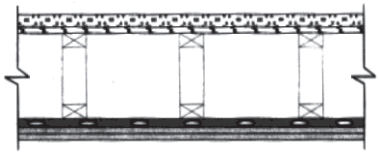
Type of Assembly	Assembly Number	Description[2][3][4]	Fire-Resistance Rating[5][6][7][8]	Typical Sound Transmission Class[5][6][9][10] (STC)	Typical Impact Insulation Class[5][9][11] (IIC)
Floors and Ceilings					
Wood Floor Trusses[23]	**F34**	• 25 mm gypsum-concrete topping (at least 44 kg/m^2) • subfloor of 15.5 mm plywood, OSB or waferboard, or 17 mm tongue and groove lumber • on wood trusses spaced not more than 610 mm o.c. • with or without absorptive material in cavity • resilient metal channels spaced 406 mm or 610 mm o.c. • 2 layers of gypsum board on ceiling side			
	F34a	F34 with • no absorptive material in cavity • resilient metal channels spaced 406 mm o.c. • 15.9 mm Type X gypsum board	1 h	57	29
	F34b	F34 with • no absorptive material in cavity • resilient metal channels spaced 610 mm o.c • 15.9 mm Type X gypsum board	1 h	60	29
	F34c	F34 with • absorptive material in cavity • resilient metal channels spaced 406 mm o.c. • 15.9 mm Type X gypsum board	1 h [1.5 h][25]	65 [67][25]	37
	F34d	F34 with • absorptive material in cavity • resilient metal channels spaced 610 mm o.c. • 15.9 mm Type X gypsum board	45 min [1 h][17]	67	37
	F34e	F34 with • no absorptive material in cavity • resilient metal channels spaced 406 mm o.c. • 12.7 mm Type X gypsum board	1 h	56	28
	F34f	F34 with • no absorptive material in cavity • resilient metal channels spaced 610 mm o.c. • 12.7 mm Type X gypsum board	1 h	58	28
	F34g	F34 with • absorptive material in cavity • resilient metal channels spaced 406 mm o.c. • 12.7 mm Type X gypsum board	1 h	63	36
Column 1	2	3	4	5	6

Table 2 (Cont'd)
Fire and Sound Resistance of Floors, Ceilings and Roofs[1]

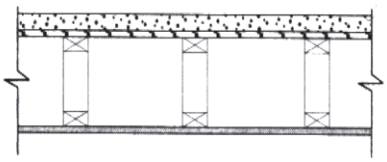
Type of Assembly	Assembly Number	Description[2][3][4]	Fire-Resistance Rating[5][6][7][8]	Typical Sound Transmission Class[5][6][9][10] (STC)	Typical Impact Insulation Class[5][9][11] (IIC)
Floors and Ceilings					
Wood Floor Trusses[23]	F34h	F34 with • absorptive material in cavity • resilient metal channels spaced 610 mm o.c. • 12.7 mm Type X gypsum board	45 min [1 h][17]	65	36
	F34i	F34 with • no absorptive material in cavity • resilient metal channels spaced 406 mm o.c. • 12.7 mm regular gypsum board	—	56	28
	F34j	F34 with • no absorptive material in cavity • resilient metal channels spaced 610 mm o.c. • 12.7 mm regular gypsum board	—	58	28
	F34k	F34 with • absorptive material in cavity • resilient metal channels spaced 406 mm o.c. • 12.7 mm regular gypsum board	—	63	36
	F34l	F34 with • absorptive material in cavity • resilient metal channels spaced 610 mm o.c. • 12.7 mm regular gypsum board	—	65	36
	F35	• 38 mm concrete topping (at least 70 kg/m^2) • subfloor of 15.5 mm plywood, OSB or waferboard, or 17 mm tongue and groove lumber • on wood trusses spaced not more than 610 mm o.c. • with or without absorptive material in cavity • 1 layer of gypsum board on ceiling side			
	F35a	F35 with • no absorptive material in cavity • 15.9 mm Type X gypsum board	—	45	26
	F35b	F35 with • absorptive material in cavity • 15.9 mm Type X gypsum board	—	47	29
	F35c	F35 with • no absorptive material in cavity • 12.7 mm Type X gypsum board	—	43	26
	F35d	F35 with • absorptive material in cavity • 12.7 mm Type X gypsum board	—	45	29
Column 1	2	3	4	5	6

Table 2 (Cont'd)
Fire and Sound Resistance of Floors, Ceilings and Roofs[1]

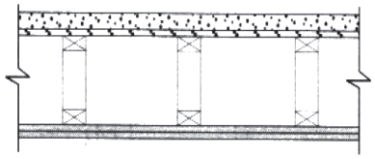
Type of Assembly	Assembly Number	Description[2][3][4]	Fire-Resistance Rating[5][6][7][8]	Typical Sound Transmission Class[5][6][9][10] (STC)	Typical Impact Insulation Class[5][9][11] (IIC)
Floors and Ceilings					
Wood Floor Trusses[23]	F35e	F35 with • no absorptive material in cavity • 12.7 mm regular gypsum board	—	43	26
	F35f	F35 with • absorptive material in cavity • 12.7 mm regular gypsum board	—	45	29
	F36	• 38 mm concrete topping (at least 70 kg/m^2) • subfloor of 15.5 mm plywood, OSB or waferboard, or 17 mm tongue and groove lumber • on wood trusses spaced not more than 610 mm o.c. • with or without absorptive material in cavity • 2 layers of gypsum board on ceiling side			
	F36a	F36 with • wood trusses spaced 406 mm o.c. • no absorptive material in cavity • 15.9 mm Type X gypsum board	1 h	49	28
	F36b	F36 with • wood trusses spaced 610 mm o.c. • no absorptive material in cavity • 15.9 mm Type X gypsum board	1 h	50	28
	F36c	F36 with • wood trusses spaced 406 mm o.c. • absorptive material in cavity • 15.9 mm Type X gypsum board	45 min [1 h][14]	51	31
	F36d	F36 with • wood trusses spaced 610 mm o.c. • absorptive material in cavity • 15.9 mm Type X gypsum board	45 min	52	31
	F36e	F36 with • wood trusses spaced 406 mm o.c. • no absorptive material in cavity • 12.7 mm Type X gypsum board	1 h	48	27
	F36f	F36 with • wood trusses spaced 610 mm o.c. • no absorptive material in cavity • 12.7 mm Type X gypsum board	45 min	49	27
Column 1	2	3	4	5	6

Table 2 (Cont'd)
Fire and Sound Resistance of Floors, Ceilings and Roofs[1]

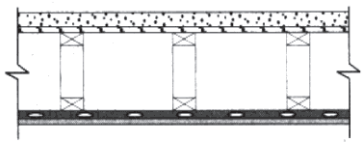
Type of Assembly	Assembly Number	Description[2][3][4]	Fire-Resistance Rating[5][6][7][8]	Typical Sound Transmission Class[5][6][9][10] (STC)	Typical Impact Insulation Class[5][9][11] (IIC)
Floors and Ceilings					
Wood Floor Trusses[23]	F36g	F36 with • absorptive material in cavity • 12.7 mm Type X gypsum board	—	50	30
	F36h	F36 with • no absorptive material in cavity • 12.7 mm regular gypsum board	—	47	27
	F36i	F36 with • absorptive material in cavity • 12.7 mm regular gypsum board	—	49	30
	F37	• 38 mm concrete topping (at least 70 kg/m^2) • subfloor of 15.5 mm plywood, OSB or waferboard, or 17 mm tongue and groove lumber • on wood trusses spaced not more than 610 mm o.c. • with or without absorptive material in cavity • resilient metal channels spaced 406 mm or 610 mm o.c. • 1 layer of gypsum board on ceiling side			
	F37a	F37 with • no absorptive material in cavity • resilient metal channels spaced 406 mm o.c. • 15.9 mm Type X gypsum board	45 min	56	35
	F37b	F37 with • no absorptive material in cavity • resilient metal channels spaced 610 mm o.c • 15.9 mm Type X gypsum board	—	59	35
	F37c	F37 with • absorptive material in cavity • resilient metal channels spaced 406 mm o.c. • 15.9 mm Type X gypsum board	30 min [45 min][24]	63	43
	F37d	F37 with • absorptive material in cavity • resilient metal channels spaced 610 mm o.c. • 15.9 mm Type X gypsum board	—	66	43
	F37e	F37 with • no absorptive material in cavity • resilient metal channels spaced 406 mm o.c. • 12.7 mm Type X gypsum board	—	55	35
Column 1	2	3	4	5	6

Table 2 (Cont'd)
Fire and Sound Resistance of Floors, Ceilings and Roofs[1]

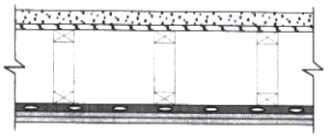
Type of Assembly	Assembly Number	Description[2][3][4]	Fire-Resistance Rating[5][6][7][8]	Typical Sound Transmission Class[5][6][9][10] (STC)	Typical Impact Insulation Class[5][9][11] (IIC)
Floors and Ceilings					
Wood Floor Trusses[23]	F37f	F37 with • no absorptive material in cavity • resilient metal channels spaced 610 mm o.c. • 12.7 mm Type X gypsum board	—	57	35
	F37g	F37 with • absorptive material in cavity • resilient metal channels spaced 406 mm o.c. • 12.7 mm Type X gypsum board	—	62	43
	F37h	F37 with • absorptive material in cavity • resilient metal channels spaced 610 mm o.c. • 12.7 mm Type X gypsum board	—	64	43
	F37i	F37 with • no absorptive material in cavity • resilient metal channels spaced 406 mm o.c. • 12.7 mm regular gypsum board	—	54	35
	F37j	F37 with • no absorptive material in cavity • resilient metal channels spaced 610 mm o.c. • 12.7 mm regular gypsum board	—	57	35
	F37k	F37 with • absorptive material in cavity • resilient metal channels spaced 406 mm o.c. • 12.7 mm regular gypsum board	—	61	43
	F37l	F37 with • absorptive material in cavity • resilient metal channels spaced 610 mm o.c. • 12.7 mm regular gypsum board	—	64	43
	F38	• 38 mm concrete topping (at least 70 kg/m^2) • subfloor of 15.5 mm plywood, OSB or waferboard, or 17 mm tongue and groove lumber • on wood trusses spaced not more than 610 mm o.c. • with or without absorptive material in cavity • resilient metal channels spaced 406 mm or 610 mm o.c. • 2 layers of gypsum board on ceiling side			
	F38a	F38 with • no absorptive material in cavity • resilient metal channels spaced 406 mm o.c. • 15.9 mm Type X gypsum board	1 h	61	37
Column 1	2	3	4	5	6

Table 2 (Cont'd)
Fire and Sound Resistance of Floors, Ceilings and Roofs[1]

Type of Assembly	Assembly Number	Description[2][3][4]	Fire-Resistance Rating[5][6][7][8]	Typical Sound Transmission Class[5][6][9][10] (STC)	Typical Impact Insulation Class[5][9][11] (IIC)
Floors and Ceilings					
Wood Floor Trusses[23]	F38b	F38 with • no absorptive material in cavity • resilient metal channels spaced 610 mm o.c • 15.9 mm Type X gypsum board	1 h	63	37
	F38c	F38 with • absorptive material in cavity • resilient metal channels spaced 406 mm o.c. • 15.9 mm Type X gypsum board	1 h [1.5 h][25]	69 [71][25]	45
	F38d	F38 with • absorptive material in cavity • resilient metal channels spaced 610 mm o.c. • 15.9 mm Type X gypsum board	1 h	70	45
	F38e	F38 with • no absorptive material in cavity • resilient metal channels spaced 406 mm o.c. • 12.7 mm Type X gypsum board	1 h	60	36
	F38f	F38 with • no absorptive material in cavity • resilient metal channels spaced 610 mm o.c. • 12.7 mm Type X gypsum board	1 h	62	36
	F38g	F38 with • absorptive material in cavity • resilient metal channels spaced 406 mm o.c. • 12.7 mm Type X gypsum board	1 h	67	44
	F38h	F38 with • absorptive material in cavity • resilient metal channels spaced 610 mm o.c. • 12.7 mm Type X gypsum board	1 h	69	44
	F38i	F38 with • no absorptive material in cavity • resilient metal channels spaced 406 mm o.c. • 12.7 mm regular gypsum board	—	59	36
	F38j	F38 with • no absorptive material in cavity • resilient metal channels spaced 610 mm o.c. • 12.7 mm regular gypsum board	—	61	36
	F38k	F38 with • absorptive material in cavity • resilient metal channels spaced 406 mm o.c. • 12.7 mm regular gypsum board	—	66	44
Column 1	2	3	4	5	6

Table 2 (Cont'd)
Fire and Sound Resistance of Floors, Ceilings and Roofs[1]

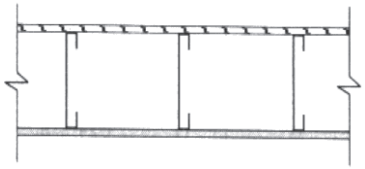
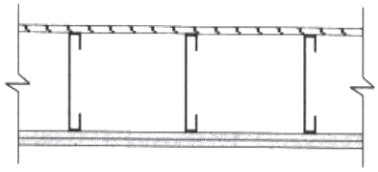
Type of Assembly	Assembly Number	Description[2][3][4]	Fire-Resistance Rating[5][6][7][8]	Typical Sound Transmission Class[5][6][9][10] (STC)	Typical Impact Insulation Class[5][9][11] (IIC)
Floors and Ceilings					
Wood Floor Trusses[23]	F38l	F38 with • absorptive material in cavity • resilient metal channels spaced 610 mm o.c. • 12.7 mm regular gypsum board	—	68	44
Cold Formed Steel Floor Joists[26]	**F39**	• subfloor of 15.5 mm plywood, OSB or waferboard, or 17 mm tongue and groove lumber • on steel joists spaced not more than 610 mm o.c. • with or without absorptive material in cavity • 1 layer of gypsum board on ceiling side			
	F39a	F39 with • no absorptive material in cavity • 15.9 mm Type X gypsum board	—	29	27
	F39b	F39 with • absorptive material in cavity • 15.9 mm Type X gypsum board	—	31	30
	F39c	F39 with • no absorptive material in cavity • 12.7 mm Type X gypsum board	—	27	26
	F39d	F39 with • absorptive material in cavity • 12.7 mm Type X gypsum board	—	29	29
	F39e	F39 with • no absorptive material in cavity • 12.7 mm regular gypsum board	—	27	25
	F39f	F39 with • absorptive material in cavity • 12.7 mm regular gypsum board	—	29	28
	F40	• subfloor of 15.5 mm plywood, OSB or waferboard, or 17 mm tongue and groove lumber • on steel joists spaced not more than 610 mm o.c. • with or without absorptive material in cavity • 2 layers of gypsum board on ceiling side			
	F40a	F40 with • steel joists spaced 406 mm o.c. • no absorptive material in cavity • 15.9 mm Type X gypsum board	1 h	34	31
Column 1	2	3	4	5	6

Table 2 (Cont'd)
Fire and Sound Resistance of Floors, Ceilings and Roofs[1]

Type of Assembly	Assembly Number	Description[2][3][4]	Fire-Resistance Rating[5][6][7][8]	Typical Sound Transmission Class[5][6][9][10] (STC)	Typical Impact Insulation Class[5][9][11] (IIC)
Floors and Ceilings					
Cold Formed Steel Floor Joists[26]	F40b	F40 with • steel joists spaced 610 mm o.c. • no absorptive material in cavity • 15.9 mm Type X gypsum board	45 min	35	31
	F40c	F40 with • steel joists spaced 406 mm o.c. • absorptive material in cavity • 15.9 mm Type X gypsum board	45 min	36	34
	F40d	F40 with • steel joists spaced 610 mm o.c. • absorptive material in cavity • 15.9 mm Type X gypsum board	45 min	37	34
	F40e	F40 with • steel joists spaced 406 mm o.c. • no absorptive material in cavity • 12.7 mm Type X gypsum board	1 h	32	30
	F40f	F40 with • steel joists spaced 610 mm o.c. • no absorptive material in cavity • 12.7 mm Type X gypsum board	45 min	33	30
	F40g	F40 with • steel joists spaced 406 mm o.c. • absorptive material in cavity • 12.7 mm Type X gypsum board	45 min	34	33
	F40h	F40 with • steel joists spaced 610 mm o.c. • absorptive material in cavity • 12.7 mm Type X gypsum board	45 min	35	33
	F40i	F40 with • no absorptive material in cavity • 12.7 mm regular gypsum board	—	31	30
	F40j	F40 with • absorptive material in cavity • 12.7 mm regular gypsum board	—	33	33
Column 1	2	3	4	5	6

Table 2 (Cont'd)
Fire and Sound Resistance of Floors, Ceilings and Roofs[1]

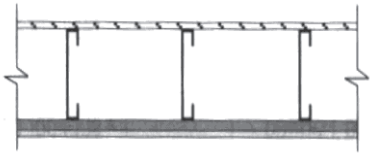
Type of Assembly	Assembly Number	Description[2][3][4]	Fire-Resistance Rating[5][6][7][8]	Typical Sound Transmission Class[5][6][9][10] (STC)	Typical Impact Insulation Class[5][9][11] (IIC)
Floors and Ceilings					
Cold Formed Steel Floor Joists[26]	**F41**	• subfloor of 15.5 mm plywood, OSB or waferboard, or 17 mm tongue and groove lumber • on steel joists spaced not more than 610 mm o.c. • with or without absorptive material in cavity • steel furring channels spaced 406 mm or 610 mm o.c. • 1 layer of gypsum board on ceiling side			
	F41a	F41 with • no absorptive material in cavity • steel furring channels spaced 406 mm o.c. • 15.9 mm Type X gypsum board	—	34	27
	F41b	F41 with • no absorptive material in cavity • steel furring channels spaced 610 mm o.c • 15.9 mm Type X gypsum board	—	37	30
	F41c	F41 with • absorptive material in cavity • steel furring channels spaced 406 mm o.c. • 15.9 mm Type X gypsum board	30 min [45 min][24]	37	30
	F41d	F41 with • absorptive material in cavity • steel furring channels spaced 610 mm o.c. • 15.9 mm Type X gypsum board	30 min	40	33
	F41e	F41 with • no absorptive material in cavity • steel furring channels spaced 406 mm o.c. • 12.7 mm Type X gypsum board	—	33	26
	F41f	F41 with • no absorptive material in cavity • steel furring channels spaced 610 mm o.c. • 12.7 mm Type X gypsum board	—	35	29
	F41g	F41 with • absorptive material in cavity • steel furring channels spaced 406 mm o.c. • 12.7 mm Type X gypsum board	30 min [45 min][24]	36	29
	F41h	F41 with • absorptive material in cavity • steel furring channels spaced 610 mm o.c. • 12.7 mm Type X gypsum board	30 min	38	32
Column 1	2	3	4	5	6

Table 2 (Cont'd)
Fire and Sound Resistance of Floors, Ceilings and Roofs[1]

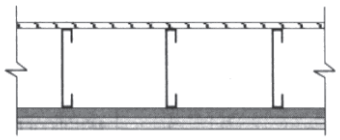
Type of Assembly	Assembly Number	Description[2][3][4]	Fire-Resistance Rating[5][6][7][8]	Typical Sound Transmission Class[5][6][9][10] (STC)	Typical Impact Insulation Class[5][9][11] (IIC)
Floors and Ceilings					
Cold Formed Steel Floor Joists[26]	F41i	F41 with • no absorptive material in cavity • steel furring channels spaced 406 mm o.c. • 12.7 mm regular gypsum board	< 30 min	32	25
	F41j	F41 with • no absorptive material in cavity • steel furring channels spaced 610 mm o.c. • 12.7 mm regular gypsum board	< 30 min	35	28
	F41k	F41 with • absorptive material in cavity • steel furring channels spaced 406 mm o.c. • 12.7 mm regular gypsum board	< 30 min	35	28
	F41l	F41 with • absorptive material in cavity • steel furring channels spaced 610 mm o.c. • 12.7 mm regular gypsum board	< 30 min	38	31
	F42	• subfloor of 15.5 mm plywood, OSB or waferboard, or 17 mm tongue and groove lumber • on steel joists spaced not more than 610 mm o.c. • with or without absorptive material in cavity • steel furring channels spaced 406 mm or 610 mm o.c. • 2 layers of gypsum board on ceiling side			
	F42a	F42 with • no absorptive material in cavity • steel furring channels spaced 406 mm o.c. • 15.9 mm Type X gypsum board	1 h	39	32
	F42b	F42 with • steel joists spaced 406 mm o.c. • no absorptive material in cavity • steel furring channels spaced 610 mm o.c • 15.9 mm Type X gypsum board	45 min	42	34
	F42c	F42 with • steel joists spaced 610 mm o.c. • no absorptive material in cavity • steel furring channels spaced 610 mm o.c. • 15.9 mm Type X gypsum board	45 min	43	34
	F42d	F42 with • absorptive material in cavity • steel furring channels spaced 406 mm o.c. • 15.9 mm Type X gypsum board	1 h	42	35
Column 1	2	3	4	5	6

Table 2 (Cont'd)
Fire and Sound Resistance of Floors, Ceilings and Roofs[1]

Type of Assembly	Assembly Number	Description[2][3][4]	Fire-Resistance Rating[5][6][7][8]	Typical Sound Transmission Class[5][6][9][10] (STC)	Typical Impact Insulation Class[5][9][11] (IIC)
Floors and Ceilings					
Cold Formed Steel Floor Joists[26]	F42e	F42 with • steel joists spaced 406 mm o.c. • absorptive material in cavity • steel furring channels spaced 610 mm o.c. • 15.9 mm Type X gypsum board	45 min [1 h][27]	45	37
	F42f	F42 with • steel joists spaced 610 mm o.c. • absorptive material in cavity • steel furring channels spaced 610 mm o.c. • 15.9 mm Type X gypsum board	45 min [1 h][14]	46	37
	F42g	F42 with • no absorptive material in cavity • steel furring channels spaced 406 mm o.c. • 12.7 mm Type X gypsum board	1 h	38	30
	F42h	F42 with • steel joists spaced 406 mm o.c. • no absorptive material in cavity • steel furring channels spaced 610 mm o.c. • 12.7 mm Type X gypsum board	45 min	40	33
	F42i	F42 with • steel joists spaced 610 mm o.c. • no absorptive material in cavity • steel furring channels spaced 610 mm o.c. • 12.7 mm Type X gypsum board	45 min	41	33
	F42j	F42 with • absorptive material in cavity • steel furring channels spaced 406 mm o.c. • 12.7 mm Type X gypsum board	1 h	41	33
	F42k	F42 with • steel joists spaced 406 mm o.c. • absorptive material in cavity • steel furring channels spaced 610 mm o.c. • 12.7 mm Type X gypsum board	45 min [1 h][27]	43	36
	F42l	F42 with • steel joists spaced 610 mm o.c. • absorptive material in cavity • steel furring channels spaced 610 mm o.c. • 12.7 mm Type X gypsum board	45 min [1 h][14]	44	36
	F42m	F42 with • no absorptive material in cavity • steel furring channels spaced 406 mm o.c. • 12.7 mm regular gypsum board	—	37	30
Column 1	2	3	4	5	6

Table 2 (Cont'd)
Fire and Sound Resistance of Floors, Ceilings and Roofs[1]

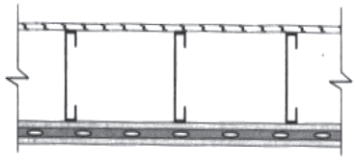
Type of Assembly	Assembly Number	Description[2][3][4]	Fire-Resistance Rating[5][6][7][8]	Typical Sound Transmission Class[5][6][9][10] (STC)	Typical Impact Insulation Class[5][9][11] (IIC)
Floors and Ceilings					
Cold Formed Steel Floor Joists[26]	F42n	F42 with • no absorptive material in cavity • steel furring channels spaced 610 mm o.c. • 12.7 mm regular gypsum board	—	39	33
	F42o	F42 with • absorptive material in cavity • steel furring channels spaced 406 mm o.c. • 12.7 mm regular gypsum board	—	40	33
	F42p	F42 with • absorptive material in cavity • steel furring channels spaced 610 mm o.c. • 12.7 mm regular gypsum board	—	42	36
	F43	• subfloor of 15.5 mm plywood, OSB or waferboard, or 17 mm tongue and groove lumber • on steel joists spaced not more than 610 mm o.c. • with or without absorptive material in cavity • 1 layer of gypsum board attached directly to joists on ceiling side • resilient metal channels spaced 406 mm or 610 mm o.c. attached to joists through the gypsum board • 1 layer of gypsum board attached to resilient metal channels			
	F43a	F43 with • no absorptive material in cavity • 15.9 mm Type X gypsum board • resilient metal channels • 15.9 mm Type X gypsum board	1 h	35	37
	F43b	F43 with • absorptive material in cavity • 15.9 mm Type X gypsum board • resilient metal channels • 15.9 mm Type X gypsum board	1 h	37	30
	F43c	F43 with • no absorptive material in cavity • 12.7 mm Type X gypsum board • resilient metal channels • 12.7 mm Type X gypsum board	1 h	35	27
Column 1	2	3	4	5	6

Table 2 (Cont'd)
Fire and Sound Resistance of Floors, Ceilings and Roofs[1]

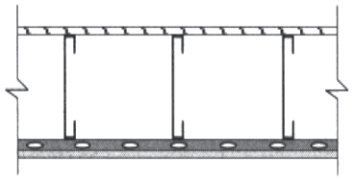
Type of Assembly	Assembly Number	Description[2][3][4]	Fire-Resistance Rating[5][6][7][8]	Typical Sound Transmission Class[5][6][9][10] (STC)	Typical Impact Insulation Class[5][9][11] (IIC)
Floors and Ceilings					
Cold Formed Steel Floor Joists[26]	F43d	F43 with • absorptive material in cavity • 12.7 mm Type X gypsum board • resilient metal channels • 12.7 mm Type X gypsum board	1 h	37	30
	F43e	F43 with • no absorptive material in cavity • 12.7 mm regular gypsum board • resilient metal channels • 12.7 mm regular gypsum board	—	32	26
	F43f	F43 with • absorptive material in cavity • 12.7 mm regular gypsum board • resilient metal channels • 12.7 mm regular gypsum board	—	35	28
	F44	• subfloor of 15.5 mm plywood, OSB or waferboard, or 17 mm tongue and groove lumber • on steel joists spaced not more than 610 mm o.c. • with or without absorptive material in cavity • resilient metal channels spaced 406 mm or 610 mm o.c. • 1 layer of gypsum board on ceiling side			
	F44a	F44 with • no absorptive material in cavity • resilient metal channels spaced 406 mm o.c. • 15.9 mm Type X gypsum board	—	40	33
	F44b	F44 with • no absorptive material in cavity • resilient metal channels spaced 610 mm o.c. • 15.9 mm Type X gypsum board	—	43	36
	F44c	F44 with • absorptive material in cavity • resilient metal channels spaced 406 mm o.c. • 15.9 mm Type X gypsum board	30 min [45 min][24]	47	41
	F44d	F44 with • absorptive material in cavity • resilient metal channels spaced 610 mm o.c. • 15.9 mm Type X gypsum board	30 min	50	44
Column 1	2	3	4	5	6

Table 2 (Cont'd)
Fire and Sound Resistance of Floors, Ceilings and Roofs[1]

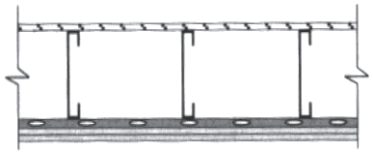
Type of Assembly	Assembly Number	Description[2][3][4]	Fire-Resistance Rating[5][6][7][8]	Typical Sound Transmission Class[5][6][9][10] (STC)	Typical Impact Insulation Class[5][9][11] (IIC)
Floors and Ceilings					
Cold Formed Steel Floor Joists[26]	F44e	F44 with • no absorptive material in cavity • resilient metal channels spaced 406 mm o.c. • 12.7 mm Type X gypsum board	—	39	32
	F44f	F44 with • no absorptive material in cavity • resilient metal channels spaced 610 mm o.c. • 12.7 mm Type X gypsum board	—	41	35
	F44g	F44 with • absorptive material in cavity • resilient metal channels spaced 406 mm o.c. • 12.7 mm Type X gypsum board	30 min [45 min][24]	46	40
	F44h	F44 with • absorptive material in cavity • resilient metal channels spaced 610 mm o.c. • 12.7 mm Type X gypsum board	30 min	48	43
	F44i	F44 with • no absorptive material in cavity • resilient metal channels spaced 406 mm o.c. • 12.7 regular gypsum board	< 30 min	38	31
	F44j	F44 with • no absorptive material in cavity • resilient metal channels spaced 610 mm o.c. • 12.7 regular gypsum board	< 30 min	41	34
	F44k	F44 with • absorptive material in cavity • resilient metal channels spaced 406 mm o.c. • 12.7 regular gypsum board	< 30 min	45	39
	F44l	F44 with • absorptive material in cavity • resilient metal channels spaced 610 mm o.c. • 12.7 regular gypsum board	< 30 min	48	42
	F45	• subfloor of 15.5 mm plywood, OSB or waferboard, or 17 mm tongue and groove lumber • on steel joists spaced not more than 610 mm o.c. • with or without absorptive material in cavity • resilient metal channels spaced 406 mm or 610 mm o.c. • 2 layers of gypsum board on ceiling side			
Column 1	2	3	4	5	6

Table 2 (Cont'd)
Fire and Sound Resistance of Floors, Ceilings and Roofs[1]

Type of Assembly	Assembly Number	Description[2][3][4]	Fire-Resistance Rating[5][6][7][8]	Typical Sound Transmission Class[5][6][9][10] (STC)	Typical Impact Insulation Class[5][9][11] (IIC)
Floors and Ceilings					
Cold Formed Steel Floor Joists[26]	F45a	F45 with • no absorptive material in cavity • resilient metal channels spaced 406 mm o.c. • 15.9 mm Type X gypsum board	1 h	45	38
	F45b	F45 with • steel joists spaced 406 mm • no absorptive material in cavity • resilient metal channels spaced 610 mm o.c. • 15.9 mm Type X gypsum board	45 min	48	40
	F45c	F45 with • steel joists spaced 610 mm • no absorptive material in cavity • resilient metal channels spaced 610 mm o.c. • 15.9 mm Type X gypsum board	45 min	49	40
	F45d	F45 with • absorptive material in cavity • resilient metal channels spaced 406 mm o.c. • 15.9 mm Type X gypsum board	1 h	52	46
	F45e	F45 with • steel joists spaced 406 mm • absorptive material in cavity • resilient metal channels spaced 610 mm o.c. • 15.9 mm Type X gypsum board	45 min [1 h][27]	55	48
	F45f	F45 with • steel joists spaced 610 mm • absorptive material in cavity • resilient metal channels spaced 610 mm o.c. • 15.9 mm Type X gypsum board	45 min [1 h][14]	56	48
	F45g	F45 with • no absorptive material in cavity • resilient metal channels spaced 406 mm o.c. • 12.7 mm Type X gypsum board	1 h	44	36
	F45h	F45 with • steel joists spaced 406 mm • no absorptive material in cavity • resilient metal channels spaced 610 mm o.c. • 12.7 mm Type X gypsum board	45 min	46	39
Column 1	2	3	4	5	6

Table 2 (Cont'd)
Fire and Sound Resistance of Floors, Ceilings and Roofs[1]

Type of Assembly	Assembly Number	Description[2][3][4]	Fire-Resistance Rating[5][6][7][8]	Typical Sound Transmission Class[5][6][9][10] (STC)	Typical Impact Insulation Class[5][9][11] (IIC)
Floors and Ceilings					
Cold Formed Steel Floor Joists[26]	F45i	F45 with • steel joists spaced 610 mm • no absorptive material in cavity • resilient metal channels spaced 610 mm o.c. • 12.7 mm Type X gypsum board	45 min	47	39
	F45j	F45 with • absorptive material in cavity • resilient metal channels spaced 406 mm o.c. • 12.7 mm Type X gypsum board	1 h	51	44
	F45k	F45 with • steel joists spaced 406 mm o.c. • absorptive material in cavity • resilient metal channels spaced 610 mm o.c. • 12.7 mm Type X gypsum board	45 min [1 h][27]	53	47
	F45l	F45 with • steel joists spaced 610 mm • absorptive material in cavity • resilient metal channels spaced 610 mm o.c. • 12.7 mm Type X gypsum board	45 min [1 h][14]	54	47
	F45m	F45 with • no absorptive material in cavity • resilient metal channels spaced 406 mm o.c. • 12.7 mm regular gypsum board	—	43	36
	F45n	F45 with • no absorptive material in cavity • resilient metal channels spaced 610 mm o.c. • 12.7 mm regular gypsum board	—	45	39
	F45o	F45 with • absorptive material in cavity • resilient metal channels spaced 406 mm o.c. • 12.7 mm regular gypsum board	—	50	44
	F45p	F45 with • absorptive material in cavity • resilient metal channels spaced 610 mm o.c. • 12.7 mm regular gypsum board	—	52	47
Column 1	2	3	4	5	6

Table 2 (Cont'd)
Fire and Sound Resistance of Floors, Ceilings and Roofs[1]

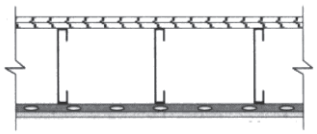
Type of Assembly	Assembly Number	Description[2][3][4]	Fire-Resistance Rating[5][6][7][8]	Typical Sound Transmission Class[5][6][9][10] (STC)	Typical Impact Insulation Class[5][9][11] (IIC)
Floors and Ceilings					
Cold Formed Steel Floor Joists[26]	**F46**	• one subfloor layer of 11 mm sanded plywood, or OSB or waferboard • one subfloor layer of 15.5 mm plywood, OSB or waferboard, or 17 mm tongue and groove lumber • on steel joists spaced not more than 610 mm o.c. • with or without absorptive material in cavity • resilient metal channels spaced 406 mm or 610 mm o.c. • 1 layer of gypsum board on ceiling side			
	F46a	F46 with • no absorptive material in cavity • resilient metal channels spaced 406 mm o.c. • 15.9 mm Type X gypsum board	—	43	34
	F46b	F46 with • no absorptive material in cavity • resilient metal channels spaced 610 mm o.c. • 15.9 mm Type X gypsum board	—	46	37
	F46c	F46 with • absorptive material in cavity • resilient metal channels spaced 406 mm o.c. • 15.9 mm Type X gypsum board	—	50	42
	F46d	F46 with • absorptive material in cavity • resilient metal channels spaced 610 mm o.c. • 15.9 mm Type X gypsum board	—	53	45
	F46e	F46 with • no absorptive material in cavity • resilient metal channels spaced 406 mm o.c. • 12.7 mm Type X gypsum board	—	42	33
	F46f	F46 with • no absorptive material in cavity • resilient metal channels spaced 610 mm o.c. • 12.7 mm Type X gypsum board	—	44	36
	F46g	F46 with • absorptive material in cavity • resilient metal channels spaced 406 mm o.c. • 12.7 mm Type X gypsum board	—	49	41
	F46h	F46 with • absorptive material in cavity • resilient metal channels spaced 610 mm o.c. • 12.7 mm Type X gypsum board	—	51	44
Column 1	2	3	4	5	6

Table 2 (Cont'd)
Fire and Sound Resistance of Floors, Ceilings and Roofs[1]

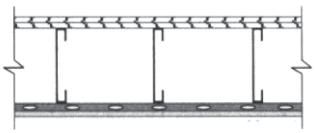
Type of Assembly	Assembly Number	Description[2][3][4]	Fire-Resistance Rating[5][6][7][8]	Typical Sound Transmission Class[5][6][9][10] (STC)	Typical Impact Insulation Class[5][9][11] (IIC)
Floors and Ceilings					
Cold Formed Steel Floor Joists[26]	F46i	F46 with • no absorptive material in cavity • resilient metal channels spaced 406 mm o.c. • 12.7 mm regular gypsum board	—	41	33
	F46j	F46 with • no absorptive material in cavity • resilient metal channels spaced 610 mm o.c. • 12.7 mm regular gypsum board	—	44	36
	F46k	F46 with • absorptive material in cavity • resilient metal channels spaced 406 mm o.c. • 12.7 mm regular gypsum board	—	48	41
	F46l	F46 with • absorptive material in cavity • resilient metal channels spaced 610 mm o.c. • 12.7 mm regular gypsum board	—	51	44
	F47	• one subfloor layer of 15.5 mm plywood or OSB or waferboard • one subfloor layer of 15.5 mm plywood, OSB or waferboard, or 17 mm tongue and groove lumber • on steel joists spaced not more than 406 mm o.c. • with or without absorptive material in cavity • resilient metal channels spaced 406 mm or 610 mm o.c. • 1 layer of gypsum board on ceiling side			
	F47a	F47 with • no absorptive material in cavity • resilient metal channels spaced 406 mm o.c. • 15.9 mm Type X gypsum board	30 min	45	35
	F47b	F47 with • no absorptive material in cavity • resilient metal channels spaced 610 mm o.c. • 15.9 mm Type X gypsum board	30 min	47	38
	F47c	F47 with • absorptive material in cavity • resilient metal channels spaced 406 mm o.c. • 15.9 mm Type X gypsum board	30 min [45 min][17] [1 h][27]	51	45
	F47d	F47 with • absorptive material in cavity • resilient metal channels spaced 610 mm o.c. • 15.9 mm Type X gypsum board	[30 min][17] [45 min][27]	53	47
Column 1	2	3	4	5	6

Table 2 (Cont'd)
Fire and Sound Resistance of Floors, Ceilings and Roofs[1]

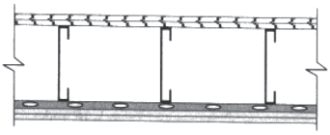
Type of Assembly	Assembly Number	Description[2][3][4]	Fire-Resistance Rating[5][6][7][8]	Typical Sound Transmission Class[5][6][9][10] (STC)	Typical Impact Insulation Class[5][9][11] (IIC)
Floors and Ceilings					
Cold Formed Steel Floor Joists[26]	F47e	F47 with • no absorptive material in cavity • resilient metal channels spaced 406 mm o.c. • 12.7 mm Type X gypsum board	30 min	43	44
	F47f	F47 with • no absorptive material in cavity • resilient metal channels spaced 610 mm o.c. • 12.7 mm Type X gypsum board	—	45	47
	F47g	F47 with • absorptive material in cavity • resilient metal channels spaced 406 mm o.c. • 12.7 mm Type X gypsum board	[30 min][17] [45 min][27]	50	43
	F47h	F47 with • absorptive material in cavity • resilient metal channels spaced 610 mm o.c. • 12.7 mm Type X gypsum board	—	52	46
	F48	• one subfloor layer of 11 mm sanded plywood, or OSB or waferboard • one subfloor layer of 15.5 mm plywood, OSB or waferboard, or 17 mm tongue and groove lumber • on steel joists spaced not more than 610 mm o.c. • with or without absorptive material in cavity • resilient metal channels spaced 406 mm or 610 mm o.c. • 2 layers of gypsum board on ceiling side			
	F48a	F48 with • no absorptive material in cavity • resilient metal channels spaced 406 mm o.c. • 15.9 mm Type X gypsum board	1 h	48	39
	F48b	F48 with • no absorptive material in cavity • resilient metal channels spaced 610 mm o.c. • 15.9 mm Type X gypsum board	1 h	50	42
	F48c	F48 with • absorptive material in cavity • resilient metal channels spaced 406 mm o.c. • 15.9 mm Type X gypsum board	1 h	56	47
	F48d	F48 with • absorptive material in cavity • resilient metal channels spaced 610 mm o.c. • 15.9 mm Type X gypsum board	1 h	57	50
Column 1	2	3	4	5	6

Table 2 (Cont'd)
Fire and Sound Resistance of Floors, Ceilings and Roofs[1]

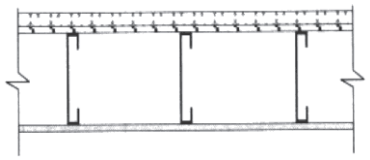
Type of Assembly	Assembly Number	Description[2][3][4]	Fire-Resistance Rating[5][6][7][8]	Typical Sound Transmission Class[5][6][9][10] (STC)	Typical Impact Insulation Class[5][9][11] (IIC)
Floors and Ceilings					
Cold Formed Steel Floor Joists[26]	F48e	F48 with • no absorptive material in cavity • resilient metal channels spaced 406 mm o.c. • 12.7 mm Type X gypsum board	1 h	47	38
	F48f	F48 with • no absorptive material in cavity • resilient metal channels spaced 610 mm o.c. • 12.7 mm Type X gypsum board	—	49	40
	F48g	F48 with • absorptive material in cavity • resilient metal channels spaced 406 mm o.c. • 12.7 mm Type X gypsum board	1 h	54	46
	F48h	F48 with • absorptive material in cavity • resilient metal channels spaced 610 mm o.c. • 12.7 mm Type X gypsum board	—	56	48
	F48i	F48 with • no absorptive material in cavity • resilient metal channels spaced 406 mm o.c. • 12.7 mm regular gypsum board	—	46	37
	F48j	F48 with • no absorptive material in cavity • resilient metal channels spaced 610 mm o.c. • 12.7 mm regular gypsum board	—	48	40
	F48k	F48 with • absorptive material in cavity • resilient metal channels spaced 406 mm o.c. • 12.7 mm regular gypsum board	—	53	45
	F48l	F48 with • absorptive material in cavity • resilient metal channels spaced 610 mm o.c. • 12.7 mm regular gypsum board	—	55	48
	F49	• 25 mm gypsum-concrete topping (at least 44 kg/m^2) • subfloor of 15.5 mm plywood, OSB or waferboard, or 17 mm tongue and groove lumber • on steel joists spaced not more than 610 mm o.c. • with or without absorptive material in cavity • 1 layer of gypsum board on ceiling side			
Column 1	2	3	4	5	6

Table 2 (Cont'd)
Fire and Sound Resistance of Floors, Ceilings and Roofs[1]

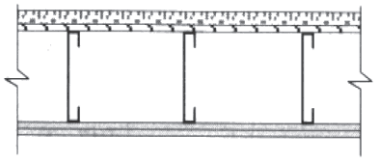
Type of Assembly	Assembly Number	Description[2][3][4]	Fire-Resistance Rating[5][6][7][8]	Typical Sound Transmission Class[5][6][9][10] (STC)	Typical Impact Insulation Class[5][9][11] (IIC)
Floors and Ceilings					
Cold Formed Steel Floor Joists[26]	F49a	F49 with • no absorptive material in cavity • 15.9 mm Type X gypsum board	—	40	13
	F49b	F49 with • absorptive material in cavity • 15.9 mm Type X gypsum board	—	42	16
	F49c	F49 with • no absorptive material in cavity • 12.7 mm Type X gypsum board	—	39	12
	F49d	F49 with • absorptive material in cavity • 12.7 mm Type X gypsum board	—	41	15
	F49e	F49 with • no absorptive material in cavity • 12.7 mm regular gypsum board	—	38	12
	F49f	F49 with • absorptive material in cavity • 12.7 mm regular gypsum board	—	40	15
	F50	• 25 mm gypsum-concrete topping (at least 44 kg/m^2) • subfloor of 15.5 mm plywood, OSB or waferboard, or 17 mm tongue and groove lumber • on steel joists spaced not more than 610 mm o.c. • with or without absorptive material in cavity • 2 layers of gypsum board on ceiling side			
	F50a	F50 with • no absorptive material in cavity • 15.9 mm Type X gypsum board	—	45	16
	F50b	F50 with • absorptive material in cavity • 15.9 mm Type X gypsum board	—	47	19
	F50c	F50 with • no absorptive material in cavity • 12.7 mm Type X gypsum board	—	44	15
	F50d	F50 with • absorptive material in cavity • 12.7 mm Type X gypsum board	—	46	18
Column 1	2	3	4	5	6

Table 2 (Cont'd)
Fire and Sound Resistance of Floors, Ceilings and Roofs[1]

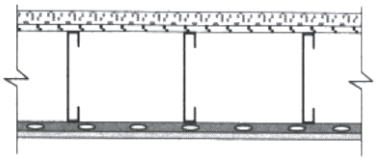
Type of Assembly	Assembly Number	Description[2][3][4]	Fire-Resistance Rating[5][6][7][8]	Typical Sound Transmission Class[5][6][9][10] (STC)	Typical Impact Insulation Class[5][9][11] (IIC)
Floors and Ceilings					
Cold Formed Steel Floor Joists[26]	F50e	F50 with • no absorptive material in cavity • 12.7 mm regular gypsum board	—	43	14
	F50f	F50 with • absorptive material in cavity • 12.7 mm regular gypsum board	—	45	17
	F51	• 25 mm gypsum-concrete topping (at least 44 kg/m^2) • subfloor of 15.5 mm plywood, OSB or waferboard, or 17 mm tongue and groove lumber • on steel joists spaced not more than 610 mm o.c. • with or without absorptive material in cavity • resilient metal channels spaced 406 mm or 610 mm o.c. • 1 layer of gypsum board on ceiling side			
	F51a	F51 with • no absorptive material in cavity • resilient metal channels spaced 406 mm o.c. • 15.9 mm Type X gypsum board	—	52	22
	F51b	F51 with • no absorptive material in cavity • resilient metal channels spaced 610 mm o.c. • 15.9 mm Type X gypsum board	—	54	22
	F51c	F51 with • absorptive material in cavity • resilient metal channels spaced 406 mm o.c. • 15.9 mm Type X gypsum board	—	59	30
	F51d	F51 with • absorptive material in cavity • resilient metal channels spaced 610 mm o.c. • 15.9 mm Type X gypsum board	—	61	30
	F51e	F51 with • no absorptive material in cavity • resilient metal channels spaced 406 mm o.c. • 12.7 mm Type X gypsum board	—	51	21
	F51f	F51 with • no absorptive material in cavity • resilient metal channels spaced 610 mm o.c. • 12.7 mm Type X gypsum board	—	53	21
Column 1	2	3	4	5	6

Table 2 (Cont'd)
Fire and Sound Resistance of Floors, Ceilings and Roofs[1]

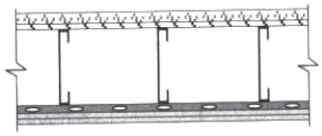
Type of Assembly	Assembly Number	Description[2][3][4]	Fire-Resistance Rating[5][6][7][8]	Typical Sound Transmission Class[5][6][9][10] (STC)	Typical Impact Insulation Class[5][9][11] (IIC)
Floors and Ceilings					
Cold Formed Steel Floor Joists[26]	F51g	F51 with • absorptive material in cavity • resilient metal channels spaced 406 mm o.c. • 12.7 mm Type X gypsum board	—	58	29
	F51h	F51 with • absorptive material in cavity • resilient metal channels spaced 610 mm o.c. • 12.7 mm Type X gypsum board	—	60	29
	F51i	F51 with • no absorptive material in cavity • resilient metal channels spaced 406 mm o.c. • 12.7 mm regular gypsum board	—	50	21
	F51j	F51 with • no absorptive material in cavity • resilient metal channels spaced 610 mm o.c. • 12.7 mm regular gypsum board	—	52	21
	F51k	F51 with • absorptive material in cavity • resilient metal channels spaced 406 mm o.c. • 12.7 mm regular gypsum board	—	57	29
	F51l	F51 with • absorptive material in cavity • resilient metal channels spaced 610 mm o.c. • 12.7 mm regular gypsum board	—	59	29
	F52	• 25 mm gypsum-concrete topping (at least 44 kg/m^2) • subfloor of 15.5 mm plywood, OSB or waferboard, or 17 mm tongue and groove lumber • on steel joists spaced not more than 610 mm o.c. • with or without absorptive material in cavity • resilient metal channels spaced 406 mm or 610 mm o.c. • 2 layers of gypsum board on ceiling side			
	F52a	F52 with • no absorptive material in cavity • resilient metal channels spaced 406 mm o.c. • 15.9 mm Type X gypsum board	1 h	57	25
	F52b	F52 with • no absorptive material in cavity • resilient metal channels spaced 610 mm o.c. • 15.9 mm Type X gypsum board	1 h	59	25
Column 1	2	3	4	5	6

Table 2 (Cont'd)
Fire and Sound Resistance of Floors, Ceilings and Roofs[1]

Type of Assembly	Assembly Number	Description[2][3][4]	Fire-Resistance Rating[5][6][7][8]	Typical Sound Transmission Class[5][6][9][10] (STC)	Typical Impact Insulation Class[5][9][11] (IIC)
Floors and Ceilings					
Cold Formed Steel Floor Joists[25]	F52c	F52 with • absorptive material in cavity • resilient metal channels spaced 406 mm o.c. • 15.9 mm Type X gypsum board	1 h	64	33
	F52d	F52 with • absorptive material in cavity • resilient metal channels spaced 610 mm o.c. • 15.9 mm Type X gypsum board	45 min [1 h][24]	66	33
	F52e	F52 with • no absorptive material in cavity • resilient metal channels spaced 406 mm o.c. • 12.7 mm Type X gypsum board	1 h	55	24
	F52f	F52 with • no absorptive material in cavity • resilient metal channels spaced 610 mm o.c. • 12.7 mm Type X gypsum board	1 h	58	24
	F52g	F52 with • absorptive material in cavity • resilient metal channels spaced 406 mm o.c. • 12.7 mm Type X gypsum board	1 h	62	32
	F52h	F52 with • absorptive material in cavity • resilient metal channels spaced 610 mm o.c. • 12.7 mm Type X gypsum board	45 min [1 h][24]	65	32
	F52i	F52 with • no absorptive material in cavity • resilient metal channels spaced 406 mm o.c. • 12.7 mm regular gypsum board	—	55	23
	F52j	F52 with • no absorptive material in cavity • resilient metal channels spaced 610 mm o.c. • 12.7 mm regular gypsum board	—	57	23
	F52k	F52 with • absorptive material in cavity • resilient metal channels spaced 406 mm o.c. • 12.7 mm regular gypsum board	—	62	31
	F52l	F52 with • absorptive material in cavity • resilient metal channels spaced 610 mm o.c. • 12.7 mm regular gypsum board	—	64	31
Column 1	2	3	4	5	6

Table 2 (Cont'd)
Fire and Sound Resistance of Floors, Ceilings and Roofs[1]

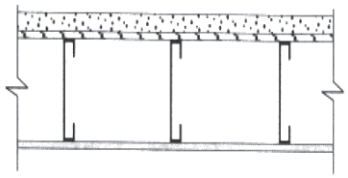
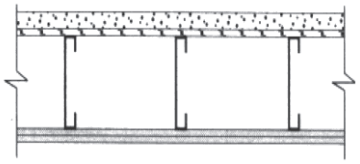
Type of Assembly	Assembly Number	Description[2][3][4]	Fire-Resistance Rating[5][6][7][8]	Typical Sound Transmission Class[5][6][9][10] (STC)	Typical Impact Insulation Class[5][9][11] (IIC)
Floors and Ceilings					
Cold Formed Steel Floor Joists[26]	**F53**	• 38 mm concrete topping (at least 70 kg/m^2) • subfloor of 12.5 mm plywood, OSB or waferboard, or 17 mm tongue and groove lumber • on steel joists spaced not more than 610 mm o.c. • 1 layer of gypsum board on ceiling side			
	F53a	F53 with • no absorptive material in cavity • 15.9 mm Type X gypsum board	—	44	22
	F53b	F53 with • absorptive material in cavity • 15.9 mm Type X gypsum board	—	46	25
	F53c	F53 with • no absorptive material in cavity • 12.7 mm Type X gypsum board	—	42	21
	F53d	F53 with • absorptive material in cavity • 12.7 mm Type X gypsum board	—	44	24
	F53e	F53 with • no absorptive material in cavity • 12.7 mm regular gypsum board	—	42	21
	F53f	F53 with • absorptive material in cavity • 12.7 mm regular gypsum board	—	44	24
	F54	• 38 mm concrete topping (at least 70 kg/m^2) • subfloor of 15.5 mm plywood, OSB or waferboard, or 17 mm tongue and groove lumber • on steel joists spaced not more than 610 mm o.c. • 2 layers of gypsum board on ceiling side			
	F54a	F54 with • no absorptive material in cavity • 15.9 mm Type X gypsum board	—	48	24
	F54b	F54 with • absorptive material in cavity • 15.9 mm Type X gypsum board	—	50	27
Column 1	2	3	4	5	6

Table 2 (Cont'd)
Fire and Sound Resistance of Floors, Ceilings and Roofs[1]

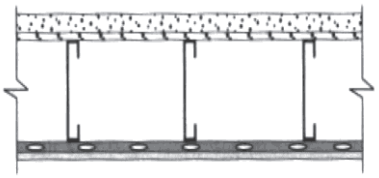
Type of Assembly	Assembly Number	Description[2][3][4]	Fire-Resistance Rating[5][6][7][8]	Typical Sound Transmission Class[5][6][9][10] (STC)	Typical Impact Insulation Class[5][9][11] (IIC)
Floors and Ceilings					
Cold Formed Steel Floor Joists[26]	F54c	F54 with • no absorptive material in cavity • 12.7 mm Type X gypsum board	—	47	23
	F54d	F54 with • absorptive material in cavity • 12.7 mm Type X gypsum board	—	49	26
	F54e	F54 with • no absorptive material in cavity • 12.7 mm regular gypsum board	—	47	23
	F54f	F54 with • absorptive material in cavity • 12.7 mm regular gypsum board	—	49	26
	F55	• 38 mm concrete topping (at least 70 kg/m^2) • subfloor of 15.5 mm plywood, OSB or waferboard, or 17 mm tongue and groove lumber • on steel joists spaced not more than 610 mm o.c. • with or without absorptive material in cavity • resilient metal channels spaced 406 mm or 610 mm o.c. • 1 layer of gypsum board on ceiling side			
	F55a	F55 with • no absorptive material in cavity • resilient metal channels spaced 406 mm o.c. • 15.9 mm Type X gypsum board	—	56	31
	F55b	F55 with • no absorptive material in cavity • resilient metal channels spaced 610 mm o.c. • 15.9 mm Type X gypsum board	—	58	31
	F55c	F55 with • absorptive material in cavity • resilient metal channels spaced 406 mm o.c. • 15.9 mm Type X gypsum board	—	63	39
	F55d	F55 with • absorptive material in cavity • resilient metal channels spaced 610 mm o.c. • 15.9 mm Type X gypsum board	—	65	39
	F55e	F55 with • no absorptive material in cavity • resilient metal channels spaced 406 mm o.c. • 12.7 mm Type X gypsum board	—	54	30
	F55f	F55 with • no absorptive material in cavity • resilient metal channels spaced 610 mm o.c. • 12.7 mm Type X gypsum board	—	56	30
Column 1	2	3	4	5	6

Table 2 (Cont'd)
Fire and Sound Resistance of Floors, Ceilings and Roofs[1]

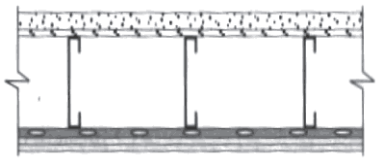
Type of Assembly	Assembly Number	Description[2][3][4]	Fire-Resistance Rating[5][6][7][8]	Typical Sound Transmission Class[5][6][9][10] (STC)	Typical Impact Insulation Class[5][9][11] (IIC)
Floors and Ceilings					
Cold Formed Steel Floor Joists[26]	F55g	F55 with • absorptive material in cavity • resilient metal channels spaced 406 mm o.c. • 12.7 mm Type X gypsum board	—	61	38
	F55h	F55 with • absorptive material in cavity • resilient metal channels spaced 610 mm o.c. • 12.7 mm Type X gypsum board	—	63	38
	F55i	F55 with • no absorptive material in cavity • resilient metal channels spaced 406 mm o.c. • 12.7 mm regular gypsum board	—	54	30
	F55j	F55 with • no absorptive material in cavity • resilient metal channels spaced 610 mm o.c. • 12.7 mm regular gypsum board	—	56	30
	F55k	F55 with • absorptive material in cavity • resilient metal channels spaced 406 mm o.c. • 12.7 mm regular gypsum board	—	61	38
	F55l	F55 with • absorptive material in cavity • resilient metal channels spaced 610 mm o.c. • 12.7 mm regular gypsum board	—	63	38
	F56	• 38 mm concrete topping (at least 70 kg/m^2) • subfloor of 15.5 mm plywood, OSB or waferboard, or 17 mm tongue and groove lumber • on steel joists spaced not more than 610 mm o.c. • with or without absorptive material in cavity • resilient metal channels spaced 406 mm or 610 mm o.c. • 2 layers of gypsum board on ceiling side			
	56a	F56 with • no absorptive material in cavity • resilient metal channels spaced 406 mm o.c. • 15.9 mm Type X gypsum board	1 h	60	33
	56b	F56 with • no absorptive material in cavity • resilient metal channels spaced 610 mm o.c. • 15.9 mm Type X gypsum board	1 h	62	33
Column 1	2	3	4	5	6

Table 2 (Cont'd)
Fire and Sound Resistance of Floors, Ceilings and Roofs[1]

Type of Assembly	Assembly Number	Description[2][3][4]	Fire-Resistance Rating[5][6][7][8]	Typical Sound Transmission Class[5][6][9][10] (STC)	Typical Impact Insulation Class[5][9][11] (IIC)
Floors and Ceilings					
Cold Formed Steel Floor Joists[26]	F56c	F56 with • absorptive material in cavity • resilient metal channels spaced 406 mm o.c. • 15.9 mm Type X gypsum board	1 h	67	41
	F56d	F56 with • absorptive material in cavity • resilient metal channels spaced 610 mm o.c. • 15.9 mm Type X gypsum board	45 min [1 h][24]	69	41
	F56e	F56 with • no absorptive material in cavity • resilient metal channels spaced 406 mm o.c. • 12.7 mm Type X gypsum board	1 h	59	32
	F56f	F56 with • no absorptive material in cavity • resilient metal channels spaced 610 mm o.c. • 12.7 mm Type X gypsum board	1 h	61	32
	F56g	F56 with • absorptive material in cavity • resilient metal channels spaced 406 mm o.c. • 12.7 mm Type X gypsum board	1 h	66	40
	F56h	F56 with • absorptive material in cavity • resilient metal channels spaced 610 mm o.c. • 12.7 mm Type X gypsum board	45 min [1 h][24]	68	40
	F56i	F56 with • no absorptive material in cavity • resilient metal channels spaced 406 mm o.c. • 12.7 mm regular gypsum board	—	58	32
	F56j	F56 with • no absorptive material in cavity • resilient metal channels spaced 610 mm o.c. • 12.7 mm regular gypsum board	—	61	32
	F56k	F56 with • absorptive material in cavity • resilient metal channels spaced 406 mm o.c. • 12.7 mm regular gypsum board	—	65	40
	F56l	F56 with • absorptive material in cavity • resilient metal channels spaced 610 mm o.c. • 12.7 mm regular gypsum board	—	68	40
Column 1	2	3	4	5	6

Table 2 (Cont'd)
Fire and Sound Resistance of Floors, Ceilings and Roofs[1]

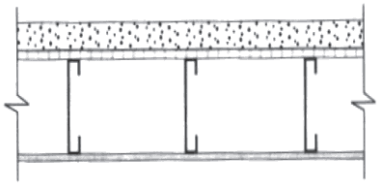
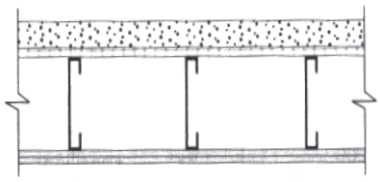
Type of Assembly	Assembly Number	Description[2][3][4]	Fire-Resistance Rating[5][6][7][8]	Typical Sound Transmission Class[5][6][9][10] (STC)	Typical Impact Insulation Class[5][9][11] (IIC)
Floors and Ceilings					
Cold Formed Steel Floor Joists[26]	**F57**	• 50 mm concrete • 0.46 mm metal pan with a 19 mm rib • on steel joists spaced not more than 610 mm o.c. • 1 layer of gypsum board on ceiling side			
	F57a	F57 with • no absorptive material in cavity • 15.9 mm Type X gypsum board	—	45	26
	F57b	F57 with • absorptive material in cavity • 15.9 mm Type X gypsum board	—	47	29
	F57c	F57 with • no absorptive material in cavity • 12.7 mm Type X gypsum board	—	44	25
	F57d	F57 with • absorptive material in cavity • 12.7 mm Type X gypsum board	—	46	28
	F57e	F57 with • no absorptive material in cavity • 12.7 mm regular gypsum board	—	43	25
	F57f	F57 with • absorptive material in cavity • 12.7 mm regular gypsum board	—	45	28
	F58	• 50 mm concrete • 0.38 mm metal pan with a 16 mm rib • on steel joists spaced not more than 610 mm o.c. • 2 layers of gypsum board on ceiling side			
	F58a	F58 with • no absorptive material in cavity • 15.9 mm Type X gypsum board	—	50	27
	F58b	F58 with • absorptive material in cavity • 15.9 mm Type X gypsum board	—	52	30
Column 1	2	3	4	5	6

Table 2 (Cont'd)
Fire and Sound Resistance of Floors, Ceilings and Roofs[1]

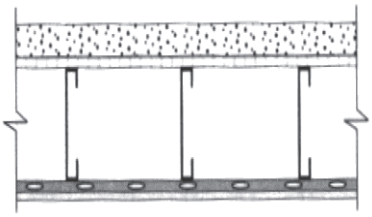
Type of Assembly	Assembly Number	Description[2][3][4]	Fire-Resistance Rating[5][6][7][8]	Typical Sound Transmission Class[5][6][9][10] (STC)	Typical Impact Insulation Class[5][9][11] (IIC)
Floors and Ceilings					
Cold Formed Steel Floor Joists[26]	F58c	F58 with • no absorptive material in cavity • 12.7 mm Type X gypsum board	—	48	27
	F58d	F58 with • absorptive material in cavity • 12.7 mm Type X gypsum board	—	50	30
	F58e	F58 with • no absorptive material in cavity • 12.7 mm regular gypsum board	—	48	27
	F58f	F58 with • absorptive material in cavity • 12.7 mm regular gypsum board	—	50	30
	F59	• 50 mm concrete • 0.38 mm metal pan with a 16 mm rib • on steel joists spaced not more than 610 mm o.c. • with or without absorptive material in cavity • resilient metal channels spaced 406 mm or 610 mm o.c. • 1 layer of gypsum board on ceiling side			
	F59a	F59 with • no absorptive material in cavity • resilient metal channels spaced 406 mm o.c. • 15.9 mm Type X gypsum board	—	57	35
	F59b	F59 with • no absorptive material in cavity • resilient metal channels spaced 610 mm o.c • 15.9 mm Type X gypsum board	—	59	35
	F59c	F59 with • absorptive material in cavity • resilient metal channels spaced 406 mm o.c. • 15.9 mm Type X gypsum board	—	64	43
	F59d	F59 with • absorptive material in cavity • resilient metal channels spaced 610 mm o.c. • 15.9 mm Type X gypsum board	—	66	43
Column 1	2	3	4	5	6

Table 2 (Cont'd)
Fire and Sound Resistance of Floors, Ceilings and Roofs[1]

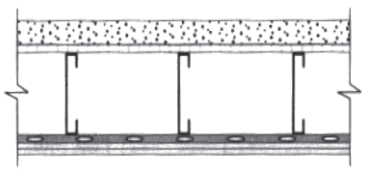
Type of Assembly	Assembly Number	Description[2][3][4]	Fire-Resistance Rating[5][6][7][8]	Typical Sound Transmission Class[5][6][9][10] (STC)	Typical Impact Insulation Class[5][9][11] (IIC)
Floors and Ceilings					
Cold Formed Steel Floor Joists[26]	F59e	F59 with • no absorptive material in cavity • resilient metal channels spaced 406 mm o.c. • 12.7 mm Type X gypsum board	—	56	34
	F59f	F59 with • no absorptive material in cavity • resilient metal channels spaced 610 mm o.c. • 12.7 mm Type X gypsum board	—	56	34
	F59g	F59 with • absorptive material in cavity • resilient metal channels spaced 406 mm o.c. • 12.7 mm Type X gypsum board	—	63	42
	F59h	F59 with • absorptive material in cavity • resilient metal channels spaced 610 mm o.c. • 12.7 mm Type X gypsum board	—	65	42
	F59i	F59 with • no absorptive material in cavity • resilient metal channels spaced 406 mm o.c. • 12.7 mm regular gypsum board	—	55	34
	F59j	F59 with • no absorptive material in cavity • resilient metal channels spaced 610 mm o.c. • 12.7 mm regular gypsum board	—	57	34
	F59k	F59 with • absorptive material in cavity • resilient metal channels spaced 406 mm o.c. • 12.7 mm regular gypsum board	—	62	42
	F59l	F59 with • absorptive material in cavity • resilient metal channels spaced 610 mm o.c. • 12.7 mm regular gypsum board	—	64	42
	F60	• 50 mm concrete • 0.46 mm metal pan with a 19 mm rib • on steel joists spaced not more than 610 mm o.c. • with or without absorptive material in cavity • resilient metal channels spaced 406 mm or 610 mm o.c. • 2 layers of gypsum board on ceiling side			
Column 1	2	3	4	5	6

Table 2 (Cont'd)
Fire and Sound Resistance of Floors, Ceilings and Roofs[1]

Type of Assembly	Assembly Number	Description[2][3][4]	Fire-Resistance Rating[5][6][7][8]	Typical Sound Transmission Class[5][6][9][10] (STC)	Typical Impact Insulation Class[5][9][11] (IIC)
Floors and Ceilings					
Cold Formed Steel Floor Joists[26]	F60a	F60 with • no absorptive material in cavity • resilient metal channels spaced 406 mm o.c. • 15.9 mm Type X gypsum	1 h	62	36
	F60b	F60 with • no absorptive material in cavity • resilient metal channels spaced 610 mm o.c • 15.9 mm Type X gypsum board	1 h	64	36
	F60c	F60 with • absorptive material in cavity • resilient metal channels spaced 406 mm o.c. • 15.9 mm Type X gypsum board	1 h	69	44
	F60d	F60 with • absorptive material in cavity • resilient metal channels spaced 610 mm o.c. • 15.9 mm Type X gypsum board	45 min [1 h][24]	71	44
	F60e	F60 with • no absorptive material in cavity • resilient metal channels spaced 406 mm o.c. • 12.7 mm Type X gypsum board	1 h	60	36
	F60f	F60 with • no absorptive material in cavity • resilient metal channels spaced 610 mm o.c. • 12.7 mm Type X gypsum board	1 h	62	36
	F60g	F60 with • absorptive material in cavity • resilient metal channels spaced 406 mm o.c. • 12.7 mm Type X gypsum board	1 h	67	44
	F60h	F60 with • absorptive material in cavity • resilient metal channels spaced 610 mm o.c. • 12.7 mm Type X gypsum board	45 min [1 h][24]	69	44
	F60i	F60 with • no absorptive material in cavity • resilient metal channels spaced 406 mm o.c. • 12.7 mm regular gypsum board	—	60	36
	F60j	F60 with • no absorptive material in cavity • resilient metal channels spaced 610 mm o.c. • 12.7 mm regular gypsum board	—	62	36
Column 1	2	3	4	5	6

Table 2 (Cont'd)
Fire and Sound Resistance of Floors, Ceilings and Roofs[1]

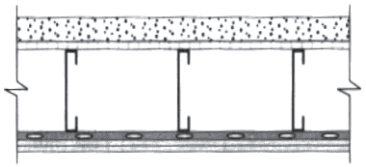
Type of Assembly	Assembly Number	Description[2][3][4]	Fire-Resistance Rating[5][6][7][8]	Typical Sound Transmission Class[5][6][9][10] (STC)	Typical Impact Insulation Class[5][9][11] (IIC)
Floors and Ceilings					
Cold Formed Steel Floor Joists[26]	F60k	F60 with • absorptive material in cavity • resilient metal channels spaced 406 mm o.c. • 12.7 mm regular gypsum board	—	67	44
	F60l	F60 with • absorptive material in cavity • resilient metal channels spaced 610 mm o.c. • 12.7 mm regular gypsum board	—	69	44
	F61	• 50 mm concrete • 0.38 mm metal pan with a 16 mm rib • on steel joists spaced not more than 610 mm o.c. • with or without absorptive material in cavity • resilient metal channels spaced 406 mm or 610 mm o.c. • 2 layers of gypsum board on ceiling side			
	F61a	F61 with • no absorptive material in cavity • resilient metal channels spaced 406 mm o.c. • 15.9 mm Type X gypsum board	1 h	62	32
	F61b	F61 with • steel joists spaced 406 mm o.c. • no absorptive material in cavity • resilient metal channels spaced 610 mm o.c • 15.9 mm Type X gypsum board	1 h	64	32
	F61c	F61 with • steel joists spaced 610 mm o.c. • no absorptive material in cavity • resilient metal channels spaced 610 mm o.c. • 15.9 mm Type X gypsum board	—	65	29
	F61d	F61 with • absorptive material in cavity • resilient metal channels spaced 406 mm o.c. • 15.9 mm Type X gypsum board	1 h	68	37
	F61e	F61 with • steel joists spaced 406 mm o.c. • absorptive material in cavity • resilient metal channels spaced 610 mm o.c. • 15.9 mm Type X gypsum board	1 h	66	34
Column 1	2	3	4	5	6

Table 2 (Cont'd)
Fire and Sound Resistance of Floors, Ceilings and Roofs[1]

Type of Assembly	Assembly Number	Description[2][3][4]	Fire-Resistance Rating[5][6][7][8]	Typical Sound Transmission Class[5][6][9][10] (STC)	Typical Impact Insulation Class[5][9][11] (IIC)
Floors and Ceilings					
Cold Formed Steel Floor Joists[26]	F61f	F61 with • steel joists spaced 610 mm o.c. • absorptive material in cavity • resilient metal channels spaced 610 mm o.c. • 15.9 mm Type X gypsum board	—	71	34
	F61g	F61 with • no absorptive material in cavity • resilient metal channels spaced 406 mm o.c. • 12.7 mm Type X gypsum board	1 h	62	32
	F61h	F61 with • steel joists spaced 406 mm o.c. • no absorptive material in cavity • resilient metal channels spaced 610 mm o.c. • 12.7 mm Type X gypsum board	1 h	64	32
	F61i	F61 with • steel joists spaced 610 mm o.c. • no absorptive material in cavity • resilient metal channels spaced 610 mm o.c. • 12.7 mm Type X gypsum board	—	64	28
	F61j	F61 with • absorptive material in cavity • resilient metal channels spaced 406 mm o.c. • 12.7 mm Type X gypsum board	1 h	68	36
	F61k	F61 with • steel joists spaced 406 mm o.c. • absorptive material in cavity • resilient metal channels spaced 610 mm o.c. • 12.7 mm Type X gypsum board	1 h	64	32
	F61l	F61 with • steel joists spaced 610 mm o.c. • no absorptive material in cavity • resilient metal channels spaced 610 mm o.c. • 12.7 mm Type X gypsum board	—	70	34
Column 1	2	3	4	5	6

Table 2 (Cont'd)
Fire and Sound Resistance of Floors, Ceilings and Roofs[1]

Type of Assembly	Assembly Number	Description[2][3][4]	Fire-Resistance Rating[5][6][7][8]	Typical Sound Transmission Class[5][6][9][10] (STC)	Typical Impact Insulation Class[5][9][11] (IIC)
Roofs					
Wood Roof Trusses	**R1**	• wood roof trusses spaced not more than 610 mm o.c. • 1 layer 15.9 mm Type X gypsum board	45 min	—	—
Roofs - Rating Provided by Membrane Only					
	M1	• supporting members spaced not more than 610 mm o.c. • 1 layer 15.9 mm Type X gypsum board	30 min	—	—
	M2	• supporting members spaced not more than 610 mm o.c. • 2 layers 15.9 mm Type X gypsum board	1 h	—	—
Column 1	2	3	4	5	6

Notes to Table 2:

(1) See Figure 1 for butt joint detail of single layer gypsum board application, Figure 2 for butt joint detail of double layer gypsum board application, Figure 3 for example of steel furring channel and Figure 4 for example of resilient metal channel.

(2) For assemblies with a ceiling consisting of a single layer of gypsum board on resilient metal channels to obtain the listed ratings, the resilient metal channel arrangement at the gypsum board butt end joints should be as shown in Figure 1.

(3) For assemblies with a ceiling consisting of 2 layers of gypsum board on resilient metal channels to obtain the listed ratings, the fastener and resilient metal channel arrangement at the gypsum board butt end joints should be as shown in Figure 2.

(4) The fire-resistance rating and sound transmission class values given are for a minimum thickness of subfloor or deck as shown. Minimum subfloor thickness required is determined by structural member spacing (see Table 9.23.14.5.A. of Division B). Thicker subflooring or decking is also acceptable.

(5) Sound absorptive material includes
   (i) fibre processed from rock, slag or glass, and
   (ii) loose-fill or spray-applied cellulose fibre.

   To obtain the listed sound transmission class rating, the nominal insulation thickness is 150 mm for rock, slag, or glass fibres or loose-fill cellulose fibre, and 90 mm for spray-applied cellulose fibre, unless otherwise specified. Absorptive material will affect the sound transmission class by approximately adding or subtracting 1 per 50 mm change of thickness. However, no additional sound transmission class value is achieved by adding a greater thickness of insulation than the depth of the assembly.

(6) The fire-resistance rating and sound transmission class values are based on the spacing of ceiling supports as noted. [See also Table Note (10)]. A narrower spacing will be detrimental to the sound transmission class rating, but not to the fire-resistance rating.

(7) To obtain the listed rating, the type and spacing of fasteners are as described in and installed in accordance with Subsection 9.29.5. of Division B or CSA A82.31-M1980, “Gypsum Board Application”:
   (i) fastener distance to board edges and butt ends shall be no less than 38 mm, except for fasteners on the butt ends of the base layer in ceilings with two layers (see Figure 2), and
   (ii) fasteners are spaced not more than 305 mm o.c.

(8) See Sentence 1.2.1.(2) in MMAH Supplementary Standard SB-2, “Fire Performance Ratings” for the significance of fire-resistance ratings.

(9) The sound transmission class values given in the Table are for the minimum depth of structural member noted in the description and applicable Table notes. To obtain sound transmission class values for structural members deeper than that minimum, add 1 to the sound transmission class value in the Table for each 170 mm increase in structural member depth.

(10) The sound transmission class values given in the Table are for structural member spacing of 305 mm o.c., unless otherwise noted in the description and applicable Table notes. To obtain sound transmission class values for assemblies with structural members spaced more than 500 mm o.c., add 1 to the sound transmission class value in the Table.

(11) The impact insulation class values given are for floor assemblies tested with no finished flooring.

(12) Wood floor joists are:
- (i) wood joists with a minimum member size of 38 mm (width) x 235 mm (depth), except as otherwise noted [See Table Note (15)], or
- (ii) wood I-joists with a minimum flange size of 38 mm x 38 mm, a minimum OSB or plywood web thickness of 9.5 mm, and a minimum joist depth of 241 mm.

(13) Except where assemblies with wood I-joists are tested according to CAN/ULC-S101-14, "Fire Endurance Tests of Building Construction and Materials”, the fire-resistance rating values apply only to I-joists that have been fabricated with a phenolic-based structural wood adhesive complying with CSA O112.10-08, "Evaluation of Adhesives for Structural Wood Products (Limited Moisture Exposure)”. For I-joists with flanges made of laminated veneer lumber (LVL), the fire-resistance rating values apply only where the adhesive used in the LVL fabrication is a phenolic-based structural wood adhesive complying with CSA O112.9-10, "Evaluation of Adhesives for Structural Wood Products (Exterior Exposure)”.

(14) The fire-resistance rating value within square brackets is achieved only where absorptive material includes spray-applied cellulose fibre with
- (i) adhesive that is capable of providing a minimum cohesive/adhesive bond strength per unit area of 5 times the weight of the material under the test plate when tested in accordance with ASTM E736-00, “Cohesion/Adhesion of Sprayed Fire-Resistive Materials Applied to Structural Members”,
- (ii) a minimum density of 35 kg/m^3, and
- (iii) a minimum thickness of 90 mm on the underside of the subfloor or deck, of 90 mm on the sides of the structural members, and for cold-formed steel joists, of 13 mm on the underside of the bottom flange other than at resilient metal channel locations.

(15) The fire-resistance rating value within square brackets only applies to assemblies with solid wood joists and is achieved only where absorptive material includes:
- (i) fibre processed from rock or slag with a minimum thickness of 90 mm and a minimum surface area mass of 2.8 kg/m^2, or
- (ii) spray-applied cellulose fibre with a minimum density of 50 kg/m^3 and a minimum depth of 90 mm on the underside of the subftoor and of 90 mm on the sides of the floor joists.

(16) The fire-resistance rating, sound transmission class and impact insulation class values given are also applicable to assemblies with 38 mm (width) x 184 mm (depth) solid wood joists.

(17) The fire-resistance rating value within square brackets is achieved only where absorptive material includes:
- (i) fibre processed from rock or slag with a minimum thickness of 90 mm and a minimum surface area mass of 2.8 kg/m^2, or
- (ii) spray-applied cellulose fibre with a minimum density of 50 kg/m^3 and a minimum depth of 90 mm on the underside of the subfioor and of 90 mm on the webs or the sides of the structural members.

(18) The fire-resistance rating, sound transmission class and impact insulation class values within the square brackets only apply to assemblies with solid wood joists and are achieved only where absorptive material includes dry-blown cellulose fibre with a minimum density of 40 kg/m^3 filling the entire cavity; the cellulose fibre is supported on zinc-coated (galvanized) steel poultry fence fabric conforming to ASTM A390-06,” Zinc-Coated (Galvanized) Steel Poultry Fence Fabric (Hexagonal and Straight Line)” which has 25 mm wide hexagonal mesh openings and 0.81 mm thick (20-gauge) wire and is attached to wood joists with metal staples having legs that are 50 mm long.

(19) The fire-resistance rating and sound transmission class values are achieved only where absorptive material includes:
- (i) fibre processed from rock or slag that fills the joist cavity and has a minimum surface area mass of 2.8 kg/m^2, and for structural members at least 270 mm in depth, the fibre includes three layers each of which has a minimum thickness of 90 mm, or
- (ii) dry-blown cellulose fibre with a minimum density of 40 kg/m^3 filling the entire cavity; the cellulose fibre is supported on zinc-coated (galvanized) steel poultry fence fabric conforming to ASTM A390-06," Zinc-Coated (Galvanized) Steel Poultry Fence Fabric (Hexagonal and Straight Line)" which has 25 mm wide hexagonal mesh openings and 0.81 mm thick (20-gauge) wire and is attached to wood joists or wood I-joists with metal staples having legs that are 50 mm or 30 mm long, respectively.

(20) The fire-resistance rating value only applies to assemblies with wood I-joists with flanges with a minimum thickness of 38 mm and a minimum width of 63 mm.

(21) The fire-resistance rating and sound transmission class values are achieved only where absorptive material includes:
- (i) fibre processed from rock or slag that fills the joist cavity and has a minimum surface area mass of 2.8 kg/m^2, and for structural members at least 270 mm in depth, the fibre includes three layers each of which has a minimum thickness of 90 mm, or
- (ii) dry-blown cellulose fibre with a minimum density of 40 kg/m^3 filling the entire cavity; the cellulose fibre is supported on zinc-coated (galvanized) steel poultry fence fabric conforming to ASTM A390-06," Zinc-Coated (Galvanized) Steel Poultry Fence Fabric (Hexagonal and Straight Line)" which has 25 mm wide hexagonal mesh openings and 0.81 mm thick (20-gauge) wire and is attached to wood joists with metal staples having legs that are 50 mm long.

(22) The fire-resistance rating values given only apply to assemblies with solid wood joists spaced not more than 406 mm o.c. No information is available for assemblies constructed with wood I-joists.

(23) Wood floor trusses are:
- (i) metal plate-connected wood trusses with wood framing members not less than 38 mmx 64 mm, metal connector plates not less than 1 mm (nominal) thick with teeth not less than 8 mm long, and a minimum truss depth of 305 mm,
- (ii) metal web wood trusses with wood chords not less than 38 mm x 64 mm, V-shaped webs made from galvanized steel of 1 mm (nominal) thickness with plate areas having teeth not less than 8 mm long, and a minimum truss depth of 286 mm, or
- (iii) fingerjoined wood trusses with glued fingerjoined connections, chord members not less than 38 mm x 64 mm, web members not less than 38 mm x 38 mm and a minimum truss depth of 330 mm, all of which is glued together with an R-14 phenol-resorcinol resin conforming to CSA O112.10-08, "Evaluation of Adhesives for Structural Wood Products (Limited Moisture Exposure)".

(24) The fire-resistance rating value within square brackets is achieved only where absorptive material includes fibre processed from rock or slag with a minimum thickness of 90 mm and a minimum surface area mass of 2.8 kg/m^2.

(25) The fire-resistance rating and sound transmission class values within square brackets are achieved only where absorptive material includes dry-blown cellulose fibre with a minimum density of 40 kg/m^3 filling the entire cavity; the cellulose fibre is supported on zinc-coated (galvanized) steel poultry fence fabric conforming to ASTM A390-06," Zinc-Coated (Galvanized) Steel Poultry Fence Fabric (Hexagonal and Straight Line)"which has 25 mm wide hexagonal mesh openings and 0.81 mm thick (20-gauge) wire and is attached to wood trusses with metal staples having legs that are 38 mm long.

(26) Cold-formed steel floor joists (C-shaped joists) are members with a minimum size of 41 mm (width) x 203 mm (depth) x 1.22 mm (material thickness).

(27) The fire-resistance rating value within square brackets is achieved only where absorptive material includes spray-applied cellulose fibre with a minimum density of 50 kg/m^3 and a minimum thickness of 90 mm on the underside of the subfloor, of 90 mm on the sides of the cold-formed steel floor joists, and of 13 mm on the underside of the bottom flange other than at resilient metal channel locations.

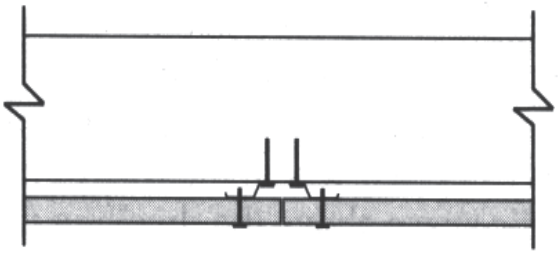


Figure 1
Butt Joint Detail of Single Gypsum Board Layer Application

Notes to Figure 1:

(1) Figure is for illustration purposes only and is not to scale.
(2) The structural member can be any one of the types described in the Table.
(3) Adjacent gypsum board butt ends are to be attached to separate resilient channels using regular Type S screws, located a minimum of 38 mm from the butt end.

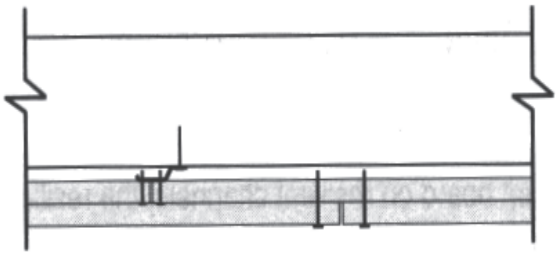


Figure 2
Butt Joint Detail of Double Gypsum Board Layer Application

Notes to Figure 2:

(1) Figure is for illustration purposes only and is not to scale.
(2) The structural member can be any one of the types described in the Table.
(3) Base layer butt ends can be attached to a single resilient channel using regular Type S screws.
(4) Type G screws measuring a minimum of 32 mm in length and located a minimum of 38 mm from the butt end are to be used to fasten the butt ends of the face layer to the base layer.

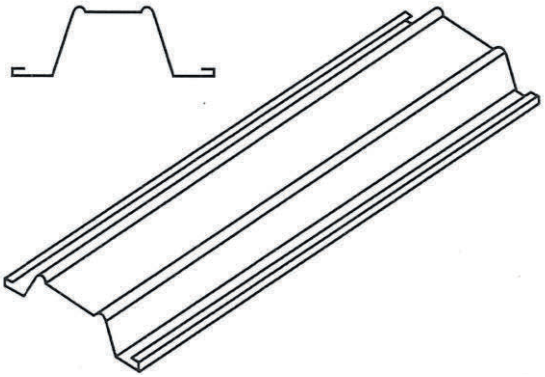


Figure 3
Example of Steel Furring Channel

Notes to Figure 3:

(1) Figure is for illustration purposes only and is not to scale.

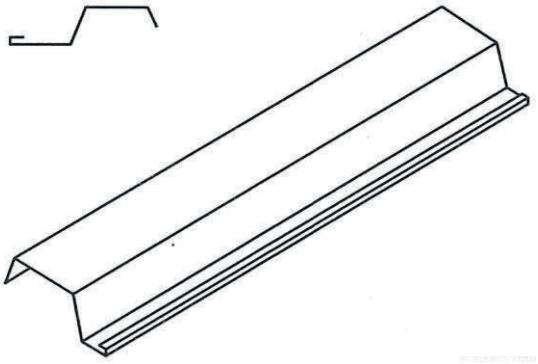


Figure 4
Example of Resilient Metal Channel

Notes to Figure 4:

(1) Figure is for illustration purposes only and is not to scale.

MMAH Supplementary Standard SB-4

Measures for Fire Safety in High Buildings

January 15, 2019 Update

Effective Date: January 1, 2020

Issued July 26, 2019

COMMENCEMENT

MMAH Supplementary Standard SB-4 comes into force on the 1st day of January, 2014.

r11.1 SB-4 as amended by Ontario Regulation 88/19 comes into force on the 1st day of January, 2020.

EDITORIAL

e1 Editorial correction issued for January 1st, 2020.

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SB-4 Measures for Fire Safety in High Buildings

(This Supplementary Standard is based in large measure on the Supplement to the National Building Code of Canada 1990 and the Appendix Notes to Subsection 3.2.6. of the National Building Code of Canada 2015)

Introduction

r11.1 Experience with high buildings has demonstrated that the time required for the complete evacuation in these buildings can exceed that which is considered necessary for the safe egress of all occupants. Studies of the "chimney effect" and observations of smoke movement in fire conditions have shown that measures for containing a fire on a lower storey will not always prevent the movement of smoke through the elevator, stair or other vertical shafts to the upper storeys of a high building. Occupants of high buildings, and particularly those on upper storeys, may be faced with severe smoke conditions from fires occurring in storeys below them before their own evacuation is possible. The provisions in Section 3.2.6. of Division B in the 2012 Building Code are intended to mitigate the risk to occupants of high buildings by restricting the generation and movement of smoke, ensuring adequate fire safety and by providing efficient access for firefighters.

Application of SB-4: Design of New Buildings and Renovations to Existing Buildings

This Standard is intended to assist in complying with the provisions in Subsection 3.2.6. of Division B of the Code.

Section 1: Section 1 of this standard, describes compliance with the requirements of Subsection 3.2.6. of Division B of the Code and is applicable to both new and existing buildings. The Code user should review the provisions contained in Section 1 with the corresponding provisions in Subsection 3.2.6. of Division B and determine the applicability of each. Provision [3.2.6.2.(1)] is applicable to the renovation of existing buildings that are sprinklered. Provision [3.2.6.2.(6)] is specifically applicable to the renovation of existing buildings that are not sprinklered.

Section 2: Section 2 of this standard summarizes smoke control measures applicable to certain common building designs. Compliance with one of these measures is considered to meet the requirements of the code for smoke control in existing buildings.

Section 3: Section 3 further details the measures that are referenced in Section 2 and can be utilized to achieve the strategies described in Section 2.

Smoke Control in High Buildings

The designer should understand the principles that govern smoke movement, and realize that the information contained in this Supplementary Standard is intended to be applied to buildings with conventional configurations. If the building under consideration has unconventional characteristics, the designer must determine the extent to which the contents of this standard are applicable and adjust the design accordingly.

This is particularly true of strategies employing air-handling systems where, for example, a realistic assessment of the leakage characteristics of the enclosures of spaces into which air is introduced may be critical. In this context, special attention is drawn to the building pressurization approach used in conjunction with a smoke shaft. The recommendations contained in this Supplementary Standard for this approach were developed assuming a building with fairly uniform leakage characteristics. Where a building or building element departs substantially from this model, the design must be adjusted to compensate. An example of the latter condition would be a building which contains at the lower levels a large shopping complex of much greater floor area than at the higher levels.

Buildings regulated by Subsection 3.2.6. of Division B will likely be in an area served by a fire department capable of an early response and that the response will be directed by the officer in charge of the fire department responding to the emergency. It is important that firefighters be provided with a smoke free access to fire floors below grade. Provisions are included to separate exit stairways serving storeys above grade from those serving storeys below grade, and to limit entry of smoke into these shafts. Similarly, elevator hoistways and service shafts are required to be provided with a separation near grade, or be designed to limit their acting as paths of smoke movement into upper floor areas from storeys below grade.

During a fire emergency, it is assumed that the occupants of the floor on which the fire occurs will leave by exit stairs immediately following the sounding of a fire alarm, and that occupants of the floor immediately above the floor on which the fire occurs will be advised to leave by the first fire department officer on the scene or other person assigned this responsibility. Occupants of all other floors may remain on their floors unless otherwise directed. It is also assumed that the owner of the building has prepared and filed a comprehensive fire safety plan to safeguard the building occupants and that the building supervisory staff are familiar with the provisions of Subsection 3.2.6. of Division B and with their responsibilities under the fire safety plan.

It is further assumed that the cumulative population of storeys below grade divided by 1.8 times the width in metres of all exit stairs at the storey under consideration will not exceed the 300 limit referred to in Article 3.2.6.1. of Division B, and that occupants of storeys below grade will evacuate the building by the stair shafts immediately after the discovery of a fire in a storey below grade.

The Building Code requires that a check be made of the smoke control system when requested by the authority having jurisdiction in accordance with the procedures described in Appendix C of this Supplementary Standard. This check will indicate deficiencies caused by inexact estimates of the leakage characteristics or of air supply requirements and, in all but the most extreme cases, will provide an opportunity for appropriate adjustments before the system is put into service.

Section 1 Building Code Provisions

r11.1 [3.2.6.2.(1)] Limits to Smoke Movement in New and Existing Buildings that are Sprinklered

(1) A new or an existing building that is sprinklered and is required to conform to the provisions of Subsection 3.2.6. of Division B shall be designed in accordance with Sentences 3.2.6.2.(2) to (5) and this Supplementary Standard to limit the danger to occupants and firefighters from exposure to smoke in a building fire.

(2) Except as required in Sentence (1), where smoke control system of an existing sprinklered building is materially altered, the altered portions of the system shall meet the requirements of Sentences 3.2.6.2.(2) to (5) and this Supplementary Standard to limit the danger to occupants and firefighters from exposure to smoke in a building fire.

Electrical Sprinkler Supervision

(3) The sprinkler system is equipped with a water flow and supervisory signal system that will,
(a) transmit automatically a waterflow signal directly to the fire department, or through an independent central station,
(b) transmit automatically other supervisory signals to a proprietary control centre or to an independent central station, and
(c) actuate a signal at the central alarm and control facility described in Article 3.2.6.7. of Division B.

[3.2.6.2.(2)] Stairway Protection Below Lowest Exit Level

These provisions are intended to apply to common building designs. Where a stair serving floors below the lowest exit level is open to the exterior or the stair serves only one storey below grade, compliance with the following provisions may not be necessary.

A stairway serving floors below the lowest exit level is considered to comply with the intent of Sentence 3.2.6.2.(2) of Division B if all of the following conditions are satisfied.

(1) The stairway has a vent or door to the outdoors at or near the top of the stair shaft that has an openable area of not less than 0.1 m^2 for each storey served by the stairway, less 0.01 m^2 for each weatherstripped door and 0.02 m^2 for each door that is not weatherstripped opening into the stairway.

(2) The stairway is enclosed in a shaft that
(a) does not pass through the floor above the lowest exit level and is separate from a shaft that contains a stairway serving upper storeys, or
(b) contains a stairway serving upper storeys, but is separated from that stairway at the lowest exit level by a fire separation having a fire resistance rating not less than that required for the shaft enclosure.

(3) The stairway is provided with equipment capable of maintaining a flow of air introduced at or near the bottom of the stair shaft, at a rate equal to 0.47 m^3/s for each storey served by the stairway.

[3.2.6.2.(3)] Requirements for Stair Shafts Serving Storeys Above Lowest Exit Level

Open doors and vents at the bottom of a stair shaft that serve storeys above the lowest exit level, will create a positive pressure in the shaft relative to adjacent floor areas and thus prevent smoke infiltration into the shaft. This pressure differential, created as a result of the stack effect will be the greatest during the winter, when the difference in temperature between the interior and the exterior of the building is most pronounced. If a stair shaft does not have a direct opening to the exterior, alternative means must be provided to achieve the pressure differential and consequent smoke control. In the instance where a corridor or vestibule is used as a link between the exit level of an interior stair shaft and the outdoors, it will be necessary to assess the reliability and performance of the overall system in creating the necessary stairway pressurization. The probability of all doors or closures being opened at the same time, as well as the size of the vestibule and its impact on the overall smoke control system, are factors that need to be considered.

r11.1 **(1)** Each stairway that serves storeys above the lowest exit level shall have a vent to the outdoors, at or near the bottom of the stair shaft, that,
(a) has an openable area of 0.05 m^2 for every door between the stair shaft and a floor area, but not less than 1.8 m^2,
(b) opens directly to the outdoors or into a vestibule that has a similar opening to the outdoors, and
(c) has a door or closure that,
  (i) is openable manually, and
  (ii) can remain in the open position during a fire emergency.

If mechanical methods are used to develop a positive pressure in a stair shaft, a minimum pressure differential of 12 Pa is recommended to prevent smoke migration from floor areas in a sprinklered building where fire temperatures are controlled and smoke movement may be dominated by stack effect in a stair shaft. During a fire emergency, persons will be entering and exiting a stair shaft as they move to a place of safety and under these conditions the number of doors open to the stair shaft cannot be predetermined. The number will vary depending on the occupancy of the building, population density and the evacuation plan for the building. It should be assumed that two doors are open. This is based in part as a practical level for most buildings and considers the positive fire experience in sprinklered buildings.

The maximum pressure differential created by a mechanical system should not prevent doors to the stair shafts from being opened. A specific maximum value cannot be given, as this value will depend on the door opening force and size of the door. These values should be calculated for each specific case. A maximum value of 130 N is suggested by research as the force that can be opened by the majority of people in most occupancies, however this value is above the maximum value of 90 N generally specified in this Code (Section 3.4. of Division B). The use of values below 130 N can create a practical problem in achieving effective smoke control as it is difficult to design for the acceptable minimum and maximum pressure differential range. Special consideration may need to be given to doors located in a barrier free path of travel.

Care should be taken by designers and by building and fire officials in implementation of these requirements. Assumptions involved in the design of a smoke control system may be different from final construction conditions. For this reason each system should be tested after installation to ensure that the design intent is met. The minimum pressure differential is not intended to apply to locations in stair shafts when nearby doors are open to adjacent floor areas.

[3.2.6.2.(4)] Limiting Smoke Movement into Storeys Above Lowest Exit Level.

Measures to prevent the migration of smoke from floor areas below the lowest exit storey into upper storeys include the following.

(1) An elevator hoistway that passes through the floor above the lowest exit storey should not penetrate the floor of the storey immediately below the lowest exit storey, unless there is a vestibule between the shaft and each floor area below the lowest exit storey that

(a) has a fire separation, with a fire resistance rating not less than 45 min, between the vestibule and any public corridor,
(b) has a fire separation, with a fire resistance rating not less than that required for an exit by Article 3.4.4.1. of Division B, between the vestibule and any stair or elevator enclosure or any part of a floor area, other than a public corridor, and
(c) except for elevator hoistway entrances, has a self-closing device on any door through the fire separation required by Clauses (a) and (b), with the door opening in the direction of travel from the floor area to the exit stairway.

(2) A vertical service space, other than an elevator hoistway, that passes through the floor assembly above the lowest exit storey, should be provided with a tight fitting noncombustible seal or fire stop at the floor assembly of the storey immediately below the lowest exit storey, unless

(a) the vertical service space is vented to the outdoors at the top and the vent has an openable area that is not less than
  (i) that obtained from Graph 1 in Appendix A to SB-4 if the vertical service space is in a building in which other shafts are not mechanically pressurized, or
  (ii) that obtained from Graph 2 in Appendix A to SB-4 if the vertical service space is in a building in which other shafts are mechanically pressurized,
(b) for a shaft that serves floor areas above the lowest exit storey, a vent is located
  (i) at or near the top of the shaft if the shaft is above the mid height of the building, or
  (ii) at or near the foot of the shaft at or near the exit level if the top of the shaft is below the mid height of the building, or
(c) for a shaft that serves floor areas below the lowest exit storey, a vent is located at or near the top of the shaft.

(3) Any closure provided for a vent opening referred to in Sentence (2) must be openable:

(a) manually,
(b) on a signal from a smoke detector located at or near the top of the shaft, and
(c) by a control device located at the central alarm and control facility.

r11.1 [3.2.6.2.(5)] Air Moving Fans

(1) Except for exhaust fans in kitchens, washrooms and bathrooms in dwelling units, and except for fans used for smoke venting in Article 3.2.6.6. of Division B, air moving fans in a system that serves more than 2 storeys shall be designed and installed so that in the event of a fire these fans can be stopped by means of a manually operated switch at the central alarm and control facility.

r11.1 Equivalent Measure

Where a building is designed in accordance with Measure A as described in Sections 2 and 3 of this Supplementary Standard, the building shall be deemed to comply with Sentences 3.2.6.2.(2) to (5) of Division B of the Building Code.

[3.2.6.2.(6)] Limits to Smoke Movement in Existing Buildings that are Not Sprinklered

(1) An existing building that is not sprinklered and that is governed by the provisions of Subsection 3.2.6. of Division B shall be designed in accordance with Sentences (2) to (8) to limit the danger to occupants and firefighters from exposure to smoke in a building fire.

Smoke Protection for Floor Areas

(2) Except as provided in Sentences (5) to (8), a building referred to in Sentence (1), shall be designed so that, during a period of 2 h after the start of a fire, all floor areas that are above the lowest exit storey will not contain more than 1% by volume of contaminated air from the fire floor, assuming an outdoor temperature equal to the January design temperature on a 2.5% basis determined in conformance with Supplementary Standard SB-1.

Smoke Protection for Exit Stairs

(3) Except as provided in Sentences (7) and (8), a building referred to in Sentence (1), shall be designed so that during a period of 2 h after the start of a fire, the limit described in Sentence (2) on the movement of contaminated air into other floor areas is not exceeded in,

(a) each exit stair serving storeys above the lowest exit level, and
(b) each exit stair serving storeys below the lowest exit level.

Smoke Protection for Firefighters' Elevators

(4) Except as provided in Sentence (7), a building referred to in Sentence (1), shall be designed so that during a period of 2 h after the start of a fire, the limit described in Sentence (2) on the movement of contaminated air into other floor areas is not exceeded in a shaft that contains an elevator for use by firefighters required by Article 3.2.6.5. of Division B.

Areas of Refuge

(5) In a building of Group C major occupancy classification, the requirements of Sentence (2) are waived where occupants above the first storey can enter and be safely accommodated in floor areas or parts of floor areas that shall

(a) be designated and identified in the building as areas of refuge,
(b) be located on every storey except if the building is not more than 75 m, measured between grade and the floor level of the top storey, on every fifth storey,
(c) provide not less than 0.5 m^2 of floor space per ambulatory occupant and 1.5 m^2 of floor space per non-ambulatory occupant,
(d) have access corridors and doors leading to each designated part of a floor area on the same storey sufficient to provide 3.67 mm of width for every person who may have to use these passages to reach the designated part of a floor area,

(e) have access stairs from intervening storeys leading to each designated part of a floor area sufficient to provide 5.5 mm of width for every person who may have to use these stairs to reach the designated part of a floor area, and
(f) not contain more than 1% by volume of contaminated air from the fire floor during a period of 2 h after the start of a fire, assuming an outdoor temperature equal to the January design temperature on a 2.5% basis determined in conformance with Supplementary Standard SB-1.

Lower Buildings

(6) The requirements of Sentence (2) are waived in a building of Group C major occupancy classification where,
(a) the building is not more than 75 m high measured between grade and the floor level of the top storey, and
(b) the number of occupants of storeys above grade is not more than 3.6 times the area in square metres of treads and landings in the exit stairs serving these storeys.

Residential Buildings

(7) The requirements of Sentences (2) and (4) and Clause (3)(a) are waived in a building of Group C major occupancy classification, where
(a) each suite above grade has direct access to an exterior balcony that conforms to the requirements of Sentence 3.3.1.7.(7) of Division B,
(b) each stairway that serves storeys above the lowest exit level is vented to the outdoors at or near the bottom of the stair shaft,
(c) measures are taken to limit movement of smoke from a fire in a floor area below the lowest exit storey into upper storeys, and
(d) where, except for exhaust fans in kitchens, washrooms and bathrooms in dwelling units, air moving fans are designed and installed so that in the event of a fire such fans can be stopped by means of a manually operated switch at the central alarm and control facility where the system serves more than 2 storeys.

(8) The requirements of Sentences (2) and (3) are waived in a Group C major occupancy apartment building.

[3.2.6.3.(1)] Connected Buildings

r11.1 The measures described here are intended to prevent movement of smoke from one building to another where at least one building is a high building. They are of particular significance for two buildings of unequal height that are joined together. The measures suggested include the provision of a large opening to the outdoors in a connecting vestibule enabling smoke entering through leakage areas around doors to be vented to the outdoors, or pressurization to maintain a higher pressure in the vestibule than in adjacent spaces, as illustrated in Figures 17 to 18A in Section 2.

The provisions for protection of openings are described in terms applicable doorways, as this is expected to be the most commonly occurring opening. Openings other than doorways should be avoided if possible. Openings should be protected by an airlock that gives the at least the same level of protection as the vestibule described below.

The requirement of Article 3.2.6.3. of Division B limiting the movement of smoke from one building to another may be met by incorporating in the link between the buildings the provisions of Sentences (1) and (2) described below.

(1) A firewall conforming to Subsection 3.1.10. of Division B is constructed between one building and the other with any opening in the firewall protected against the passage of smoke by a vestibule that has
(a) a fire separation between the vestibule and a public corridor with a fire resistance rating not less than 45 min,
(b) a fire separation between the vestibule and the remainder of the floor area, other than a public corridor, with a fire resistance rating not less than that required by Article 3.4.4.1. of Division B for an exit,
(c) a fire separation between the vestibule and a stair enclosure or elevator hoistway with a fire resistance rating not less than that required by Article 3.4.4.1. of Division B for an exit, and
(d) any door in the fire separation required by Clauses (a), (b) or (c), except for an elevator entrance, provided with a self-closing device as required by Article 3.1.8.11. of Division B and opening in the direction of travel from the floor area to the exit stairway.

(2) The vestibule referred to in Sentence (1) should have
(a) a vent to the outdoors that has a net area of $10(0.023d + 0.00045a)$ m^2, where 'd' is the number of doors having a perimeter not more than 6 m that open into the vestibule, or if the perimeter of doors exceeds 6 m, the value 'd' is increased in direct proportion to the increase in the perimeter, and 'a' is the area in square metres of enclosing walls, floors and ceilings whose outer face is in contact with the outside air, except that where the outer face of a wall is in contact with the ground or fill, it is assumed that there is no leakage through that portion, and the value of 'a' is assumed to be zero, or
(b) equipment capable of maintaining a supply of air into the vestibule sufficient to ensure that the air pressure in the vestibule when the doors are closed is higher by at least 12 Pa than that in adjacent floor areas when the outdoor temperature is equal to the January design temperature on a 2.5% basis.

[3.2.6.5.(6)(b)] Electrical Cable Protection

r11.1 Electrical cables that provide continuous operation for 1 hour when subjected to the fire exposure/temperature curve of CAN/ULC-S101-14, "Fire Endurance Tests of Building Construction and Materials", do not need additional protection against exposure to fire.

[3.2.6.6.(1)] Venting to Aid Firefighting

(1) The requirements of Sentence 3.2.6.6.(1) of Division B and of Measures H or I are met by incorporating in a floor area windows or wall panels as described in Sentence (2), by smoke shafts as described in Sentences (3) to (7) or by the use of building exhaust systems as described in Sentence (8).

(2) Where windows or wall panels are used for venting as required in Sentence (1), they must
(a) be uniformly distributed along the exterior wall of each storey,
(b) have a total area of not less than one percent of the exterior wall area of each storey,
(c) be readily openable from the interior without the use of wrenches or keys,
(d) be readily identified from the interior, and from the exterior where they are accessible to firefighters, and
(e) be designed so that when opened they will not endanger persons outside the building during a fire.

(3) Where one or more smoke shafts or vertical service spaces are used for venting to meet the requirements of Sentence (1), they must
r11.1 (a) have an opening or openings into each storey with an aggregate area not less than that obtained from Table 1 for the height of the shaft, the area of the largest floor area served by the smoke shaft and the leakage characteristics of the shaft wall and closures obtained from Tables 2 and 3,
(b) have an aggregate unobstructed cross-sectional area equal to that provided in Clause (a), and
(c) be designed to comply with the requirements of Sentence (4).

(4) Each smoke shaft or vertical service space described in Sentence (3) must
(a) be separated from the remainder of the building by a fire separation that has a fire-resistance rating at least equal to that required for the floor assembly through which it passes, or be designed as a chimney conforming to Part 6 of Division B, except that flue liners need not be provided,
(b) have an opening to the outdoors at the top that has an area not less than the cross-sectional area of the shaft which may be protected from the weather,
(c) terminate not less than 900 mm above the roof surface where it penetrates the roof, and
(d) contain no combustible material, fuel lines or services that are required for use in an emergency.

(5) Each opening required by Clause (3)(a) must be located so that the top of the opening is not more than 250 mm below the ceiling, except that the opening may be above the ceiling if the ceiling freely allows passage of air and the opening into the smoke shaft is provided with a closure that

(a) has a fire-protection rating conforming to Sentence 3.1.8.4.(2) of Division B, except that the temperature on the unexposed face of the closure is not more than 250°C after 30 min during the fire test and there is no combustible material within the distances described in Table 4, and except that paint or tightly-adhering paper covering not more than 1 mm thick shall be exempted from these requirements when applied to a noncombustible backing,

(b) can be opened from a remote location such as a stair shaft, the storey immediately below or the central alarm and control facility, and

(c) must not open automatically on any floor, other than the fire floor, when smoke or hot gases pass through the shaft.

(6) Closures for openings described in Clause 4(b) are to be openable from the outside and will open automatically on a signal from a smoke detector in the shaft, by operation of the fire alarm system and when a closure required in Sentence (5) opens.

(7) A smoke shaft opening referred to in Sentence (2) or (3) that is less than 1 070 mm above the floor must be protected by guards in conformance with Article 3.3.1.17. of Division B.

(8) In a sprinklered building, the air handling system may be used for smoke venting provided

(a) the system can maintain an exhaust to the outdoors at the rate of six air changes per hour from any floor area, and

(b) emergency power to the fans required by (a) is provided as described in Article 3.2.7.9. of Division B.

r11.1 **(9)** Where a closure is required by Sentence (5), the leakage area between closure components and between damper and frame must be not more than 3 percent of the openable area of the damper.

Table 1
Minimum Size of Vent Openings into Smoke Shafts from Each Floor Area, m^2 (1),(3)

Floor Area, m^2	Leakage Area, %(2)	Building Height, m								
		18	37	73	110	146	183	220	256	293
200	0	0.1	0.11	0.13	0.15	0.16	0.18	0.19	0.2	0.22
500		0.22	0.25	0.29	0.32	0.36	0.37	0.39	0.41	0.43
1 000		0.43	0.48	0.53	0.59	0.63	0.67	0.71	0.75	0.77
2 000		0.83	0.91	1.01	1.08	1.16	1.22	1.29	1.34	1.39
3 000		1.21	1.33	1.46	1.55	1.67	1.75	1.82	1.9	1.97
4 000		1.62	1.75	1.9	2.02	2.15	2.25	2.35	2.44	2.53
5 000		2.01	2.17	2.34	2.46	2.63	2.74	2.86	2.88	3.07
6 000		2.39	2.57	2.76	2.91	3.1	3.23	3.37	3.47	3.58
200	1	0.1	0.12	0.15	0.19	0.22	0.27	0.35	0.43	0.55
500		0.23	0.27	0.35	0.4	0.49	0.57	0.69	0.83	1.04
1 000		0.44	0.5	0.71	0.72	0.86	1.01	1.19	1.43	1.73
2 000		0.85	0.97	1.15	1.33	1.56	1.81	2.1	2.48	2.95
3 000		1.26	1.42	1.67	1.91	2.23	2.56	2.97	3.47	4.08
4 000		1.66	1.88	2.18	2.49	2.37	3.28	3.79	4.4	5.16
5 000		2.07	2.32	2.69	3.05	3.51	3.99	4.6	5.32	6.21
6 000		2.47	2.76	3.18	3.59	4.14	4.68	5.37	6.2	7.23
200	2	0.1	0.13	0.18	0.24	0.37	0.61	1.28	4.6	89.57
500		0.24	0.29	0.39	0.52	0.75	1.13	2.1	6.11	94.5
1 000		0.46	0.55	0.72	0.94	1.3	1.9	3.27	8.29	102.11
2 000		0.88	1.05	1.34	1.73	2.32	3.28	5.36	12.14	116.8
3 000		1.31	1.53	1.95	2.47	3.29	4.58	7.28	15.63	130.83
4 000		1.73	2.01	2.55	3.2	4.23	5.83	9.12	19.97	144.03
5 000		2.15	2.49	3.13	3.92	5.15	7.05	10.9	22.15	157.05
6 000		2.57	2.96	3.73	4.63	6.07	8.26	12.65	25.39	169.29
200	3	0.11	0.14	0.21	0.37	0.88	2.06			
500		0.25	0.31	0.47	0.76	1.58	9			
1 000		0.47	0.59	0.86	1.33	2.6	11.99			
2 000		0.91	1.12	1.6	2.41	4.47	17.46			
3 000		1.35	1.64	2.31	3.43	5.21	22.48			
4 000		1.79	2.17	3.02	4.43	7.91	27.29			
5 000		2.22	2.68	3.71	5.42	9.55	31.95			
6 000		2.65	3.2	4.4	6.39	11.18	36.47			
200	4	0.11	0.15	0.28	0.7	24.83				
500		0.25	0.34	0.58	1.33	29.18				
1 000		0.49	0.63	1.06	2.27	36.07				
2 000		0.95	1.21	1.97	3.99	48.56				
3 000		1.41	1.78	2.84	6.63	60.15				
4 000		1.86	2.34	3.7	7.22	71.15				
5 000		2.21	2.9	4.55	8.79	81.81				
6 000		2.75	3.46	5.4	10.33	90.05				
Column 1	2	3	4	5	6	7	8	9	10	11

Table 1 (Cont'd)
Minimum Size of Vent Openings into Smoke Shafts from Each Floor Area, m^2 (1),(3)

Floor Area, m^2	Leakage Area, %(2)	Building Height, m								
		18	37	73	110	146	183	220	256	293
200	5	0.11	0.16	0.36	3.33					
500		0.28	0.36	0.76	5.09					
1 000		0.5	0.69	1.37	7.67					
2 000		0.99	1.31	2.54	12.35					
3 000		1.46	1.94	3.65	16.75					
4 000		1.92	2.55	4.75	20.99					
5 000		2.4	3.16	5.84	25.11					
6 000		2.87	3.74	6.92	29.11					
Column 1	2	3	4	5	6	7	8	9	10	11

Notes to Table 1:

r11.1 (1) The minimum size of a vent opening into a smoke shaft is obtained from Table 1 and is dependent on the floor area and total leakage area of the smoke shaft walls and closures. This total leakage area may be estimated by adding the leakage areas for the shaft wall obtained from Table 2 and for the dampered openings obtained from Table 3 provided the cross-sectional area of the smoke shaft, the opening into the shaft and the opening to the outdoors at the top of the shaft are equal.

r11.1 (2) Leakage area is the total of the leakage area of smoke shaft wall obtained from Table 2 and the leakage area of openings in smoke shafts obtained from Table 3.

(3) The size of the vent opening refers to the free or unobstructed area of the opening.

Table 2
Leakage Area of Smoke Shaft Wall

Wall Construction	Leakage Area as % of Wall Area
Monolithic concrete	0.5
Masonry wall unplastered	1.5
Masonry wall plastered	0.5
Gypsum board on steel studs	1.0
Column 1	2

r11.1

Table 3
Leakage Area of Closures into Smoke Shaft

Type of Closure	Leakage Area as % of Closure Area(1), (2)
Curtain fire damper	2.5
Single-blade fire damper	3.5
Multi-blade fire damper	4.5
Column 1	2

Notes to Table 3:

(1) Values include allowance for 0.5% leakage between frame and wall construction.

(2) These leakage data contemplate clearances applicable to closures that have been tested in accordance with CAN/ULC-S112-10, "Fire Test of Fire-Damper Assemblies."

r11.1

Table 4
Minimum Distance from Closure to Combustible Material

Area of Closure, m^2 (1)	Minimum Distance in Front of or Above Closure, m	Minimum Distance to the Sides or Below Closure, m
0.5	0.35	0.20
1.0	0.50	0.25
1.5	0.60	0.30
2.0	0.70	0.35
2.5(2)	0.80	0.40
Column 1	2	3

Notes to Table 4:
(1) For closure areas between those given in Table 4, interpolation may be used to determine the appropriate distances.
(2) For closure areas greater than 2.5 m^2, the minimum distance in front of or above the closure shall be one half of the square root of the closure area, and the minimum distance to the sides or below the closure shall be one quarter of the square root of the closure area.

[3.2.6.7.(1)] Protection of Central Control Room

The design of a room provided for a central alarm and control facility should be adequately protected from fire and smoke and take into account the nature and sensitivity of the electronic components of the equipment it contains. The room should also be ventilated with a supply of fresh air in order to maintain a clean environment. Adequate lighting is also required.

[3.2.6.7.(2)] Central Control Room Air Control

Depending on the method of mechanical venting and air control that is selected for the building, additional controls may be required at the central alarm and control facility. These additional controls include those with a capability of opening closures to vents in shafts, stopping air handling systems, and initiating mechanical air supply to stair shafts.

[3.2.6.9.(1)] Testing for Smoke Control

The efficiency of a smoke control system maybe checked by measuring pressure differences and the directions of airflow around doors and through separating walls of compartments. A pressure meter can be used to measure pressure differences on either side of a door or partition. Where this is impracticable, a punk stick held near a crack will indicate the direction of airflow. Measurements of airflow may be taken on the intake side of supply fans or in supply ducts to determine whether the specified airflow is being provided. In general, airflow should be from the spaces which may be occupied for various lengths of time during a fire emergency (e.g., vestibules, stair shafts, and elevator hoistways) toward the space in which the fire is assumed to have occurred. Measurements may be taken at certain critical locations to check the overall efficiency of the smoke control system.

In buildings where protection is obtained by venting corridors or vestibules to the outdoors, inspection of the building to determine whether the requirements have been met should be sufficient. Where service shafts are vented to the outdoors at the top, a check may be made of the wall between the shaft and the uppermost occupied floor areas, to ensure that the direction of flow is from each floor area into the shaft, when the vent to the outside is open and the outdoor air temperature is significantly less than that indoors. Where mechanically pressurized vestibules are used, a check may be made to ensure that the pressure in each vestibule or area of refuge is greater than that in the adjacent floor areas at each floor level.

Doors to stair shafts, elevator hoistways and vestibules in locations subject to pressure differences that may interfere with normal opening should be checked when the outdoor temperature is near the January design temperature, with the air injection system operating and a number of windows open to the outdoors on each floor in turn.

Section 2 Scope of Measures for Fire Safety in Existing High Buildings

This Supplementary Standard includes a number of detailed measures that may be incorporated in a building in order to comply with the requirements relating to control of smoke for existing buildings. It is not the intention to exclude other means of attaining the same objectives. Where smoke control methods other than those described in this Supplementary Standard are developed, they may be based on the information in Appendix B of this Supplementary Standard.

Smoke control measures appropriate to existing buildings vary depending on the height and occupancy of a building. In a sprinklered building, the requirements for control of smoke movement are minimal (see Measure A, Section 3). In very tall buildings, limits are placed on the penetration of smoke into exit stairs, elevators for firefighters and all floor areas other than the one on which fire occurs. Such limits are achieved by Measures B, D, F, H and I in Section 3. In certain buildings of lesser height and limited population, exit stairs and elevators for firefighters are protected and smoke may be expected to enter upper floor areas. This situation applies where Measures C, E, G and J, described in Section 3, are employed. In other buildings, the spread of smoke into shafts and floor areas is accepted, but areas of refuge are provided

that are maintained smoke free, that can be reached by all people in the building within a few minutes and that are linked to outdoors by safe means of egress. They are described in Measures K and L in Section 3.

Where Measures A, B, D, F, H and I in Section 3 are applied, it is assumed that in the event of fire occupants of the floor on which the fire occurs will leave by exit stairs immediately following the sounding of a fire alarm, and that occupants of the floor immediately above the floor on which the fire occurs will be advised to leave by the first fire department officer on the scene or other person assigned this responsibility. Occupants of all other floors may remain on their floors unless otherwise directed.

Where Measures C, E, G and J in Section 3 are applied, it is assumed that occupants of all floors will move immediately into the stair shafts and will then proceed slowly to the outdoors following the sounding of a general fire alarm.

Where Measure K in Section 3 is applied (i.e. the building is divided vertically into two zones), it is assumed that occupants of the floor on which the fire originates will leave by exit stairs, and that the occupants of all other floors in the zone in which the fire is discovered will move through vestibules or bridges to floor areas on the same level in the fire-free smoke control region immediately following the sounding of a fire alarm. Occupants may remain in these areas of refuge until further directed by the fire department officer.

Where Measure L in Section 3 is applied, it is assumed that occupants of the floor on which the fire originates will leave by the exit stairs, and that occupants of all other floors will move by corridors or stairs to areas of refuge that are distributed throughout the building immediately following the sounding of the fire alarm. Occupants may remain in these areas of refuge until otherwise directed.

In a residential building where reliance is placed on balconies as places of refuge from smoke, as described in Measure M in Section 3, occupants may remain in their suites when a general fire alarm is given, but should be prepared to move on to their balconies if conditions in the suite should become untenable.

It is assumed that the cumulative population of storeys below grade divided by 1.8 times the width in metres of all exit stairs at the storey under consideration will not exceed the 300 limit referred to in Article 3.2.6.1. of Division B, and that occupants of storeys below grade will evacuate the building by the stair shafts immediately after the discovery of a fire in a storey below grade.

It is also important that firefighters are provided with a smoke-free access to fire floors below grade. Measures A, B, C, D, E, F, G, L and M include provisions designed to separate the exit stairs serving storeys above grade from those serving storeys below grade, and to limit entry of smoke into these shafts. Elevator shafts and service shafts are required to be provided with a separation near grade, or be designed to limit their functioning as paths of smoke movement into upper floor areas. In Measures H, I and J, no special precautions are necessary to protect shafts in storeys below grade, because the system of pressurization plus venting of the fire floor protects all shafts, whether or not these penetrate storeys below grade. In Measure K, the separation into two zones is maintained in storeys below grade. Smoke-free access will thus be available to any floor on which the fire occurs.

Synopsis of Measures for Fire Safety in High Buildings

r11.1 Each of the measures is illustrated by a sketch with notes describing the applicable conditions (Figures 1 to 18A). These sketches are intended as a guide to the detailed requirements and as an aid to finding the relative clauses, but they are not intended to limit in any way the scope of the detailed provisions which in general provide a wider range of choice than can be shown in the sketches and notes. A summary of requirements applicable to all buildings, regardless of the measure being used, is given in the following paragraph.

Requirements Common to all Measures for Fire Safety in High Buildings

(1) Elevators controlled by keyed switch (Article 3.2.6.4. of Division B).

(2) Elevator for firefighters required (Article 3.2.6.5. of Division B).

(3) Means of venting each floor area to outdoors by smoke shaft, windows or building exhaust system (Article 3.2.6.6. of Division B).

(4) Certain floor areas in the building to be sprinklered (Articles 3.2.1.5. and 3.2.2.15. of Division B).

(5) Limits on flame-spread rating and smoke developed classification for interior finish materials in certain locations (Article 3.1.13.7. of Division B).

(6) Central alarm and control facility required (Article 3.2.6.7. of Division B).

(7) Voice communication system required if building is more than 36 m high (Article 3.2.6.8. of Division B).

(8) Fire protection required for electrical feeders to emergency equipment (Article 3.2.7.10. of Division B).

(9) Power to operate emergency lighting, fire alarm and voice communication systems (Articles 3.2.7.4. and 3.2.7.8. of Division B).

(10) Emergency power to operate elevators required if building is more than 36 m high (Article 3.2.7.9. of Division B).

Measure A Fully Sprinklered Building

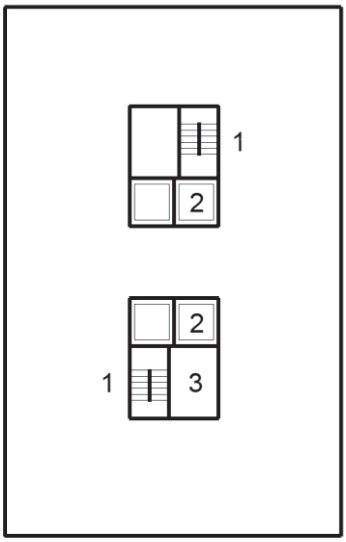


Figure 1
Typical floor plan, Measure A

Measure A satisfies 3.2.6.2.(1) provision (6) as described in Section 1 for existing sprinklered buildings of any major occupancy classification.

No limit on height.

All floor areas sprinklered (3.2.6.2.(1) provision (6) as described in Section 1).

Limits on flame-spread ratings and smoke developed classifications described in Sentence 3.1.13.7.(1) of Division B are relaxed (Sentence 3.1.13.7.(2) of Division B).

1. Door to outdoors in each stair shaft held open during a fire emergency (3A(2))*
   Stair shaft serving floors below the lowest exit level is separate from stair shaft serving floors above that storey (3A(3)).
   Stair shaft serving floors below the lowest exit level is pressurized during a fire emergency (3A(3)).

2. Elevator shaft terminates not lower than the first floor below the lowest exit storey or has elevator vestibules in every storey below the lowest exit storey (3A(5)).

3. Vertical service spaces, other than elevator shafts, provided with firestops at the first floor below the lowest exit storey or vented to outdoors at top during a fire emergency (3A(6)).
   Air moving fans are stopped during a fire emergency in a system that serves more than two storeys (3.2.6.2.(1) provision (6)(d) as described in Section 1).

* First number indicates Section number. Letter indicates Measure. Last number indicates number of Sentence in that Measure.

Measure N Connected Buildings

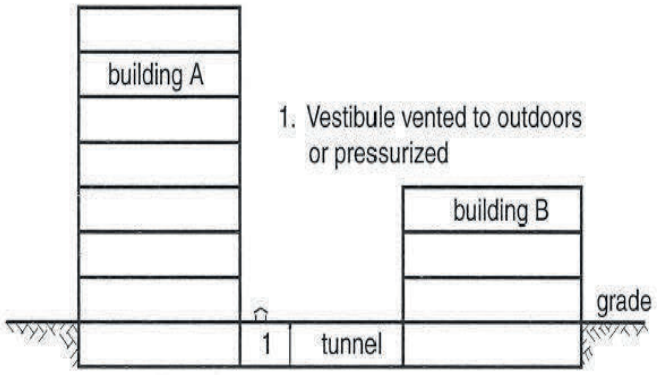
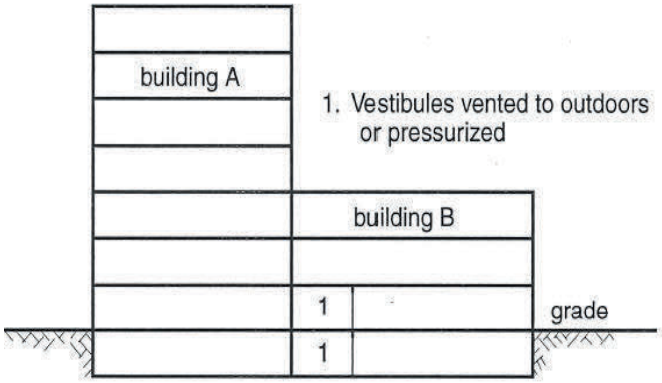
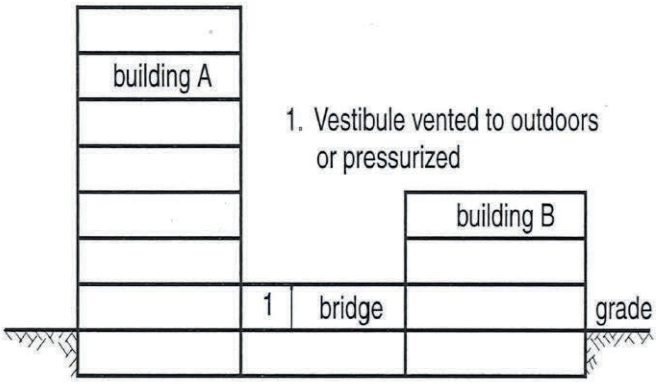


Figure 17
Section through buildings linked by underground tunnel



r11.1

Figure 18
Section through buildings joined at firewall



r11.1

Figure 18A
Section through buildings connected by a bridge

Measure N satisfies Article 3.2.6.3. of Division B for existing connected buildings.

Section 3 Measures for Life Safety in Existing High Buildings

Measure A Fully Sprinklered Buildings

General

The steps described in this Measure amount to an adequate smoke control measure, satisfying the requirements for existing sprinklered buildings. Reliance is placed on the full sprinkler installation to limit fire spread and consequently, the generation of smoke.

Some additional protection of exit stairs is afforded by the provision of an opening to the outdoors at the foot of the stair shaft. In cold weather, when stack action is likely to be most significant, this measure may give a general increase in air pressure in the stair shaft, thus restricting entry of smoke.

In this Measure is included the requirement that elevator shafts and service shafts should not be continuous from above to below grade, except when vestibules are provided at elevator doors in below grade storeys.

Where Measure A is adopted and a fire is detected by an automatic device or a manual pull station is actuated, it is intended that a fire alarm will sound on all floors simultaneously, and that the occupants of the fire floor will walk downstairs to the street floor or to a safe intermediate floor area. Occupants of other floors may remain where they are until advised to evacuate by the person operating the central alarm and control facility.

Measure A

(1) The requirements for existing sprinklered buildings may be met by incorporating the requirements in Sentences (2) to (8).

(2) A stairway serving storeys above the lowest exit level has a vent or door to the outdoors at or near the bottom of the stair shaft, as described in Sentence (4).

(3) A stairway serving floors below the lowest exit level
(a) has a vent or door to the outdoors at or near the top of the stair shaft that has an openable area of not less than 0.1 m^2 for each storey served by the stairway, less 0.01 m^2 for each weatherstripped door and 0.02 m^2 for each non-weatherstripped door opening into the stair shaft,
(b) is enclosed in a shaft that does not pass through the floor above the lowest exit level and is separate from a shaft that contains a stairway serving upper storeys, or is enclosed in a shaft that contains a stairway serving upper storeys, but is separated from that stairway at the lowest exit level by a fire separation having a fire-resistance rating not less than that required for the shaft enclosure, and
(c) is provided with equipment capable of maintaining a flow of air introduced at or near the bottom of the stair shaft, at a rate equal to 0.47 m^3/s for each storey served by the stairway.

(4) A stair shaft required to be vented to the outdoors by Sentence (2) or by other provisions in this Supplementary Standard is provided with a vent or door that
(a) has an openable area of 0.05 m^2 for every door between the stair shaft and a floor area, but not less than 1.8 m^2,
(b) opens directly to the outdoors or into a vestibule or exit corridor that has a similar opening to the outdoors, and
(c) has a door or closure that is openable manually and can remain in this open position during a fire emergency.

(5) Any elevator shaft that passes through the floor above the lowest exit storey does not penetrate the floor of the storey immediately below the lowest exit storey, except where there is a vestibule between the shaft and each floor area below grade as described in Sentence (3) of Measure D.

Where air is injected into vestibules, the pressure characteristics in cold weather are likely to be as shown in Figure 22. The rates of air injection should be sufficient to keep the pressures in the vestibules a little higher than the pressure in the shaft. This limits the possibility of movement of smoke into the vestibules from the floor areas. In cold weather vents at the bottom of the stair shafts and elevator shafts provide additional protection.

Service shafts that will not be used in a fire emergency are provided with vents at the top to the outdoors where Measure D (but not Measure E) requires that movement of smoke into upper floors be limited. However, some smoke may pass from top vented service shafts into the top floor or floors, because air pressures at the top of the shafts and in the floor area of the top storey are approximately equal.

Stack action and the operation of smoke control measures may provide pressures that will interfere with the normal operation of certain doors. Where a vestibule is vented to the outdoors, this may apply to any door between a vestibule and an elevator shaft that is farther above or below the mid-height of a building than the height given by Graph 8 in Appendix A of this Supplementary Standard and to any door between a vestibule and a stair shaft that is farther above grade than the height given by Graph 8. Where a vestibule is pressurized, this may apply to any door between a vestibule and a floor space that is farther above grade than the height shown in Graph 8.

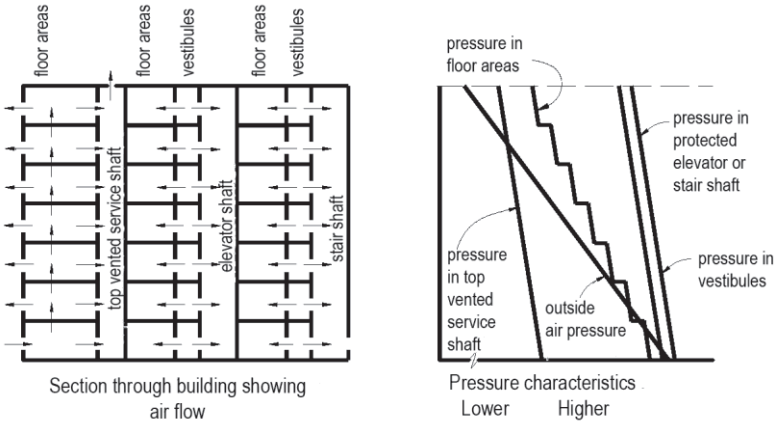


Figure 22
Pressure characteristics in a Measure D building having air injected into vestibules

As an alternative to the provision of a mechanical air supply for a vestibule to an elevator shaft, as described in Sentence (5) of Measure D, the mechanical air supply can be introduced directly into the shaft as described in Sentence (4) of Measure F provided there are no open vents to the elevator shaft as described in Sentence (9) of Measure D.

Where a mechanical air supply is required by Sentence (5) of Measure D and Sentence (4) of Measure E, it may be desirable to heat the air supply and to provide two air intakes in separate locations on the building face as discussed in the general provisions to Measures F and G.

Where Measure D is adopted, and a fire is detected by an automatic device or a manual pull station is actuated, it is intended that a fire alarm will sound on all floors simultaneously, and that the occupants of the fire floor will walk down stairs to the street floor or to a safe intermediate floor area. Occupants of other floors may remain until advised to evacuate by the person operating the central alarm and control facility.

Where Measure E is adopted, and a fire is detected by an automatic device or a manual pull station is actuated, it is intended that a fire alarm will sound on all floors simultaneously, and that occupants of all floors will walk down stairs to the street floor or to a safe intermediate floor area.

Measure D (including restriction on the movement of smoke from floor to floor)

(1) The requirements of measures to limit the movement of smoke in existing buildings may be met by incorporating the requirements of Sentences (2) to (17).

(2) Between each floor area and each stair shaft or elevator shaft that contains an elevator for firefighters, a vestibule is provided as described in Sentence (3).

(3) Where a vestibule is required by Sentence (2) or by other provisions of this document
(a) a fire separation is provided between a public corridor and the vestibule that has a fire-resistance rating of not less than 45 min,
(b) a fire separation is provided between a floor area, other than the corridor described in Clause (a), and the vestibule that has a fire-resistance rating not less than that required for an exit in Article 3.4.4.1. of Division B,
(c) a fire separation is provided between a stair or elevator enclosure and the vestibule that has a fire-resistance rating not less than that required for an exit in Article 3.4.4.1. of Division B, and
r11.1 (d) a door in the fire separation described in Clauses (a), (b) or (c) (except for an elevator door) is provided with a self-closing device as required by Article 3.1.8.11. of Division B, and opens in the direction of travel from the floor area to the exit stairway.

(4) On each floor any vestibule that has a door to an exit stair may also have a door to an elevator for firefighters, but two exit stairs may not open onto the same vestibule.

(5) Each vestibule described in Sentence (2) that provides access to a stair shaft or an elevator shaft
(a) has a vent opening to the outdoors that has an opening area not less than 0.1 m^2 for each door that opens onto the vestibule, but not less than 0.4 m^2, or
(b) has equipment capable of providing for a vestibule to a stair shaft or an elevator shaft a mechanical air supply not less than that obtained from Graph 3 in Appendix A of this Supplementary Standard.

(6) The vent to each vestibule referred to in Clause (5)(a) may be provided with a closure that is openable manually, and in a building that is more than 36 m high, it can be opened from the central control facility as provided in Sentence (17).

(7) A stairway serving storeys above the lowest exit level is vented to the outdoors at the bottom of the stair shaft as described in Sentence (4) of Measure A.

(8) A stairway serving storeys below the lowest exit level is protected as described in Sentence (3) of Measure A.

(9) Each elevator shaft protected by a vestibule having a mechanical air supply as described in Clause (5)(b) has a vent at or near the bottom of the shaft, opening directly to the outdoors or into a vestibule or corridor that has a similar opening to the outdoors, having an openable area not less than 0.02 m^2 for every door into the shaft, other than doors at street floor level.

(10) The vent at the bottom of an elevator shaft referred to in Sentence (9) may be provided with a closure which is openable manually and is designed to remain open during a fire emergency.

(11) A vertical service space other than an elevator shaft is provided with
(a) a tight-fitting noncombustible fire stop at the level of the floor immediately below the lowest exit storey, and at the level of certain other floors that are fire separations, provided the space between fire stops is not more than five storeys, or
(b) a vent to the outdoors as described in Sentence (10) of Measure F.

(12) Except as provided in Sentence (13), an elevator shaft other than a shaft that contains an elevator for firefighters is protected against entry of smoke by a vestibule as described in Sentence (5).

(13) The provisions in Sentence (12) are waived for an elevator shaft that serves floor areas below the lowest exit storey and does not penetrate the floor immediately above that storey.

Measure M Residential Buildings with Balconies

General

In residential buildings the greater part of the requirements for control of smoke movement are waived where each suite has direct access to a balcony. The protective features are limited to stopping air handling systems, providing an opening to the outdoors at the foot of stair shafts serving upper floors and protection of stair shafts in storeys below grade. A typical arrangement is shown in Figure 16.

Where Measure M is adopted and a fire is detected by an automatic device or a manual pull station is actuated, it is intended that occupants on the fire floor will evacuate if possible, and that occupants of other floors may remain in their suites to await instructions.

Measure M

(1) The requirements specific to existing unsprinklered residential buildings may be met by incorporating the requirements of Sentences (2) to (7).

(2) A stair shaft serving storeys above the lowest exit level has a vent or door to the outdoors at or near the bottom of the stair shaft, as described in Sentence (4) of Measure A.

(3) A stairway serving storeys below the lowest exit level is protected as described in Sentence (3) of Measure A.

(4) Any elevator shaft that passes through the floor above the lowest exit storey does not penetrate the floor of the storey immediately below the lowest exit storey, except where there is a vestibule between the elevator door or doors and each floor area below grade as described in Sentence (3) of Measure D.

(5) Except for exhaust from kitchens, washrooms and bathrooms in dwelling units, air moving fans are stopped during a fire emergency in an air handling system that serves more than two storeys.

(6) Where a supply of air is required by Sentence (3), it is carried in ducts as described in Sentence (13) of Measure F.

(7) The central alarm and control facility required by Article 3.2.6.7. of Division B is provided with additional controls that are capable of

(a) stopping air handling systems as required by requirements specific to existing unsprinklered residential buildings, and

(b) initiating the mechanical air supply to stair shafts as may be required by Clause (3)(c).

Measure N Connected Buildings

General

r11.1 The measures described here are intended to prevent movement of smoke from one building to another. They are of particular significance where two buildings of unequal height are joined together. The techniques suggested are the provision of a large opening to the outdoors in a connecting vestibule so that smoke entering through leakage areas around doors will be vented to the outdoors, or pressurization to maintain a higher pressure in the vestibule than in adjacent spaces as illustrated in Figures 17 to 18A.

The requirements for protection of openings are described in terms appropriate to a doorway. Any other openings should be avoided if possible. Where they occur, they should be protected by the provision of an air lock that gives the same standard of protection as the vestibule described in Sentence (3).

Measure N

(1) The requirement of Sentence 3.2.6.3. of Division B that limits movement of smoke from one building to another may be met by incorporating in the link between the buildings the requirements in Sentences (2) and (3).

(2) Between one building and the other is a firewall as described in Subsection 3.1.10. of Division B.

(3) Any opening in the firewall is protected against passage of smoke by a vestibule described in Sentence (3) of Measure D and has

(a) a vent to the outdoors that has a net area of $10(0.023d + 0.00045a)$ m^2, where d is the number of doors having a perimeter not more than 6 m that open into the vestibule, or if the perimeter of doors exceeds 6 m, the value of d is increased in direct proportion to the increase in the perimeter, and a is the area in square metres of enclosing walls, floors and ceilings whose outer face is in contact with the outside air, except that where the outer face of a wall is in contact with the ground or fill, it is assumed that there is no leakage through that portion, and the value of a is assumed to be zero, or

(b) equipment capable of maintaining a supply of air into the vestibule sufficient to ensure that the air pressure in the vestibule when the doors are closed is higher by at least 12 Pa than that in adjacent floor areas when the outdoor temperature is equal to the January design temperature on a 2.5 percent basis.

Important Notice

Pending Amendments –
Keep in a Secure Place.

These changes come into effect January 1, 2022.

These pages, which have date bars at the bottom, are to replace or add to the existing corresponding pages on January 1, 2022.

Exit means that part of a *means of egress*, including doorways, that leads from the *floor area* it serves to a separate *building*, an open public thoroughfare or an exterior open space protected from fire exposure from the *building* and having access to an open public thoroughfare. (See Appendix A.)

Exit level means the level of an *exit* stairway in a *building* at which an exterior *exit* door or *exit* passageway leads to the exterior.

Exit storey means a *storey* having an exterior *exit* door in a *building* governed by Subsection 3.2.6. of Division B.

Exposing building face means that part of the exterior wall of a *building* that faces one direction and is located between ground level and the ceiling of its top *storey* or, where the *building* is divided into *fire compartments*, the exterior wall of a *fire compartment* that faces one direction.

Exterior cladding means those components of a *building* that are exposed to the outdoor environment and are intended to provide protection against wind, water or vapour.

Factory-built chimney means a *chimney* consisting entirely of factory-made parts, each designed to be assembled with the other without requiring fabrication on site.

Farm building means all or part of a *building*,

(a) that does not contain any area used for *residential occupancy*,
(b) that is associated with and located on land devoted to the practice of farming, and
(c) that is used essentially for the housing of equipment or livestock or the production, storage or processing of agricultural and horticultural produce or feeds.

(See Appendix A.)

Fill means *soil*, *rock*, rubble, industrial waste such as slag, organic material or a combination of these that is transported and placed on the natural surface of a *soil* or *rock* or organic terrain; it may or may not be compacted.

Fire block means a material, component or system that restricts the spread of fire within a concealed space or from a concealed space to an adjacent space.

Fire compartment means an enclosed space in a *building*,

(a) that is separated from all other parts of the *building* by enclosing construction that provides a *fire separation*, and
(b) that may be required to have a *fire-resistance rating*.

Fire damper means a *closure* that consists of a normally held open damper installed in an air distribution system or in a wall or floor assembly and designed to close automatically in the event of a fire in order to maintain the integrity of the *fire separation*.

Fire detector means a device that detects a fire condition and automatically initiates an electrical signal to actuate an *alert signal* or *alarm signal* and includes *heat detectors* and *smoke detectors*.

Fire load means, when applied to *occupancy*, the *combustible* contents of a room or *floor area* expressed in terms of the average weight of *combustible* materials per unit area, from which the potential heat liberation may be calculated based on the calorific value of the materials, and includes the furnishings, finished floor, wall and ceiling finishes, trim and temporary and movable *partitions*.

Fire-protection rating means the time in minutes or hours that a *closure* will withstand the passage of flame when exposed to fire under specified conditions of test and performance criteria, or as otherwise prescribed in this Code.

Fire-resistance rating means the time in minutes or hours that a material or assembly of materials will withstand the passage of flame and the transmission of heat when exposed to fire under specified conditions of test and performance criteria, or as determined by extension or interpretation of information derived from that test and performance as prescribed in this Code.

Fire-retardant treated wood means wood or a wood product that has been impregnated with fire-retardant chemicals to reduce its surface-burning characteristics such as flame spread, rate of fuel contribution and the density of smoke developed.

Fire separation means a construction assembly that acts as a barrier against the spread of fire. (See Appendix A.)

Fire service main means a pipe and its appurtenances that are connected to a source of water and that are located on a property,

(a) between the source of water and the base of the riser of a water-based fire protection system,
(b) between the source of water and inlets to foam making systems,

(c) between the source of water and the base elbow of private hydrants or monitor nozzles,
(d) as fire pump suction and discharge piping not within a *building*, or
(e) beginning at the inlet side of the check valve on a gravity or pressure tank.

Fire stop means a system consisting of a material, component and means of support, used to fill gaps between *fire separations* or between *fire separations* and other assemblies, or used around items that wholly or partially penetrate a *fire separation*.

Fire stop flap means a device,
(a) that is intended for use in horizontal assemblies that are required to have a *fire-resistance rating* and incorporate protective ceiling membranes, and
(b) that operates to close off a duct opening through the membrane in the event of a fire.

Firewall means a type of *fire separation* of *noncombustible construction* that subdivides a *building* or separates adjoining *buildings* to resist the spread of fire and that has a *fire-resistance rating* as prescribed in this Code and the structural stability to remain intact under fire conditions for the required fire-rated time.

First storey means the *storey* that has its floor closest to *grade* and its ceiling more than 1.8 m above *grade*.

Fixture means a receptacle, *plumbing appliance*, apparatus or other device that discharges *sewage* or *clear water waste*, and includes a floor drain.

Fixture drain means the pipe that connects a *trap* serving a *fixture* to another part of a *drainage system*.

Fixture outlet pipe means a pipe that connects the waste opening of a *fixture* to the *trap* serving the *fixture*.

Fixture unit means, when applied to a *drainage system*, the unit of measure based on the rate of discharge, time of operation and frequency of use of a *fixture* that expresses the hydraulic load that is imposed by that *fixture* on the *drainage system*.

Fixture unit means, when applied to a *water distribution system*, the unit of measure based on the rate of supply, time of operation and frequency of use of a *fixture* or outlet that expresses the hydraulic load that is imposed by that *fixture* or outlet on the supply system.

Flame-spread rating means an index or classification indicating the extent of the spread of flame on the surface of a material or an assembly of materials, as determined in a standard fire test prescribed in this Code.

Flammable liquid means any liquid having a *flash point* below 37.8°C and having a vapour pressure not more than 275.8 kPa (absolute) at 37.8°C as determined by ASTM D323, "Vapor Pressure of Petroleum Products (Reid Method)".

Flash point means the minimum temperature at which a liquid within a container gives off vapour in sufficient concentration to form an ignitable mixture with air near the surface of the liquid.

r11.2 *Flight* means a series of steps between landings.

Flood level rim means the top edge at which water can overflow from a *fixture* or device.

Floor area means the space on any *storey* of a *building* between exterior walls and required *firewalls*, including the space occupied by interior walls and *partitions*, but not including *exits*, *vertical service spaces* and their enclosing assemblies.

Flow control roof drain means a *roof drain* that restricts the flow of *storm water* into the *storm drainage system*.

Flue means an enclosed passageway for conveying *flue* gases.

Flue collar means the portion of a fuel-fired *appliance* designed for the attachment of the *flue pipe* or *breeching*.

Flue pipe means the pipe connecting the *flue collar* of an *appliance* to a *chimney*.

Food premises means a *floor area* where food or drink for human consumption, or an ingredient of food or drink for human consumption, is manufactured, processed, prepared, stored, displayed, handled, served, distributed, sold or offered for sale, but does not include,
(a) a private residence,
(b) a boarding house that provides meals for fewer than 10 boarders,
r11.1 (c) a *building* to which Ontario Regulation 502/17 (Camps in Unorganized Territory) or Ontario Regulation 503/17 (Recreational Camps) made under the *Health Protection and Promotion Act* applies,
(d) a plant, as defined in the *Milk Act*, that is required to be operated under the authority of a licence issued under that Act,

Private use means, when applied to plumbing *fixtures, fixtures* in residences and apartments, in private bathrooms of hotels, and in similar installations in other *buildings* for a single household or an individual.

Private water supply means piping that serves as a source of supply on the property to more than one *water service pipe*.

Private water supply system means an assembly of pipes, fittings, valves, equipment and appurtenances that supplies water from a private source to a *potable water system*.

Privy vault means a latrine in which the receptacle for human waste consists of a constructed vault from which the waste is periodically removed.

Process plant means an *industrial occupancy* where materials, including *flammable liquids, combustible liquids* or gases, are produced or used in a process.

Professional engineer means a person who holds a licence or a temporary licence under the *Professional Engineers Act*.

Public corridor means a corridor that provides *access to exit* from more than one *suite*. (See Appendix A.)

Public heritage building means a *heritage building* where the *occupancy* in whole or in part includes viewing of the *building* by the public provided that displays in it are limited to those relevant to the heritage significance of the *building*. (See Appendix A.)

Public pool means a structure, basin, chamber or tank containing or intended to contain an artificial body of water for swimming, water sport, water recreation or entertainment, but does not include,

(a) pools operated in conjunction with less than six *dwelling units*, *suites* or single family residences or any combination of them,
(b) pools that are used only for commercial display and demonstration purposes,
(c) wading pools,
(d) hydro-massage pools, or
(e) pools that serve only as receiving basins for persons at the bottom of water slides.

Public spa means a hydro-massage pool that contains an artificial body of water, that is intended primarily for therapeutic or recreational use, that is not drained, cleaned or refilled before use by each individual and that utilizes hydrojet circulation, air induction bubbles, current flow or a combination of them over the majority of the pool area, but does not include,

(a) wading pools, or
(b) spas operated in conjunction with less than six *dwelling units*, *suites* or single family residences, or any combination of them, for the use of occupants or residents and their visitors.

Public use means, when applied to plumbing *fixtures*, *fixtures* in general washrooms of schools, gymnasiums, hotels, bars, public comfort stations and other installations in which *fixtures* are installed so that their use is unrestricted.

Public way means a sidewalk, *street*, highway, square or another open space to which the public has access, as of right or by invitation, expressed or implied.

Rainwater means *storm sewage* runoff that is collected from a roof or the ground, but not from accessible patios and driveways.

Recirculation system means a system,

(a) that maintains the circulation of water through a *public pool* by pumps, and
(b) that provides continuous treatment of the water, including filtration and chlorination or bromination and any other process that may be necessary for the treatment of the water.

Recreational camp means a camp for recreational activities consisting of one or more *buildings* or other structures established or maintained as living quarters, with or without charge, for the temporary *occupancy* of 10 or more persons for five or more days.

Relief vent means a *vent pipe* that is used in conjunction with a *circuit vent* to provide additional air circulation between a *drainage system* and a *venting system*.

Repair garage means a *building* or part of a *building* where facilities are provided for the repair or servicing of motor vehicles.

Residential full flow-through fire sprinkler/standpipe system means an assembly of pipes and fittings installed in the residential portions of a *building* containing one or two *dwelling units* that conveys water from the *water service pipe* to

outlets in the sprinkler and standpipe systems and is fully integrated into the *potable water system* to ensure a regular flow of water through all parts of the sprinkler and standpipe systems.

r6 *Residential occupancy* means an *occupancy* in which sleeping accommodation is provided to residents who are not harboured for the purpose of receiving special care or treatment and are not involuntarily detained and includes an *occupancy* in which sleeping accommodation is provided to residents of a *retirement home*.

Residential partial flow-through sprinkler/standpipe system means an assembly of pipes and fittings installed in the residential portions of a *building* containing one or two *dwelling units* that conveys water from the *water service pipe* to outlets in the sprinkler and standpipe systems and in which flow occurs during inactive periods of the sprinkler and standpipe systems only through the main header to the water closet located at the farthest point of the sprinkler and standpipe systems.

r6 *Retirement home* means a *building* or part of a *building* that is a retirement home as defined in subsection 2(1) of the *Retirement Homes Act, 2010*.

Return duct means a duct for conveying air from a space being heated, ventilated or air-conditioned back to the heating, ventilating or *air-conditioning appliance*.

Riser means a water *distributing pipe* that extends through at least one full *storey*, as defined in Part 7 of Division B.

Rock means a portion of the earth's crust that is consolidated, coherent and relatively hard and that is a naturally formed, solidly bonded, mass of mineral matter that cannot readily be broken by hand.

Roof drain means a fitting or device that is installed in the roof to permit *storm sewage* to discharge into a *leader*.

Roof gutter means an exterior channel installed at the base of a sloped roof to convey *storm sewage*.

r11.2 *Run* means the horizontal distance between two adjacent tread nosings on a stair.

Sanitary building drain means a *building drain* that conducts *sewage* to a *building sewer* from the most upstream *soil* or *waste stack*, *branch* or *fixture drain* serving a water closet.

Sanitary building sewer means a pipe that is connected to a *sanitary building drain* 1 000 mm outside a wall of a *building* and that conducts *sewage* to a public sewer or *private sewage disposal system*.

Sanitary drainage pipe means all piping that conveys *sanitary sewage* to a place of disposal, including the *sanitary building drain*, *sanitary building sewer*, *soil pipe*, *soil stack*, *waste stack* and *waste pipe* but not the main sewer or piping in a *sewage* treatment plant.

Sanitary drainage system means a *drainage system* that conducts *sanitary sewage*.

Sanitary sewage means,

(a) liquid or water borne waste,
  (i) of industrial or commercial origin, or
  (ii) of domestic origin, including human body waste, toilet or other bathroom waste, and shower, tub, culinary, sink and laundry waste, or
(b) liquid or water borne waste discharged from a *public pool* to a drain.

Sanitary sewer means a sewer that conducts *sewage*.

Sanitary unit means a water closet, urinal, bidet or bedpan washer.

Self-service storage building means a *building* that is used to provide individual storage spaces to the public and that is open to the public only for those purposes.

Septic tank means a watertight vault in which *sanitary sewage* is collected for the purpose of removing scum, grease and solids from the liquid without the addition of air and in which solids settling and anaerobic digestion of the *sanitary sewage* takes place.

Service room means a room provided in a *building* to contain equipment associated with *building* services. (See Appendix A.)

Service space means space provided in a *building* to facilitate or conceal the installation of building service facilities such as chutes, ducts, pipes, shafts or wires.

Service water heater means a device for heating water for *plumbing* services.

Subsurface investigation means the appraisal of the general subsurface conditions at a *building* site by analysis of information gained by methods such as geological surveys, in situ testing, sampling, visual inspection, laboratory testing of samples of the subsurface materials and *groundwater* observations and measurements.

Suite means a single room or series of rooms of complementary use, operated under a single tenancy, and includes,
(a) *dwelling units*,
(b) individual guest rooms in motels, hotels, boarding houses, rooming houses and dormitories, and
(c) individual stores and individual or complementary rooms for *business and personal services occupancies*.
(See Appendix A.)

Supply duct means a duct for conveying air from a heating, ventilating or *air-conditioning appliance* to a space to be heated, ventilated or air-conditioned.

Surface water means water on the surface of the ground.

r11.2 *Tapered tread* means a tread with non-parallel edges that increases or decreases its *run* uniformly over its width.

Tarion Warranty Corporation means Tarion Warranty Corporation as designated under section 2 of the *Ontario New Home Warranties Plan Act*.

Theatre means a place of public assembly intended for the production and viewing of the performing arts or the screening and viewing of motion pictures, and consisting of an auditorium with permanently fixed seats intended solely for a viewing audience.

Trap means a fitting or device that is designed to hold a liquid seal that will prevent the passage of gas but will not materially affect the flow of a liquid.

Trap arm means that portion of a *fixture drain* between the *trap weir* and the *vent pipe* fitting.

Trap dip means the lowest part of the upper interior surface of a *trap*.

Trap seal depth means the vertical distance between the *trap dip* and the *trap weir*.

Trap standard means the *trap* for a *fixture* that is integral with the support for the *fixture*.

Trap weir means the highest part of the lower interior surface of a *trap*.

Treatment unit means a device that, when designed, installed and operated in accordance with its design specifications, provides a specific degree of *sanitary sewage* treatment to reduce the contaminant load from that of *sanitary sewage* to a given *effluent* quality.

Tribunal means the Licence Appeal Tribunal established under the *Licence Appeal Tribunal Act*, *1999*.

r6.1 *Type A dispersal bed* means a *leaching bed* that receives *effluent* from a Level IV *treatment unit* as described in Table 8.6.2.2. of Division B and that is comprised of a stone layer or *leaching chambers* installed over an unsaturated sand layer as described in Subsection 8.7.7. of Division B.

Type B dispersal bed means a *leaching bed* comprised of a *pressurized distribution system* that uniformly distributes *effluent* from a Level IV *treatment unit* as described in Table 8.6.2.2. of Division B to the underlying *soil*, as defined in Part 8 of Division B, through a set of *distribution pipes* installed in a bed comprised of septic stone.

Unit heater means a suspended *space heater* with an integral air circulating fan.

Unprotected opening means, when applied to an *exposing building face,*
(a) a doorway, window or opening, other than one equipped with a closure having the required *fire-protection rating*, or
(b) any part of a wall forming part of the *exposing building face* that has a *fire-resistance rating* less than required for the *exposing building face*.

Unstable liquid means a liquid, including *flammable liquids* and *combustible liquids*, that is chemically reactive to the extent that it will vigorously react or decompose at or near normal temperature and pressure conditions or that is chemically unstable when subjected to impact.

Vacuum breaker means *back-siphonage preventer*.

Vapour barrier means the elements installed to control the diffusion of water vapour.

Vent connector means, when applied to a heating or cooling system, the part of a venting system that conducts the *flue* gases or vent gases from the *flue collar* of a gas *appliance* to the *chimney* or *gas vent*, and may include a draft control device.

Vent pipe means a pipe that is part of a *venting system*.

Vent stack means a *vent pipe* that is connected at its upper end to a *header* or is terminated in *open air* and that is used to limit pressure differential in a *soil* or *waste stack*.

Venting system means an assembly of pipes and fittings that connects a *drainage system* with *open air* for circulation of air and the protection of *trap* seals in the *drainage system*.

Vertical leg means the vertical portion of a *fixture* drain and includes the portion of a drain from the outlet of a water closet bowl to the point where the connecting piping changes to horizontal.

Vertical service space means a shaft that is oriented essentially vertically and that is provided in a *building* to facilitate the installation of *building* services, including mechanical, electrical and plumbing installations and facilities such as elevators, refuse chutes and linen chutes.

Vulnerable area has the same meaning as in subsection 2(1) of the *Clean Water Act, 2006*.

Walkway means a covered or roofed pedestrian thoroughfare used to connect two or more *buildings*.

Waste pipe means a *sanitary drainage pipe* that carries the discharge from a *fixture* directly to a *waste stack*, *soil stack*, *sanitary building drain*, *branch* or *sewage system*.

Waste stack means a vertical *waste pipe* that passes through one or more *storeys* and includes any offset that is part of the stack that conducts liquid waste from *fixtures* other than *sanitary units*.

Water distribution system means an assembly of pipes, fittings, valves and appurtenances that conveys *potable water* to water supply outlets, *fixtures*, *plumbing appliances* and devices from the *water service pipe* or from a *point of entry treatment unit* located in the *building*.

Water purveyor means the owner or operator of a *drinking water system*.

Water service pipe means a pipe on the property that conveys *potable* water from a *drinking water system* or a *private water supply* to the inside of the *building*.

Water system means a *water service pipe*, a *private water supply*, a *water distribution system*, a *fire service main* or any part of any of them.

Wave action pool means a *public pool* equipped with a means for inducing wave motion in the water.

Wet vent means a *waste pipe* that also serves as a *vent pipe*.

Working capacity means the volume of liquid that a *treatment unit* or *holding tank* is capable of holding without overflowing while it is in its working position, but does not include the volume of liquid contained in a compartment in which a pump or siphon is installed.

X-ray equipment includes x-ray imaging systems, processing equipment and equipment directly related to the production of images for diagnosis or directly related to irradiation with x-rays for therapy.

X-ray machine means an electrically-powered device producing x-rays,

(a) for the irradiation of a human being or an animal for a therapeutic or diagnostic purpose, or
(b) for industrial use.

Yoke vent means a *vent pipe* that is connected at its lower end to a *soil* or *waste stack* and at its upper end to a *vent stack* or a *branch vent* that is connected to a *vent stack*.

Part 3

Fire Protection, Occupant Safety and Accessibility

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(8) Controls for the remote release of door locking devices permitted by Sentence (6) shall be located in an area readily available to security personnel.

(9) Locking devices permitted by Sentence (6) that are electrically operated shall be,
(a) designed to operate on emergency power, and
(b) capable of manual release by security personnel.

(10) A door in an *access to exit* is permitted to be equipped with an electromagnetic locking device conforming to Sentence 3.4.6.16.(4), except that this permission does not apply to a door,
(a) in an elementary or secondary school,
(b) a door leading from a Group F, Division 1 *occupancy*, or
(c) except as provided in Sentence (11), requiring a latch release device by Article 3.3.2.6.

(11) A door in an *access to exit* in a *gaming premise* is permitted to be equipped with an electromagnetic locking device conforming to Sentences 3.4.6.16.(4) and (7).

3.3.1.13. Ramps and Stairways

(1) Except as permitted by Sentence (2), Article 3.3.4.7. and Subsection 3.3.2., ramps and stairways that do not serve as *exits* shall conform to the dimensional, *guard*, handrail and slip-resistance requirements for *exit* ramps and stairways of Sentence 3.4.3.2.(7) and Articles 3.4.3.5. and 3.4.6.1. to 3.4.6.9.

(2) Ramps and stairways that do not conform to the requirements of Sentence (1) and are intended only for occasional use for servicing equipment and machinery are permitted,
(a) to serve *service rooms* and *service spaces,* and
(b) in *industrial occupancies*.

3.3.1.14. Exterior Passageways

(1) An exterior passageway leading to a required *exit* shall conform to the requirements of Section 3.4. for exterior *exit* passageways.

r11.2 ## 3.3.1.15. Tapered Treads in a Curved Flight

(1) *Flights* shall consist solely of,
(a) straight *flights*, or
(b) curved *flights* complying with Sentence (2).

(2) *Tapered treads* in a curved *flight* that is not required as an *exit* shall have,
(a) a minimum *run* of 150 mm,
(b) a *run* not less than 280 mm when measured at a point 300 mm from the centre line of the inside handrail, and
(c) a riser conforming to Sentence 3.4.6.8.(2).

(3) *Tapered treads* shall have a consistent angle and uniform *run* and rise dimensions in accordance with the construction tolerances described in Article 3.4.6.8. when measured at a point 300 mm from the centre line of the inside handrail.

(4) All *tapered treads* within a *flight* shall turn in the same direction.

3.3.1.16. Capacity of Access to Exits

(1) The capacity of an *access to exit* shall be based on the *occupant load* of the portionof the *floor area* served.

(2) In an *access to exit* the required width of ramps with a slope not more than 1 in 8, doorways, and corridors shall be based on not less than 6.1 mm per person.

(3) In an *access to exit* the required width of a ramp with a slope more than 1 in 8 shall be based on not less than 9.2 mm per person.

(4) In an *access to exit* from a *floor area* used or intended to be used for patients or residents in a Group B, Division 2 or Division 3 *occupancy*, the required width of corridors, doorways, and ramps shall be based on not less than 18.4 mm per person.

(5) The capacity of stairs in an *access to exit* shall conform to the requirements for stairs in Sentences 3.4.3.2.(1) to (3).

r11.1 **(6)** In a *building* that is not *sprinklered* in accordance with Sentence 3.2.5.13.(1), an *access to exit* that is part of the principal entrance serving a dance hall or a licensed beverage establishment with an *occupant load* more than 250 shall be at least one-half of the required *exit* width.

3.3.1.17. Guards

(1) Except as provided in Sentence (6) and Articles 3.3.2.8. and 3.3.4.7., a *guard* not less than 1 070 mm high shall be provided,

(a) around each roof to which access is provided for other than maintenance,

(b) at openings into smoke shafts referred to in Subsection 3.2.6. that are less than 1 070 mm above the floor, and

r11.2 (c) at each raised floor, *mezzanine*, balcony, gallery, interior or exterior vehicular ramp, and at other locations where,

(i) the difference in level is more than 600 mm between the walking surface and the adjacent surface, or

(ii) the adjacent surface within 1 200 mm of the walking surface has a slope of more than 1 in 2 away from the walking surface.

(2) Except as provided in Sentence (3) and Sentence 3.3.2.8.(4), openings through any *guard* that is required by Sentence (1) shall be of a size that will prevent the passage of a sphere having a diameter more than 100 mm unless it can be shown that the location and size of openings that exceed this limit do not represent a hazard.

r11.2 **(3)** Except as permitted by Sentence 3.3.5.9.(1), openings through any *guard* that is required by Sentence (1) and that is installed in a *building* of *industrial occupancy* shall be of a size which will prevent the passage of a sphere having a diameter more than 200 mm unless it can be shown that the location and size of openings that exceed this limit do not represent a hazard.

(4) Openings through any *guard* that is not required by Sentence (1) and that serves a *building* of other than *industrial occupancy*, shall be of a size that,

(a) will prevent the passage of a sphere having a diameter more than 100 mm, or

(b) will permit the passage of a sphere having a diameter more than 200 mm unless it can be shown that the location and size of openings that exceed these limits do not represent a hazard.

(5) Unless it can be shown that the location and size of openings do not present a hazard, a *guard* shall be designed so that no member, attachment or opening located between 140 mm and 900 mm above the level protected by the *guard* will facilitate climbing.

r11.2 **(6)** Sentence (1) does not apply,

(a) to the front edges of *stages*,

(b) to loading docks,

(c) to floor pits in *repair garages*, or

(d) where access is provided for maintenance purposes only.

3.3.1.18. Transparent Doors and Panels

r11.1 **(1)** Except for *dwelling units* and as permitted by Sentence (4), a glass or transparent door shall be designed and constructed so that the existence and position of the door is readily apparent, by attaching visually contrasting hardware, bars or other permanent fixtures to it.

r11.1 **(1.1)** Fully glazed transparent doors, and fully glazed transparent sidelights and panels with widths greater than 300 mm, shall be marked in conformance with Sentence 3.8.3.3.(15).

(2) A glass door shall be constructed of,
(a) laminated or tempered safety glass conforming to CAN/CGSB-12.1-M, "Tempered or Laminated Safety Glass", or
(b) wired glass conforming to CAN/CGSB-12.11-M, "Wired Safety Glass".

(3) Except as permitted by Sentence (4), transparent panels used in an *access to exit* that, because of their physical configuration or design, could be mistaken as a *means of egress* shall be made inaccessible by barriers or railings.

r11.1 **(4)** Sliding glass *partitions* that separate a *public corridor* from an adjacent *occupancy* and that are intended to be open during normal working hours need not conform to Sentences (1) and (3), provided the *partitions* are marked in conformance with Sentence 3.8.3.3.(15).

r11.1 **(4.1)** Glass in a vision panel in a door or in a transparent sidelight shall conform to Sentence 3.8.3.3.(14).

(5) Glass in doors and glass sidelights that could be mistaken for doors, within or at the entrances to *dwelling units* and in public areas, shall conform to the requirements of Article 9.6.1.4.

(6) A window in a public area that extends to less than 1 070 mm above the floor and is located above the second *storey* in a *building* of *residential occupancy*, shall be protected by a barrier or railing from the floor to not less than 1 070 mm above the floor, or the window shall be non-openable and designed to withstand the lateral design loads for balcony *guards* required by Article 4.1.5.14.

r11.1 3.3.1.19. Exhaust Ventilation and Explosion Venting

(1) Except as provided in Sentence (2), an exhaust ventilation system designed in conformance with the appropriate requirements of Part 6 shall be provided in a *building* or part of a *building* in which dust, fumes, gases, vapour or other impurities or contaminants have the potential to create a fire or explosion hazard.

(2) Where a *fire separation* required to have a *fire-resistance rating* is penetrated by a ventilation system required by Sentence (1) for power-ventilated enclosures in laboratories, the ducts shall be continuously enclosed from the first penetrated *fire separation* to any subsequent *fire separations* or concealed spaces and to the outdoors so that the highest *fire-resistance rating* of all the penetrated *fire separations* is maintained.

(3) Ducts described in Sentence (2) need not be equipped with a *fire damper,* a smoke damper or a combination smoke and *fire damper*.

(4) Explosion relief devices, vents or other protective measures conforming to Subsection 6.2.2. shall be provided for a space in which substances or conditions that have the potential to create an explosion hazard are present as a result of the principal use of a *building*.

3.3.1.20. Janitors' Rooms

(1) Except as permitted by Sentences (2) and (3), a room or space within a *floor area* for the storage of janitorial supplies shall be separated from the remainder of the *building* by a *fire separation* having a *fire-resistance rating* not less than 1 h.

(2) The *fire-resistance rating* of the *fire separation* required by Sentence (1) is permitted to be not less than 45 min provided the *fire-resistance rating* required by Subsection 3.2.2. is permitted to be less than 1 h for,
(a) the floor assembly above the *floor area*, or
(b) the floor assembly below the *floor area*, if there is no floor assembly above.

(3) The *fire separation* required by Sentence (1) is not required to have a *fire-resistance rating* if the *floor area* in which the room or space is located is *sprinklered*.

3.3.1.21. Common Laundry Rooms

(1) Except as permitted by Sentences (2) and (3), in a *building* of *residential occupancy*, a laundry room in a *floor area* that is not within a *dwelling unit* shall be separated from the remainder of the *building* by a *fire separation* having a *fire-resistance rating* not less than 1 h.

(2) The *fire-resistance rating* of the *fire separation* required by Sentence (1) is permitted to be not less than 45 min provided the *fire-resistance rating* required by Subsection 3.2.2. is permitted to be less than 1 h for,
(a) the floor assembly above the *floor area*, or
(b) the floor assembly below the *floor area*, if there is no floor assembly above.

(3) The *fire separation* required by Sentence (1) is not required to have a *fire-resistance rating* if the *floor area* in which the laundry room is located is *sprinklered*.

3.3.1.22. Obstructions

(1) No obstruction shall be permitted in any *occupancy* that would restrict the width of a normal *means of egress* from any part of a *floor area* to less than 750 mm unless an unobstructed alternative *means of egress* is provided adjacent to, accessible from, and plainly visible from the obstructed *means of egress*. (See Appendix A.)

3.3.1.23. Signs in Service Spaces

(1) Illuminated signs conforming to Sentence 3.4.5.1.(2) or (7) shall be provided to indicate the direction to egress points in a *service space* referred to in Sentence 3.2.1.1.(9).

3.3.1.24. Welding and Cutting

(1) Except as provided in Sentence (2), welding and cutting operations shall be located in a room,
(a) separated from the remainder of the *building* by a *fire separation* having a *fire-resistance rating* not less than 1 h, or
(b) protected by an automatic fire extinguishing system.

(2) Sentence (1) does not apply to an *industrial occupancy* where the welding and cutting operations do not present a fire or explosion hazard to adjacent areas.

3.3.2. Assembly Occupancy

3.3.2.1. Scope

(1) This Subsection applies to *assembly occupancies* and to outdoor places of assembly.

3.3.2.2. Fire Separations

(1) Except as permitted by Sentence (2), the seating area of a Group A, Division 1 *occupancy* shall be separated from adjacent *occupancies* in the *floor area* by a *fire separation* having a *fire-resistance rating* not less than 1 h if the *occupant load* in the seating area exceeds 200.

(2) The *fire-resistance rating* of the *fire separation* required by Sentence (1) is permitted to be less than 1 h but not less than 45 min provided the *fire-resistance rating* required by Subsection 3.2.2. is permitted to be less than 1 h for,
(a) the floor assembly above the *floor area*, or
(b) the floor assembly below the *floor area*, if there is no floor assembly above.

(3) If usable space exists under tiers of seats in arena type *buildings*, a *fire separation* with a *fire-resistance rating* not less than 45 min shall be provided between the space and the seats or the space shall be *sprinklered*.

(4) Except as required in Sentences (5) to (7), in an elementary or secondary school, a *hazardous classroom* shall be separated from the remainder of the *building* by a *fire-separation* having a *fire-resistance rating* not less than,
(a) 1 h where the *building* is not *sprinklered*, or
(b) 30 min where the *building* is *sprinklered*.

(5) Except as provided in Sentence (6), in an elementary or secondary school, a *hazardous classroom* containing an auto repair shop shall be separated from the remainder of the *building* by a *fire-separation* having a *fire-resistance rating* not less than,
(a) 2 h where the *building* is not *sprinklered*, or
(b) 1 h where the *building* is *sprinklered*.

(6) In an elementary or secondary school, if there is a group of *hazardous classrooms* or a group of *hazardous classrooms* and ancillary rooms of a complementary use, the *fire separation* required by Sentence (4) or (5) need not be provided within the group but the *fire separation* is required between the group and the remainder of the *building*.

(7) In an elementary or secondary school, a *hazardous classroom* containing a spray painting operation shall be separated from the remainder of the *building* by a *fire separation* having a *fire-resistance rating* not less than,
(a) 2 h, or
(b) 1 h where the spray painting operation is separated from the classroom by a *fire-separation* having a *fire-resistance rating* not less than 1 h.

(8) Except as required in Sentence (9), in an elementary or secondary school, where the *occupant load* of a room exceeds 200 persons, the room and any ancillary rooms of a complementary use shall be separated from the remainder of the *building* by a *fire separation* having a *fire-resistance rating* not less than,
(a) 1 h where the *building* is not *sprinklered*, or
(b) 30 min where the *building* is *sprinklered*.

(9) A kitchen shall not be located within the *fire compartment* required in Sentence (8).

3.3.2.3. Fixed Seats

(1) Except for the requirements of Article 3.3.2.7. for bench-type seats and except as required or permitted by Sentence (2) and Articles 3.3.2.9. and 3.3.2.10., fixed seats in places of assembly shall be,

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r5 (b) the travel distance is not more than 25 m measured along the path of travel from any seat to an *exit*, to an egress doorway or to an opening into a vomitory,
(c) at least one *means of egress*, comprising not less than 30 per cent of the required *exit* capacity, is through an exterior *exit*, an *exit* stairway or a corridor not containing an *occupancy*,
(d) each row served by a dead-end aisle has a minimum unobstructed width of 400 mm plus 6.1 mm for each additional seat above seven seats in a row, but not more than 550 mm,
(e) the activation of a *fire detector* or a sprinkler head in the seating area will,
(i) cause the shutdown of the projection system serving the seating area, and
(ii) turn on the normal lighting in the seating area,
(f) a voice communication system is installed in conformance with Article 3.2.4.23.,
(g) a smoke control system is installed to control movement of smoke in the seating area or a smoke exhaust system is provided so that, in the event of detection of smoke by a *smoke detector* in the seating area, air handling equipment is activated to extract air directly from the seating area at the rate of at least six air changes per hour, and
(h) the *floor area* is *sprinklered*.

(15) Where a seating area is separated as required by Sentences 3.3.2.2.(1) and (2) or 3.3.2.2.(8), the length of travel by any aisle shall be not more than 45 m measured from the most remote point of the aisle to,
(a) an egress doorway in the required separation, or
(b) an *exit* leading directly from the seating area.

(16) Where a seating area is not required to be separated by Sentences 3.3.2.2.(1) and (2) or 3.3.2.2.(8), the travel distance shall be not more than 45 m measured from the most remote point of the aisle to an *exit*.

(17) Side aisles shall be not less than 1 100 mm wide if seating is provided in conformance with Sentence 3.3.2.3.(4).

(18) An aisle that has a slope not more than 1 in 8 shall not be stepped.

(19) An aisle that slopes more than 1 in 8 shall be stepped.

(20) The passageway between rows of seats served by a stepped aisle shall be level at right angles to the line of travel.

(21) The riser of a step in an aisle shall be,
(a) not less than 110 mm high, and
(b) not more than 200 mm high.

(22) Variations are permitted in riser height provided,
(a) the height of adjacent risers does not vary by more than 6 mm, and
(b) the depth of a tread or a platform in the direction of travel is not less than 430 mm.

(23) Steps in an aisle shall,
r11.2 (a) have a *run* not less than 230 mm exclusive of nosings,
(b) have a tread depth not less than 250 mm,
(c) extend to the adjacent rows of seats in a manner that will not create a hazard from tripping, and
(d) have a finish on the treads conforming to Sentence 3.4.6.1.(1).

(24) The location of every riser in an aisle shall be made apparent from both directions of travel by strategically placed lighting or contrasting marking stripes.

(25) A platform in an aisle shall be level, except that a slope not more than 1 in 50 is permitted for a platform that is not less than 430 mm deep in the direction of *exit* travel.

(26) If a step is used at the entry to a row of seats from a stepped aisle, an unobstructed platform not less than 800 mm square shall be provided adjacent to the aisle.

(27) The finish of the surface of a platform in or adjacent to a stepped aisle shall conform to Sentence 3.4.6.1.(1).

3.3.2.5. Corridors

(1) Except as permitted by Sentences (2) to (4), a corridor used by the public in an *assembly occupancy* as an *access to exit* shall be separated from the remainder of the *floor area* by a *fire separation* having a *fire-resistance rating* not less than 1 h.

(2) The *fire-resistance rating* of the *fire separation* required by Sentence (1) is permitted to be less than 1 h but not less than 45 min provided the *fire-resistance rating* required by Subsection 3.2.2. is permitted to be less than 1 h for,
(a) the floor assembly above the *floor area*, or
(b) the floor assembly below the *floor area*, if there is no floor assembly above.

(3) The *fire-resistance rating* required by Sentence (1) is permitted to be waived if the *floor area* in which the corridor is located is *sprinklered*.

(4) The *fire separation* required by Sentence (1) is permitted to be waived if the distance from any point in the *floor area* to an *exit* measured along the path of travel to an *exit* does not exceed the travel distance permitted by Article 3.4.2.5.

3.3.2.6. Doors

(1) A door equipped with a latching mechanism in an *access to exit* from a room or *suite* of *assembly occupancy* containing an *occupant load* more than 100 shall be equipped with a device that will release the latch and allow the door to swing wide open when a force not more than that specified in Sentence 3.8.3.3.(7) is applied to the device in the direction of travel to the *exit*.

3.3.2.7. Fixed Bench-Type Seats Without Arms

(1) If fixed bench-type seats without arms are provided, the seat width per person shall be assumed to be 450 mm.

(2) The centre-to-centre spacing between rows of bench-type seats shall be not less than 760 mm if back rests are provided, and not less than 550 mm if back rests are not provided.

(3) A clear space of not less than 300 mm shall be provided between the back of each seat and the front of the seat immediately behind it.

3.3.2.8. Guards

(1) Except as required by Sentences (2) to (4) for bleacher seats, *guards* shall be installed in outdoor and indoor places of assembly with fixed seats so that,
(a) at the fascia of every box, balcony or gallery where the seats extend to the edge, the height of *guards* is not less than,
  (i) 760 mm in front of the seats, and
  (ii) 920 mm if located at the end of aisles or at the foot of steps,
(b) the height of *guards* along every cross aisle other than those adjacent to the fascia of every box, balcony or gallery is not less than 660 mm, except that *guards* need not be provided if the backs of the seats along the front side of the aisle are not less than 600 mm above the floor of the aisle, and
(c) where the seating is arranged in successive tiers and the height of rise between platforms is more than 450 mm, the height of *guards* is not less than 660 mm along the entire row of seats at the edge of the platform.

(2) The backs and ends of bleacher seats more than 1 200 mm above the ground or floor that are not adjacent to a wall shall be protected with a *guard,*
(a) not less than 1 070 mm high above an adjacent aisle surface or foot rest, and
(b) not less than 920 mm high above the centre of an adjacent seat board.

(3) If the front of a bleacher is more than 600 mm above the ground or floor, it shall be protected with a *guard* not less than 840 mm high above the front foot rest.

(4) Openings through any *guard* that is required by Sentences (2) and (3) shall be of a size that will prevent the passage of a sphere having a diameter more than 300 mm.

r11.2 ## 3.3.2.8A. Handrails in Aisles with Steps (See Appendix A.)

(1) Handrails shall be provided in aisles with steps in conformance with Table 3.3.2.8A.

(2) Handrails installed along aisle centre lines as required by Table 3.3.2.8A. shall,
(a) comply with Sentences 3.4.6.5.(3) to (5), (7) and (12),
(b) have gaps not less than 560 mm and not more than 915 mm wide, measured horizontally, at intervals not exceeding five rows of seats,
(c) comply with Sentence 3.4.6.5.(11) at terminations and required gaps, and
(d) have an intermediate rail located 305 mm below the principal handrail.

Table 3.3.2.8A.
Types and Location of Handrails in Aisles with Steps
Forming Part of Sentences 3.3.2.8A.(1) and (2)

Aisle Width	Handrail Requirements Aisle Serving Seating on One Side	Handrail Requirements Aisle Serving Seating on Both Sides
Less than 1 100 mm	A continuous handrail that is located on the side of the aisle opposite the seats and conforms to Sentences 3.4.6.5.(3) to (7), (9), (11) and (12).	A handrail that is located on one side at the end of each row of seats and conforms to Sentences 3.4.6.5.(3) to (6), (9), (11) and (12).
1 100 mm or more	(a) a centre line handrail that conforms to Sentence (2), or (b) a continuous handrail that is located on the side of the aisle opposite the seats and conforms to Sentences 3.4.6.5.(3) to (7), (9), (11) and (12), and, in addition to that continuous handrail, a handrail that is located at the end of each row of seats and conforms to Sentences 3.4.6.5.(3) to (6), (9), (11) and (12).	A centre line handrail that conforms to Sentence (2).
Column 1	2	3

3.3.2.9. Outdoor Places of Assembly

(1) A Group A, Division 4 *occupancy* and each tier or balcony that has a capacity of more than,
(a) 1 000 persons shall have no fewer than three separate *exits*, or
(b) 4 000 persons shall have no fewer than four separate *exits*.

(2) In a Group A, Division 4 *occupancy*, every seat shall be located so that the travel distance is not more than 45 m measured along the path of travel from the seat to,
(a) the ground,
(b) an *exit*,
(c) an opening to a passageway leading from the seating area, or
r5 (d) a portal, a vomitory or any other opening through the seating deck structure.

(3) *Exits* from outdoor stadia or grandstands shall be located not more than 25 m apart.

(4) The capacity of a *means of egress* for a Group A, Division 4 *occupancy* shall conform to the requirements of Sentence 3.4.3.2.(3).

(5) Aisles in a Group A, Division 4 *occupancy*,
(a) shall be located so that there are not more than 20 seats between any seat and the nearest aisle, and
(b) shall be not less than 1 200 mm wide, except that an aisle serving less than 60 persons is permitted to be 750 mm wide.

3.3.2.10. Bleachers

(1) Steps provided in aisles of bleachers of the telescopic type shall,
(a) have risers not more than 250 mm high, and
r11.2 (b) have treads with a *run* not less than 280 mm.

(2) If the vertical distance between seating platforms in bleachers is more than 280 mm, an intermediate step shall be provided the full width of the aisle and proportioned to provide two equal risers between platforms.

(3) If the vertical distance between seating platforms in bleachers is more than 450 mm, two intermediate steps shall be provided the full width of the aisle so that there are three equal risers between platforms.

(4) If the passageway between rows of seats is not a closed deck, footboards shall be provided so that,
(a) the total width of the footboards shall be not less than three-quarters of the centre-to-centre spacing between rows of seats, and
(b) the spacing between footboard members shall be not more than 25 mm.

(5) Openings above footboards and below the seats in rows of bleachers shall be of a size that will prevent the passage of a sphere having a diameter more than 100 mm.

3.3.2.11. Libraries

(1) Except as permitted by Sentence (2), a library book storage room that is not normally accessible to the public shall be separated from the remainder of the *building* by a *fire separation* with a *fire-resistance rating* not less than 2 h if it,
(a) is more than 250 m^2 in area, or
(b) contains book stacks that,
  (i) are more than 10 m high, or
  (ii) penetrate more than one floor assembly.

(2) The *fire separation* required by Sentence (1) is not required if the book storage room is *sprinklered*.

(3) Open book shelves are permitted above and below a *mezzanine* floor in a library *building* provided the height of the shelves is not more than 2.1 m but not more than 75% of the floor-to-ceiling height of the space above or below the *mezzanine* floor assembly.

3.3.2.12. Stages for Theatrical Performances

(1) A *stage* for theatrical performances and ancillary spaces, including workshops, dressing rooms and storage areas, shall be *sprinklered*.

(2) A *fire separation* with a *fire-resistance rating* not less than 1 h shall be provided between a *stage* for theatrical performances and ancillary spaces, including workshops, dressing rooms and storage areas.

(3) Except as permitted by Sentence (6), a *stage* for theatrical performances and ancillary spaces, including workshops, dressing rooms and storage areas, shall be separated from the seating area by a *fire separation* having a *fire-resistance rating* not less than 1 h, except for a proscenium opening protected with,
(a) a sprinkler deluge system conforming to the requirements of NFPA 13 "Installation of Sprinkler Systems",
(b) an unframed fire curtain if the opening is not more than 20 m wide, or
(c) a semi-rigid fire curtain if the opening is more than 20 m wide.

(4) A fire curtain required by Sentence (3) shall be of a type designed to close,
(a) automatically upon the actuation of the sprinkler system,
(b) automatically upon actuation of the fire alarm system,
(c) manually by remote control devices located at the curtain control panel and at each side of the *stage*, and
(d) automatically by heat-actuated devices.

(5) At least two vents for the purpose of venting fire and smoke to the outside of a *building* shall be provided above a *stage* designed for theatrical performances and shall,
(a) have an aggregate area not less than one-eighth of the area of the *stage* behind the proscenium opening, and
(b) be arranged to open automatically upon actuation of the sprinkler system.

(6) The *fire separation* referred to in Sentence (3) is not required between a *stage* and a seating area in a *floor area* that is *sprinklered*, provided a sprinkler deluge system is installed at the boundary between the *stage* and the seating area.

3.3.2.13. Risers for Stairs

r11.2 **(1)** In a Group A, Division 2 *occupancy* used for the serving of food and beverages, an interior *flight* with fewer than three risers is permitted provided it,
(a) is not less than 900 mm wide,
(b) is illuminated at all times that occupants are on the premises, and
(c) has a handrail on each side.

3.3.2.14. Storage Rooms

(1) A room intended for the storage of *flammable liquids* or *combustible liquids* required by the Fire Code made under the *Fire Protection and Prevention Act, 1997* shall not be located above or below the *first storey* of the *building*.

r1 3.3.3. Care, Care and Treatment or Detention Occupancy

3.3.3.1. Scope

r1 **(1)** This Subsection applies to *care occupancies*, *care and treatment occupancies* and *detention occupancies*. (See Appendix A.)

3.3.3.2. Fire Separations

r1 **(1)** The *fire separation* required by Sentence 3.3.5.5.(1) between a *care*, *care and treatment* or *detention occupancy* and a *repair garage* shall have no openings.

(2) Except as permitted by Sentence (4), in a Group B, Division 3 *occupancy*, walls between sleeping rooms and adjacent rooms shall be constructed as *fire separations* having a *fire-resistance rating* not less than 1 h, except that the *fire-resistance rating* need not be more than 45 min where the floor assembly is not required to be more than 45 min.

(3) Except as permitted by Sentence (4), in a Group B, Division 3 *occupancy*, walls separating corridors serving sleeping rooms from adjacent rooms shall be constructed as *fire separations* having a *fire-resistance rating* not less than 1 h, except that the *fire-resistance rating* need not be more than 45 min where the floor assembly is not required to be more than 45 min.

(4) The walls separating sleeping rooms from adjacent rooms and corridors in those parts of a *floor area* classified as a Group B, Division 3 *occupancy* shall be constructed as *fire separations* but are not required to have a *fire-resistance rating* if,
(a) those parts of the *floor area* contain sleeping accommodation for not more than 10 persons, and
(b) not more than six occupants require assistance in evacuation in case of an emergency.

(5) The door in the *fire-separation* required in Sentence (4) is permitted to be equipped with a roller latch and need not be provided with a self-closing device.

3.3.3.3. Corridors

(1) A corridor used by the public or serving patients or residents shall have no dead-end portion unless the area served by the dead-end portion has a second and separate *means of egress*.

(2) A corridor serving patients in a hospital shall be not less than 2 400 mm wide.

(3) Except as permitted in Sentence (5), a corridor serving residents who are not ambulatory in a Group B, Division 2 or 3 *occupancy* shall be not less than 1 650 mm wide.

(4) Paired doors in a corridor serving patients or residents shall,
(a) swing in opposite directions, the right hand door swinging in the direction of travel, and
(b) be not less than 1 100 mm wide.

(5) A corridor in a Group B, Division 3 *occupancy* that contains sleeping accommodation for not more than 10 persons and not more than six occupants require assistance in evacuation in case of an emergency need not comply with Sentence (3).

3.3.3.4. Doorway Width

r6 **(1)** In a Group B, Division 2 or 3 *occupancy*, the minimum clear width of doorways through which it is necessary to move a patient or resident in a bed shall be 1 050 mm. (See Appendix A.)

3.3.3.5. Hospitals and Long-Term Care Homes

(1) *Floor areas* containing patients' or residents' sleeping rooms in a hospital or long-term care home shall conform to Sentences (2) to (12). (See Appendix A.)

(2) Except as permitted by Sentence (3), a *floor area* containing patients' or residents' sleeping rooms in a hospital or long-term care home shall be divided into no fewer than two *fire compartments*, each not more than 1 000 m^2 in area.

(3) The *floor area* on either side of a *horizontal exit* conforming to Article 3.4.6.10. is permitted to be considered as a *fire compartment* in applying the requirements of this Article.

(4) Except as permitted by Sentence (5), *fire separations* separating *fire compartments* required by Sentence (2) shall have a *fire-resistance rating* not less than 1 h.

(5) The *fire-resistance rating* of a *fire separation* referred to in Sentence (4) is permitted to be less than 1 h but not less than 45 min provided the *fire-resistance rating* required by Subsection 3.2.2. is permitted to be less than 1 h for,
(a) the floor assembly above the *floor area*, or
(b) the floor assembly below the *floor area*, if there is no floor assembly above.

r11.1 **(6)** Reserved

(7) The travel distance from any point within each *fire compartment* referred to in Sentence (2) to a door to an adjoining *fire compartment* shall be not more than 45 m.

(8) Each *fire compartment* referred to in Sentence (2) shall be capable of accommodating, in addition to its own occupants, the occupants of the largest adjacent *fire compartment* based on a clear floor space of 2.5 m^2 per patient or resident in the adjacent *fire compartment*.

(9) Except as permitted by Sentences (10) and (11), walls between patients' or residents' sleeping rooms and the remainder of the *floor area* shall be constructed as *fire separations* but are not required to have a *fire-resistance rating* unless a *fire-resistance rating* is required by other provisions in this Part.

(10) The *fire separation* requirements of Sentence (9) do not apply to walls within a group of intercommunicating patients' or residents' rooms, provided the group of rooms does not
(a) contain more than five patients or residents, or
(b) include storage, bathing or toilet facilities serving persons not occupying the group of rooms.
(See Appendix A.)

(11) A door in a *fire separation* required by Sentence (9) is permitted to be equipped with a roller latch.

(12) A *fire separation* required by Sentence (9) shall not contain any grilles, louvres or other openings.

3.3.3.6. Protection for Special Care and Treatment Facilities

(1) Compartments containing rooms such as operating rooms, recovery rooms, delivery rooms, intensive care units and critical care units, from which it is impracticable to move patients in an emergency, shall be,
(a) separated from adjacent spaces by *fire separations* having a *fire-resistance rating* not less than 1 h, and
(b) provided with a mechanical air supply so that during a period of 2 h after the start of a fire in another space, the compartments will not contain more than 1% by volume of contaminated air from the fire area.

3.3.3.7. Contained Use Areas

(1) A *contained use area* shall conform to Sentences (2) to (5).

(2) A *contained use area* shall be separated from the remainder of the *building* by a *fire separation* having a *fire-resistance rating* not less than 1 h.

(3) Except as permitted by Sentence (4), a *building* that includes a *contained use area* shall be *sprinklered*.

(4) A *contained use area*, in a *building* for which Articles 3.2.2.20. to 3.2.2.83. do not require the installation of an automatic sprinkler system, is not required to be *sprinklered* as required by Sentence (3) provided,
(a) the *building* is designed so that during a period of 2 h after the start of a fire in the *contained use area*, other *fire compartments* will not contain more than 1% by volume of contaminated air from the *contained use area*,
(b) the *building* is designed so that during a period of 2 h after the start of a fire in another part of the *building*, the *contained use area* will not contain more than 1% by volume of contaminated air from the other part of the *building*,
(c) all doors are designed to be remotely released in conformance with Sentence 3.3.1.12.(6), and
(d) the *contained use area* does not contain any rooms lined with *combustible* padding.

(5) A corridor serving a *contained use area* shall have no dead-end portion unless the area served by the dead-end portion has a second and separate *means of egress*.

3.3.3.8. Handrails

r11.2 **(1)** Corridors and ramps used by residents in a long-term care home shall be equipped with handrails on each side conforming to Sentences 3.4.6.5.(5) to (7) and (11) to (13).

3.3.4. Residential Occupancy

3.3.4.1. Scope

(1) This Subsection applies to *residential occupancies*.

3.3.4.2. Fire Separations

(1) Except as permitted by Sentences (2) and 3.2.2.9.(2), *suites* of *residential occupancy* shall be separated from each other and the remainder of the *building* by a *fire separation* having a *fire-resistance rating* not less than 1 h.

(2) The *fire-resistance rating* of the *fire separation* required by Sentence (1) is permitted to be less than 1 h but not less than 45 min provided the *fire-resistance rating* required by Subsection 3.2.2. is permitted to be less than 1 h for,
(a) the floor assembly above the *floor area*, or
(b) the floor assembly below the *floor area*, if there is no floor assembly above.

(3) Floor assemblies within a *dwelling unit* need not be constructed as *fire separations* provided,
(a) the distance between the lowest floor level and the uppermost floor level within the *dwelling unit* is not more than 6 m, and
(b) the *dwelling unit* is separated from the remainder of the *building* by a *fire separation* having a *fire-resistance rating* not less than,
  (i) 45 min if the *building* is *sprinklered* and is not more than 3 *storeys* in *building height*,
  (ii) 1 h if the *building* is *sprinklered* and is more than 3 *storeys* in *building height*,
  (iii) 1 h if the *building* is not *sprinklered* and is not more than 6 *storeys* in *building height*, or
  (iv) 2 h if the *building* is not *sprinklered* and is more than 6 *storeys* in *building height*.

r6 **(4)** Except in a *retirement home*, the *fire-resistance rating* of the *fire separation* located between a *dwelling unit* and an attached *storage garage* need not conform to that required by Sentence 3.3.5.6.(1) provided,
(a) the *storage garage* contains not more than five vehicles,
(b) the *dwelling unit* and the attached *storage garage* are *sprinklered*,
(c) the *dwelling unit* is separated from the remainder of the *building* in conformance with Sentences (1) to (3),
(d) there are no air duct systems connecting the *storage garage* and the *dwelling unit*,
(e) the construction between the *storage garage* and the *dwelling unit* provides an effective barrier to gas and exhaust fumes, and
(f) every door between the *storage garage* and the *dwelling unit* is,
  (i) tight fitting and weather-stripped to provide an effective barrier against the passage of gas and exhaust fumes,
  (ii) fitted with a self-closing device, and
  (iii) not located in a room intended for sleeping.

r6 **(5)** Except in a *retirement home*, the *fire separation* required by Sentence 3.3.5.6.(1) is not required between a *dwelling unit* and an attached *storage garage*, serving that *dwelling unit* only, provided,
(a) the *dwelling unit* and its attached *storage garage* are separated from the remainder of the *building* in conformance with Sentences (1) to (3),
(b) there are no air duct systems connecting the *storage garage* and the *dwelling unit*,
(c) the construction between the *storage garage* and the *dwelling unit* provides an effective barrier to gas and exhaust fumes, and
(d) every door between the *storage garage* and the *dwelling unit* is,
  (i) tight fitting and weather-stripped to provide an effective barrier against the passage of gas and exhaust fumes,
  (ii) fitted with a self-closing device, and
  (iii) not located in a room intended for sleeping.

3.3.4.3. Storage Rooms

(1) Sprinklers shall be installed in a storage room provided for the use of tenants in a *residential occupancy* within a *floor area* but not contained within a *suite*.

(2) Except as permitted by Sentence (3), a storage room referred to in Sentence (1) shall be separated from the remainder of the *building* by a *fire separation* having a *fire-resistance rating* not less than 1 h.

(3) The *fire-resistance rating* of the *fire separation* required by Sentence (2) is permitted to be less than 1 h but not less than 45 min provided the *fire-resistance rating* required by Subsection 3.2.2. is permitted to be less than 1 h for,
(a) the floor assembly above the *floor area*, or
(b) the floor assembly below the *floor area*, if there is no floor assembly above.

(4) Except where located within a *dwelling unit*, a room intended for the storage of *flammable liquids* or *combustible liquids* required by the Fire Code made under the *Fire Protection and Prevention Act, 1997* shall not be located above or below the *first storey* of the *building*.

3.3.4.4. Egress from Dwelling Units

(1) Except as required by Sentence (8), single *storey dwelling units* in an apartment *building* need not lead to a *public corridor* or exterior passageway on the same *storey* provided the *dwelling units* are served by private stairways leading directly to a public *access to exit* on the *storey,*
(a) immediately above, and
(b) immediately below.
(See Appendix A.)

(2) Except as required by Sentence (8) and as permitted by Sentences (3) and (4), a *dwelling unit* containing more than 1 *storey* shall have an *exit* door or an egress door opening directly into a public *access to exit* from the uppermost *storey* and from the lowest *storey* of the *dwelling unit* so that each *storey* is served by an *exit* or egress door located not more than 1.5 m above or below its floor level.

(3) A single *exit* is permitted from a *dwelling unit* provided the *exit* is an exterior doorway not more than 1.5 m above adjacent ground level and,
(a) it is not necessary to travel up or down more than 1 *storey* to reach the *exit* door, or
(b) the uppermost floor level opens to a balcony not more than 6 m above adjacent ground level.

(4) An egress door from either the uppermost *storey* or the lowest *storey* in a *dwelling unit*, as required in Sentence (2), need not be provided,
(a) except as required by Sentence (8), if that *storey* is served by a stairway that,
  (i) leads to a public *access to exit*,
  (ii) has no direct access to any other *storey* in the *dwelling unit*, and
  (iii) is separated from the other *storeys* in the *dwelling unit* by a *fire separation* having a *fire-resistance rating* of not less than 45 min,
(b) on the uppermost *storey* in the *dwelling unit* if the *dwelling unit* has not more than 2 *storeys* above the *first storey* of the *building*,
(c) if it is not necessary to travel either more than 18 m or more than 1 *storey* up or down within the *dwelling unit* to reach the egress door, or
(d) if that *storey* is,
  (i) provided with a balcony conforming to Sentence (7),
  (ii) not more than 2 *storeys* above or below the *dwelling unit* egress door, and
  (iii) in a *building* that is not more than 6 *storeys* in *building height*.

(5) In a *building* of *residential occupancy* not more than 3 *storeys* in *building height*, a doorway from a *dwelling unit* is permitted to open directly into an *exit* stairway provided the *dwelling unit* has a second and separate *means of egress*.

(6) If a *dwelling unit* has a second and separate *means of egress*, one *means of egress* from a *dwelling unit* is permitted to pass through,
(a) an interior corridor served by a single *exit*,
(b) an exterior balcony served by a single *exit* stairway, or
(c) an exterior passageway served by a single *exit* stairway.

(7) Where a balcony is provided to meet the requirements of Sentence (3) or (4), the balcony shall have,
(a) a solid floor having a *fire-resistance rating* not less than that required for a floor assembly between *suites*, and
(b) an area providing not less than 1.5 m^2 per *suite* occupant, based on *occupant load*, and a minimum dimension of 1 200 mm.

(8) Each *dwelling unit* in a *building* conforming to Subclause 3.2.2.44.(1)(a)(ii) shall be served by,
(a) a direct *exit* that is an exterior doorway located not more than 1.5 m above adjacent ground level, or
(b) a stairway that,
  (i) leads to an exterior doorway not more than 1.5 m above adjacent ground level,
  (ii) has no access to another *dwelling unit*, and
  (iii) is separated from the remainder of the *building* with a *fire separation* having a *fire-resistance rating* not less than 1 h.

3.3.4.5. Automatic Locking Prohibition

(1) Except for *hotels*, a door opening onto a *public corridor* that provides *access to exit* from a *suite* shall be designed not to lock automatically. (See Appendix A.)

3.3.4.6. Sound Transmission

r11.1 **(1)** *Buildings* containing *dwelling units* shall be constructed so that airborne noise is controlled in conformance with Section 5.8.

3.3.4.7. Stairs, Ramps, Landings, Handrails and Guards for Dwelling Units

(1) Except as required by Article 3.3.4.8., stairs, ramps, landings, handrails and interior *guards* within a *dwelling unit* shall conform to the applicable requirements in Section 9.8.

(2) Except as provided in Sentence (3), exterior stairs, ramps, landings, handrails and *guards* serving a single *dwelling unit* shall conform to the applicable requirements in Section 9.8. and Sentence 3.1.20.1.(1).

r3 **(3)** Loads on exterior *guards* serving a *single dwelling unit* shall comply with Part 4.

3.3.4.8. Protection of Openable Windows

(1) Except as provided by Sentence (2), openable windows in *suites* of *residential occupancy* shall be protected by,
(a) a *guard* with a minimum height of 1 070 mm constructed in accordance with Article 3.3.1.17., or
r5 (b) a mechanism capable of controlling the free swinging or sliding of the openable part of the window so as to limit any clear unobstructed opening to a size that will prevent the passage of a sphere having a diameter more than 100 mm.

(2) Windows need not be protected in accordance with Sentence (1) where,
(a) the only opening having greater dimensions than those allowed by Clause (1)(b) is located higher than 1 070 mm above the finished floor, or
(b) the bottom edge of the openable portion of the window is located less than 1 800 mm above the floor or ground on the other side of the window.

3.3.4.9. Stud Wall Reinforcement

(1) If wood wall studs or sheet steel wall studs enclose the main bathroom in a *dwelling unit*, reinforcement shall be installed to permit the future installation of the following:

(a) for a water closet, a grab bar described in Clauses 3.8.3.8.(3)(a) and a grab bar described in Clause 3.8.3.8.(3)(c),

r11.1 (b) for a shower, grab bars described in Clause 3.8.3.13.(2)(g), and

r11.1 (c) for a bathtub, grab bars described in Clause 3.8.3.13.(4)(e).

(See Appendix A.)

3.3.4.10. Resistance to Forced Entry

(1) Resistance to forced entry into *dwelling units* shall conform to the applicable requirements in Articles 9.7.5.2. and 9.7.5.3.

r6 3.3.4.11. Retirement Homes

(1) *Floor areas* containing residents' sleeping rooms in a *retirement home* shall conform to Sentences (2) to (12).

(2) Except as permitted by Sentence (3), a *floor area* containing residents' sleeping rooms in a *retirement home* where sleeping accommodation is provided for more than 10 residents shall be divided into no fewer than two *fire compartments*, each not more than 1 000 m^2 in area.

(3) The *floor area* on either side of a *horizontal exit* conforming to Article 3.4.6.10. is permitted to be considered as a *fire compartment* in applying the requirements of this Article.

(4) Except as permitted by Sentence (5), *fire separations* separating *fire compartments* required by Sentence (2) shall have a *fire-resistance rating* not less than 1 h.

(5) The *fire-resistance rating* of a *fire separation* referred to in Sentence (4) is permitted to be less than 1 h but not less than 45 min provided the *fire-resistance rating* required by Subsection 3.2.2. is permitted to be less than 1 h for,

(a) the floor assembly above the *floor area*, or

(b) the floor assembly below the *floor area*, if there is no floor assembly above.

(6) A *closure* in a *fire separation* between *fire compartments* referred to in Sentence (2) shall be weatherstripped or otherwise designed and installed to retard the passage of smoke.

(7) The travel distance from any point within each *fire compartment* referred to in Sentence (2) to a door to an adjoining *fire compartment* shall be not more than 45 m.

(8) Each *fire compartment* referred to in Sentence (2) shall be capable of accommodating, in addition to its own occupants, the occupants of the largest adjacent *fire compartment* based on a clear floor space of 1.5 m^2 per resident in the adjacent *fire compartment*.

(9) The *fire separation* required by Sentence 3.3.5.5.(1) between a *retirement home* and a *repair garage* shall have no openings.

(10) In a *retirement home*, a dead end *public corridor* is permitted provided it is not more than 3 m long.

(11) The minimum clear width of doorways serving residents in a *retirement home* shall be 860 mm.

(12) A voice communication system conforming to Article 3.2.4.23. shall be provided in a *retirement home*.

3.3.5. Industrial Occupancy

3.3.5.1. Scope

(1) This Subsection applies to *industrial occupancies*.

3.3.5.2. Fire Extinguishing Systems

(1) In addition to other requirements in this Division for the installation of automatic fire extinguishing systems, an appropriate fire extinguishing system shall be installed in every *industrial occupancy floor area* to provide protection if required by,

(a) the Fire Code made under the *Fire Protection and Prevention Act, 1997*, or

r11.1 (b) the CCBFC NRCC 56192, "National Fire Code of Canada", in the absence of provisions referred to in Clause (a).

3.3.5.3. Basements

(1) A *basement* shall not be used for the storage, manufacture or handling of volatile solids, liquids or gases that generate explosive air-vapour mixtures or for processes that involve explosive dusts.

(2) Entrances and *exits* to a *basement* and to rooms containing *building* services shall be separate from the remainder of the *building* in a *building* in which,

(a) the storage, manufacture or handling of volatile materials can generate explosive air-vapour mixtures, or

(b) processes occur that produce explosive dusts.

(3) *Basements* and rooms referred to in Sentence (2) shall be separated from the remainder of the *building* with a vapour-tight separation.

3.3.5.4. Repair and Storage Garages (See Appendix A.)

(1) If access is provided from a *storage garage* to a stair tower or elevator serving *occupancies* above the level of the *storage garage*, the access shall be through a vestibule conforming to Sentence 3.3.5.7.(3).

(2) Treads and landings in interior stairs that extend to the roof of a *storage garage* shall be designed to be free of accumulations of ice and snow.

(3) A mechanical *storage garage* not more than 4 *storeys* in *building height*, in which no persons other than parking attendants are permitted above the *street* floor level, need not have a *fire separation* between the *exits* and the remainder of the *building*.

r11.2 **(4)** A *storage garage* or *repair garage* shall be provided with natural or mechanical ventilation in conformance with the requirements of Subsection 6.2.2. to prevent excessive accumulation of carbon monoxide, exhaust fumes or flammable and toxic vapours.

(5) Except as required by Sentence 3.8.2.2.(2), the clear height in a *storage garage* shall be not less than 2 m.

r11.2 **(6)** Where *storage garage* or *repair garage* floors or ramps are 600 mm or more above the adjacent ground or floor level, every opening through such floors and the perimeter of such floors and ramps shall be provided with,

(a) a continuous curb not less than 140 mm high, a *guard* not less than 1 070 mm high and a vehicle guardrail not less than 500 mm high conforming to Sentence (6.1), or

(b) a full-height wall conforming to Sentence (6.1).

r11.2 **(6.1)** Vehicle guardrails and full-height walls required by Sentence (6) shall be designed and constructed to withstand the loading values specified in Sentence 4.1.5.15.(1).

(7) Except for *open-air storeys*, every *storey* of a *storage garage* or *repair garage* located below *grade* shall be *sprinklered*.

3.3.5.5. Repair Garage Separation

(1) A *repair garage* and any ancillary spaces serving it, including waiting rooms, reception rooms, tool and parts storage areas and supervisory office space, shall be separated from other *occupancies* by a *fire separation* having a *fire-resistance rating* not less than 2 h.

3.3.5.6. Storage Garage Separation

(1) Except as permitted by Sentences 3.3.4.2.(4) and (5), a *storage garage* shall be separated from other *occupancies* by a *fire separation* with a *fire-resistance rating* not less than 1.5 h.

3.3.5.7. Vestibules

r6 **(1)** If access is provided through a *fire separation* between a *storage garage* and a Group A, Division 1 or Group B *occupancy* or a *retirement home*, the access shall be through a vestibule conforming to Sentence (3).

(2) In a *building* more than 3 *storeys* in *building height*, access through a *fire separation* between a *storage garage* and a Group A, Division 2, 3 or 4, or a Group C *occupancy*, shall be through a vestibule conforming to Sentence (3).

(3) If access is provided through a vestibule, as required by Sentences (1), (2) and 3.3.5.4.(1), the vestibule shall,
(a) be not less than 1.8 m long,
(b) be ventilated,
  (i) naturally to outside air by a vent that has an unobstructed area of not less than 0.1 m^2 for each door that opens into the vestibule but not less than 0.4 m^2, or
  (ii) mechanically at a rate of 14 m^3/h for each square metre of vestibule floor surface area, and
(c) have openings between the vestibule and an adjoining *occupancy* provided with self-closing doors with no hold-open devices.

3.3.5.8. Toe-Boards Required

(1) Where tools or other objects could fall from the floor of an upper level to a lower level in a room or space intended for use as a Group F *occupancy*, the edge of the floor at the upper level shall be provided with a toe-board extending from the floor surface to a height at least 125 mm above the floor surface.

r11.2 ### 3.3.5.9. Guards

(1) *Guards* in *industrial occupancies*, other than *guards* in *storage garages*, are permitted to consist of,
(a) a top rail, and
(b) one or more intermediate rails spaced such that the openings through the *guard* are of a size that prevents the passage of a spherical object having a diameter of 535 mm.

3.3.6. Design of Hazardous Areas

3.3.6.1. Application

(1) This Subsection applies to design and fire protection requirements for *buildings* or parts of *buildings* intended for the storage, handling, use and processing of,
(a) *dangerous goods*,
(b) materials that involve a risk of explosion or high flammability, and
(c) materials that are highly reactive.
(See Appendix A.)

r11.1 **3.3.6.2. Storage of Dangerous Goods**

(1) A room intended for the storage of solid and liquid *dangerous goods* classified as oxidizers or organic peroxides shall be separated from the remainder of the *building* by a *fire separation* having a *fire-resistance rating* of not less than 2 h.

(2) A room intended for the storage of reactive materials shall be separated from the remainder of the *building* by a *fire separation* having a *fire-resistance rating* of not less than 2 h. (See Appendix A.)

(3) The design and *construction* of a *building* or part of a *building* intended for the storage of *dangerous goods* classified as explosives shall conform to the *Explosives Act* (Canada) and the regulations made under that Act.

3.3.6.3. Indoor Storage of Compressed Gases

(1) Except as provided by Sentence (3), where required by the Fire Code made under the *Fire Protection and Prevention Act, 1997*, a room intended for the indoor storage of cylinders containing flammable *compressed gases* shall meet the following requirements,
(a) it is separated from the remainder of the *building* by a gas-tight *fire separation* having a *fire-resistance rating* of not less than 2 h,
(b) it is located on an exterior wall of the *building*,
(c) it can be entered from the exterior,
(d) it is ventilated in conformance with Sentence (4),
(e) it is constructed so that an exterior wall provides explosion venting,
  (i) in the ratio of 0.2 m^2 for each cubic metre of room volume, or
  (ii) in the ratio computed in accordance with NFPA 68, "Explosion Protection by Deflagration Venting", but in no case less than 0.065 m^2 of vent area for each cubic metre of room volume,
(f) it is not intended to contain fuel-fired equipment or high temperature heating elements, and
(g) it is not intended to be used for a purpose other than the storage of *compressed gas*.

(3) Travel distance to an *exit* shall be not more than 50 m from any point in a *service space* referred to in Sentence 3.2.1.1.(9).

(4) If there is a *firewall* in an elementary or secondary school, the travel distance shall not be measured to a door in the *firewall*, but shall be measured to an exterior *exit* door or an *exit* door to a stairway.

3.4.2.5. Location of Exits

(1) Except as permitted by Sentences (2), 3.2.8.4.(4) and 3.3.2.4.(13) to (16), if more than one *exit* is required from a *floor area*, the *exits* shall be located so that the travel distance to at least one *exit* shall be not more than,

(a) 25 m in a *high hazard industrial occupancy*,
(b) 40 m in a *business and personal services occupancy*,
(c) 45 m in a *floor area* that contains an *occupancy* other than a *high hazard industrial occupancy*, provided it is *sprinklered*,
(d) 105 m in any *floor area*, served by a *public corridor*, in which rooms and *suites* are not separated from the remainder of the *floor area* by a *fire separation*, provided,
  (i) the *public corridor* is not less than 9 m wide,
  (ii) the ceiling height in the *public corridor* is not less than 4 m above all floor surfaces,
  (iii) the *building* is *sprinklered*, and
  (iv) not more than one-half of the required egress doorways from a room or *suite* open into the *public corridor* if the room or *suite* is required to have more than one egress doorway,
(e) 60 m in any *storage garage* that conforms to the requirements of Article 3.2.2.83., and
(f) 30 m in any *floor area* other than those referred to in Clauses (a) to (e).

(2) Except for a *high hazard industrial occupancy*, Sentence (1) need not apply if *exits* are placed along the perimeter of the *floor area* and are not more than 60 m apart, measured along the perimeter, provided each main aisle in the *floor area* leads directly to an *exit*.

(3) *Exits* shall be located and arranged so that they are clearly visible or their locations are clearly indicated and they are accessible at all times.

3.4.2.6. Principal Entrance

(1) For the purposes of this Section, at least one door at every principal entrance from ground level shall be designed in accordance with the requirements for *exits*.

r11.1 **(2)** In a *building* that is not *sprinklered* in accordance with Sentence 3.2.5.13.(1), the principal entrance serving a dance hall or a licensed beverage establishment with an *occupant load* more than 250 shall provide at least one-half of the required *exit* width.

3.4.3. Width and Height of Exits

3.4.3.1. Exit Width Based on Occupant Load

(1) For the purpose of determining the aggregate width of *exits*, the *occupant load* of every room or *floor area* shall be determined in conformance with Subsection 3.1.17.

(2) Except as permitted by Sentence 3.4.3.2.(4), the required *exit* width shall be cumulative if two or more *exits* converge.

3.4.3.2. Exit Width

(1) Except as permitted by Sentence (3), the minimum aggregate required width of *exits* serving *floor areas* intended for *assembly occupancies*, *residential occupancies*, *business and personal services occupancies*, *mercantile occupancies*, and *industrial occupancies* shall be determined by multiplying the *occupant load* of the area served by,

(a) 6.1 mm per person for ramps with a slope of not more than 1 in 8, doorways, corridors and passageways,

r11.2 (b) 8 mm per person for a stair consisting of steps whose rise is not more than 180 mm and whose *run* is not less than 280 mm, or

(c) 9.2 mm per person for,

(i) ramps with a slope of more than 1 in 8, or

(ii) stairs, other than stairs conforming to Clause (b).

r1 **(2)** The minimum aggregate width of *exits* serving *floor areas* intended for a *care*, *care and treatment* or *detention occupancy* shall be determined by multiplying the *occupant load* of the area served by 18.4 mm per person.

(3) The minimum aggregate width of *means of egress* serving a Group A, Division 4 *occupancy* shall be determined by multiplying the *occupant load* of the area served by,

(a) 1.8 mm per person for,

(i) aisles,

(ii) stairs other than *exit* stairs, and

(iii) ramps and passageways in vomitories and *exits*, and

(b) 2.4 mm per person for *exit* stairs.

(4) Except as required by Sentence (5), the required *exit* width need not be cumulative in an *exit* serving two or more *floor areas* located one above the other.

(5) The required *exit* width for an *exit* stair in an assembly hall or *theatre* serving more than one balcony level shall conform to the appropriate requirements for stairs serving *interconnected floor spaces* in Article 3.2.8.4.

(6) If more than one *exit* is required, every *exit* shall be considered as contributing not more than one-half of the required *exit* width.

(7) The width of an *exit* shall be not less than,

(a) 1 100 mm for corridors and passageways,

(b) 1 100 mm for ramps not serving patients' or residents' sleeping rooms,

(c) 1 100 mm for stairs, not serving patients' or residents' sleeping rooms, that serve more than two *storeys* above the lowest *exit level* or more than one *storey* below the lowest *exit level*,

(d) 900 mm for stairs, not serving patients' or residents' sleeping rooms, that serve not more than two *storeys* above the lowest *exit level* or not more than one *storey* below the lowest *exit level*,

(e) 1 650 mm for stairs and ramps serving patients' or residents' sleeping rooms,

(f) 1 050 mm for doorways serving patients' or residents' sleeping rooms, and

(g) 790 mm for doorways not serving patients' or residents' sleeping rooms.

(See Appendix A.)

3.4.3.3. Exits from Interconnected Floor Space

(1) *Exit* stairs that serve *interconnected floor spaces* as provided in Articles 3.2.8.3. to 3.2.8.11. shall conform to the requirements in Article 3.2.8.4. and in this Section.

3.4.3.4. Exit Width Reduction (See Appendix A.)

(1) Except as permitted by Sentences (2) to (4), no fixture, turnstile or construction shall project into or be fixed within the required width of an *exit*.

(2) *Exit* doors shall be hung so that, when open, they shall neither diminish nor obstruct the required width of the *exit* by more than 50 mm for each door leaf.

(3) Swinging doors in their swing shall not reduce the required width of *exit* stairs or landings to less than 750 mm or reduce the width of an *exit* passageway to less than the minimum required width.

r11.2 **(4)** Handrails and construction below handrails, including handrail supports and stair stringers, are permitted to project into the required width of *means of egress* but the projections shall be not more than 100 mm on each side of the required width.

(5) In an elementary or secondary school, where a stair lift is installed in an *exit* stair, an intermediate handrail shall be installed between the path of travel of the stair lift and the remainder of the stair to ensure that the stair lift will not reduce the required width of the *exit* stair.

3.4.3.5. Headroom Clearance (See Appendix A.)

(1) Except as provided by Sentences (2), (4) and (5), every *exit* shall have a clear height over the clear width of the *exit* of not less than 2 100 mm.

(2) The clear height of stairways shall be measured vertically, over the clear width of the stairway, from a straight line tangent to the tread and landing nosings to the lowest point above, and shall not be less than 2 050 mm.

(3) The clear height of landings shall be measured vertically, over the clear width of the landing, to the lowest point above.

(4) Except as permitted by Sentence (5), the clear height of doorways shall not be less than 2 030 mm.

(5) No door closer or other device shall be installed so as to reduce the clear height of a doorway to less than 1 980 mm.

3.4.4. Fire Separation of Exits

3.4.4.1. Fire-Resistance Rating of Exit Separations

r5 **(1)** Except as provided by Sentences (2), (3) and (5) and Sentences 3.3.5.4.(3), 3.4.4.2.(2), 3.4.4.3.(1) and 3.13.3.1.(3), every *exit* shall be separated from the remainder of the *building* by a *fire separation* having a *fire-resistance rating* not less than that required by Subsection 3.2.2., but not less than 45 min, for,
(a) the floor assembly above the *storey*, or
(b) the floor assembly below the *storey*, if there is no floor assembly above.

(2) The *fire-resistance rating* of the *fire separation* referred to in Sentence (1) need not be more than 2 h.

r5 **(3)** In a *building* within the scope of Article 3.2.2.43A. or 3.2.2.50A., the *fire-resistance rating* of the *fire separation* referred to in Sentence (1) shall not be less than 1.5 h.

r5 **(4)** If an *exit* stair in an assembly hall or *theatre* serves more than one balcony level, the *exit* stair shall be separated from the remainder of the *building* in conformance with Sentence (1).

r5 **(5)** The path of *exit* travel may lead from an *exit* door or *exit* enclosure through *open air* parking that is located below a roof or floor assembly that is part of the *building* served by the *exit* door or *exit* enclosure where,
(a) the portion of the path of *exit* travel that leads through the *open air* parking is not more than 9 m in length measured from the *exit* door to a point at ground level at the perimeter of the *building*,
(b) measures are taken to prevent vehicles intended to park in spaces adjacent to the path of *exit* travel from encroaching on the path of *exit* travel, and
(c) an alternate *means of egress* not leading through the *open air* parking is available from the interior side of the door opening onto the path of *exit* travel through the *open air* parking area.

3.4.4.2. Exits Through Lobbies

(1) Except as permitted by Sentence (2), no *exit* from a *floor area* above or below the *first storey* shall lead through a lobby.

(2) Not more than one *exit* from a *floor area* is permitted to lead through a lobby provided,
(a) the lobby floor is not more than 4.5 m above *grade*,
(b) the path of travel through the lobby to the outdoors is not more than 15 m,
(c) the adjacent rooms or premises having direct access to the lobby do not contain a *residential occupancy* or an *industrial occupancy*, except that *dwelling units* may open directly onto the lobby where,
  (i) from the interior of the *exit* stair that opens onto the lobby there is alternate *means of egress* not leading through the lobby and such *means of egress* is entirely within the same *storey* as the lobby, or
  (ii) the *floor area* is *sprinklered*,
(d) except as required by Clause (g), the lobby is not located within an *interconnected floor space* other than as described in Sentence 3.2.8.2.(6),
(e) the lobby conforms to the requirements for *exits*, except that,
  (i) rooms other than *service rooms* and storage rooms are permitted to open onto the lobby,
  (ii) the *fire separation* between the lobby and a room used for the sole purpose of control and supervision of the *building* need not have a *fire-resistance rating*,
  (iii) the *fire separation* between the lobby and adjacent *occupancies* that are permitted to open onto the lobby need not have a *fire-resistance rating* provided the lobby and adjacent *occupancies* are *sprinklered,* and
  (iv) passenger elevator entrances are permitted to open onto the lobby provided the elevator entrance doors are designed to remain closed except while loading and unloading,
  (See Appendix A.)
(f) a *fire separation*, constructed in accordance with Sentence 3.4.4.1.(1), is maintained between the lobby and any *exit* permitted by this Sentence to lead through the lobby, and
(g) that if the *exit* serves a *hotel*, the lobby is not located within an *interconnected floor space*.

3.4.4.3. Exterior Passageway Exceptions

(1) The requirements of Sentences 3.4.4.1.(1) and 3.2.3.13.(1) and (3) do not apply to an exterior *exit* passageway provided,
(a) not less than 50% of the exterior side is open to the outdoors, and
(b) an *exit* stair is provided at each end of the passageway.

3.4.4.4. Integrity of Exits

(1) A *fire separation* that separates an *exit* from the remainder of the *building* shall have no openings except for,
(a) standpipe and sprinkler piping,
(b) electrical wires and cables, totally enclosed *noncombustible* raceways and *noncombustible* piping that serve only the *exit*,
(c) openings required by the provisions of Subsection 3.2.6.,
(d) *exit* doorways,
(e) wired glass and glass block permitted by Article 3.1.8.14., and
(f) a sprinkler protected glazed wall assembly conforming to Article 3.1.8.18.

(2) *Exits* within scissors stairs and other contiguous *exit* stairways shall be separated from each other by a smoke-tight *fire separation* having a *fire-resistance rating* not less than that required for the floor assembly through which they pass.

(3) *Fire separations* separating contiguous stairs described in Sentence (2) shall not be pierced by doorways, ductwork, piping or any other openings that affect the continuity of the separation.

(4) A fuel-fired *appliance* shall not be installed in an *exit*.

(5) An *exit* shall not be used as a *plenum* for a heating, ventilating or *air-conditioning* system.

(6) An *exit* shall be designed for no purpose other than for exiting, except that an *exit* is permitted also to be designed to serve as an access to a *floor area*.

(7) A *service room* shall not open directly into an *exit*.

(8) Storage rooms, washrooms, toilet rooms, laundry rooms and similar ancillary rooms shall not open directly into an *exit*.

(9) *Service spaces* referred to in Sentence 3.2.1.1.(9) shall not open directly into an *exit*.

(10) In elementary and secondary schools, an *exit* shall be designed so that it does not serve as an access from one portion of a *floor area* to another portion of the same *floor area*.

3.4.5. Exit Signs

3.4.5.1. Exit Signage

(1) Except as provided by Sentences (9) and (10), every *exit* door shall have an *exit* sign placed over or adjacent to it if the *exit* serves,
(a) a *building* more than 2 *storeys* in *building height*,
(b) a *building* having an *occupant load* of more than 150, or
(c) a room or *floor area* that has a fire escape as part of a required *means of egress*.

(2) Except as provided by Sentence (7), every *exit* sign shall,
(a) be visible on approach to the *exit*,
r5 (b) consist of a green pictogram and white graphic symbol meeting the visibility specifications referred to in ISO 3864-1, "Graphical Symbols – Safety Colours and Safety Signs – Part 1: Design Principles for Safety Signs and Safety Markings", and
r11.1 (c) conform to ISO 7010, "Graphical Symbols - Safety Colours and Safety Signs - Registered Safety Signs" for the following symbols:
(i) E001 emergency exit left,
(ii) E002 emergency exit right,
(iii) E005 90-degree directional arrow, and
(iv) E006 45-degree directional arrow.
(See Appendix A.)

(3) Internally illuminated *exit* signs shall,
(a) be continuously illuminated, and
r11.1 (b) where illumination of the sign is powered by an electrical circuit, be constructed in conformance with CSA C22.2 No. 141, "Emergency Lighting Equipment".

(4) Externally illuminated *exit* signs shall be continuously illuminated by a light fixture supplied by an electrical circuit.

(5) Photoluminescent and self-luminous *exit* signs shall,
(a) conform to CAN/ULC-S572, "Photoluminescent and Self-Luminous Signs and Path Marking Systems",
r5 (b) be labelled in accordance with the time duration for which they have been tested and *listed*,
r5 (c) be so installed that upon failure of the regular power they will continue to be illuminated for the applicable time duration specified in Clause 3.2.7.4.(1)(b), and
r5 (d) be continuously illuminated if reliant on an external energy source to energize the reflective coating of the sign.
(See Appendix A.)

(6) If illumination of an *exit* sign is provided from an electrical circuit, that circuit shall,
(a) serve no equipment other than emergency lighting in the area where *exit* signs are installed, and
(b) be connected to an emergency power supply as described in Sentence 3.2.7.4.(1).

(7) Where no *exit* is visible from a *public corridor*, from a corridor used by the public in a Group A or B *major occupancy* or from principal routes serving an open *floor area* having an *occupant load* of more than 150, an *exit* sign conforming to Clauses (2)(b) and (c) with an arrow or other indicator pointing at the direction of egress shall be provided.

(8) Except for egress doorways described in Sentence 3.3.2.3.(4), an *exit* sign conforming to Sentences (2) to (6) shall be placed over or adjacent to every egress doorway from rooms with an *occupant load* more than 60 in Group A, Division 1 *occupancies*, dance halls, licensed beverage establishments and other similar *occupancies* that, when occupied, have lighting levels below the level that would provide easy identification of the egress doorway.

(9) Except for *suite* doors opening directly to the exterior, every *exit* serving a *hotel* shall have an *exit* sign placed over or adjacent to it.

(10) An *exit* sign is not required within a *suite* containing a Group B, Division 3 *occupancy* if the following requirements are met:
(a) the *suite* contains sleeping accommodation for not more than 10 persons, and
(b) not more than 6 occupants require assistance in evacuation in case of an emergency.

3.4.5.2. Signs Within Exit Facilities

(1) In a *building* more than 2 *storeys* in *building height*, any part of an *exit* ramp or stair that continues up or down past the lowest *exit level* shall be clearly marked by a sign indicating that it does not lead to an *exit*.

(2) An *exit* stair serving a *building* more than 6 *storeys* in *building height* shall be clearly marked by signs indicating that it does not lead to an *exit* at the roof level. (See Appendix A.)

3.4.6. Types of Exit Facilities (See Appendix A.)

r4 3.4.6.1. Surface Finish of Ramps and Stairs

(1) The surfaces of ramps, landings and treads shall,
(a) have a finish that is slip-resistant, and
(b) if accessible to the public, have a colour contrast or a distinctive visual pattern to demarcate,
  (i) the leading edge of the tread,
  (ii) the leading edge of the landing, and
  (iii) the beginning and end of a ramp.

(2) A tactile attention indicator conforming to Article 3.8.3.18. shall be installed,
(a) at the top of the stairs, starting one tread depth back from the edge of the top stair, and
r5 (b) at the leading edge of landings where a doorway opens onto stairs, starting one tread depth back from the edge of the landing.
(See Appendix A.)

(3) Treads and landings of exterior *exit* stairs shall be designed to be free of ice and snow accumulations if the stairs,
(a) are more than 10 m high, or
(b) serve a *hotel*.

3.4.6.2. Minimum Number of Risers

r11.2 **(1)** Except as permitted by Sentence 3.3.2.13.(1), every *flight* of interior stairs shall have no fewer than 3 risers.

3.4.6.3. Maximum Vertical Rise of Stair Flights and Required Landings

r11.2 **(1)** No *flight* shall have a vertical rise of more than 3.7 m between floors or landings, except that a *flight* serving as an *exit* in a Group B, Division 2 or 3 *occupancy* shall have a vertical rise not more than 2.4 m between floors or landings.

(2) Except as provided by Sentence (3), a landing shall be provided,

r11.2 (a) at the top and bottom of each *flight* of interior and exterior stairs,
(b) at the top and bottom of every section of ramp,
(c) where a doorway opens onto a stair or ramp,
(d) where a ramp opens onto a stair, and
(e) where a stair opens onto a ramp.

(3) A landing may be omitted at the bottom of an exterior stair or ramp, provided there is no gate, door or fixed obstruction within the lesser of,
(a) the width of the stair or ramp, or
(b) 1 100 mm.

r11.2 3.4.6.4. Dimensions of Landings (See Appendix A.)

(1) Except as permitted in Sentences (2) and (6), a landing shall be,
(a) at least as wide as the width of the stair or ramp in which it occurs, and
(b) at least as long as the width of the stair or ramp in which it occurs.

(2) Where a landing in a stair or ramp does not turn or turns less than 90°, the length of the landing need not be more than the lesser of,
(a) the required width of the stair or ramp, or
(b) 1 100 mm.

(3) Where a landing in a stair or ramp turns less than 90°, the length of the landing shall be measured perpendicular to the nosings of adjacent steps or to the end of the ramp, at a distance equal to half the length required by Sentence (2) from the narrow edge of the landing.

(4) Where a doorway or stair empties onto a ramp through a side wall, there shall be a level area extending across the full width of the ramp, and for a distance of 300 mm on either side of the wall opening, except one side if it abuts on an end wall.

(5) Where a doorway or stair empties onto a ramp through an end wall, there shall be a level area extending across the full width of the ramp and along its length for not less than 900 mm.

(6) Where the direction of *exit* travel changes at a landing, the landing is permitted to be chamfered or curved in plan, provided the required width of the stair is maintained where measured perpendicular to the direction of *exit* travel across the landing.

r11.2 3.4.6.5. Handrails

(1) At least one handrail shall be provided on straight *flights* that are less than 1 100 mm in width.

(2) One handrail shall be provided on each side of,
(a) straight *flights* that are 1 100 mm or more in width,
(b) curved *flights*, and
(c) ramps.

(3) In addition to Sentence (2), intermediate handrails shall be provided so that,
(a) a handrail is reachable within 825 mm of all portions of the required *exit* width, and
(b) at least one portion of the stair or ramp between two handrails is the required *exit* width for stairs or ramps as described in Sentences 3.4.3.2.(7) and 3.4.3.4.(4).

(4) Where a stair or ramp is wider than its required *exit* width, handrails shall be located along the most direct path of travel. (See Appendix A.)

(5) Handrails shall be continuously graspable along their entire length, shall be free of any sharp or abrasive elements, and shall have,
(a) a circular cross-section with an outside diameter not less than 30 mm and not more than 43 mm, or
(b) any non-circular cross-section with a perimeter not less than 100 mm and not more than 125 mm and whose largest cross-sectional dimension is not more than 45 mm.

(6) The height of handrails on stairs, on aisles with steps and on ramps shall be measured vertically from the top of the handrail to,
(a) a straight line drawn tangent to the tread nosings of the stair served by the handrail, or
(b) the surface of the ramp, floor or landing served by the handrail.

(7) Except as provided by Sentence (8) and Clause 3.8.3.4.(1)(e), the height of handrails on stairs, on aisles with steps and on ramps shall be,
(a) not less than 865 mm, and
(b) not more than 1070 mm.

(8) Handrails installed in addition to required handrails need not comply with Sentence (7).

(9) Required handrails shall be continuous throughout the length of,
(a) a ramp, and
(b) a *flight*, from the bottom riser to the top riser.

(10) Except as required by Sentence (16) and except where interrupted by doorways or newels at changes in direction, at least one handrail shall be continuous throughout the length of a stair or ramp, including at landings. (See Appendix A.)

(11) Handrails shall be terminated in a manner that will not obstruct pedestrian travel or create a hazard.

(12) At least one handrail shall,
(a) in the case of a stair,
  (i) extend horizontally at the required height, not less than 300 mm beyond the top riser, and
  (ii) continue to slope for a depth of one tread beyond the bottom riser followed by a 300 mm horizontal extension, and
(b) in the case of a ramp, extend horizontally at the required height, not less than 300 mm beyond the top and bottom edges of the incline.

(13) The clearance between a handrail and any surface behind it shall be not less than,
(a) 60 mm, if the surface behind the handrail is rough or abrasive, or
(b) 50 mm, in all other cases.

(14) Handrails and their supports shall be designed and constructed to withstand the loading values specified in Sentence 4.1.5.14.(7).

(15) A ramp shall have handrails on both sides.

(16) In a long-term care home, a Group B, Division 3 *occupancy* and a *retirement home*, a continuous handrail shall be provided on both sides of a stair throughout the length of the stair, including landings, except where a handrail is interrupted by doorways or newels at changes in direction.

3.4.6.6. Guards

r11.2 **(1)** Every *exit* shall have a wall or a well-secured *guard* on each side where,
(a) the difference in level is more than 600 mm between the walking surface and the adjacent surface, or
(b) the adjacent surface within 1 200 mm of the walking surface has a slope of more than 1 in 2 away from the walking surface.

r11.2 **(2)** Except as required by Sentence (4), the height of *guards* for *exit* stairs and *exit* ramps, as well as their landings, shall be not less than 1 070 mm.

r11.2 **(3)** The height of *guards* shall be measured vertically to the top of the *guard* from,
(a) a line drawn through the outside edges of the tread nosings, or
(b) the surface of the ramp or landing.

r11.2 **(4)** The height of *guards* for exterior stairs and landings more than 10 m above adjacent ground level shall be not less than 1 500 mm measured vertically to the top of the *guard* from the surface of the landing or a line drawn through the outside edges of the tread nosings.

(5) Except as provided in Sentence (6), openings through any *guard* that is required by Sentence (1) shall be of a size that will prevent the passage of a sphere having a diameter more than 100 mm unless it can be shown that the location and size of openings that exceed this limit do not represent a hazard.

(6) Openings through any *guard* that is required by Sentence (1) and that is installed in a *building* of *industrial occupancy* shall be of a size that will prevent the passage of a sphere having a diameter more than 200 mm unless it can be shown that the location and size of openings that exceed this limit do not represent a hazard.

r11.2 **(7)** In a stairway, a window for which the distance measured vertically between the bottom of the window and a line drawn through the outside edges of the tread nosings is less than 900 mm, or a window that extends to less than 1 070 mm above the landing, shall,
(a) be protected by a *guard* that is,
r11.2 (i) located approximately 900 mm above a line drawn through the outside edges of the tread nosings, or
(ii) not less than 1 070 mm high measured to the top of the *guard* from the surface of the landing, or
(b) be fixed in position and designed to resist the lateral design loads specified for *guards* and walls in Articles 4.1.5.14. and 4.1.5.16.

(8) Unless it can be shown that the location and size of openings do not present a hazard, a *guard* shall be designed so that no member, attachment or opening located between 140 mm and 900 mm above the level being protected by the *guard* will facilitate climbing.

3.4.6.7. Ramp Slope

(1) Except as required for aisles by Article 3.3.2.4., the maximum slope of a ramp shall be,

r1 (a) 1 in 10 in any *assembly, care, care and treatment, detention* or *residential occupancy*,

r11.2 (b) 1 in 6 in an *industrial occupancy*,

r11.2 (c) 1 in 8 in all other *occupancies*, and

(d) 1 in 10 for an exterior ramp.

3.4.6.8. Treads and Risers

r11.2 **(1)** Except as permitted for *dwelling units* and by Sentence 3.4.7.5.(1) for fire escapes, steps in *flights* shall have a *run* of not less than 280 mm and not more than 355 mm between successive steps.

r11.2 **(2)** Steps referred to in Sentence (1) shall have a rise between successive treads not less than 125 mm and not more than 180 mm.

r11.2 **(2.1)** Steps in *flights* shall have no open risers,

(a) except as provided in Article 3.3.4.7., and

(b) except for the following stairs:

(i) fire escape stairs,

(ii) stairs that are principally used for maintenance and service, and

(iii) stairs that serve *industrial occupancies* other than *storage garages*.

r11.2 **(3)** Except in fire escape stairs and where an exterior stair adjoins a *walkway* as permitted by Sentence 3.4.6.3.(3), risers, measured as the vertical nosing-to-nosing distance, shall be of uniform height in any one *flight*, with a maximum tolerance of,

(a) 5 mm between adjacent treads or landings, and

(b) 10 mm between the tallest and shortest risers in a *flight*.

r11.2 **(4)** Except in fire escape stairs, treads, measured as the horizontal nosing-to-nosing distance, shall have a uniform *run* with a maximum tolerance of,

(a) 5 mm between adjacent treads, and

(b) 10 mm between the deepest and shallowest treads in a *flight*.

r11.2 **(5)** Treads and risers shall not differ significantly in *run* and rise in successive *flights* in any stair system. (See Appendix A.)

r11.2 **(6)** Reserved

(7) The slope on treads or landings shall not exceed 1 in 50.

(8) Except as permitted by Sentence (10), the top of the nosing of a stair tread shall have a rounded or bevelled edge extending not less than 6 mm and not more than 13 mm measured horizontally from the front of the nosing.

(9) The front edge of stair treads in *exits* and public *access to exits* shall be at right angles to the direction of *exit* travel.

(10) If resilient material is used to cover the nosing of a stair tread, the minimum radius or bevel required by Sentence (8) is permitted to be reduced to 3 mm.

r11.2 3.4.6.9. Curved Flights in Exits

(1) *Flights* used as an *exit* shall consist solely of,

(a) straight *flights*, or

(b) curved *flights* complying with Sentence (2).

(2) A curved *flight* used as an *exit* shall have,
(a) a handrail on each side,
(b) treads with a minimum *run* of 240 mm,
(c) treads with a *run* that conforms to Article 3.4.6.8. when measured at a point 300 mm from the centre line of the inside handrail, and
(d) an inside radius that is not less than twice the stair width.

(3) *Tapered treads* shall have a consistent angle and uniform *run* and rise dimensions in accordance with the construction tolerances described in Article 3.4.6.8. when measured at a point 300 mm from the centre line of the inside handrail.

(4) All *tapered treads* within a *flight* shall turn in the same direction.

3.4.6.10. Horizontal Exits

(1) Except in an elementary or secondary school that is subdivided by a *firewall*, the *floor area* on each side of a *horizontal exit* shall be sufficient to accommodate the occupants of both *floor areas*, allowing not less than 0.5 m^2 of clear floor space per person, except that 1.5 m^2 shall be provided for each person in a wheelchair and 2.5 m^2 for each patient in bed.

(2) If vestibules, enclosed balconies or bridges are used as parts of a *horizontal exit*, their clear width shall be not less than that of the *exit* doorways opening into them, except that handrails are not permitted to project into this clear width more than 100 mm.

(3) In a *horizontal exit* where there is a difference in level between the connected *floor areas*, slopes not more than those specified for ramps in Article 3.4.6.7. are permitted to be used.

(4) No stairs or steps shall be used at a *horizontal exit*.

(5) If two doors are provided in a *horizontal exit* that comprises a part of the required number of *exits* from the *floor areas* on both sides of the *exit,*
(a) the doors shall be mounted adjacent to each other with the door on the right side in the direction of travel through the *horizontal exit* swinging in the direction of travel through the *horizontal exit*, and
(b) signs shall be provided on each side of the *horizontal exit* to indicate the door that swings in the direction of travel from that side.
(See Appendix A.)

(6) If a *horizontal exit* utilizes bridges between *buildings* or outside balconies, the bridges or balconies shall conform to Article 3.2.3.19.

(7) Any change in floor level from one side of a *horizontal exit* to the other side shall not exceed 2 000 mm.

3.4.6.11. Doors

(1) The distance between a stair riser and the leading edge of a door during its swing shall be not less than 300 mm.

r11.1 **(1.1)** Except as provided in Sentence (2) and where a threshold is used to contain spillage, a threshold for a doorway in an *exit* shall be not more than 13 mm higher than the surrounding finished floor surface.

(2) No *exit* door shall open directly onto a step except that, if there is danger of blockage from ice or snow, an *exit* door is permitted to open onto not more than one step which shall be not more than 150 mm high.

(3) *Exit* doors shall be clearly identifiable. (See Appendix A.)

(4) No door leaf in an *exit* doorway with more than one leaf shall be less than 600 mm wide.

r11.1 **(5)** Where an *exit* door leading directly to the outside is subject to being obstructed by a parked vehicle or storage because of its location, a visible sign prohibiting such obstructions shall be permanently mounted on the exterior side of the door.

3.4.6.12. Direction of Door Swing

r11.1 **(1)** Except as permitted by Sentences (2) to (4) and Article 3.4.6.14., every *exit* door shall,
(a) open in the direction of *exit* travel, and
(b) swing on its vertical axis.

(2) A door serving a single *dwelling unit* shall swing on its vertical axis.

(3) Except in a *high hazard industrial occupancy*, an *exit* door need not swing in the direction of *exit* travel where it serves,
(a) a room, *suite* or *floor area* having an *occupant load* of not more than 60 persons, or
(b) as part of a *means of egress* from more than one *floor area* and the *floor areas* so served have a total *occupant load* of not more than 60 persons.

r11.1 **(4)** *Exit* doors need not conform to Sentence (1) where they serve,
(a) *storage garages* serving not more than one *dwelling unit*,
(b) accessory *buildings* serving not more than one *dwelling unit*, or
(c) storage *suites* not more than 28 m^2 in area that are on the *first storey* of a warehouse and open directly outdoors at ground level.

3.4.6.13. Self-Closing Devices

(1) An *exit* door that is normally required to be kept closed,
(a) shall be provided with a self-closing mechanism, and
(b) shall not be secured in an open position except as permitted by Sentence 3.1.8.12.(1).

3.4.6.14. Sliding Doors

r11.1 **(1)** Except as permitted by Sentences (2) and 3.4.6.12.(4), an exit *door* leading directly to outdoors at ground level is permitted to be a sliding door provided it is released in conformance with Sentence 3.3.1.11.(1).

(2) An *exit* door serving a Group B, Division 1 *occupancy*, or an *impeded egress zone* in other *occupancies*, is permitted to be a sliding door that does not conform to Sentence 3.3.1.11.(1) provided it is designed to be released in conformance with Article 3.3.1.12.

3.4.6.15. Revolving Doors

(1) Except as permitted by Sentence (3), a revolving door, if used, shall,
(a) be collapsible,
(b) have hinged doors providing equivalent exiting capacity located adjacent to it,
(c) be used as an *exit* from the ground floor level only,
(d) be not less than 3 m from the foot of any stairway, and
(e) have all glass in door leaves and enclosure panels conforming to,
  (i) CAN/CGSB-12.1-M, "Tempered or Laminated Safety Glass", or
  (ii) CAN/CGSB-12.11-M, "Wired Safety Glass".

(2) Except as permitted by Sentence (3), a revolving door shall not be considered to have an exiting capacity for more than 45 persons.

(3) An electrically powered revolving door is not required to conform to Sentences (1) and (2) provided,
(a) the door leaves will collapse and stop automatic rotation of the door system and not obstruct the doorway if a force not more than that specified in Sentence 3.4.6.16.(2) is applied at the centre of a door leaf,
(b) the door leaves are capable of being opened from inside the *building* without requiring keys, special devices, or specialized knowledge of the door opening mechanism,
(c) the allowable exiting capacity is based on the clear width of passage through the door enclosure when the doors are fully collapsed,
(d) a permanent sign, whose centreline is between 1 000 mm and 1 500 mm above the floor, is placed on each face of each door leaf indicating the method for collapsing the door leaf in an emergency, and
(e) glass used for door leaves and enclosure panels is safety glass conforming to,
  (i) CAN/CGSB-12.1-M, "Tempered or Laminated Safety Glass", or
  (ii) CAN/CGSB-12.11-M, "Wired Safety Glass".

3.4.6.16. Door Release Hardware

(1) Except for *dwelling units*, except for devices on doors serving a *contained use area* or an *impeded egress zone* designed to be released in conformance with Article 3.3.1.12., and except as permitted by Sentence (4), locking, latching and other fastening devices on every *exit* door shall permit the door to be readily opened from the inside with not more than one releasing operation and without requiring keys, special devices or specialized knowledge of the door opening mechanism. (See Appendix A.)

(2) If a door is equipped with a latching mechanism, a device that will release the latch and allow the door to swing wide open when a force of not more than 90 N is applied to the device in the direction of travel to the *exit* shall be installed on,
(a) every *exit* door from a *floor area* containing an *assembly occupancy* having an *occupant load* more than 100,
(b) every door leading to an *exit* lobby from an *exit* stair shaft, and every exterior door leading from an *exit* stair shaft in a *building* having an *occupant load* more than 100, and
(c) every *exit* door from a *floor area* containing a *high hazard industrial occupancy*.

(3) Except as required by Sentence 3.8.3.3.(7), every *exit* door shall be designed and installed so that, when the latch is released, the door will open under a force of not more than 90 N, applied at the knob or other latch releasing device.

(4) Except as permitted by Sentence 3.3.1.12.(6), electromagnetic locks that do not incorporate latches, pins or other similar devices to keep the door in the closed position are permitted to be installed on *exit* doors other than doors described in Sentence (5) provided,
(a) the *building* is equipped with a fire alarm system conforming to Subsection 3.2.4.,
(b) the locking device, and all similar devices in the *access to exit* leading to the *exit* door, are installed as ancillary devices to the fire alarm system and release immediately upon activation of,
  (i) the *alarm signal* where a single stage fire alarm system is installed,
  (ii) except as provided in Subclause (iii), the *alert signal* where a two stage fire alarm system is installed, or
r6 (iii) the *alarm signal* of a two stage fire alarm system installed in a *care*, *care and treatment* or *detention occupancy* or in a *retirement home*,
(c) the locking device releases immediately upon loss of power to the fire alarm control panel or loss of power controlling the electromagnetic locking mechanism and its associated auxiliary controls,
(d) the locking device releases immediately upon actuation of a manually operated switch readily accessible only to authorized personnel and located near the main entrance of the *building* or in the central alarm and control facility of Sentence 3.2.6.7.(1),
(e) the locking device releases immediately upon a fault being detected in the electrical circuit between the fire alarm control panel and the controller of the locking device,
(f) the locking device releases immediately upon the operation of a manual pull station for the fire alarm system located on the wall not more than 600 mm from the door,
(g) a legible sign having the words **EMERGENCY EXIT UNLOCKED BY FIRE ALARM** is permanently mounted on the door,

(h) the lettering on the sign required in Clause (g) is at least 25 mm high with a 5 mm stroke,
(i) upon release, the locking device must be reset manually by the actuation of the switch referred to in Clause (d),
(j) the operation of any by-pass switch, where provided for testing of the fire alarm system, causes an audible signal and a visual signal to be indicated at the fire alarm annunciator panel and at the monitoring station referred to in Clause 3.2.4.8.(4) (a), and
(k) emergency lighting is provided at the doors.
(See Appendix A.)

(5) Except as permitted by Sentences (6) and (7), electromagnetic locks are not permitted to be installed on *exit* doors,
(a) described in Clause (2)(a), (b) or (c),
(b) serving an elementary or secondary school, or
(c) leading directly from a *high hazard industrial occupancy*.

r6 **(6)** Electromagnetic locks are permitted to be installed on an exterior door leading from an *exit* stairway in a *building* containing only a Group B, Division 2 *major occupancy*, a Group B, Division 3 *major occupancy* or a *retirement home*.

(7) Electromagnetic locks are permitted to be installed on an *exit* door that serves only a *gaming premises* if,
(a) the *gaming premises* is located within a *sprinklered floor area*,
(b) *smoke detectors* are installed in each room and each corridor accessible to the public,
(c) a force of not more than 90 N applied to the door opening hardware initiates an irreversible process that will release the locking device within 15 s and not relock until the door has been opened, and
(d) a legible sign conforming with Clause (4)(h) is permanently mounted on the *exit* door to indicate that the locking device will release within 15 s of applying pressure to the door release hardware.

(8) Door hardware for the operation of the doors referred to in this Section shall be installed at a height not more than 1 200 mm above the finished floor.

3.4.6.17. Reserved

r11.1 3.4.6.18. Emergency Crossover Access to Floor Areas

(1) Except as permitted in Sentence (2), doors providing access to *floor areas* from *exit* stairs shall not have locking devices to prevent entry into any *floor area* from which the travel distance up or down to an unlocked door is more than 2 *storeys*.

(2) Doors referred to in Sentence (1) are permitted to be equipped with electromagnetic locks provided they comply with Sentences 3.4.6.16.(4) and (5).

(3) Doors referred to in Sentence (1) shall be identified by a permanently mounted sign on the stair side to indicate that they are openable from that side.

(4) Locked doors intended to prevent entry into a *floor area* from an *exit* stair shall,
(a) be identified by a permanently mounted sign on the stair side to indicate the location of the nearest unlocked door in each direction of travel, and
(b) be openable with a master key that fits all locking devices and is kept in a designated location accessible to firefighters or be provided with a wired glass panel not less than 0.0645 m^2 in area and located not more than 300 mm from the door opening hardware.

(5) Where access to a *floor area* is required by Sentence (1), access through unlocked doors to the *floor area* from at least one other *exit* shall also be provided.

(6) In a *building* not more than 6 *storeys* in *building height*, doors providing access from *exit* stairs to a *floor area* containing a *hotel* are permitted to have locking devices to prevent entry into the *floor area* provided the requirements in Clause (4)(b) are complied with.

3.4.6.19. Floor Numbering

(1) Arabic numerals indicating the assigned floor number shall,
(a) be mounted permanently on each side of doors to *exit* stair shafts,
(b) be not less than 60 mm high, raised approximately 0.7 mm above the surface,
(c) be located 1 500 mm from the finished floor, and
(d) be contrasting in colour with the surface to which they are applied. (See Appendix A.)

(2) Upper case letters indicating the designation assigned to each *exit* stair shaft shall be mounted permanently on each side of doors to the *exit* stair shaft and shall,
(a) be not less than 60 mm high, raised approximately 0.7 mm above the surface,
(b) be located 1 500 mm from the finished floor, and
(c) be contrasting in colour with the surface on which they are applied.

3.4.7. Fire Escapes

3.4.7.1. Scope

(1) Except as permitted by Sentence (2), fire escapes shall not be erected on a *building*.

(2) If it is impracticable to provide one or more of the *exit* facilities listed in Article 3.4.1.4., fire escapes conforming to Articles 3.4.7.2. to 3.4.7.7. are permitted to serve *floor areas* in an existing *building* provided the *floor areas* served are,
r6 (a) not in an elementary or secondary school or a *retirement home*,
r1 (b) not more than 2 *storeys* above ground level in *care*, *care and treatment* or *detention occupancies*, and
(c) not more than 5 *storeys* above ground level in other *occupancies*.

3.4.7.2. Fire Escape Construction

(1) Fire escapes shall be of metal or concrete, of the stair type extending to ground level, constructed throughout in a strong substantial manner and securely fixed to the *building*, except that wooden fire escapes are permitted to be used on *buildings* of *combustible construction* if all posts and brackets are not less than 89 mm in their least dimension and all other woodwork is not less than 38 mm in its least dimension.

3.4.7.3. Access to Fire Escapes

(1) Access to fire escapes shall be from corridors through doors at floor level, except that access from a *dwelling unit* is permitted to be through a casement window having an unobstructed opening not less than 1 100 mm high by 550 mm wide with a sill height of not more than 900 mm above the inside floor.

(2) The clear area of a fire escape balcony onto which a door opens, shall be not less than 1 m^2.

3.4.7.4. Protection of Fire Escapes

(1) If a fire escape serves any *storey* above the second, openings located in a zone described in Sentence (2), including access doorways in the exterior walls of the *building* to which the fire escape is attached, shall be protected by *closures* conforming to Subsection 3.1.8.

(2) The zone referred to in Sentence (1) extends from any balcony, platform or stairway of a fire escape to a distance,
(a) 3 m horizontally,
(b) 10 m below, and
(c) 1 800 mm above.

3.4.7.5. Stairs

(1) Stairs shall be inclined at an angle of not more than 45° with the horizontal, and their steps shall have risers not more than 210 mm high and treads not less than 220 mm wide exclusive of nosing.

(2) Stairway headroom shall be not less than 1 950 mm plus the height of one riser measured vertically above the nosing of any tread or platform.

(3) The width of a fire escape shall conform to Articles 3.4.3.1., 3.4.3.2. and 3.4.3.4., except that the width is permitted to be reduced to 550 mm provided the fire escape serves,
(a) not more than 3 *storeys*, and
(b) not more than 15 persons.

r11.2 **(4)** If a *flight* leading to the ground at the foot of a fire escape is not fixed in position, it shall,
(a) be held in the raised position without a latch or locking device,
(b) be fitted with a counterbalancing device,
(c) be easily and quickly brought into position for use, and
(d) reach the ground in the lowered position.

3.4.7.6. Guards and Railings

(1) The open sides of every platform, balcony and stairway forming part of a fire escape shall be protected by *guards* not less than 920 mm high measured vertically above the nosing of any tread or platform.

(2) The top rail of a *guard* is permitted to serve as a handrail if it is free from obstructions that could break a handhold.

(3) A wall handrail shall be installed if the fire escape is more than 550 mm wide.

(4) Openings through any *guard* that is required by Sentence (1) shall be of a size that will prevent the passage of a sphere having a diameter more than 100 mm unless it can be shown that the location and size of openings that exceed this limit do not represent a hazard.

(5) Unless it can be shown that the location and size of openings do not present a hazard, a *guard* for a fire escape shall be designed so that no member, attachment or opening located between 140 mm and 900 mm above a platform or the nosing of any tread will facilitate climbing.

(14) Where a vision panel is provided in a door in a *barrier-free* path of travel, such panel shall be at least 75 mm in width and be located so that,
(a) the bottom of the panel is not more than 900 mm above the finished floor, and
(b) the edge of the panel closest to the latch is not more than 250 mm from the latch side of the door.

(15) A door in a *barrier-free* path of travel consisting of a sheet of glass shall be marked with a continuous opaque strip that,
(a) shall be colour and brightness contrasted to the background of the door,
(b) shall be at least 50 mm wide,
(c) shall be located across the width of the door at a height of 1 350 mm to 1 500 mm above the finished floor, and
(d) may incorporate a logo or symbol provided such logo or symbol does not diminish,
  (i) the opacity of the strip,
  (ii) the width of the strip,
  (iii) the colour and brightness contrast of the strip to the background of the door, and
  (iv) the continuity of the strip across the width of the door.

r11.1 **(16)** Reserved.

(17) Except where a proximity scanning device is installed in conformance with Sentence (18), the control for a power door operator required by Sentence (4), (5) or (6) shall,
(a) have a face dimension of not less than,
  (i) 150 mm in diameter where the control is circular, or
  (ii) 50 mm by 100 mm where the control is rectangular,
(b) be operable using a closed fist,
(c) be located so that,
  (i) its centre is located not less than 900 mm and not more than 1 100 mm from the finished floor or ground, or
  (ii) it extends from not more than 200 mm to not less than 900 mm above the finished floor or ground,
  (See Appendix A.)
(d) be located not less than 600 mm and not more than 1 500 mm beyond the door swing where the door opens towards the control,
r11.1 (e) be located to allow persons to activate the opening of the door from either direction of travel,
r11.1 (f) be located so that the path of travel is not obstructed,
r11.1 (g) be located in a clearly visible position, and
r11.1 (h) contain a sign incorporating the International Symbol of Access.

r4 **(18)** A proximity scanning device that activates a power door shall be capable of detecting a person in a wheelchair. (See Appendix A.)

r4 **(19)** A normally occupied *floor area* that is not required by Article 3.8.2.1. to have a *barrier-free* path of travel shall comply with the following requirements:
(a) all doorways in *public corridors* in the normally occupied *floor area* shall comply with Sentence (1),
(b) door opening devices that are the only means of operation on doors in the normally occupied *floor area* shall comply with Sentence (3), (See Appendix A.)
(c) where a vision panel is provided in a door in the normally occupied *floor area*, the panel shall comply with Sentence (14),
(d) doors consisting of a sheet of glass in the normally occupied *floor area* shall comply with Sentence (15), and
r11.1 (e) where a power door operator is installed for doors in the normally occupied *floor area*, the control for the power door operator shall comply with Sentence (17).

3.8.3.4. Ramps

(1) Ramps located in a *barrier-free* path of travel shall,
(a) have a minimum width of 900 mm between handrails,
(b) have a maximum gradient of 1 in 12, (See Appendix A.)

(c) have a level area of at least 1 670 mm by 1 670 mm at the top and bottom of a ramp and where a door is located in a ramp, so that the level area extends at least 600 mm beyond the latch side of the door opening, except that where the door opens away from the ramp, the area extending beyond the latch side of the door opening may be reduced to 300 mm, (See Appendix A.)

(d) have a level area at least 1 670 mm long and at least the same width as the ramp,

(i) at intervals of not more than 9 m along its length, and

r4 (ii) where there is a change of 90° or more in the direction of the ramp,

(e) except as provided in Sentence (2), be equipped with handrails on both sides that shall,

(i) be continuously graspable along their entire length and have circular cross-section with an outside diameter not less than 30 mm and not more than 40 mm, or any non-circular shape with a graspable portion that has a perimeter not less than 100 mm and not more than 155 mm and whose largest cross-sectional dimension is not more than 57 mm,

(ii) be not less than 865 mm and not more than 965 mm high, measured vertically from the surface of the ramp, except that handrails not meeting these requirements are permitted provided they are installed in addition to the required handrail,

(iii) be terminated in a manner that will not obstruct pedestrian travel or create a hazard,

(iv) extend horizontally not less than 300 mm beyond the top and bottom of the ramp,

r11.2 (v) be provided with a clearance that conforms to Sentence 3.4.6.5.(13), and

(vi) be designed and constructed such that handrails and their supports will withstand the loading values obtained from the nonconcurrent application of a concentrated load not less than 0.9 kN applied at any point and in any direction for all handrails and a uniform load not less than 0.7 kN/m applied in any direction to the handrail,

(f) except as provided in Sentence (2), have a wall or a *guard* on both sides and where a *guard* is provided the *guard* shall,

(i) be not less than 1 070 mm measured vertically to the top of the *guard* from the ramp surface, and

r4 (ii) be designed so that no member, attachment or opening located between 140 mm and 900 mm above the ramp surface being protected by the *guard* will facilitate climbing,

(g) be provided,

(i) with a curb at least 50 mm high on any side of the ramp where no solid enclosure or solid *guard* is provided, and

r4 (ii) with railings or other barriers that extend to within 50 mm of the finished ramp surface or have a curb not less than 50 mm high, and

r4 (h) except as provided in Sentence (2), where the ramp is wider than 2 200 mm, have an intermediate handrail with a clear width of 900 mm between the intermediate handrail and one of the handrails described in Clause (e).

r4 **(2)** Where a ramp serves as an aisleway for fixed seating, the requirements for handrails in Clauses (1)(e) and (h) and for walls or *guards* in Clause (1)(f) need not apply. (See Appendix A.)

(3) Floors or walks in a *barrier-free* path of travel having a slope steeper than 1 in 20 shall be designed as ramps. (See Appendix A.)

3.8.3.5. Passenger Elevating Devices

r5 **(1)** A passenger elevating device referred to in Article 3.8.2.1. shall conform to CSA B355, "Lifts for Persons with Physical Disabilities".

r4 3.8.3.6. Wheelchair Spaces and Adaptable Seating

(1) Spaces designated for wheelchair use required by Sentence 3.8.2.1.(4) shall be,

(a) clear and level or level with removable seats,

(b) not less than 900 mm wide and not less than,

(i) 1 525 mm long where designed to permit a wheelchair to enter from a side approach, and

(ii) 1 220 mm long where designed to permit a wheelchair to enter from the front or rear of the space,

(10) The *building* shall be of *noncombustible construction* and,
(a) floor assemblies shall be *fire separations* with a *fire-resistance rating* not less than 2 h,
(b) *mezzanines* shall have a *fire-resistance rating* not less 1 h,
(c) roof assemblies shall have a *fire-resistance rating* not less than 1 h, and
(d) all *loadbearing* walls, columns and arches shall have a *fire-resistance rating* not less than that required for the supported assembly.

(11) Except as provided in Sentence (12), the *building* shall be of *noncombustible construction*, and,
(a) floor assemblies shall be *fire separations* with a *fire-resistance rating* not less than 1 h,
(b) *mezzanines* shall have a *fire-resistance rating* not less than 1 h,
(c) roof assemblies shall have a *fire-resistance rating* not less than 1 h, and
(d) all *loadbearing* walls, columns and arches shall have a *fire-resistance rating* not less than that required for the supported assembly.

(12) A *building* classified as Group A, Division 2 *occupancy* that is not more than 1 *storey* in *building height*, and in which the *building area* is not more than 3 200 m^2 if not *sprinklered*, or 6 400 m^2 if *sprinklered*, is permitted to be constructed with a roof of *heavy timber construction* and have columns of *heavy timber construction*.

3.13.3. Safety Requirements Within Stations

3.13.3.1. Application

(1) Except as provided in this Subsection and Subsection 3.13.4., the requirements in Subsections 3.3.1. and 3.6.2. apply to a *rapid transit station*.

(2) A door in a *fire separation* is permitted to be equipped with pivot hinges in conformance with NFPA 80, "Fire Doors and Other Opening Protectives".

(3) The requirements in Subsection 3.4.4. for *fire separation* of *exits* do not apply in a *rapid transit station*.

(4) Except as provided in Sentence (5), the requirements in Sentence 3.4.6.16.(1) for doors to be readily opened from the inside apply to required *exit* doors in a *rapid transit station*.

(5) Where a group of two or more doors serves as a single *exit* facility, only one door in the group is required to comply with Sentence 3.4.6.16.(1).

(6) A door that is required to be readily opened in Sentence (4) or (5) shall have a sign attached to it that,
(a) displays the words **EMERGENCY EXIT** with the letters not less than 25 mm high, and
(b) is visible from the *exit* approach.

3.13.3.2. Booths and Kiosks

(1) Booths and kiosks that are not more than 20 m^2 in area and are used only by the transit agency for fare collection, dissemination of information or similar non-*mercantile occupancies* shall be of *noncombustible construction* and are not required to be separated from the remainder of the *floor area* by a *fire separation*.

(2) Booths and kiosks that are more than 20 m^2 in area and are used only by the transit agency for fare collection, dissemination of information or similar non-*mercantile occupancies* shall be,
(a) *sprinklered*, and
(b) separated from the remainder of the *floor area* by a *fire separation* of *noncombustible construction* that is not required to have a *fire-resistance rating*.

(3) A door acting as a *closure* in the *fire separation* in Sentence (2) is not required to be equipped with a self-closing device.

3.13.3.3. Service Rooms and Ancillary Spaces

(1) An *ancillary space* in a *rapid transit station* shall be separated from the remainder of the *floor area* by a *fire separation* having a *fire-resistance rating* not less than 1 h.

r11.2 **(2)** Except as provided in Sentence (3), a door opening from a *service room* onto a *means of egress* in a *rapid transit station* shall be located not less than 5 m from an escalator balustrade and from the top and bottom riser of a *flight* used as a *means of egress* from the *rapid transit station*.

(3) The requirements in Sentence (2) do not apply where,
(a) the *service room* is *sprinklered*, or
(b) there is a vestibule between the *service room* and the *means of egress*.

(4) Where a door from a *service room* opens onto a *means of egress* less than 5 m wide,
(a) the *service room* shall be *sprinklered*, or
(b) there shall be a vestibule between the *service room* and the *means of egress*.

3.13.3.4. Leased Areas

(1) All leased areas within a *rapid transit station* shall be,
(a) *sprinklered*, and
(b) separated from the remainder of the *floor area* by a *fire separation* of *noncombustible construction* that is not required to have a *fire-resistance rating*.

(2) A door acting as a *closure* in the *fire separation* in Clause (1)(b) is not required to be equipped with a self-closing device.

(3) Where leased areas are located on opposite sides of a *means of egress*, the width of the *means of egress* shall not be reduced to less than 5 m.

(4) Except as provided in Sentence (5), where the leased area on any floor level exceeds 15% of the *public area* on that level, the *public area* shall be *sprinklered*.

(5) In a *rapid transit station* that is erected entirely above the adjoining finished ground level and is a stand-alone *building*, where the leased area on any floor level exceeds 20% of the *public area* on that level, the *public area* shall be *sprinklered*.

(6) In determining the leased area in Sentences (4) and (5), it is not necessary to include a leased area that is separated from the *public area* by a *fire separation* having a *fire-resistance rating* not less than,
(a) 2 h where the leased area contains a *mercantile* or *medium hazard industrial occupancy*, or
(b) 1 h where the leased area contains any other *occupancy*.

(7) A leased area is permitted on a platform level provided it is,
(a) located not less than 5 m from the platform edge,
(b) located not less than 5 m from an egress facility, and
(c) not located in a dead end portion of the platform.

3.13.3.5. Vehicle Terminal

(1) Where an enclosed terminal serves vehicles powered by combustible fuels, and the terminal has direct access to a *rapid transit station*,

(3) Crane runway structures shall be designed to resist a horizontal force applied normal to the top of the rails equal to not less than 20% of the sum of the weights of the lifted load and the crane trolley, excluding other parts of the crane.

(4) The force described in Sentence (3) shall be equally distributed on each side of the runway and shall be assumed to act in either direction.

(5) Crane runway structures shall be designed to resist a horizontal force applied parallel to the top of the rails equal to not less than 10% of the maximum wheel loads of the crane.

4.1.5.12. Bleachers

(1) Bleacher seats shall be designed for a uniformly distributed *live load* of 1.75 kN for each linear metre or for a concentrated load of 2.2 kN distributed over a length of 750 mm, whichever produces the most critical effect on the supporting members.

(2) Bleachers shall be checked by the erector after erection to ensure that all structural members, including bracing specified in the design, have been installed.

(3) Telescopic bleachers shall be provided with locking devices to ensure stability while in use.

4.1.5.13. Helicopter Landing Areas

(1) Helicopter landing areas on roofs shall be constructed in conformance with the requirements for heliports contained in Part III of the *Canadian Aviation Regulations* made under the *Aeronautics Act* (Canada).

r11.2 4.1.5.14. Loads on Guards and Handrails (See Appendix A.)

(1) The minimum specified horizontal load applied outward at the minimum required height of every required *guard* shall be,

(a) 3.0 kN/m for open viewing stands without fixed seats and for *means of egress* in grandstands, stadia, bleachers and arenas,

(b) a concentrated load of 1.0 kN applied at any point so as to produce the most critical effect, for access ways to equipment platforms, contiguous stairs and similar areas where the gathering of many people is improbable, and

(c) 0.75 kN/m or a concentrated load of 1.0 kN applied at any point so as to produce the most critical effect, whichever governs for locations other than those described in Clauses (a) and (b).

(2) The minimum specified horizontal load applied inward at the minimum required height of every required *guard* shall be half that specified in Sentence (1).

(3) Individual elements within the *guard*, including solid panels and pickets, shall be designed for a load of 0.5 kN applied outward over an area of 100 mm by 100 mm located at any point in the element or elements so as to produce the most critical effect.

(4) The size of the opening between any two adjacent vertical elements within a *guard* shall not exceed the limits required by Part 3 when each of these elements is subjected to a specified *live load* of 0.1 kN applied in opposite directions in the in-plane direction of the *guard* so as to produce the most critical effect.

(5) The loads required in Sentence (3) need not be considered to act simultaneously with the loads provided for in Sentences (1), (2) and (6).

(6) The minimum specified load applied vertically at the top of every required *guard* shall be 1.5 kN/m and need not be considered to act simultaneously with the horizontal load provided for in Sentence (1).

(7) Handrails and their supports shall be designed and constructed to withstand the following loads, which need not be considered to act simultaneously:

(a) a concentrated load not less than 0.9 kN applied at any point and in any direction for all handrails, and
(b) a uniform load not less than 0.7 kN/m applied in any direction to handrails not located within *dwelling units*.

4.1.5.15. Loads on Vehicle Guardrails

r11.2 **(1)** Vehicle guardrails shall be designed for a concentrated load of 22 kN applied horizontally outward at any point 500 mm above the floor surface so as to produce the most critical effect. (See A-4.1.5.14. in Appendix A.)

r11.2 **(2)** The loads described in Sentence (1) need not be considered to act simultaneously with the loads provided for in Article 4.1.5.14.

4.1.5.16. Loads on Walls Acting As Guards

r11.1 **(1)** Where the floor elevation on one side of a wall, including a wall around a shaft, is more than 600 mm higher than the elevation of the floor or ground on the other side, the wall shall be designed to resist the appropriate outward lateral design loads prescribed elsewhere in this Subsection or 0.5 kPa acting outward, whichever produces the more critical effect.

4.1.5.17. Firewalls (See Appendix A.)

(1) *Firewalls* shall be designed to resist the maximum effect due to,
(a) the appropriate lateral design loads prescribed elsewhere in this Section, or
(b) a factored lateral load of 0.5 kPa under fire conditions, as described in Sentence (2).

(2) Under fire conditions, where the *fire-resistance rating* of the structure is less than that of the *firewall*,
(a) lateral support shall be assumed to be provided by the structure on one side only, or
(b) another structural support system capable of resisting the loads imposed by a fire on either side of the *firewall* shall be provided.

4.1.6. Loads Due to Snow and Rain

4.1.6.1. Specified Load Due to Rain or to Snow and Associated Rain

(1) The specified load on a roof or any other *building* surface subject to snow and associated rain shall be the snow load specified in Article 4.1.6.2., or the rain load specified in Article 4.1.6.4., whichever produces the more critical effect.

r11.1 ### 4.1.6.2. Specified Snow Load (See Appendix A.)

(1) The specified load, **S**, due to snow and associated rain accumulation on a roof or any other *building* surface subject to snow accumulation shall be calculated from the formula,

$$S = I_s [S_s (C_b C_w C_s C_a) + S_r]$$

where,

I_s = importance factor for snow load as provided in Table 4.1.6.2.A.,
S_s = 1-in-50-year ground snow load, in kPa, determined in accordance with Subsection 1.1.2.,
C_b = basic roof snow load factor in Sentence (2),
C_w = wind exposure factor in Sentences (3) and (4),
C_s = slope factor in Sentences (5), (6) and (7),
C_a = accumulation factor in Sentence (8), and
S_r = 1-in-50-year associated rain load, in kPa, determined in accordance with Subsection 1.1.2., but not greater than $S_s(C_b C_w C_s C_a)$.

Part 9

Housing and Small Buildings

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9.7.6. Installation

9.7.6.1. Installation of Windows, Doors and Skylights

r11.1 **(1)** The installation of windows, doors and skylights shall conform to CAN/CSA-A440.4, "Window, Door, and Skylight Installation", except that,

(a) shims used to support windows, doors and skylights are permitted to be of treated plywood, and

(b) protection from precipitation for walls incorporating windows or doors and for roofs incorporating skylights, and the interfaces of these walls with windows or doors and of roofs with skylights, shall conform to Section 9.27.

(2) The installation of manufactured and pre-assembled windows, doors and skylights and the field assembly of manufactured window and door combination units shall conform to the manufacturer's instructions.

(3) Windows, doors and skylights shall be sealed to air barriers and *vapour barriers*.

9.7.6.2. Sealants, Trim and Flashing

(1) The sealing compound used to seal the glass component of an insulating glazing unit to the sash component shall be compatible with the sealing compound used to edge seal the glass component.

(2) Flashing used to protect openings shall conform to Articles 9.27.3.7. and 9.27.3.8.

(3) Sealants shall be applied between window frames or trim and the exterior cladding or masonry in conformance with Subsection 9.27.4.

(4) All unfinished portions of the frame and other components of aluminum windows, doors or skylights in contact with the edges of masonry, concrete, stucco or plaster shall be protected with an alkali-resistant coating.

e8 Section 9.8. Stairs, Steps, Ramps, Landings, Handrails and Guards

9.8.1. Application

9.8.1.1. General

r11.2 **(1)** This Section applies to the design and construction of interior and exterior stairs, steps, ramps, landings, handrails and *guards*.

9.8.1.2. Stairs, Ramps, Landings, Handrails and Guards in Garages

r6 **(1)** Except as provided in Sentence 9.8.6.2.(3), stairs, ramps, landings, handrails and *guards* in a garage that serves a *house* or an individual *dwelling unit* shall conform to the requirements for stairs, ramps, landings, handrails and *guards* within a *dwelling unit*.

9.8.1.3. Exit Stairs, Ramps and Landings

(1) Where a stair, ramp or landing forms part of an *exit*, the appropriate requirements in Sections 9.9. and 9.10. shall also apply.

9.8.1.4. Escalators and Moving Walks

(1) Escalators and moving walks shall conform to the appropriate requirements in Part 3.

r11.2 9.8.2. Stair Dimensions

9.8.2.1. Stair Width

(1) Except as provided in Sentence (2) and Article 9.8.4.5A., required *exit* stairs and public stairs serving *buildings* of *residential occupancy* shall have a width, measured between wall faces or *guards*, of not less than 900 mm.

(2) Required *exit* stairs serving a *house* or an individual *dwelling unit* shall have a width of not less than 860 mm.

(3) Except as provided in Article 9.8.4.5A., required *exit* stairs and public stairs serving *buildings* of other than *residential occupancy* shall have a width of not less than the greater of,
(a) 900 mm, or
(b) 8 mm per person based on the *occupant load* limits specified in Table 3.1.17.1.

(4) Except as provided in Article 9.8.4.5A., at least one stair between each floor level within a *dwelling unit* and exterior stairs serving a *house* or an individual *dwelling unit* shall have a width of not less than 860 mm.

9.8.2.2. Height Over Stairs

(1) The clear height over stairs shall be measured vertically, over the clear width of the stair, from a straight line tangent to the tread and landing nosings to the lowest point above. (See A-3.4.3.4. in Appendix A.)

(2) Except as provided in Sentence (3) and Article 9.8.4.5A., the clear height over stairs shall not be less than 2 050 mm.

(3) Except as provided in Article 9.8.4.5A., the clear height over stairs serving a *house* or an individual *dwelling unit* shall not be less than 1 950 mm.

9.8.3. Stair Configurations

r11.2 9.8.3.1. Straight and Curved Runs in Stairs (See Appendix A and A-9.8.4. in Appendix A.)

(1) Except as permitted in Sentence (2), stairs shall consist of,
(a) straight *flights*,
(b) curved *flights*, or
(c) spiral stairs.

(2) Stairs within *houses* and individual *dwelling units* may consist of,
(a) *flights* with rectangular treads and winders provided winders as described in Article 9.8.4.5. are installed between floor levels, or
(b) *flights* with a mix of rectangular and *tapered treads* provided all *tapered treads* within a *flight* turn in the same direction.

(3) Curved *flights* in *exits* shall comply with Sentence 3.4.6.9.(2).

(4) Spiral stairs shall comply with Article 9.8.4.5A.

9.8.3.2. Minimum Number of Risers

r11.2 **(1)** Except for stairs within a *dwelling unit*, at least three risers shall be provided in interior *flights*.

r11.2 9.8.3.3. Maximum Height of Flights

(1) The vertical height of a *flight* shall not exceed 3.7 m.

9.8.4. Step Dimensions (See Appendix A.)

9.8.4.1. Dimensions for Risers (See A-9.8.4. in Appendix A.)

r11.2 **(1)** Except as provided in Article 9.8.4.5A., the rise, which is measured as the vertical nosing-to-nosing distance, shall conform to Table 9.8.4.1.

r11.2 **Table 9.8.4.1.**
Rise for Rectangular Treads, Tapered Treads and Winders and Run for Rectangular Treads
Forming Part of Sentences 9.8.4.1.(1) and 9.8.4.2.(1)

Stair Type	Max. Rise, mm, for All Steps	Min. Rise, mm, for All Steps	Max. *Run*, mm, for Rectangular Treads	Min. *Run*, mm, for Rectangular Treads
Private stairs(1)	200	125	355	255
Public stairs(2)	180	125	no limit	280
Service stairs(3)	no limit	125	355	no limit
Stairs to unoccupied attic space(4)	no limit	125	355	no limit
Stairs to crawl spaces	no limit	125	355	no limit
Stairs that serve *mezzanines* not exceeding 20 m^2 within *live/work units*	no limit	125	355	no limit
Column 1	2	3	4	5

Notes to Table 9.8.4.1.:

(1) Private stairs are:
  (a) interior stairs within a *house* or an individual *dwelling unit*,
  (b) exterior stairs serving a *house* or an individual *dwelling unit*, and
  (c) exterior stairs serving a garage that serves a *house* or an individual *dwelling unit*.

(2) Public stairs are all stairs not described as service stairs or private stairs.

(3) Service stairs are stairs that serve areas used only as *service rooms* or *service spaces*.

(4) Stairs to unoccupied attic space are stairs that serve attics containing no storage or living space.

r11.2 9.8.4.2. Dimensions for Runs and Rectangular Treads (See A-9.8.4. in Appendix A.)

(1) The *run* for rectangular treads shall conform to Table 9.8.4.1.

(2) The depth of a rectangular tread shall be not less than its *run* and not more than its *run* plus 25 mm.

r11.2 ### 9.8.4.3. Dimensions for Tapered Treads (See A-9.8.4. in Appendix A.)

(1) Except as provided in Sentence (2) and Articles 9.8.4.5. and 9.8.4.5A., *tapered treads* shall have a *run* that,
(a) is not less than 150 mm at the narrow end of the tread, and
(b) complies with the dimensions for rectangular treads specified in Table 9.8.4.1. when measured at a point 300 mm from the centre line of the inside handrail.

(2) *Tapered treads* in required *exit* stairs shall conform to the requirements in Article 3.4.6.9.

(3) The depth of a *tapered tread* shall be not less than its *run* at any point and not more than its *run* at any point plus 25 mm.

e8.1 ### 9.8.4.4. Uniformity and Tolerances for Risers, Runs and Treads

r11.2 **(1)** Except as provided in Sentence (2), risers shall be of uniform height in any one *flight* with a maximum tolerance of,
(a) 5 mm between adjacent treads or landings, and
(b) 10 mm between the tallest and shortest risers in a *flight*.

(2) Except for required *exit* stairs, where the top or bottom riser in a stair adjoins a sloping finished walking surface such as a garage floor, driveway or sidewalk, the height of the riser across the stair shall vary by not more than 1 in 12.

r11.2 **(3)** Rectangular treads shall have uniform *run* with a maximum tolerance of,
(a) 5 mm between adjacent treads, and
(b) 10 mm between the deepest and shallowest treads in a *flight*.

r11.2 **(4)** *Tapered treads* in a *flight* shall have a uniform *run* in accordance with the tolerances described in Sentence (3) when measured at a point 300 mm from the centre line of the inside handrail.

(5) The slope of treads shall not exceed 1 in 50.

r11.2 ### 9.8.4.4A. Uniformity of Runs in Flights with Mixed Treads within a House or Dwelling Unit

(1) Except as provided in Sentence (2) and Article 9.8.4.5., where a *flight* within a *house* or individual *dwelling unit* consists of both *tapered treads* and rectangular treads, all the treads shall have a uniform *run* when measured at a point 300 mm from the centre line of the inside handrail.

(2) Where *tapered treads* are located at the bottom of a mixed-tread *flight* described in Sentence (1), the *run* of the *tapered treads* when measured at a point 300 mm from the centre line of the inside handrail is permitted to exceed the *run* of the rectangular treads.

9.8.4.5. Winders (See Appendix A.)

(1) Stairs within *dwelling units* are permitted to contain winders that converge to a centre point provided,
(a) the winders turn through an angle of not more than 90°,
(b) individual treads turn through an angle of not less than 30° or not more than 45°, and
(c) adjacent winders turn through the same angle.

(2) Where more than one set of winders described in Sentence (1) is provided in a single stairway between adjacent floor levels, such winders shall be separated in plan by at least 1 200 mm.

r11.2 ### 9.8.4.5A. Spiral Stairs (See Appendix A.)

(1) Spiral stairs shall have,
(a) handrails on both sides, the outer handrail being not less than 1 070 mm high,
(b) a clear width not less than 660 mm between handrails,
(c) risers that are not more than 240 mm high,
(d) treads that,
  (i) are a minimum of 190 mm deep at a point 300 mm from the centre line of the inside handrail,
  (ii) have a consistent angle and uniform dimension, and
  (iii) turn in the same direction, and
(e) a clear height not less than 1 980 mm.

(2) Spiral stairs conforming to Sentence (1) are permitted to be used as the only *means of egress* where they serve not more than 3 persons.

(3) Except as permitted by Sentence (2), spiral stairs shall not serve as an *exit*.

9.8.4.6. Leading Edges of Treads (See A-9.8.4. in Appendix A.)

(1) Leading edges of treads that are bevelled or rounded shall,
(a) not reduce the required tread depth by more than 15 mm, and
(b) not, in any case, exceed 25 mm horizontally.

(See Appendix A.)

9.8.4.7. Interior Stairs Extending Through the Roof

(1) Interior stairways extending through the roof of a *building* shall be protected from ice and snow.

9.8.5. Ramps

9.8.5.1. Application

(1) This Subsection applies to pedestrian ramps except ramps in a *barrier-free* path of travel.

(2) Ramps in a *barrier-free* path of travel shall conform to the requirements in Article 3.8.3.4.

r11.2 ### 9.8.5.2. Ramp Width

(1) Except as provided in Sentence (2), ramps shall not be less than 1 100 mm wide.

(2) Ramps serving a *house* or an individual *dwelling unit* shall not be less than 860 mm wide.

9.8.5.3. Height Over Ramps

r6 **(1)** The clear height over ramps shall be not less than,
(a) 1 950 mm for ramps serving a *house* or an individual *dwelling unit*, and
(b) 2 050 mm for ramps not serving a *house* or an individual *dwelling unit*.

e8.1 ### 9.8.5.4. Ramp Slope

(1) The slope of ramps shall be not more than,
(a) 1 in 10 for exterior ramps,
(b) 1 in 10 for interior ramps serving *residential occupancies*,
r11.2 (c) 1 in 6 for *industrial occupancies*, and
(d) 1 in 8 for all other *occupancies*.

9.8.5.5. Maximum Rise

(1) Where the slope of the ramp is greater than 1 in 12, the maximum rise between floors or landings shall be 1 500 mm.

9.8.6. Landings

9.8.6.1. Application

(1) This Subsection applies to landings, except landings for ramps in a *barrier-free* path of travel.

(2) Landings for ramps in a *barrier-free* path of travel shall conform to the requirements in Article 3.8.3.4.

(3) Finished floors, and ground surfaces with a slope not exceeding 1 in 50, at the top and bottom of stairs or ramps shall be considered as landings.

9.8.6.2. Required Landings

r6 **(1)** Except as provided in Sentences (2), (3) and (4) and Sentence 9.9.6.6.(2), a landing shall be provided,
r11.2 (a) at the top and bottom of each *flight* of interior and exterior stairs, including stairs in garages,
(b) at the top and bottom of every ramp with a slope greater than 1 in 50, and
(c) where a doorway opens onto a stair or ramp.

(2) Where a door at the top of a stair in a *dwelling unit* swings away from the stair, no landing is required between the doorway and the stair.

r6 **(3)** A landing may be omitted at the top of an exterior stair serving a garage or a secondary entrance to a *house* or an individual *dwelling unit*, including an entrance from an attached garage, provided,
(a) the stair does not contain more than three risers,
(b) except as provided in Clause (c), the door is a sliding door or swings away from the stair, and
(c) where a storm or screen door is provided, it may swing over the stair if it is equipped with hardware to hold it open.

r6 **(3.1)** Sentence (3) does not apply to an exterior stair serving a secondary entrance to a *house* that is also a main entrance to a *dwelling unit* in the *house*.

r6 **(4)** A landing may be omitted at the bottom of an exterior stair or ramp provided there is no obstruction, such as a gate or door, within the lesser of the width of the stair or ramp, or,
(a) 900 mm for stairs or ramps serving a *house* or an individual *dwelling unit*, and
(b) 1 100 mm for stairs or ramps not serving a *house* or an individual *dwelling unit*.

r11.2 **9.8.6.3. Dimensions of Landings** (See A-3.4.6.4. in Appendix A.) (See also Articles 9.9.6.1. and 9.9.6.6. regarding landings in exits)

(1) Except as provided in Sentences (2) to (7), landings shall be,
(a) at least as wide as the width of the stair or ramp in which they occur, and
(b) at least as long as the width of the stair or ramp in which they occur.

(2) Where the landing in a stair or ramp does not turn or turns less than 90°, the length of the landing shall not be less than the lesser of,
(a) the required width of the stair or ramp, or
(b) 1 100 mm.

(3) The length of a landing described in Sentence (2) shall be measured perpendicular to the nosings of adjacent treads or to the end of the ramp, at a distance equal to half the length required by Sentence (2) from the narrow edge of the landing.

(4) Where *flights* or ramps of different widths adjoin a single landing, the minimum width of the landing shall be,
(a) not less than the greater required stair or ramp width, where one or more of the stair or ramp widths do not exceed their respective required widths, or
(b) not less than the lesser actual stair or ramp width, where all of the widths of the stairs or ramps exceed their respective required widths.

(5) Where a door swings toward a stair, the full arc of the swing shall be over the landing.

(6) The slope of landings shall not exceed 1 in 50.

(7) Where a doorway or stair opens onto the side of a ramp, the landing shall extend for a distance of not less than 300 mm on either side of the doorway or stair, except on a side abutting an end wall.

9.8.6.4. Height Over Landings

r6 **(1)** The clear height over landings shall be not less than,
(a) 1 950 mm for landings serving a *house* or an individual *dwelling unit*, and
(b) 2 050 mm for landings not serving a *house* or an individual *dwelling unit*.

9.8.7. Handrails

9.8.7.1. Required Handrails

r11.2 **(1)** Except as provided in Sentences (2) to (5), a handrail shall be installed on stairs and ramps in conformance with Table 9.8.7.1.

(2) Where a stair or a ramp is required to be at least 2 200 mm wide due to the *occupant load*, a handrail shall be installed such that no position on the stair or ramp is more than 825 mm from a handrail. (See Appendix A.)

r6 **(3)** A handrail is not required for stairs and ramps serving a *house* or an individual *dwelling unit*, where,
(a) interior stairs have not more than two risers,
(b) exterior stairs have not more than three risers, or
(c) ramps rise not more than 400 mm.

r6 **(4)** Only one handrail is required on exterior stairs having more than three risers, provided such stairs serve a *house* or an individual *dwelling unit*.

r3

Table 9.8.7.1.
Handrails for Stairs and Ramps
Forming Part of Sentence 9.8.7.1.(1)

Location of Stair or Ramp	Handrails Serving Stairs			Handrails Serving Ramps	
	Stairs < 1 100 mm Wide		Stairs ≥ 1 100 mm Wide	Ramps < 1 100 mm Wide	Ramps ≥ 1 100 mm Wide
	Straight	Curved	All	Straight or Curved	All
	Number of Sides Required to have a Handrail				
Within a *dwelling unit*	1	1	1	1	2
All other locations	1	2	2	2	2
Column 1	2	3	4	5	6

r11.2 **(5)** Except for stairs with winders, where a *flight* of stairs within a *house* or an individual *dwelling unit* consists of *tapered treads*, or a mix of *tapered treads* and rectangular treads, one handrail shall be installed along the narrow end of the treads.

9.8.7.2. Continuity of Handrails (See Appendix A.)

r11.2 **(1)** Except for stairs or ramps serving a *house* or an individual *dwelling unit*, at least one required handrail shall be continuous throughout the length of the stair or ramp, including at the landings, except where interrupted by doorways.

r6 **(2)** For stairs or ramps serving a *house* or an individual *dwelling unit*, at least one required handrail shall be continuous throughout the length of the stair or ramp, except where interrupted by,
(a) doorways,
(b) landings, or
(c) newel posts at changes in direction.

(See A-3.4.6.5.(10) in Appendix A.)

9.8.7.3. Termination of Handrails

(1) Handrails shall be terminated in a manner that will not obstruct pedestrian travel or create a hazard. (See Appendix A.)

r11.2 **(2)** Except for stairs and ramps serving a house or an individual dwelling unit, at least one handrail at the sides of a stair or ramp shall extend horizontally not less than 300 mm beyond the top and bottom of each *flight* or ramp. (See Appendix A.)

9.8.7.4. Height of Handrails (See Appendix A.)

(1) The height of handrails on stairs and ramps shall be measured vertically from the top of the handrail to,
(a) a straight line drawn tangent to the tread nosings of the stair served by the handrail, or
(b) the surface of the ramp, floor or landing served by the handrail.

r11.2 **(2)** Except as provided in Sentence (3), Clause 3.8.3.4.(1)(e) and Sentence 9.8.4.5A.(1), handrails shall be 865 mm to 1 070 mm high.

r11.2 **(3)** Handrails installed in addition to required handrails need not comply with Sentence (2).

r11.2 ### 9.8.7.5. Ergonomic Design

(1) The clearance between a handrail and any surface behind it shall be not less than,
(a) 60 mm, if the surface behind the handrail is rough or abrasive, or
(b) 50 mm, in all other cases.

(2) All handrails shall be constructed so as to be continually graspable along their entire length with no obstruction on or above them to break a handhold. (See Appendix A.)

9.8.7.6. Projections into Stairs and Ramps

(1) Handrails and projections below handrails, including handrail supports and stair stringers, shall not project more than 100 mm into the required width of a stair or ramp.

r11.2 ### 9.8.7.7. Design and Attachment of Handrails (See Appendix A.)

(1) Handrails and their supports shall be designed and constructed to withstand the following loads, which need not be considered to act simultaneously:
(a) a concentrated load of not less than 0.9 kN applied at any point and in any direction for all handrails, and
(b) for handrails other than those serving a *house* or an individual *dwelling unit*, a uniform load of not less than 0.7 kN/m.

(2) Where exterior or interior handrails serving a *house* or an individual *dwelling unit* are attached to wood studs or blocking, the attachment shall be deemed to comply with Sentence (1), where,
(a) the attachment points are spaced not more than 1.2 m apart measured on the horizontal plane,
(b) the first attachment point at either end is located not more than 300 mm from the end of the handrail, and
(c) the fasteners consist of no fewer than two No. 8 wood screws at each point, penetrating not less than 32 mm into solid wood.

9.8.8. Guards

9.8.8.1. Required Guards (See Appendix A.)

r11.2 **(1)** Except as provided in Sentence (2), every surface to which access is provided, including but not limited to *flights*, ramps, exterior landings, porches, balconies, *mezzanines*, galleries and raised walkways, shall be protected by a *guard* on each side that is not protected by a wall for the length, where,
(a) there is a difference in elevation of more than 600 mm between the walking surface and the adjacent surface, or
(b) the adjacent surface within 1.2 m from the walking surface has a slope of more than 1 in 2.

(2) *Guards* are not required,
(a) at loading docks,
(b) at floor pits in *repair garages*, or
(c) where access is provided for maintenance purposes only.

r11.2 **(3)** Reserved

(4) Doors in *buildings* of *residential occupancy*, where the finished floor on one side of the door is more than 600 mm above the floor or other surface or ground level on the other side of the door, shall be protected by,
(a) a *guard* in accordance with this Subsection, or
(b) a mechanism capable of controlling the free swinging or sliding of the door so as to limit any clear unobstructed opening to not more than 100 mm.

(5) Except as provided in Sentence (6), openable windows in *buildings* of *residential occupancy* shall be protected by,
(a) a *guard* in accordance with this Subsection, or
r5 (b) a mechanism capable of controlling the free swinging or sliding of the openable part of the window so as to limit any clear unobstructed opening to a size that will prevent the passage of a sphere having a diameter more than 100 mm.
(See Appendix A.)

(6) Windows need not be protected in accordance with Sentence (5), where,
(a) the window serves a *dwelling unit* that is not located above another *suite*,
r5 (b) the only opening having greater dimensions than those allowed by Clause (5)(b) is a horizontal opening at the top of the window,
(c) the top surface of the window sill is located more than 480 mm above the finished floor on one side of the window, or
(d) the window is located in a room or space with the finished floor described in Clause (c) located less than 1 800 mm above the floor or ground on the other side of the window.

(7) Except as provided in Sentence (8), glazing installed over stairs, ramps and landings that extends to less than 1 070 mm above the surface of the treads, ramp or landing shall be,
(a) protected by *guards* in accordance with this Subsection, or
(b) non-openable and designed to withstand the specified lateral loads for *guards* as provided in Article 4.1.5.14.

(8) In *dwelling units*, glazing installed over stairs, ramps and landings that extends to less than 900 mm above the surface of the treads, ramp or landing shall be,
(a) protected by *guards* in accordance with this Subsection, or
(b) non-openable and designed to withstand the specified lateral loads for *guards* as provided in Article 4.1.5.14.

(9) Glazing installed in public areas that extends to less than 1 000 mm from the floor and is located above the second *storey* in *buildings* of *residential occupancy* shall be,
(a) protected by *guards* in accordance with this Subsection, or
(b) non-openable and designed to withstand the specified lateral loads for *guards* as provided in Article 4.1.5.14.

9.8.8.2. Loads on Guards (See Appendix A.)

r11.2 **(1)** Except as provided in Sentences (2), (4) and (5), *guards* shall be designed to resist the specified loads prescribed in Table 9.8.8.2.

r11.2 **(2)** For *guards* within *dwelling units* and in exterior *guards* serving not more than 2 *dwelling units*, where the width and spacing of pickets are such that three pickets can be engaged by a load imposed over a 300 mm width, the load shall be imposed so as to engage three pickets.

(3) None of the specified loads prescribed in Table 9.8.8.2. need be considered to act simultaneously.

(4) For *guards* within *dwelling units* and for exterior *guards* serving not more than 2 *dwelling units*, Table 9.8.8.2. need not apply where the *guard* construction has been demonstrated to provide effective performance.

(5) *Guards* constructed in accordance with the requirements in MMAH Supplementary Standard SB-7, "Guards for Housing and Small Buildings" shall be deemed to satisfy the requirements of Sentence (1).

Table 9.8.8.2.
Specified Loads for Guards
Forming Part of Sentence 9.8.8.2.(1)

Location of *Guard*	Minimum Specified Loads		
	Horizontal Load Applied Inward or Outward at any Point at the Minimum Required Height of the *Guard*	Horizontal Load Applied Outward on Elements Within the *Guard*, Including Solid Panels and Pickets	Evenly Distributed Vertical Load Applied at the Top of the *Guard*
Guards within *dwelling units* and exterior *guards* serving not more than 2 *dwelling units*	0.5 kN/m or concentrated load of 1.0 kN applied at any point(1)	0.5 kN applied over a maximum width of 300 mm and a height of 300 mm(2)	1.5 kN/m
Guards serving access ways to equipment platforms and similar areas where the gathering of many people is improbable	Concentrated load of 1.0 kN applied at any point	Concentrated load of 0.5 kN applied over any area of 100 mm by 100 mm located at any point on the element or elements so as to produce the most critical effect	1.5 kN/m
All other *guards*	0.75 kN/m or concentrated load of 1.0 kN applied at any point(1)	Concentrated load of 0.5 kN applied over any area of 100 mm by 100 mm located at any point on the element or elements so as to produce the most critical effect	1.5 kN/m
Column 1	2	3	4

Notes to Table 9.8.8.2.:
(1) The load that creates the most critical condition shall apply.
(2) See Sentence (2).

9.8.8.3. Height of Guards (See Appendix A.)

r11.2 **(1)** Except as provided in Sentences (2), (3), (4) and (6), all *guards* shall be not less than 1 070 mm high.

r11.2 **(2)** All *guards* within *dwelling units*, other than *guards* serving spiral stairs, shall be not less than 900 mm high.

r6 **(3)** Exterior *guards* serving a *house* or an individual *dwelling unit* shall be not less than 900 mm high where the walking surface served by the *guard* is not more than 1 800 mm above the finished ground level.

r11.2 **(4)** *Guards* for *flights*, except in required *exit* stairs, shall be not less than 900 mm high.

r11.2 **(5)** Reserved

(6) The height of *guards* for exterior stairs and landings more than 10 m above adjacent ground level shall be not less than 1 500 mm.

r11.2 **(7)** The height of *guards* for *flights* shall be measured vertically from the top of the *guard* to a straight line tangent to tread nosings served by the *guard*.

9.8.8.4. Guards for Floors and Ramps in Garages

(1) Except for floors of garages referred to in Section 9.35., where garage floors or ramps are 600 mm or more above the adjacent ground or floor level, every opening through a garage floor and the perimeter of floors and ramps that have no exterior walls shall be provided with,

r11.2 (a) a continuous curb not less than 140 mm in height, and

(b) a *guard* not less than 1 070 mm above the floor level.

r11.2 **(2)** Vehicle guardrails shall be designed and constructed to withstand the loading values specified in Sentence 4.1.5.15.(1).

r11.2 9.8.8.5. Openings in Guards

(1) Except as permitted in Sentences (2) and (3), openings through *guards* shall be of a size that prevents the passage of a spherical object having a diameter of 100 mm. (See Appendix A.)

(2) Except where they serve *storage garages*, *guards* in *industrial occupancies* are permitted to consist of,

(a) a top railing, and

(b) one or more horizontal intermediate rails spaced such that the size of the openings through the *guard* prevents the passage of a spherical object having a diameter of 535 mm.

(See Appendix A.)

(3) Openings through any *guard* that is not required by Article 9.8.8.1. and that serves an *occupancy* other than *industrial occupancy*, shall be of a size that,

(a) prevents the passage of a spherical object having a diameter of 100 mm, or

(b) permits the passage of a spherical object having a diameter of 200 mm.

(See Appendix A.)

9.8.8.6. Guards Designed Not to Facilitate Climbing

(1) *Guards* required by Article 9.8.8.1., except those in *industrial occupancies* and where it can be shown that the location and size of openings do not represent a hazard, shall be designed so that no member, attachment or opening located between 140 mm and 900 mm above the floor or walking surface protected by the *guard* will facilitate climbing. (See Appendix A.)

9.8.8.7. Glass in Guards

(1) Glass in *guards* shall be,

(a) safety glass of the laminated or tempered type conforming to CAN/CGSB-12.1-M, "Tempered or Laminated Safety Glass", or

(b) wired glass conforming to CAN/CGSB-12.11-M, "Wired Safety Glass".

9.8.9. Construction

9.8.9.1. Loads on Stairs and Ramps

(1) Except as required in Articles 9.8.9.4. and 9.8.9.5., stairs and ramps shall be designed for strength and rigidity under uniform loading criteria to support specified loads of,

r6 (a) 1.9 kPa for stairs and ramps serving a *house* or an individual *dwelling unit*, and

(b) 4.8 kPa for other stairs and ramps.

9.8.9.2. Exterior Concrete Stairs

(1) Exterior concrete stairs with more than two risers and two treads shall be,
(a) supported on unit masonry or concrete walls or piers not less than 150 mm in cross-section, or
(b) cantilevered from the main *foundation* wall.

(2) Stairs described in Sentence (1), when cantilevered from the *foundation* wall, shall be constructed and installed in conformance with Subsection 9.8.10.

(3) The depth below ground level for *foundations* for exterior steps shall conform to the requirements in Section 9.12.

9.8.9.3. Exterior Wood Steps

(1) Exterior wood steps shall not be in direct contact with the ground unless suitably treated with a wood preservative.

9.8.9.4. Wooden Stair Stringers

(1) Wooden stair stringers shall,
(a) have a minimum effective depth of 90 mm, measured perpendicularly to the bottom of the stringer at the point of minimum cross-section, and an overall depth of not less than 235 mm,
(b) be supported and secured top and bottom,
(c) be not less than 25 mm actual thickness if supported along their length and 38 mm actual thickness if unsupported along their length, and
r6 (d) except as permitted in Sentence (2), be spaced not more than 900 mm o.c. for stairs serving a *house* or an individual *dwelling unit*, and 600 mm o.c. in other stairs.

r6 **(2)** For stairs serving a *house* or an individual *dwelling unit*, where risers support the front portion of the tread, the space between stringers shall be not more than 1 200 mm.

9.8.9.5. Treads

(1) Stair treads of lumber, plywood or O-2 grade OSB within *dwelling units* shall be not less than 25 mm actual thickness, except that if open risers are used and the distance between stringers exceeds 750 mm, the treads shall be not less than 38 mm actual thickness.

(2) Stair treads of plywood or OSB, that are not continuously supported by the riser shall have their face grain or direction of face orientation at right angles to the stringers.

e8.1 9.8.9.6. Finish for Treads, Landings and Ramps (See Appendix A.)

r4 **(1)** Except as required by Sentence (5), the finish for treads, landings and ramps shall be,
(a) wear-resistant,
(b) slip-resistant, and
(c) smooth, even and free from open defects.

r6 **(2)** The finish for treads, landings and ramps within a *house* or an individual *dwelling unit*, including those from an attached garage serving a *house* or an individual *dwelling unit*, shall be deemed to comply with Sentence (1) where these treads, landings or ramps are finished with,
(a) hardwood,
(b) vertical grain softwood,
(c) resilient flooring,
(d) low-pile carpet,

(e) mat finish ceramic tile,
(f) concrete, or
(g) for stairs to unfinished *basements* and to garages, plywood.

r6 **(3)** Stairs and ramps, except those serving a *house*, an individual *dwelling unit*, *service rooms* or *service spaces*, shall have a colour contrast or a distinctive visual pattern to demarcate,
(a) the leading edge of the treads,
(b) the leading edge of the landing, and
(c) the beginning and end of a ramp.

r6 **(4)** Except for stairs serving a *house*, an individual *dwelling unit*, *service rooms* or *service spaces*, a tactile attention indicator conforming to Article 3.8.3.18. shall be installed,
(a) at the top of the stairs, starting one tread depth back from the edge of the top stair, and
(b) at the leading edge of landings where a doorway opens onto stairs, starting one tread depth back from the edge of the landing.

r4 **(5)** Treads and landings of interior and exterior stairs and ramps, other than those within *dwelling units*, shall have a slip-resistant finish or be provided with slip-resistant strips that extend not more than 1 mm above the surface.

9.8.10. Cantilevered Precast Concrete Steps

9.8.10.1. Design

(1) Exterior concrete steps and their anchorage system that are cantilevered from a *foundation* wall shall be designed and installed to support the loads to which they may be subjected.

9.8.10.2. Anchorage

(1) Cantilevered concrete steps referred to in Article 9.8.10.1. shall be anchored to concrete *foundation* walls at least 200 mm thick.

9.8.10.3. Prevention of Damage Due to Frost

(1) Suitable precautions shall be taken during backfilling and grading operations to ensure that subsequent freezing of the *soil* will not cause uplift forces on the underside of cantilevered concrete steps to the extent that the steps or the walls to which they are attached will be damaged.

Section 9.9. Means of Egress

9.9.1. General

9.9.1.1. Application

(1) Stairways, handrails and *guards* in a *means of egress* shall conform to the requirements in Section 9.8. as well as to the requirements in this Section.

Table 11.5.1.1.A. (Cont'd)
Compliance Alternatives for Assembly Occupancies
Forming Part of Article 11.5.1.1.

	C.A. Number	Division B Requirements	*Compliance Alternative*
r11.1	A29	3.3.1.9.(8)	An existing dead end corridor is permitted where the *occupant load* is not greater than 20 persons, provided travel distance is not greater than 6 m plus corridor width to "*exit* choice" point.
	A30	3.3.1.10.; 3.3.1.11.	Existing door swings may remain in *heritage buildings*, existing or being restored, with no change in *major occupancy* and with *occupant load* no greater than 100.
	A31	3.3.1.12.	Existing doors may remain in a *heritage building*, existing or being restored, with no change in *major occupancy*.
	A32	3.3.1.18.	Existing stained, etched, bevelled, leaded or figured glass acceptable.
	A33	3.3.5.4.(1); 3.3.5.7.(1) to (3)	Need not comply where a gasketed door and self closer are provided in the existing *fire separation*.
	A34	3.4.1.5.(1)	Existing acceptable.
	A35	3.4.1.5.(2)	Existing acceptable provided the existing *guard* is not less than 914 mm.
	A36	3.4.1.8.	Existing stained, etched, bevelled, leaded or figured glass acceptable.
	A37	3.4.2.5.(1)	Existing travel distance acceptable where *floor area* is *sprinklered* and where there is no change in *major occupancy*.
	A38	3.4.3.2.(5)	Need not comply where there is no increase in *occupant load*.
	A39	3.4.3.2.(7)	Existing width of *exits* acceptable provided the *occupant load* is not more than 15% above the *exit* capacity.
	A40	3.4.3.4.	Existing acceptable.
	A41	3.4.3.5.	Existing headroom clearance of not less than 1 980 mm is acceptable.
	A42	3.4.4.4.(8)	Existing washrooms opening directly into an *exit* stairwell shall be separated from the *exit* stairwell by a 45 min *closure*.
	A43	3.4.5.1.(2) and (9)	Existing illuminated legible *exit* signs are acceptable.
	A44	3.4.6.2.	Existing acceptable, if visually apparent.
	A45	3.4.6.3.	Existing acceptable.
	A46	3.4.6.4.	Existing acceptable.
r11.2	A47	3.4.6.5.(3) to (13)	Existing acceptable.
r11.2	A48	3.4.6.6.(2) to (5)	Existing acceptable.
	A49	3.4.6.7.(1)	Existing acceptable.
	A50	3.4.6.8.	Existing acceptable.
	A51	3.4.6.9.	Existing acceptable.
r11.1	A52	3.4.6.11.(1) to (3) and (5)	Existing acceptable.
	A53	3.4.6.12.	Existing acceptable in *public heritage buildings* or a change in *occupancy* with no increase in *occupant load*.
	Column 1	2	3

Table 11.5.1.1.A. (Cont'd)
Compliance Alternatives for Assembly Occupancies
Forming Part of Article 11.5.1.1.

	C.A. Number	Division B Requirements	*Compliance Alternative*
r11.1	A54	3.4.6.16.(2) and (3)	Existing functionally operable panic hardware acceptable.
	A55	3.4.7.2.	*Combustible* fire escapes which are protected from fire in accordance with Sentence 3.2.3.14.(2) are permitted or may be reconstructed or recreated (as in the case of a *heritage building*).
	A56	3.5.1.	Existing acceptable.
	A57	3.6.2.1.(7)	Existing *fire separation* of not less than 30 min is acceptable.
	A58	3.6.2.2.	Existing acceptable where explosion-resistant *construction* or venting is provided.
	A59	3.6.2.6.	Existing acceptable.
	A60	3.6.2.7.(1)	2 h *fire separation* acceptable.
	A61	3.6.3.1.(1) to (5)	45 min *fire separation* acceptable.
	A62	3.6.3.3.(1) to (5) and (8)	Existing acceptable.
	A63	3.6.3.3.(9)	1 h acceptable if *sprinklered*.
	A64	3.6.3.3.(10)	Existing acceptable.
	A65	3.6.3.4.	Existing acceptable.
	A66	3.6.4.	Existing acceptable.
	A67	3.7.1.3.(3)	2.1 m is acceptable.
	A68	3.7.2.1.(3)	The minimum glass areas may be reduced by 50%.
	A69	3.7.4.	Where the *occupant load* is increased by more than 15% above the capacity of the existing facilities, facilities to be added to accommodate the increase.
r4	A70	3.8.1.2.	Existing accessible entrance acceptable. (See *C.A.* A74) Existing curb ramp conforming to Sentence 3.8.3.2.(3) is acceptable. Existing principal entrance acceptable, provided at least one *barrier-free* entrance is available.
	A71	3.8.1.3.(1)	Existing unobstructed width of 920 mm minimum is acceptable.
	A72	3.8.1.3.(4)	Existing unobstructed space not less than 1 500 mm in width and 1 500 mm in length located not more than 30 m apart is acceptable.
r4	A72.1	3.8.3.2.(3)(b)	Existing curb ramp acceptable, provided width not less than 1 200 mm.
	A73	3.8.3.3.(1)	Existing doorway acceptable, provided not less than 810 mm wide.
r4	A73.1	3.8.3.3.(11)(a)	Existing distance acceptable, provided not less than 1 200 mm plus the width of any door that swings into the space in the path of travel.
	A74	3.8.3.4.(1)(a)	Existing ramp acceptable, provided not less than 870 mm between handrails.
r4	A75	3.8.3.8.(5)	Existing grab bar is acceptable.
r4	A75.1	3.8.3.12.	Existing universal washroom acceptable.
	Column 1	2	3

r1 **Table 11.5.1.1.B. (Cont'd)**
Compliance Alternatives for Care, Care and Treatment or Detention Occupancies
Forming Part of Article 11.5.1.1.

r11.1

C.A. Number	Division B Requirements	*Compliance Alternative*
B16	3.1.11.	Where the concealed space is being materially altered, provide smoke or heat detection in that space in lieu of *fire blocks* and tie into fire alarm system.
B17	3.1.14.; 3.1.15.	Existing roof assemblies and roof coverings acceptable.
B18	3.2.3.	Existing windows. (a) Existing windows in walls may be relocated to another part of the wall, provided the existing opening is blocked up to provide the same fire rating for the wall, and the projection of the new opening, at a right angle to the property line onto another *building*, lies no closer than 300 mm from a window in such other *building*, where the "opposite" window is less than 2 400 mm from the opposite new opening, and (b) except relocation of units, to be restricted to the same *fire compartment* and shall conform to the requirements of Article 3.2.3.14. or 9.10.12.3. where applicable, or (c) where a *building* does not satisfy the requirements of Subsection 3.2.3. for the amount of openings facing a yard or space that does not have sufficient *limiting distance*, such existing openings are allowed to be relocated provided: (i) such openings are not increased in size and they are protected with wired glass in steel frames conforming to Sentence 3.1.8.14.(2), or (ii) the *building* is *sprinklered*.
B19	3.2.3.6.(3)	Existing roof soffit projections acceptable.
B20	3.2.4.	(a) Existing fire alarm system may remain except that Article 3.2.4.5. does not apply where the fire safety plan (as described in the Fire Code made under the *Fire Protection and Prevention Act, 1997*) for the *building* addresses the intent of Subsection 3.2.4. (i.e. "stage" system, electrical supervision, detection as required, Fire Department connection and emergency power supply), and (b) extension of an existing system must ensure continuity and compatibility, and integrity of the system.
B21	3.2.4.9.(2)(e)	Does not apply to existing installations in *buildings*.
B22	3.2.4.10.(5)(c)	Does not apply to existing installations in *buildings*.
B23	3.2.5.1.; 3.2.5.2.	Existing access to an existing *occupancy* acceptable. Where the existing *building* is changed to a "B" *occupancy*, existing access are acceptable.
B24	3.2.5.3.(1)	Existing acceptable, except where a change in *occupancy* occurs to a "B1" or "B2" *occupancy*.
B25	3.2.5.3.(2)	Existing acceptable.
B26	3.2.5.4. to 3.2.5.6.	Existing access route to existing *occupancy* is acceptable if the *building* is *sprinklered*. Where existing *building* is changed to a "B" *occupancy*, access route shall be provided.
B27	3.2.5.7.; 3.2.5.18.	Does not apply except where a change in *occupancy* occurs to a "B1" or "B2" *occupancy*, where occupants are not normally evacuated from the *building*.
Column 1	2	3

r1 **Table 11.5.1.1.B. (Cont'd)**
Compliance Alternatives for Care, Care and Treatment or Detention Occupancies
Forming Part of Article 11.5.1.1.

r11.1

C.A. Number	Division B Requirements	*Compliance Alternative*
B28	3.2.5.13.	Existing sprinkler systems in existing *buildings* that do not conform to NFPA 13 may be altered, added to, or extended from the existing system without complying with NFPA 13, provided the system is operational and adequate with respect to coverage, water supply and controls, and provided the system is evaluated by a qualified designer.
B29	3.2.9.	Does not apply except where a change in *occupancy* occurs to a Group B *occupancy*, where occupants are not normally evacuated from the *building*.
B30	3.3.1.9.	Existing width of *public corridors* of not less than 914 mm is acceptable, except as provided in Sentence 3.3.3.3.(2).
B31	3.3.1.10.; 3.3.1.11.	Existing door swings may remain in *heritage buildings*, existing or being restored, with no change in *major occupancy* and with *occupant load* no greater than 100.
B32	3.3.1.12.	Existing doors acceptable.
B33	3.3.1.15.	Existing acceptable.
B34	3.3.1.16.	Existing non-conforming capacities of *access to exits* are acceptable, provided that the excessive capacity is no greater than 15% and, (a) corridor *fire separations* are rated to Code plus early warning system provided, or (b) there are sprinklers, plus *smoke alarms* in *suites*.
B35	3.3.1.17.	Existing acceptable.
B36	3.3.1.18.	Existing stained, etched, bevelled, leaded or figured glass acceptable.
B37	3.3.3.3.(1)	Existing dead end corridors acceptable with 30 min *fire separation* of corridor plus sprinklering of *floor area*, provided the *occupant load* is not greater than 10 persons and travel distance not greater than 6 m plus corridor width to "*exit* choice" point.
B38	3.3.3.7.	45 min *fire separation* acceptable.
B39	3.3.5.4.(1); 3.3.5.7.(3)	Need not comply where a gasketed door and self closer are provided in the existing *fire separation*.
B40	3.4.1.8.	Existing stained, etched, bevelled, leaded or figured glass acceptable.
B41	3.4.2.5.(1)	Existing travel distance acceptable where *floor area* is *sprinklered* and provided *fire separations* comply with Part 3.
B42	3.4.3.2.(7)	Existing acceptable provided there is no change in *occupancy* to a "B2" or "B3".
B43	3.4.3.4.	Existing acceptable.
B44	3.4.3.5.	Existing headroom clearance of not less than 1 980 mm is acceptable.
B45	3.4.5.1.(2) and (9)	Existing illuminated legible *exit* signs are acceptable.
B46	3.4.6.2.	Existing acceptable, if visually apparent.
B47	3.4.6.3.(1)	Existing acceptable with rise no greater than 3.7 m.
B48	3.4.6.4.(1)	Existing acceptable provided there is no change in *occupancy* to a "B2" or "B3".
B49	3.4.6.4.(2) to (4)	Existing acceptable.
B50	3.4.6.5.(3) to (13)	Existing acceptable.
Column 1	2	3

r11.2

Table 11.5.1.1.C. (Cont'd)
Compliance Alternatives for Residential Occupancies
Forming Part of Article 11.5.1.1.

r11.1

C.A. Number	Division B Requirements	*Compliance Alternative*
C27	3.2.5.13.	Existing sprinkler systems in existing *buildings* that do not conform to NFPA 13 may be altered, added to, or extended from the existing system without complying with NFPA 13, provided the system is operational and adequate with respect to coverage, water supply and controls, and provided the system is evaluated by a qualified designer.
C28	3.2.9.	Does not apply to *buildings* 4 *storeys* and less. For existing *buildings* over 4 *storeys* in *building height*, existing standpipe and hose systems water supply is acceptable provided it can deliver a minimum flow rate of 265 L/min for 30 min at 345 kPa (gauge) at the two highest and most remote hose valves, with not less than 132 L/min from each of the two simultaneously.
C29	3.3.1.4.(1); 3.3.4.2.(1)	30 min is acceptable to separate corridors or *exits* in *buildings* not exceeding 6 *storeys* in *building height*, except that 45 min is required for *exits* in *buildings* exceeding 3 *storeys* in *building height*. For *buildings* exceeding 6 *storeys* in *building height*, 30 min is acceptable where *smoke detectors* are installed in corridors, except 1 h is required in *exits*. 30 min is acceptable to separate *public corridors*, *exits* or *suites* in *hotels*, provided *fire detectors* are installed in every room in a *suite* and in every room not located in a *suite*, other than corridors, washrooms, closets in *suites*, saunas, refrigerated areas and swimming pools.
C30	3.3.1.5.(1)(c); Tables 3.3.1.5.A. and 3.3.1.5.B.	In Column 2, maximum area of room or *suite* to be unlimited.
C31	3.3.1.9.	Existing width of *public corridors* of not less than 914 mm is acceptable.
C32	3.3.1.10.; 3.3.1.11.	Existing door swings may remain in *heritage buildings*, existing or being restored, with no change in *major occupancy* and with *occupant load* no greater than 100.
C33	3.3.1.12.	Existing doors acceptable, provided not less than 600 mm wide.
C34	3.3.1.15.	Existing curved or spiral stairs acceptable.
C35	3.3.1.16.	Existing non-conforming capacities of *access to exits* are acceptable, provided that the excessive capacity is no greater than 15% and, (a) corridor *fire separations* are rated to Code plus early warning system provided, or (b) there are sprinklers, plus *smoke alarms* in *suites*.
C36	3.3.1.17.	Does not apply to *heritage buildings*.
C37	3.3.1.18.	Existing stained, etched, bevelled, leaded or figured glass acceptable.
C38	3.3.4.2.(3)(b)(i) 3.3.4.2.(3)(b)(ii), (iii) 3.3.4.2.(3)(b)(iv)	30 min *fire separation* acceptable. 45 min *fire separation* acceptable. 1.5 h *fire separation* acceptable.
C39	3.3.4.4.(4) and (5)	For *buildings* 6 *storeys* and less, doorway from *dwelling unit* will be permitted to open directly into *exit* stairway or interior corridor served by a single *exit* if a fire alarm system complying with Subsection 3.2.4. is installed and the *dwelling unit* has a second and separate *means of egress*.
C40	3.3.5.4.(1) and 3.3.5.7.(3)	Need not comply where a gasketed door and self closer are provided in the existing *fire separation*.
Column 1	2	3

Table 11.5.1.1.C. (Cont'd)
Compliance Alternatives for Residential Occupancies
Forming Part of Article 11.5.1.1.

	C.A. Number	Division B Requirements	*Compliance Alternative*
r6	C41	3.4.1.4.	Except for *hotels* and *retirement homes*, the following types of *exits* may also be used for *buildings* not over 6 *storeys* in *building height*: (a) connected balconies, which connect across *firewalls*, or connect to another *exit*, or with access to ground level, (b) areas of refuge where fire service rescue is possible and that comply with Measure L of Sentences (4) to (10), (18) and Clauses (20)(a), (b) and (d) in MMAH Supplementary Standard SB-4, "Measures for Fire Safety in High Buildings".
	C42	3.4.1.8.	Existing stained, etched, bevelled, leaded or figured glass acceptable.
	C43	3.4.2.5.(1)	Existing travel distance acceptable where *floor area* is *sprinklered* and provided *fire separations* comply with Part 3.
	C44	3.4.3.2.(7)	Existing width of *exits* acceptable provided the *occupant load* is not more than 15% above the *exit* capacity.
	C45	3.4.3.4.	Except for *heritage buildings*, existing acceptable, provided not less than 800 mm.
	C46	3.4.3.5.	Existing headroom clearance of not less than 1 980 mm is acceptable.
	C47	3.4.4.1.(1)	Except for *exits*, no rating required where *floor areas* are *sprinklered*.
r11.1	C48	3.4.4.1.	*Fire separations* of *exits* permitted in *buildings*: (a) 30 min, up to 3 *storeys* in *building height*, (b) 45 min, in *hotels* up to 3 *storeys* in *building height*, (c) 45 min, up to 6 *storeys* in *building height*, (d) 1 h, over 6 *storeys* in *building height*.
	C49	3.4.4.4.(8)	Existing washrooms opening directly into an *exit* stairwell shall be separated from the *exit* stairwell by a 45 min *closure*.
	C50	3.4.5.1.(2) and (9)	Existing illuminated legible *exit* signs are acceptable.
	C51	3.4.6.1.	Existing acceptable.
	C52	3.4.6.2.	Existing acceptable, if visually apparent.
	C53	3.4.6.3.(1)	Existing acceptable with rise no greater than 3.7 m.
r11.2	C54	3.4.6.4.(1) to (3)	Existing acceptable.
r11.2	C55	3.4.6.4.(4) and (5)	Existing acceptable.
r11.2	C56	3.4.6.5.(3) to (13)	Existing acceptable.
r11.2	C57	3.4.6.6.(2) to (4)	Existing acceptable.
	C58	3.4.6.7.(1)	Existing acceptable.
	C59	3.4.6.8.	Existing acceptable.
r6	C60	3.4.6.9.	(a) Except for *retirement homes*, existing acceptable. (b) For *retirement homes*, existing acceptable provided there is no change in *major occupancy* or increase in *occupant load* greater than 15%.
	C61	3.4.6.10.(2) to (6)	Existing acceptable.
	Column 1	2	3

Table 11.5.1.1.C. (Cont'd)
Compliance Alternatives for Residential Occupancies
Forming Part of Article 11.5.1.1.

	C.A. Number	Division B Requirements	*Compliance Alternative*
r11.1	C95	6.2.4.7.(10)	In a *building* containing not more than four *dwelling units* or residential *suites*, the existing heating or *air-conditioning* system may be altered to serve more than one *dwelling unit* or *suite*, provided *smoke alarms* are installed in each *dwelling unit* or *suite* and provided a *smoke detector* is installed in the supply or return air duct system serving the entire *building* which would turn off the fuel supply and electrical power to the heating system upon activation of such detector.
	C96	6.2.9.2.	Existing acceptable.
	C97	6.2.12.3.(1)	Carbon monoxide alarms may be battery operated or plugged into an electrical outlet.
	C98	6.3.1.	Existing acceptable, provided products of combustion are safely vented.
	C99	8.2.1.4.	Existing clearances acceptable where a *sewage system* is replaced with another *sewage system* within the same class and the capacity of the replacement *sewage system* does not exceed the capacity of the existing *sewage system*.
	C100	8.2.1.4.	Existing clearances are acceptable where a replacement *sewage system* requires lesser clearances than those required in Part 8 for the existing *sewage system.*
	C101	9.3.2.1.	Sound used lumber may be acceptable for reuse without a grade stamp provided that: (a) visual examination shows no excessive weakening by holes, notches, nail splits or other damage, (b) where the grade or species is unknown, the minimum grade shall apply for span table use, and (c) lumber has not been subjected to termite infestation.
r6	C102	9.5.3.1.	In a *house*, (a) minimum room height shall not be less than 1 950 mm over the required floor area and in any location that would normally be used as a *means of egress*, or (b) minimum room height shall not be less than 2 030 mm over at least 50% of the required floor area, provided that any part of the floor having a clear height of less than 1 400 mm shall not be considered in computing the required floor area.
	C103	9.5.11.1.	Doors may be lesser heights to suit ceiling heights.
	C104	9.5.11.2.	Existing acceptable, provided not less than 600 mm.
	C105	9.6.1.2.(2) and (3); 9.6.1.4.(1) and (2)	Existing doors and sidelights being reused or relocated need not conform if identified or protected.
	C106	9.6.1.4.(3)	Existing acceptable, if marked to indicate their existence and position.
	C107	9.7.2.3.	(a) Where windows are not used as a *means of egress* and where they do not conflict with ventilation requirements, the minimum glass areas as shown in Table 9.7.2.3. may be reduced by 50%, and (b) an existing room converted to an interior room, created by an addition, shall not require a window, provided there is an opening in a dividing wall occupying not less than 30% of the separating plane to an adjoining room, where the adjoining room has a minimum of 5% window area of the combined floor areas, and provided the required ventilation for the combined room is maintained.
	Column 1	2	3

Table 11.5.1.1.C. (Cont'd)
Compliance Alternatives for Residential Occupancies
Forming Part of Article 11.5.1.1.

C.A. Number	Division B Requirements	*Compliance Alternative*
C108	9.7	Existing acceptable.
C109	9.8.1. to 9.8.4.	Replacement or extension of existing stair systems shall be exempt from the provisions of these Subsections, except that they shall have: (a) a minimum width between wall faces of 700 mm, and (b) a minimum clear height over tread nosing or landing of 1 800 mm.
C110	9.8.4.3. and 9.8.4.5A.	Existing curved or spiral stairs are acceptable.
C111	9.8.4.5.	Where a stair complies with Subsection 9.8.4., an extension to a stair may contain two sets of winders provided that they are separated by at least three treads or a landing.
C112	9.8.5.1.(2)	Existing ramps acceptable, where practical.
C113	9.8.7.	Existing handrails acceptable, unless considered unsafe by *chief building official*.
C114	9.8.8.	Existing *guards* acceptable, unless considered unsafe by *chief building official*.
C115	9.8.9.6.(4)	Existing acceptable.
C116	9.9.2.1.(1) to (3)	Except for *hotels*, the following types of *exits* may also be used: (a) connected balconies, which connect across *firewalls*, or connect to another *exit*, or with access to grade, (b) areas of refuge approved by the *chief building official*, where fire service rescue is possible, or (c) *combustible* or *noncombustible* exterior stairways or fire escapes which are protected in accordance with Sentence 3.2.3.13.(2). These may be reconstructed or recreated (as in the case of a *heritage building*).
C117	9.9.2.1.(4)	Except for *hotels*, existing acceptable.
C118	9.9.3.2.	(a) In a *building* containing not more than four *dwelling units*, the width of every *exit* facility may be as the existing, but not less than 800 mm, or (b) in a *building* containing more than four *dwelling units*, the width of every *exit* facility may be as the existing, but not less than 900 mm.
C119	9.9.3.3.	(a) In a *building* containing not more than four *dwelling units*, the minimum width of a *public corridor* may be 800 mm, or (b) in a *building* containing more than four *dwelling units*, the minimum width of a *public corridor* may be 900 mm.
C120	9.9.3.4.	Existing clear height of not less than 1 950 mm is acceptable.
C121	9.9.4.2.	Except as permitted in *C.A.* C136, in a *building* containing not more than four *dwelling units* or *suites*, one *exit* need not be separated from the remainder of the *building* at the *first storey* where there are one or more other *exits* complying with *C.A.* C122.
C122	9.9.4.2.(1) and (2)	30 min *fire separation* acceptable.
C123	9.9.5.4.	Existing acceptable.
C124	9.9.5.8.	Existing acceptable provided minimum 45 min *fire separation* and where explosion-resistant *construction* or venting is provided.
C125	9.9.5.9.	Existing acceptable, provided that the enclosure has a 45 min *fire-resistance rating*.
Column 1	2	3

Table 11.5.1.1.D/E. (Cont'd)
Compliance Alternatives for Business/Mercantile Occupancies
Forming Part of Article 11.5.1.1.

	C.A. Number	Division B Requirements	*Compliance Alternative*
	DE29	3.3.1.9.(1)	Existing width of *public corridors* of not less than 914 mm is acceptable.
	DE30	3.3.1.10.; 3.3.1.11.	Existing door swings may remain in *heritage buildings*, existing or being restored, with no change in *major occupancy* and with *occupant load* no greater than 100.
	DE31	3.3.1.12.	Existing doors acceptable, provided not less than 600 mm wide.
	DE32	3.3.1.15.	Existing curved or spiral stairs acceptable.
	DE33	3.3.1.16.	Existing non-conforming capacities of *access to exits* are acceptable, provided that: (a) the increase in *occupant load* is not greater than 15%, (b) the corridor *fire separations* are rated to Code, and (c) early warning systems are provided, or (d) there are sprinklers, plus *smoke alarms* in *suites*.
	DE34	3.3.1.17.	Does not apply to *heritage buildings*.
	DE35	3.3.1.18.	Existing stained, etched, bevelled, leaded or figured glass acceptable.
	DE36	3.3.5.4.; 3.3.5.7.(3)	Need not comply where a gasketed door and self closer are provided in the existing *fire separation*.
	DE37	3.4.1.4.	The following types of *exits* may also be used for *buildings* not over 6 *storeys* in *building height*: (a) connected balconies, which connect across *firewalls*, or connect to another *exit*, or with access to grade, (b) areas of refuge where fire service rescue is possible and that comply with Measure L of Sentences (4) to (10), (18), and Clauses (20)(a), (b) and (d) in MMAH Supplementary Standard SB-4, “Measures for Fire Safety in High Buildings”.
	DE38	3.4.1.8.	Existing stained, etched, bevelled, leaded or figured glass acceptable.
	DE39	3.4.2.5.(1)	Existing travel distance acceptable where *floor area* is *sprinklered*.
	DE40	3.4.3.2.(7)	Existing width of *exits* acceptable provided the *occupant load* is not more than 15% above the *exit* capacity.
	DE41	3.4.3.4.	Existing acceptable.
	DE42	3.4.3.5.	Existing headroom clearance of not less than 1 980 mm is acceptable.
r11.1	DE43	3.4.4.1.	*Fire separations* of *exits* permitted in *buildings*: (a) 30 min, up to 3 *storeys* in *building height*, (b) 45 min, up to 6 *storeys* in *building height*, (c) 1 h, over 6 *storeys* in *building height*.
	DE44	3.4.4.4.(8)	Existing washrooms opening directly into *exit* stairwell shall be separated from *exit* stairwell by a 45 min *closure*.
	DE45	3.4.5.1.(2) and (9)	Existing illuminated legible *exit* signs are acceptable.
	DE46	3.4.6.1.	Existing acceptable.
	DE47	3.4.6.2.	Existing acceptable, if visually apparent.
	DE48	3.4.6.3.(1)	Existing acceptable with rise no greater than 3.7 m.
	Column 1	2	3

Table 11.5.1.1.D/E. (Cont'd)
Compliance Alternatives for Business/Mercantile Occupancies
Forming Part of Article 11.5.1.1.

	C.A. Number	Division B Requirements	*Compliance Alternative*
r11.1			
r11.2	DE49	3.4.6.4.(1) to (3)	Existing acceptable.
r11.2	DE50	3.4.6.4.(4) and (5)	Existing acceptable.
r11.2	DE51	3.4.6.5.(3) to (13)	Existing acceptable.
	DE52	3.4.6.6.(1) to (5)	Existing acceptable.
	DE53	3.4.6.7.(1)	Existing acceptable.
	DE54	3.4.6.8.	Existing acceptable.
	DE55	3.4.6.9.	Existing acceptable.
	DE56	3.4.6.10.(2) to (6)	Existing acceptable.
r11.1	DE57	3.4.6.11.(1), (1.1) and (2)	Existing acceptable.
	DE58	3.4.6.12.	Existing acceptable in *public heritage buildings* or a change in *occupancy* with no increase in *occupant load*.
	DE59	3.4.6.13.	Existing acceptable.
	DE60	3.4.6.14.	Existing acceptable.
	DE61	3.4.6.16.	Existing functionally operable panic hardware acceptable.
	DE62	3.4.7.2.	*Combustible* fire escapes which are protected from fire in accordance with Sentence 3.2.3.13.(2) are permitted or may be reconstructed or recreated (as in the case of a *heritage building*).
	DE63	3.5.1.	Existing acceptable except where *building* is classified under Subsection 3.2.6.
	DE64	3.6.2.1.(7)	Existing *fire separation* of not less than 30 min is acceptable
	DE65	3.6.2.2.	Existing acceptable where explosion-resistant *construction* or venting is provided.
	DE66	3.6.2.6.	Existing acceptable.
	DE67	3.6.2.7.(1)	2 h *fire separation* acceptable.
	DE68	3.6.3.1.(1) to (5)	45 min *fire separation* acceptable up to 6 *storeys*.
	DE69	3.6.3.3.	(a) Where 2 h *fire separation* is required, 1 h is acceptable. (b) Where 1 h *fire separation* is required, 45 min is acceptable. (c) Existing need not comply with Sentence 3.6.3.3.(5).
r3	DE70	3.6.4.2.	Ceiling *fire separation* need not have a *fire-resistance rating* where sprinklering, subject to *C.A.* DE27, of *fire compartments* on both sides of vertical *fire separation* is provided and where such *fire separation* is not required to exceed 1 h.
	DE71	3.6.4.3.(1)	Existing to meet *flame-spread rating* of 25 or to be *sprinklered*.
	DE72	3.6.4.4. to 3.6.4.6.	Existing access acceptable.
	DE73	3.7.4.	Where the *occupant load* is increased by more than 15% above the capacity of the existing facilities, facilities to be added to accommodate the increase.
r4	DE74	3.8.1.2.	Existing accessible entrance acceptable. (See *C.A.* DE78) Existing curb ramp conforming to Sentence 3.8.3.2.(3) is acceptable. Existing principal entrance acceptable, provided at least one *barrier-free* entrance is available.
	Column 1	2	3

Table 11.5.1.1.D/E. (Cont'd)
Compliance Alternatives for Business/Mercantile Occupancies
Forming Part of Article 11.5.1.1.

	C.A. Number	Division B Requirements	*Compliance Alternative*
r11.1	DE75	3.8.1.3.(1)	Existing unobstructed width of 920 mm minimum is acceptable.
	DE76	3.8.1.3.(4)	Existing unobstructed space not less than 1 500 mm in width and 1 500 mm in length located not more than 30 m apart is acceptable.
r4	DE76.1	3.8.3.2.(3)(b)	Existing curb ramp acceptable, provided width not less than 1 200 mm.
	DE77	3.8.3.3.(1)	Existing doorway acceptable, provided not less than 810 mm wide.
r4	DE77.1	3.8.3.3.(11)(a)	Existing distance acceptable, provided not less than 1 200 mm plus the width of any door that swings into the space in the path of travel.
	DE78	3.8.3.4.(1)(a)	Existing ramp acceptable, provided not less than 870 mm between handrails.
r4	DE79	3.8.3.8.(5)	Existing grab bar is acceptable.
r4	DE79.1	3.8.3.12.	Existing universal washroom acceptable.
r11.1	DE80	3.8.3.13.(2)(g)	Existing grab bar is acceptable.
r4	DE80.1	3.8.3.16.	Existing drinking fountain conforming to Clauses 3.8.3.16.(2)(a) and (b) acceptable.
	DE81	4.1.8.	The requirements under this Subsection do not apply.
	DE82	6.2.2.1.(2)	Required outdoor air rates may be provided by mechanical, natural or combination of natural and mechanical means.
	DE83	6.2.3.2.; 6.2.3.9.; 6.2.3.18; 6.2.3.19.	Existing acceptable.
	DE84	6.2.3.8.(18)	Existing acceptable.
	DE85	6.2.3.12.	Existing openings, grilles and diffusers acceptable, subject to approval of *chief building official*.
	DE86	8.2.1.4.	Existing clearances acceptable where a *sewage system* is replaced with another *sewage system* within the same class and the capacity of the replacement *sewage system* does not exceed the capacity of the existing *sewage system*.
	DE87	8.2.1.4.	Existing clearances are acceptable where a replacement *sewage system* requires lesser clearances than those required in Part 8 for the existing *sewage system.*
	DE88	9.3.2.1.	Sound used lumber may be acceptable for reuse without a grade stamp provided that: (a) visual examination shows no excessive weakening by holes, notches, nail splits or other damage, (b) where the grade or species is unknown, the minimum grade shall apply for span table use, and (c) lumber has not been subjected to termite infestation.
	DE89	9.5.11.2.	Existing acceptable, provided not less than 600 mm.
	DE90	9.6.1.2.(2) and (3); 9.6.1.4.(1) and (2)	Existing doors and sidelights being reused or relocated need not conform if identified or protected.
	DE91	9.6.1.4.(3) and (4); 9.8.8.1.(7) and (9)	Existing acceptable.
	DE92	9.7.	Existing acceptable.
	Column 1	2	3

Table 11.5.1.1.D/E. (Cont'd)
Compliance Alternatives for Business/Mercantile Occupancies
Forming Part of Article 11.5.1.1.

	C.A. Number	Division B Requirements	*Compliance Alternative*
	DE93	9.8.1. to 9.8.4.	Replacement or extension of existing stair systems shall be exempt from the provisions of these Subsections, except that they shall have: (a) a minimum width between wall faces of 700 mm, and (b) a minimum clear height over tread nosing or landing of 1 800 mm.
	DE94	9.8.3.2.	Existing acceptable.
r11.2	DE95	9.8.4.3. and 9.8.4.5A.	Existing curved or spiral stairs acceptable.
	DE96	9.8.5.1.(2)	Existing ramps acceptable, where practical.
	DE97	9.8.7.	Existing handrails acceptable, unless considered unsafe by *chief building official*.
	DE98	9.8.8.	Existing *guards* acceptable, unless considered unsafe by *chief building official*.
	DE99	9.9.1.1.	Existing acceptable.
	DE100	9.9.2.1.(1) to (3)	The following types of *exits* may also be used: (a) connected balconies, which connect across *firewalls*, or connect to another *exit*, or with access to grade, (b) areas of refuge approved by the *chief building official*, where fire service rescue is possible, or (c) *combustible* or *noncombustible* exterior stairways or fire escapes which are protected in accordance with Sentence 3.2.3.13.(2). These may be reconstructed or recreated (as in the case of a *heritage building*).
	DE101	9.9.2.1.(4)	Existing acceptable.
	DE102	9.9.3.2.	Existing width of *exits* acceptable.
	DE103	9.9.3.3.	Existing width of *public corridors* of not less than 965 mm is acceptable.
	DE104	9.9.3.4.	Existing clear height of not less than 1 950 mm is acceptable.
	DE105	9.9.4.2.	30 min *fire separation* acceptable.
	DE106	9.9.5.4.; 9.9.5.5.	Existing acceptable.
	DE107	9.9.5.8.	Existing acceptable provided minimum 45 min *fire separation* and where explosion-resistant *construction* or venting is provided.
	DE108	9.9.5.9.	Existing acceptable, provided that the enclosure has a 45 min *fire-resistance rating*.
	DE109	9.9.6.1.	Existing acceptable.
	DE110	9.9.6.2.	Existing clear opening height of not less than 1 950 mm is acceptable.
	DE111	9.9.6.3.	Existing door widths are acceptable, provided *exit* widths comply with *C.A.* DE103.
	DE112	9.9.6.5.	Existing door swings are acceptable. Existing acceptable in *public heritage buildings*, where approved by *chief building official*.
	DE113	9.9.6.6.(1)	Where *exit* doors open onto a landing, they shall not extend beyond the face of the first riser.
	DE114	9.9.6.8.	Existing functionally operable passage or panic hardware acceptable.
	Column 1	2	3

Table 11.5.1.1.F. (Cont'd)
Compliance Alternatives for Industrial Occupancies
Forming Part of Article 11.5.1.1.

	C.A. Number	Division B Requirements	*Compliance Alternative*
	F49	3.4.6.2.	Existing acceptable, if visually apparent.
	F50	3.4.6.3.(1)	Existing acceptable with rise no greater than 3.7 m.
r11.2	F51	3.4.6.4.(1) to (3)	Existing acceptable.
r11.2	F52	3.4.6.4.(4) and (5)	Existing acceptable.
r11.2	F53	3.4.6.5.(3) to (13)	Existing acceptable.
	F54	3.4.6.6.(1) to (5)	Existing acceptable.
	F55	3.4.6.7.(1)	Existing acceptable.
	F56	3.4.6.8.	Existing acceptable.
	F57	3.4.6.9.	Existing acceptable.
	F58	3.4.6.10.(2) to (6)	Existing acceptable.
r11.1	F59	3.4.6.11.(1), (1.1) and (2)	Existing acceptable.
	F60	3.4.6.12.	For “F2” and “F3” *occupancies*, existing acceptable in *public heritage buildings* or a change in *occupancy* with no increase in *occupant load*.
	F61	3.4.6.13.; 3.4.6.14.	Existing acceptable.
	F62	3.4.6.16.	Existing functionally operable panic hardware acceptable.
	F63	3.4.7.2.	*Combustible* fire escapes which are protected from fire in accordance with Sentence 3.2.3.13.(2) are permitted or may be reconstructed or recreated (as in the case of a *heritage building*).
	F64	3.5.1.	Existing acceptable, except where *building* classified under Subsection 3.2.6. and except where existing elevators are “open” type.
	F65	3.6.2.1.(7)	45 min *fire separation* acceptable.
	F66	3.6.2.2.	Existing acceptable where explosion-resistant *construction* or venting is provided.
	F67	3.6.2.6.	Existing acceptable.
	F68	3.6.2.7.(1)	2 h *fire separation* acceptable.
	F69	3.6.3.1.(1) to (5)	45 min *fire separation* acceptable up to 6 *storeys*.
	F70	3.6.3.3.	(a) Where 2 h *fire separation* is required, 1 h is acceptable. (b) Where 1 h *fire separation* is required, 45 min is acceptable. (c) Existing need not comply with Sentences 3.6.3.3.(4) and (5).
	F71	3.6.4.2.	Ceiling *fire separation* need not be fire-resistance rated where sprinklering, subject to *C.A.* F27, of *fire compartments* on both sides of vertical *fire separation* is provided and where such *fire separation* is not required to exceed 1 h.
	F72	3.6.4.3.(1)	Existing to meet *flame-spread rating* of 25 or to be *sprinklered*.
	F73	3.6.4.4. to 3.6.4.6.	Existing access acceptable.
	F74	3.7.4.	Where the *occupant load* is increased by more than 15% above the capacity of the existing facilities, facilities to be added to accommodate the increase.
	Column 1	2	3

Table 11.5.1.1.F. (Cont'd)
Compliance Alternatives for Industrial Occupancies
Forming Part of Article 11.5.1.1.

	C.A. Number	Division B Requirements	*Compliance Alternative*
r11.1 r4	F75	3.8.1.2.	Existing accessible entrance acceptable. (See *C.A.* F79) Existing curb ramp conforming to Sentence 3.8.3.2.(3) is acceptable. Existing principal entrance acceptable, provided at least one *barrier-free* entrance is available.
	F76	3.8.1.3.(1)	Existing unobstructed width of 920 mm minimum is acceptable.
	F77	3.8.1.3.(4)	Existing unobstructed space not less than 1 500 mm in width and 1 500 mm in length located not more than 30 m apart is acceptable.
r4	F77.1	3.8.3.2.(3)(b)	Existing curb ramp acceptable, provided width not less than 1 200 mm.
	F78	3.8.3.3.(1)	Existing doorway acceptable, provided not less than 810 mm wide.
r4	F78.1	3.8.3.3.(11)(a)	Existing distance acceptable, provided not less than 1 200 mm plus the width of any door that swings into the space in the path of travel.
	F79	3.8.3.4.(1)(a)	Existing ramp acceptable, provided not less than 870 mm between handrails.
r4	F80	3.8.3.8.(5)	Existing grab bar is acceptable.
r4	F80.1	3.8.3.12.	Existing universal washroom acceptable.
r11.1	F81	3.8.3.13.(2)(g)	Existing grab bar is acceptable.
r4	F81.1	3.8.3.16.	Existing drinking fountain conforming to Clauses 3.8.3.16.(2)(a) and (b) acceptable.
	F82	4.1.8.	The requirements under this Subsection do not apply.
	F83	6.2.2.3.(1), (3) and (4)	*Storage garages* with a total capacity of fewer than 20 motor vehicles need not have mechanical ventilating systems if the downward slope of the floor to the outside door is 1 in 120 and the garage floor is above outside ground level.
	F84	6.2.3.2.; 6.2.3.9.; 6.2.3.18; 6.2.3.19.	Existing acceptable for “F2” and “F3” *occupancies*.
	F85	6.2.3.12.	Existing openings, grilles and diffusers acceptable.
	F86	6.2.9.2.	Existing acceptable for “F2” and “F3” *occupancies*.
	F87	8.2.1.4.	Existing clearances acceptable where a *sewage system* is replaced with another *sewage system* within the same class and the capacity of the replacement *sewage system* does not exceed the capacity of the existing *sewage system*.
	F88	8.2.1.4.	Existing clearances are acceptable where a replacement *sewage system* requires lesser clearances than those required in Part 8 for the existing *sewage system.*
	F89	9.3.2.1.	Sound used lumber is acceptable for reuse without a grade stamp provided that: (a) visual examination shows no excessive weakening by holes, notches, nail splits or other damage, (b) where the grade or species is unknown, the minimum grade shall apply for span table use, and (c) lumber has not been subjected to termite infestation.
	F90	9.5.11.2.	Existing acceptable, provided not less than 600 mm.
	F91	9.6.1.2.(2) and (3); 9.6.1.4.(1) and (2)	Existing doors and sidelights being reused or relocated need not conform if identified or protected.
	F92	9.6.1.4.(3) and (4); 9.8.8.1.(7) and (9)	Existing barriers acceptable.
	Column 1	2	3

Table 11.5.1.1.F. (Cont'd)
Compliance Alternatives for Industrial Occupancies
Forming Part of Article 11.5.1.1.

	C.A. Number	Division B Requirements	*Compliance Alternative*
	F93	9.7.	Existing acceptable.
	F94	9.8.1. to 9.8.4.	Replacement or extension of existing stair systems shall be exempt from the provisions of these Articles, except that they shall have: (a) a minimum width between wall faces of 700 mm, and (b) a minimum clear height over tread nosing or landing of 1 800 mm.
r11.2	F95	9.8.4.3. and 9.8.4.5A.	Existing curved or spiral stairs acceptable.
	F96	9.8.5.1.(2)	Existing ramps acceptable, where practical.
	F97	9.8.7.	Existing handrails acceptable, unless considered unsafe by *chief building official*.
	F98	9.8.8.	Existing *guards* acceptable, unless considered unsafe by *chief building official*.
	F99	9.8.9.6.(4)	Existing acceptable.
	F100	9.9.1.1.	Existing acceptable.
	F101	9.9.2.1.(1) to (3)	The following types of *exits* may also be used: (a) connected balconies, which connect across *firewalls*, or connect to another *exit*, or with access to grade, (b) areas of refuge approved by the *chief building official*, where fire service rescue is possible, or (c) *combustible* or *noncombustible* exterior stairways or fire escapes which are protected in accordance with Sentence 3.2.3.13.(2). These may be reconstructed or recreated (as in the case of a *heritage building*).
	F102	9.9.2.1.(4)	Existing acceptable.
	F103	9.9.3.2.	Existing width of *exits* acceptable.
	F104	9.9.3.3.	Existing width of *public corridors* of not less than 965 mm is acceptable.
	F105	9.9.3.4.	Existing clear height of not less than 1 950 mm is acceptable.
	F106	9.9.4.2.	30 min *fire separation* acceptable.
	F107	9.9.5.4.	Existing acceptable.
	F108	9.9.5.8.	Existing acceptable provided minimum 45 min *fire separation* and where explosion-resistant *construction* or venting is provided.
	F109	9.9.5.9.	Existing acceptable, provided that the enclosure has a 45 min *fire-resistance rating*.
	F110	9.9.6.3.	Existing door widths are acceptable, provided *exit* widths comply with *C.A.* F104.
	F111	9.9.6.5.	Existing door swings acceptable. Existing acceptable in *public heritage buildings*, where approved by *chief building official*.
	F112	9.9.6.6.(1)	Where *exit* doors open onto a landing, such doors shall not extend beyond the face of the first riser.
	F113	9.9.6.8.	Existing functionally operable passage or panic hardware acceptable.
	F114	9.9.7.4.	Maximum area of existing room or *suite* does not apply.
	Column 1	2	3

Table 11.5.1.1.F. (Cont'd)
Compliance Alternatives for Industrial Occupancies
Forming Part of Article 11.5.1.1.

r11.1

C.A. Number	Division B Requirements	*Compliance Alternative*
F115	9.9.8.2.(1)	Existing travel distance acceptable where *floor area* is *sprinklered* and provided *fire separations* comply with Part 9.
F116	9.9.11.3.	Existing illuminated legible signs are acceptable for *exit* signs, if approved by *chief building official*.
F117	9.10.1.1.	Assemblies required to be of *noncombustible construction* may be supported by *combustible construction* having at least the same *fire-resistance rating* as that supported.
F118	9.10.1.3.(8) to (10)	Existing acceptable subject to *C.A.*'s F27 and F28.
F119	9.10.3.	*Fire-resistance ratings* may also be used where they are based on: 1. HUD Rehabilitation Guidelines, "Guideline on Fire Ratings of Archaic Materials and Assemblies". 2. DBR Technical Paper No. 194, "Fire Endurance of Protected Steel Columns and Beams". 3. DBR Technical Paper No. 207, "Fire Endurance of Unit Masonry Walls". 4. DBR Technical Paper No. 222. Fire Endurance of Light-Framed and Miscellaneous Assemblies".
F120	9.10.5.1.	Existing openings in existing wall or ceiling membranes to remain. Existing openings may be moved to another location in the same wall or ceiling, provided the aggregate area of openings does not increase and are not cumulative, and the existing opening is blocked up to provide the same rating as the existing wall or ceiling assembly.
F121	9.10.6.2.	Existing *heavy timber construction* acceptable where *construction* is within 90% of the member sizes listed in Part 3.
F122	9.10.7.	Existing acceptable for *heritage buildings*, subject to approval of *chief building official*.
F123	9.10.8.1.	Existing 30 min rating acceptable.
F124	9.10.8.2.	Existing sprinkler systems complying with *C.A.* F27 and Sentence 3.2.2.17.(1) are acceptable.
F125	9.10.8.3.	Existing acceptable, subject to approval of *chief building official*.
F126	9.10.8.8.	30 min rating acceptable.
F127	9.10.9.7.; 9.10.9.9.	Existing acceptable in existing *fire separations*.
F128	9.10.9.10.(1)	Ceiling *fire separation* need not be *fire-resistance rated* where sprinklering of *fire compartments* on both sides of vertical *fire separation* is provided and where such *fire separation* is not required to exceed 1 h.
F129	9.10.9.11.(2)	In lieu of the 2 h *fire separation*, sprinklers may be used in the *medium hazard industrial occupancy* with a 1 h *fire separation*.
F130	9.10.9.13.; 9.10.9.15.(1)	30 min *fire separation* acceptable.
F131	9.10.10.3.(1)	45 min *fire separation* acceptable.
F132	9.10.13.1.	Existing functional *closures* are acceptable subject to *C.A.* F8.
Column 1	2	3

interconnections between building systems satisfy the intent of their design and that systems function as intended by the Code.

Clause 6.1.5. of CAN/ULC-S1001 allows the Integrated Testing Coordinator to accept documented evidence of any tests that have been performed on a system as part of its acceptance testing for the purpose of demonstrating compliance with the integrated testing requirements of that standard, so as to avoid duplication of work.

A-3.3. Safety Within Floor Area.

Section 3.3. regulates safety within floor areas including rooms or other spaces within a building, with the exception of service rooms and service spaces that are regulated by Section 3.6. The requirements are grouped according to the occupancy of the floor area, room or space. The occupancy of these floor areas and other spaces is not necessarily the major occupancy for which the building is classified.

Life safety for the occupants of any floor area depends in the first instance on the use or occupancy of that floor area. The risks to the occupants occur in the early stages of a fire. These special life risks differ from one occupancy to another and, consequently, must be regulated differently. Section 3.3. regulates risks within floor areas, and these requirements apply regardless of the major occupancy of the building that contains them. For example, an assembly room must comply with the requirements for assembly occupancy whether it is contained in an office building, hospital, hotel, theatre, industrial building or other major occupancy.

a10.1 A-3.3.1.2.(1) Hazardous Substances.

The term “hazardous substances” refers to dangerous goods that are regulated by TC SOR/2008-34, “Transportation of Dangerous Goods Regulations (TDGR)” or that are classified as “controlled products” under the “Workplace Hazardous Materials Information System (WHMIS)” established to meet the requirements of HC SOR/2015-17 “Hazardous Products Regulations”. It also refers to materials and products that are not regulated by the TDGR or WHMIS, but that pose a fire or explosion hazard due to their own properties or because of the manner in which they are stored, handled or used. These include combustible products, rubber tires, combustible fibres, combustible dusts, products producing flammable vapours or gases, etc.

A-3.3.1.2.(2) Cooking Equipment Ventilation.

Cooking equipment manufactured for use in dwelling units and other residential suites is often installed in buildings used for assembly and care or detention purposes. It is not obvious from the Building Code requirements or those of NFPA 96, “Ventilation Control and Fire Protection of Commercial Cooking Operations”, whether a ventilation and grease removal system is required in all assembly, care or detention uses. If the equipment is to be used in a manner that will produce grease-laden vapours that are substantially more than would be produced in a normal household environment, then it would be appropriate to apply the requirements of NFPA 96. If the equipment is used primarily for reheating food prepared elsewhere or is used occasionally for demonstration or educational purposes, there would be no expectation of applying the requirements of NFPA 96. In all cases the circumstances should be reviewed with the enforcement authority.

A-3.3.1.4.(1) Occupancy in Corridor.

Since the Building Code regulates new construction, alterations and changes of occupancy, kiosks in public corridors are required to be constructed on the same basis as the remainder of the building. This means that the construction of kiosks and similar structures must take into consideration all the requirements which apply to the remainder of the building, including structural fire protection, construction type, finish materials, egress widths and sprinkler installations.

A-3.3.1.7.(1) Temporary Refuge for Persons with Disabilities.

These measures are intended to provide temporary refuge for persons with disabilities. It is acknowledged, however, that the measures cannot provide absolute safety for all occupants in the fire area. It may, therefore, be necessary to develop special arrangements in the fire safety plan to evacuate persons with disabilities from these areas.

The protected elevator referred to in Clause 3.3.1.7.(1)(a) is intended to be used by firefighters as a means for evacuating persons with disabilities. It is not intended that this elevator be used by persons with disabilities as a means of egress without the assistance of firefighters.

If an estimate is to be made of the number of persons with disabilities in a floor area who can be accommodated in each zone in Clause 3.3.1.7.(1)(b), this estimate may be based on Table 3.8.2.1., which is used to determine the minimum number of spaces to be provided for wheelchair occupants in fixed seating areas. If more precise information is available, it should be used for sizing the zones.

a10.1 **A-3.3.1.7.(1)(b) Zones.**

The floor area on either side of a horizontal exit conforming to Article 3.4.6.10. may be considered as a zone in applying the requirements of Article 3.3.1.7.

A-3.3.1.9.(4) Obstruction in Corridor.

The sweep of a cane used by a person with vision loss normally detects obstructions that are within 680 mm of the floor. Any obstruction above this height would not normally be detected and can, therefore, create a hazard if it projects more than 100 mm into the path of travel.

A-3.3.1.11.(3) Movable Partitions.

Should an emergency situation arise outside of normal working hours but when occupants are still in the space, they could be left without a clear way out. This could occur during inventory or after closing time when all occupants have not yet left, but staff close the door to prevent other persons from entering. In many small tenant areas, the movable partitions (store fronts) provide the only way out. There should always be a second way out or a swinging door within or adjacent to the sliding partitions.

A-3.3.1.12.(4) Door Hardware.

The permission to have additional door releasing devices is intended to allow the use of a security chain, night latch or dead bolt to supplement the normal door latching device. These are permitted for dwelling units and locations where guests in a hotel require additional security. The height of these items is also governed by the maximum height stipulated in Sentence 3.3.1.12.(5) to ensure that they can be operated by persons with physical disabilities. This additional hardware should not require appreciable dexterity by the user and the general requirements on the ability to operate the device without the use of keys, special tools or specialized knowledge still apply.

A-3.3.1.12.(6) Controlled Egress Doors.

It is intended that Sentence 3.3.1.12.(6) apply to doors used at the perimeter of a contained use area or an impeded egress zone. If the contained use area consists of a single room, the requirements would apply to that room. In the case of individual cells within a contained use area, exterior keyed locks could be used on the cell doors consistent with the fire safety plan and continuous supervision by staff who can release the doors in an emergency.

A-3.3.1.22.(1) Obstructions in Means of Egress.

Obstructions including posts, counters or turnstiles should not be located in a manner that would restrict the width of a normal means of egress from a floor area or part of a floor area unless an alternative means of egress is provided adjacent to and plainly visible from the restricted means of egress.

A-3.3.2.3.(2) Tablet Arms.

Although it is intended that the motion to raise the tablet arm be essentially a single fluid motion, it is acceptable that the motion be a compound motion of raising the tablet arm and including an articulation to allow the tablet to fall back alongside the arm rest.

a10.2 A-3.3.2.8A. Installation Configurations of Handrails in Aisles with Steps.

Figure A-3.3.2.8A. illustrates possible installation configurations of handrails serving aisles with steps.

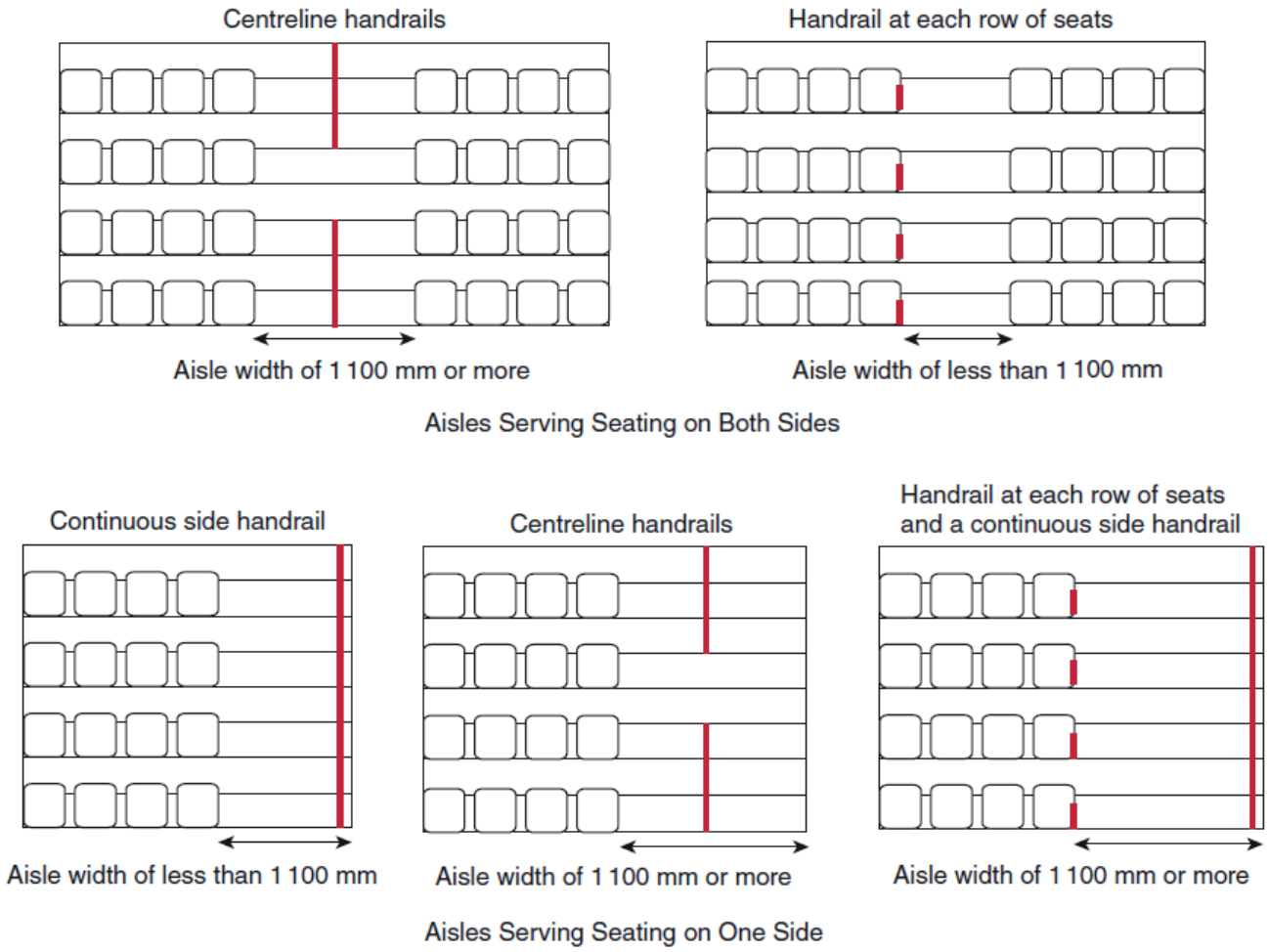


Figure A-3.3.2.8A.
Installation Configurations of Handrails in Aisles with Steps

A-3.3.3.1.(1) Safety in a Care or Detention Occupancy.

Fire safety for patients and residents in sleeping room areas in care or detention occupancies is predicated on the ability of staff to carry out at all times essential life safety functions in accordance with the fire safety plan.

A-3.3.3.4.(1) Doorway Width.

The 1 050 mm minimum clear width of doorways accounts for door stops and, thus, is intended to allow for the use of 1 100 mm doors.

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A-3.4.5.2.(2) Stairwell Signs.

Past experience indicates that some persons attempt to exit at the roof level of a building in the event of an emergency. Rescue from the roof of a building more than six storeys high is rarely possible from the exterior of a building. In order to avoid instances of persons getting trapped by smoke at the top of a stairwell that has no access to a roof, signs are required within the stairwell (at least one sign immediately above the highest normally occupied floor level) to indicate that the stairwell does not provide an exit at the roof level. The sign should consist of a graphic and text to indicate that there is no exit to the roof.

A-3.4.6. Application to Means of Egress.

The requirements in Subsection 3.4.6. apply to interior and exterior exits, as well as to ramps, stairways and passageways used by the public as access to exit. The treads, risers, landings, handrails and guards for the latter access to exit facilities must thus be provided in conformance with the appropriate requirements for exit facilities.

a3 A-3.4.6.1.(2) Surface Finish of Ramps and Stairs.

A tactile attention indicator strip signals a warning to people with no or low vision that they are approaching a change in level. The strip is set back from the leading edge of the stair to provide sufficient warning of the change in level in advance.

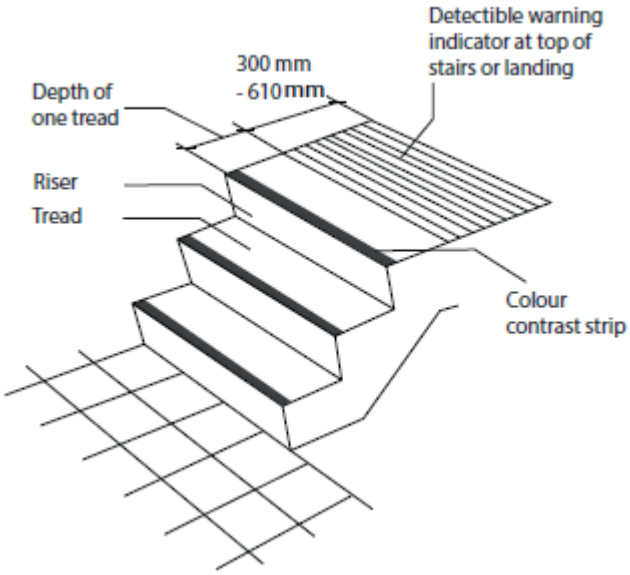


Figure A-3.4.6.1.(2)
Tactile Indicator at Stairs and Ramps

a10.2 A-3.4.6.4. Dimensions of Landings.

A landing is a floor area provided at the top or bottom of a flight of stairs or a ramp, or a platform built as part of a stairway or ramp. Landings provide a safe surface for users to rest upon, allow design flexibility, and facilitate a change in direction.

Figure A-3.4.6.4. illustrates how to measure the length of a landing for various landing configurations turning less than 90 degrees, including straight landings.

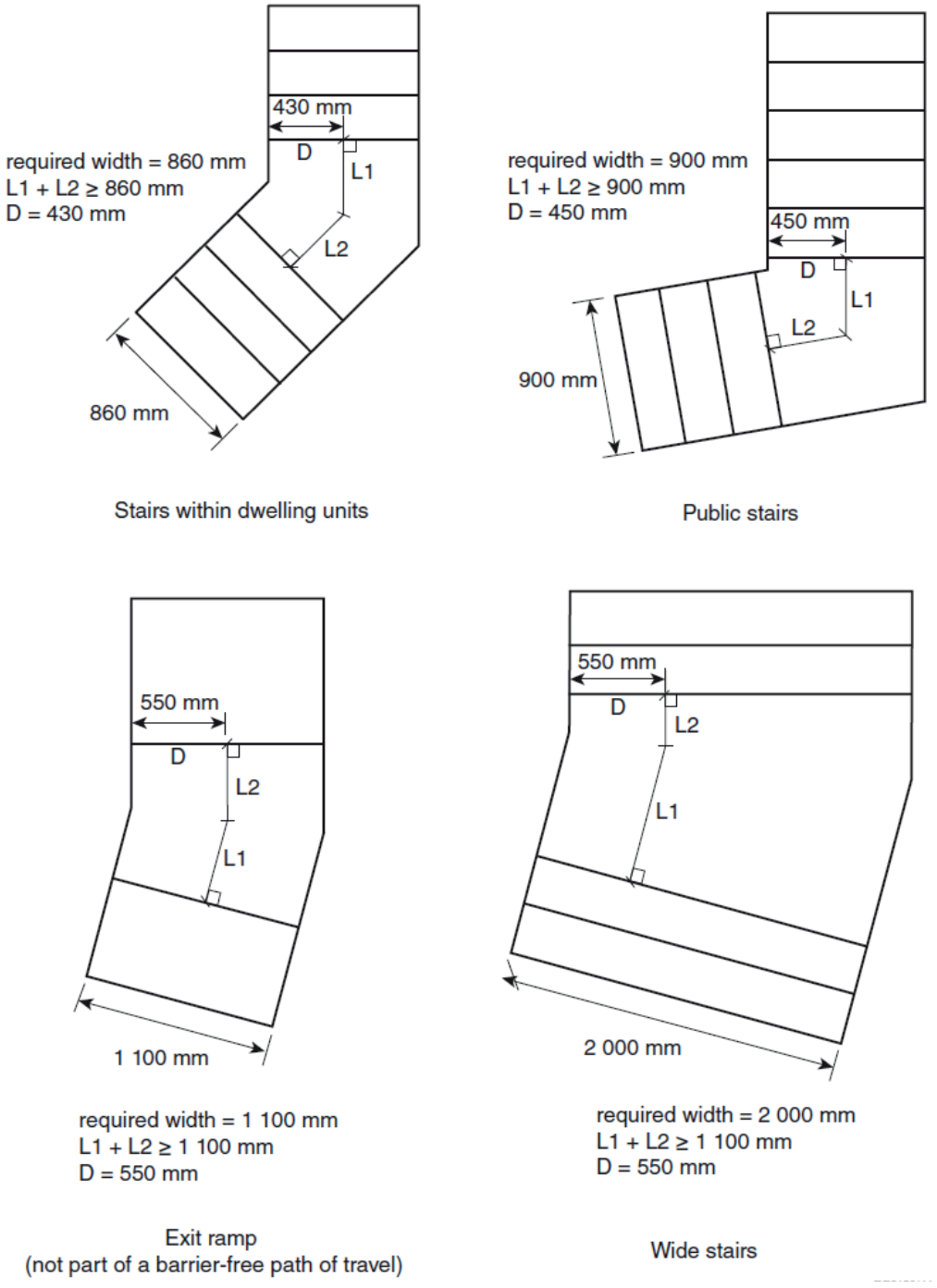


Figure A-3.4.6.4.
Landing Configurations

Notes to Figure A-3.4.6.4.:

(1) L1 + L2 = length of the landing
= the lesser of the required width of stair or ramp, or 1 100 mm
See Sentences 3.4.6.4.(2) and 9.8.6.3.(2)

(2) D = distance from the narrow edge where the length of the landing is measured
= half the required length of the landing
See Sentences 3.4.6.4.(3) and 9.8.6.3.(3)

a10.2 A-3.4.6.5.(4) Wider Stairs than Required.

The intent of Sentence 3.4.6.5.(4) is that handrails be installed in relation to the required exit width only, regardless of the actual width of the stair and ramp. The required handrails are provided along the assumed natural path of travel to and from the building.

e7.1 A-3.4.6.5.(10) Continuity of Handrail.

Persons with vision loss rely on handrails to guide them on stairways. A continuous handrail will assist them in negotiating stairs at changes in direction. The extended handrail is useful to persons with physical disabilities to steady themselves before using the stairs. Handrails should, however, return to the wall, floor or post, so as not to constitute a hazard to persons with vision loss.

A-3.4.6.8.(5) Stair Tolerances.

The term "shall not differ significantly" assumes normal construction tolerances.

A-3.4.6.10.(5) Door Swing.

Although it is required that the door on the right hand side of a pair of doors shall swing in the direction of travel through the exit, the direction of swing of the door on the left side will depend on the function of the horizontal exit. If the horizontal exit provides for movement from one building to the adjacent building but does not require movement in the reverse direction, both doors must swing in the direction of travel to the adjacent building. If the design is based upon both buildings providing complementary movement in either direction, then the doors must swing in opposite directions. Location of a required exit sign directly above a door that swings in the direction of travel is deemed to meet the intent of Clause 3.4.6.10.(5)(b).

A-3.4.6.11.(3) Exit Concealment.

Hangings or draperies placed over exit doors may conceal or obscure them.

A-3.4.6.16.(1) Fastening Device.

Turnpieces of a type which must be rotated through an angle of more than 90° before releasing a locking bolt are not considered to be readily openable. The release of a locking bolt should allow the door to open without having to operate other devices on the door.

A-3.4.6.16.(4) Electromagnetic Locks.

Electromagnetic locks are intended for use where there is a need for security additional to that provided by traditional exit hardware. They are not intended for indiscriminate use as alternative locking devices.

The design of these devices requires evaluation to ensure that their operation will be fail-safe in allowing exiting in the event of foreseeable emergencies.

If more than one locking device is used in a building, it is expected that one switch will release and reset all devices simultaneously. If more than one such switch is provided in a building, at least one switch must be installed in the annunciator panel located at the main entrance of the building or, in the case of a building within the scope of Subsection 3.2.6., in the central alarm and control facility for easy access of fire department personnel.

Most importantly, electromagnetic locks are not to be used where panic hardware must be installed. This will ensure that a large number of occupants can exit a building quickly in emergency situations created by either fire or non-fire conditions. It will also ensure that occupants in buildings containing highly hazardous substances can exit quickly unimpeded in an emergency.

In care and treatment facilities, such as hospitals and long term care homes, and residential care facilities, however, because the occupant load is relatively low and the level of staff supervision is generally high, electromagnetic devices may be installed on exit doors at the bottom of exit stairways where panic hardware is required by code to maintain security where necessary.

When installed on doors in fire separations, electromagnetic locking devices must used in conjunction with positive latching devices designed to hold the doors in the closed position since these locks do not incorporate latches and are released in an emergency. In a fire, keeping doors in fire separations closed is essential to control the spread of fire and smoke.

To enable exiting without delay (especially important in non-fire emergency situation), a manual pull station must be installed in close proximity to the door equipped with an electromagnetic locking device. The operation of this manual pull station will immediately release the electromagnetic locking device and, at the same time, activate the building fire alarm system.

Precautionary measures should be in place to ensure that by-pass switches would be deactivated at the completion of each fire alarm testing. An audible and a visual signal at the annunciator panel and at the monitory station should provide such assurance.

A-3.4.6.19.(1)(d) Colour Contrast.

The identification of floor and other signs intended to facilitate orientation for visually-impaired persons should offer maximum colour contrast to be effective. For this reason, it is recommended that white on black or black on white be used, as this combination produces the best legibility. It is also recommended that the sign surfaces be processed to prevent glare.

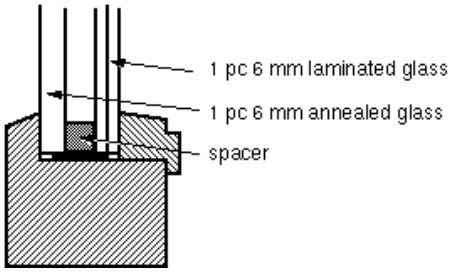


Figure A-9.7.5.2.(1)
Combined Laminated / Annealed Glazing

A-9.7.5.2.(2) Resistance of Doors to Forced Entry.

This Sentence designates standard ASTM F476, "Test Methods for Security of Swinging Door Assemblies" as an alternate to compliance with the prescriptive requirements for doors and hardware. The annex to the standard provides four security classifications, with acceptance criteria, depending on the type of building and the crime rate of the area in which it is located. The Building Code has only specified Grade 10, the minimum level. The annex suggests the following guidelines be followed when selecting security levels for door assemblies:

Grade 10: This is the minimum security level and is quite adequate for single-family residential buildings located in stable, low-crime areas.

Grade 20: This is the low-medium security level and is designed to provide security for residential buildings located in average crime-rate areas and for apartments in both low and average crime-rate areas.

Grade 30: This is the medium-high security level and is designed to provide security for residential buildings located in higher than average crime-rate areas or for small commercial buildings in average or low crime-rate areas.

Grade 40: This is the high security level and is designed for small commercial buildings located in high crime-rate areas. This level could also be used for residential buildings having an exceptionally high incidence of semi-skilled burglary attacks.

All these grades satisfy the Code and can be considered for use where a higher level of security is desired or warranted.

9.7.5.2.(6) Door Fasteners.

The purpose of the requirement for 30 mm screw penetration into solid wood is to prevent the door from being dislodged from the jamb due to impact forces. It is not the intent to prohibit other types of hinges or strikeplates that are specially designed to provide equal or greater protection.

A-9.7.5.2.(8) Hinged Doors.

Methods of satisfying this Sentence include either using non-removable pin hinges or modifying standard hinges by screw fastening a metal pin in a screw hole in one half of the top and bottom hinges. When the door is closed, the projecting portion of the pin engages in the corresponding screw hole in the other half of the hinge and then, even if the hinge pin is taken out, the door cannot be removed.

A-9.7.5.3.(1) Resistance of Windows to Forced Entry.

Although this Sentence only applies to windows within 2 m of adjacent ground level, certain house and site features, such as balconies or canopy roofs, allow for easy access to windows at higher elevations. Consideration should be given to specifying break-in resistant windows in such locations.

This Sentence does not apply to windows that do not serve the interior of the dwelling unit, such as windows to garages, sun rooms or greenhouses, provided connections between these spaces and the dwelling unit are secure.

One method that is often used to improve the resistance of windows to forced entry is the installation of metal "security bars". However, while many such installations are effective in increasing resistance to forced entry, they may also reduce or eliminate the usefulness of the window as an exit in case of fire or other emergency that prevents use of the normal building exits. Indeed, unless such devices are easily openable from the inside, their installation in some cases would contravene the requirements of Article 9.9.10.1., which requires every bedroom that does not have an exterior door to have at least one window that is large enough and easy enough to open that it can be used as an exit in case of emergency. Thus an acceptable security bar system should be easy to open from the inside while still providing increased resistance to entry from the outside.

a10.2 A-9.8.3.1. Permitted Stair Configurations.

Table A-9.8.3.1.
Permitted Stair Configurations

Location/Use of Stairs	Configuration of Stair Treads				
	Straight Flight with Rectangular Treads	Curved Flight with Tapered Treads	Winders	Flight with a mix of Rectangular Treads and Tapered Treads	Spiral Stairs
Stairs within dwelling units	Permitted(1)	Permitted(2)	Permitted(3)	Permitted(4)	Permitted(5)
Public stairs	Permitted(1)	Permitted(6)	Not permitted	Not permitted	Permitted(5)
Exit stairs	Permitted(1)	Permitted(6)	Not permitted	Not permitted	Not permitted

Notes to Table A-9.8.3.1.:

1. See Articles 9.8.4.1. and 9.8.4.2.
2. See Article 9.8.4.1. and 9.8.4.3.
3. See Article 9.8.4.5.
4. See Article 9.8.4.4A.
5. See Sentence 9.8.4.5A.
6. See Articles 3.4.6.9. and 9.8.4.3.

a10.2 A-9.8.4. Step Dimensions.

The Code distinguishes four principal types of stair treads:

- rectangular treads, which are found in straight flights;
- tapered treads are found in curved flights;
- winders are described in Appendix Note A-9.8.4.5.; and
- spiral stairs are described in Appendix Note A-9.8.4.5A. See Figure A-9.8.4.A.

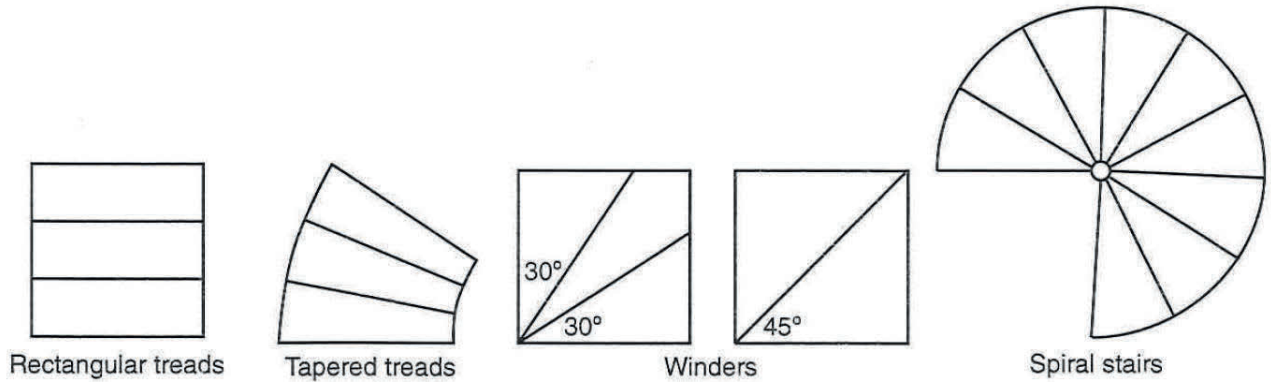


Figure A-9.8.4.A.
Types of Treads

Articles 9.8.4.1. to 9.8.4.6. specify various dimensional limits for steps. Figure A-9.8.4.B illustrates the elements of a step and how these are to be measured.

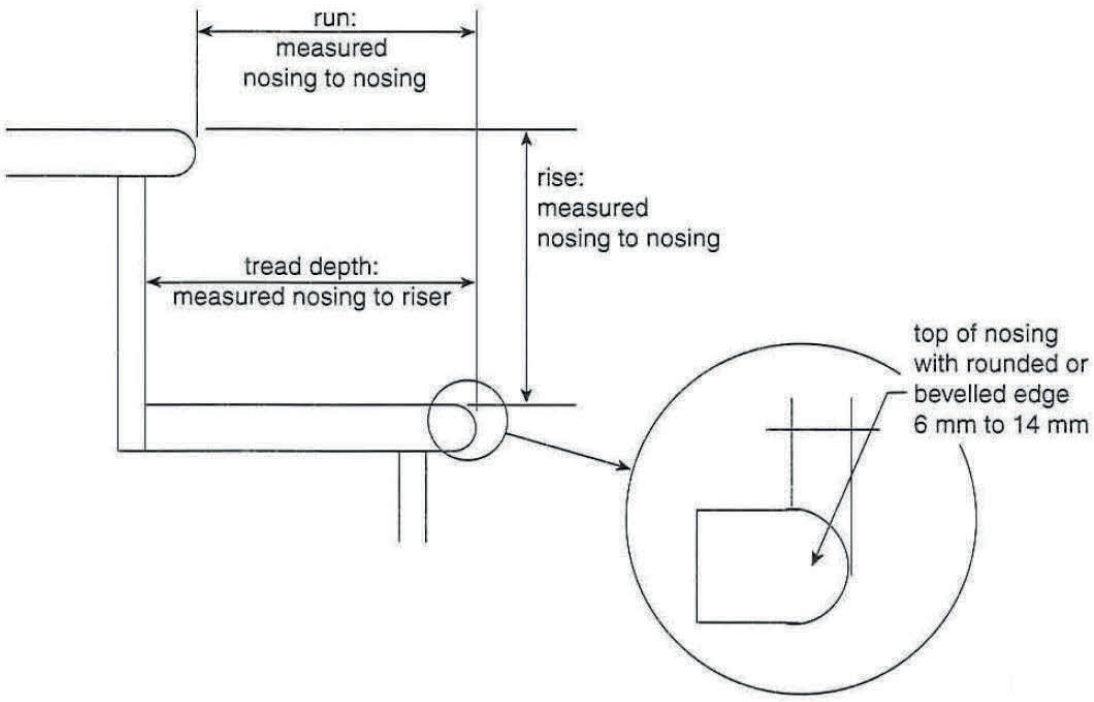


Figure A-9.8.4.B.
Elements of Steps and their Measurement

A-9.8.4.5. Winders.

The safest method of incorporating a change in the direction of a stair is to use a landing. Within a dwelling unit, however, where occupants are familiar with their environment, winders are an acceptable method of reducing the amount of floor area devoted to the stair and have not been shown to be more hazardous than a straight run of steps. Nevertheless, care is required to ensure that winders are as safe as possible. Experience has shown that 30° winders are the best compromise and require the least change in the natural gait of the stair user; 45° winders are also acceptable, as they are wider. The Code permits winders to turn through any angle between 30° and 45°, inclusive. This allows winder-type stairs to change direction through any angle between 30° (1 winder) and 90° (2 or 3 winders).

a10.2 A-9.8.4.5A. Spiral Stairs.

A spiral stair is typically described as a stair with a circular plan having uniform treads that radiate from and wind around a common central post or supporting column.

In the context of the Code, the term "spiral stair" is used to describe any stair where:

a) the plan of the treads forms part or all of the circle,
b) the maximum stair width and tread depth are less than those required for curved stairs, and
c) the maximum riser height is greater than that permitted in all other stair configurations.

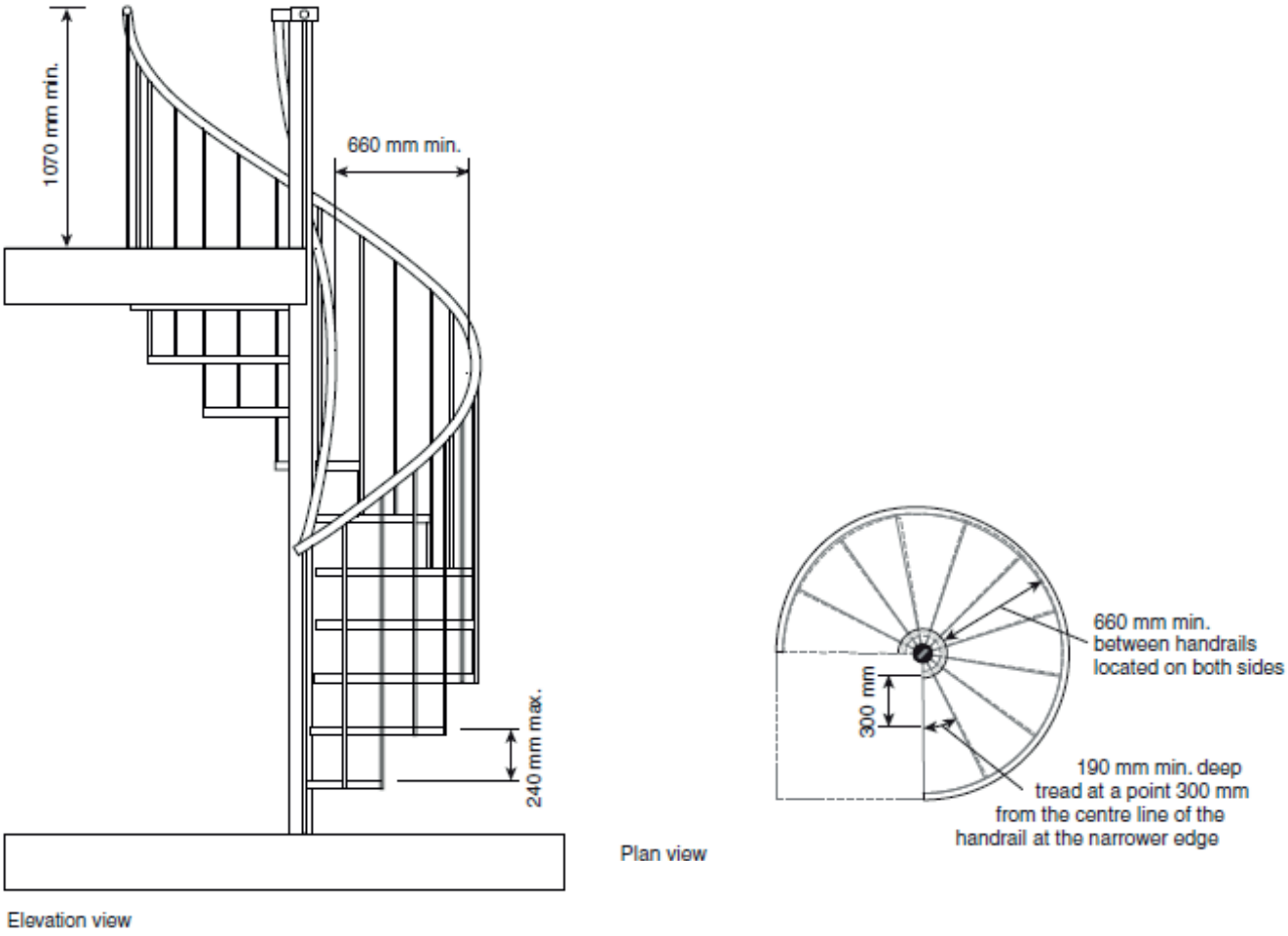


Figure A-9.8.4.5A.
Spiral Stairs

A-9.8.4.6.(1) Tread Projection and Leading Edge of Steps.

A sloped or bevelled edge on nosings or leading edges of steps will make the tread more visible through light modelling. The sloped portion of the leading edge must not be too wide so as to reduce the risk of slipping of the foot. To reduce the risk of tripping, the leading edge must not reduce the effective tread depth to less than the required minimum tread depth less 15 mm. Similarly, the projection of the tread behind the nosing can also cause tripping, particularly during a person's ascent. Figure A-9.8.4.6. illustrates the various dimensional requirements stated in Sentence 9.8.4.6.(1).

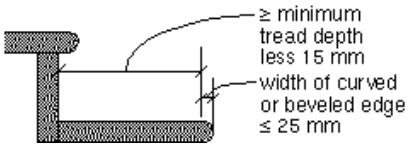


Figure A-9.8.4.6.
Tread Depth and Treatment of Leading Edge

a10.2 A-9.8.7.1.(2) Wider Stairs than Required.

The intent of Sentence 9.8.7.1.(2) is that handrails be installed in relation to the required exit width only, regardless of the actual width of the stair and ramp. The required handrails are provided along the assumed natural path of travel to and from the building.

a10.2 A-9.8.7.2. Continuity of Handrails.

The guidance and support provided by handrails is particularly important at the beginning and end of ramps and flights of stairs and at changes in direction such as at landings and winders.

The intent of the requirement in Sentence (2) for handrails to be continuous throughout the length of the stair is that the handrail be continuous from the bottom riser to the top riser of the stair. (See Figure A-9.8.7.2.)

For stairs or ramps serving a house or an individual dwelling unit, the intent of the requirement for handrails to be continuous throughout the length of the flight is that the handrail be continuous from the bottom riser to the top riser of the flight. The required handrail may start back from the bottom riser only if it is supported by a newel post or volute installed on the bottom tread. (See Figure A-9.8.7.2.) With regard to stairs serving a house or an individual dwelling unit, the handrail may terminate at landings.

In the case of stairs within dwelling units that incorporate winders, the handrail should be configured so that it will in fact provide guidance and support to the stair user throughout the turn through the winder.

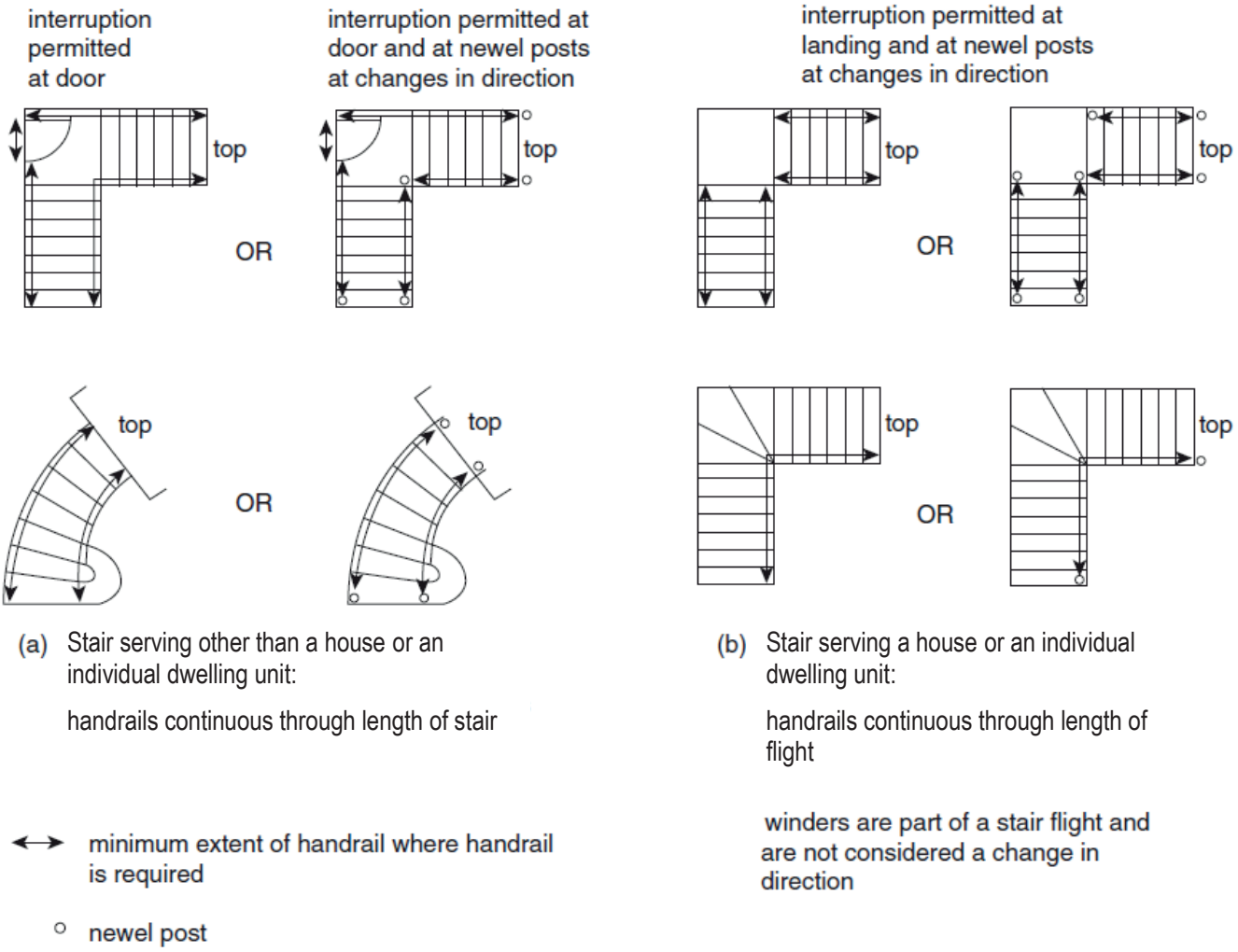


Figure A-9.8.7.2.
Continuity of Handrails at the Top and Bottom of Stairs and Flights of Stairs

Notes to Figure A-9.8.7.2.:

(1) See Article 9.8.7.1. to determine the number of handrails required. Some stairs will require only one, while some will require two or more.

A-9.8.7.3.(1) Termination of Handrails.

Handrails are required to be installed so as not to obstruct pedestrian travel. To achieve this end, the rail should not extend so far into a hallway as to reduce the clear width of the hallway to less than the required width. Where the stair terminates in a room or other space, likely paths of travel through that room or space should be assessed to ensure that any projection of the handrail beyond the end of the stair will not interfere with pedestrian travel. As extensions of handrails beyond the first and last riser are not required in dwelling units [See Sentence 9.8.7.3.(2)] and as occupants of dwellings are generally familiar with their surroundings, the design of dwellings would not generally be affected by this requirement.

Handrails are also required to terminate in a manner that will not create a safety hazard to blind or visually impaired persons, children whose heads may be at the same height as the end of the rail, or persons wearing loose clothing or carrying items that might catch on the end of the rail. One approach to reducing potential hazards is returning the handrail to a wall, floor or post. Again, within dwelling units, where occupants are generally familiar with their surroundings, returning the handrail to a wall, floor or post may not be necessary. For example, where the handrail is fastened to a wall and does not project past the wall into a hallway or other space, a reasonable degree of safety is assumed to be provided; other alternatives may provide an equivalent level of protection.

A-9.8.7.3.(2) Handrail Extensions.

As noted in Appendix Note A-9.8.7.2., the guidance and support provided by handrails is particularly important at the beginning and end of ramps and flights of stairs and at changes in direction. The extended handrail provides guidance and allows users to steady themselves upon entering or leaving a ramp or flight of stairs. Such extensions are particularly useful to visually-impaired persons, and persons with physical disabilities or who are encumbered in their use of the stairs or ramp.

A-9.8.7.4. Height of Handrails.

Figure A-9.8.7.4. illustrates how to measure handrail height.

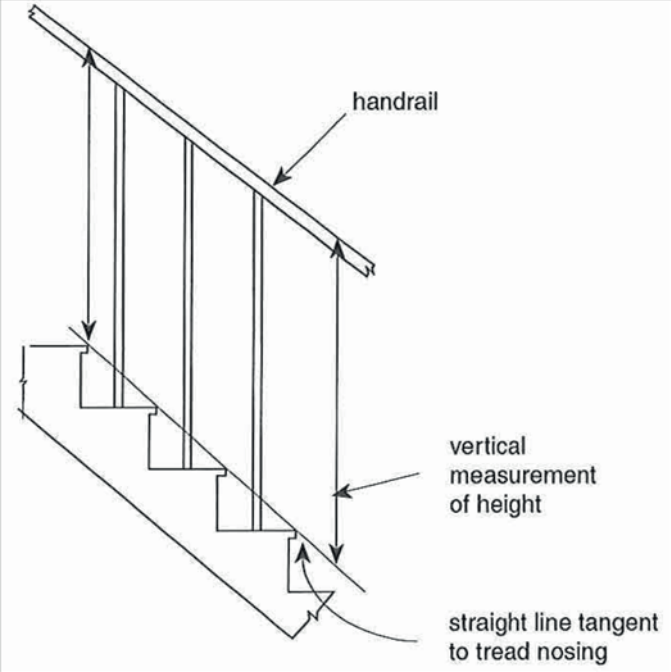


Figure A-9.8.7.4.
Measuring Handrail Height

a10.2 **A-9.8.7.5.(2) Handrail Sections.**

Handrails are intended to provide guidance and support to stair users. To fulfil this intent, handrails must be "graspable".

The graspable portion of a handrail should allow a person to comfortably and firmly grab hold by allowing their fingers and thumb to curl under part or all of the handrail. Where the configuration or dimensions of the handrail do not allow a person's fingers and thumb to reach the bottom of it, recesses that are sufficiently wide and deep to accommodate a person's fingers and thumb must be provided on both sides of the handrail, at the bottom of the graspable portion, which must not have sharp edges.

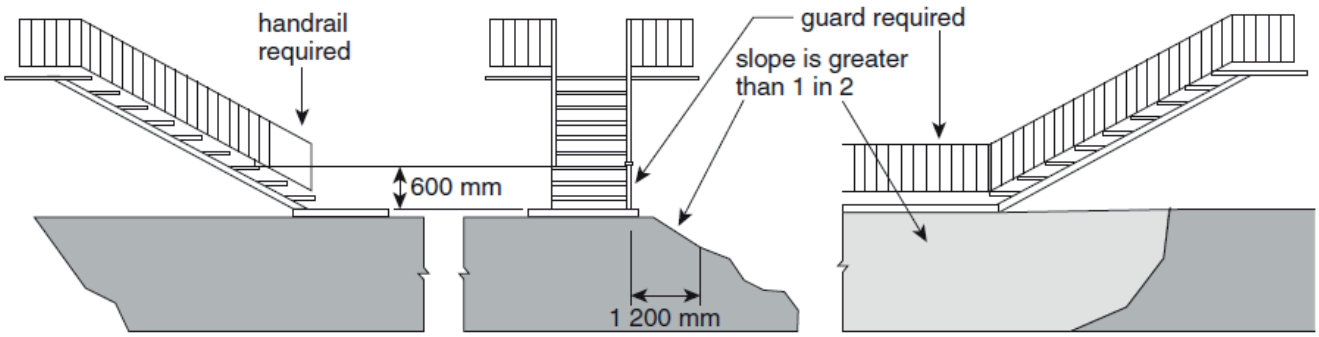
a5 **A-9.8.7.7. Attachment of Handrails.**

Handrails are intended to provide guidance and support to the stair user and to arrest falls. The loads on handrails may therefore be considerable. The attachment of handrails serving a house or an individual dwelling unit may be accepted on the basis of experience, structural design, or the prescriptive requirements of Sentence 9.8.7.7.(2).

A-9.8.8.1. Required Guards.

The requirements relating to guards stated in Part 9 are based on the premise that, wherever there is a difference in elevation of 600 mm or more between two floors, or between a floor or other surface to which access is provided for other than maintenance purposes and the next lower surface, the risk of injury in a fall from the higher surface is sufficient to warrant the installation of some kind of barrier to reduce the chances of such a fall. A wall along the edge of the higher surface will obviously prevent such a fall, provided the wall is sufficiently strong that a person cannot fall through it. Where there is no wall, a guard must be installed. Because guards clearly provide less protection than walls, additional requirements apply to guards to ensure that a minimum level of protection is provided. These relate to the characteristics described in Appendix Notes A-9.8.8.3., A-9.8.8.5.(1) and (2), A-9.8.8.5.(3) and A-9.8.8.6.(1).

Examples of such surfaces where the difference in elevation could exceed 600 mm and consequently where guards would be required include, but are not limited to, landings, porches, balconies, mezzanines, galleries, and raised walkways. Especially in exterior settings, surfaces adjacent to walking surfaces, stairs or ramps often are not parallel to the walking surface or the surface of the treads or ramps. Consequently, the walking surface, stair or ramp may need protection in some locations but not in others. (See Figure A-9.8.8.1.) In some instances, grades are artificially raised close to walking surfaces, stairs or ramps to avoid installing guards. This provides little or no protection for the users. That is why the requirements specify differences in elevation not only immediately adjacent to the construction but also for a distance of 1 200 mm from it by requiring that the slope of the ground be within certain limits. (See Figure A-9.8.8.1.)



a10.2 **Figure A-9.8.8.1.**
Required Locations of Guards

A-9.8.8.1.(5) Height of Window Sills Above Floors or Ground.

The primary intent of the requirement is to minimize the likelihood of small children falling significant heights from open windows. Reflecting reported cases, the requirement applies only to dwelling units and generally those located on the second floor or higher of residential or mixed use buildings where the windows are essentially free-swinging or free-sliding.

Free-swinging or free-sliding means that a window that has been cracked open can be opened further by simply pushing on the openable part of the window. Care must be taken in selecting windows, as some with special operating hardware can still be opened further by simply pushing on the window.

e7.1 Casement windows with crank operators could, in some cases, be considered to conform to Clause (5)(b). To provide additional safety, where slightly older children are involved, occupants can easily remove the crank handles from these windows. Awning windows with scissor hardware, however, may not keep the window from swinging open once it is unlatched. Hopper windows would be affected only if an opening is created at the bottom as well as at the top of the window. The requirement will impact primarily on the use of sliding windows which do not incorporate devices in their construction that can be used to limit the openable area of the window.

a3 The 100 mm opening limit is consistent with widths of openings that small children cannot fall through. Again, care must be taken in selecting a window. At some position, scissor hardware on an awning window may break up the open area such that there is no unobstructed opening with dimensions greater than 100 mm. At another position, however, though the window is not open much more, the hardware may not adequately break up the opening. The 480 mm height off the floor recognizes that furniture is often placed under windows and small children are often good climbers.

A-9.8.8.2. Loads on Guards.

Guards must be constructed so as to be strong enough to protect persons from falling under normal use. Many guards installed in dwelling units or on exterior stairs serving one or two dwelling units have demonstrated acceptable performance over time. The loading specified in the first row of Table 9.8.8.2. is intended to be consistent with the performance provided by these guards. Guards constructed in accordance with MMAH Supplementary Standard SB-7 are deemed to meet the requirements of Article 9.8.8.2.

The load on guards within dwelling units, or on exterior guards serving not more than two dwelling units, is to be imposed over an area of the guard such that, where standard balusters are used and installed at the maximum 100 mm spacing permitted for required guards, 3 balusters will be engaged. Where the balusters are wider, only two may be engaged unless they are spaced closer together. Where the guard is not required, and balusters are installed more than 100 mm apart, fewer balusters may be required to carry the imposed load.

A-9.8.8.3. Minimum Heights.

Guard heights are generally based on the waist heights of average persons. Generally, lower heights are permitted in dwelling units because the occupants become familiar with the potential hazards, and situations which lead to pushing and jostling under crowded conditions are less likely to arise.

e6 A-9.8.8.5.(1) and (2) Risk of Falling Through Guards.

The risk of falling through a guard is especially prevalent for children. Therefore, the requirements are stringent for guards in all buildings except industrial buildings, where children are unlikely to be present except under strict supervision.

A-9.8.8.5.(3) Risk of Children Getting Their Heads Lodged Between Balusters.

The requirements to prevent children falling through guards also serve to provide adequate protection against this problem. However, guards are often installed where they are not required by the Code; i.e., in places where the difference in elevation is less than 600 mm. In these cases, there is no need to require the openings between balusters to be less than 100 mm. However, there is a range of openings between 100 mm and 200 mm in which children can get their heads stuck. Therefore, openings in this range are not permitted except in buildings of industrial occupancy, where children are unlikely to be present except under strict supervision.

e7.1 A-9.8.8.6.(1) Risk of Children Climbing Over Guards.

Guards are sometimes constructed with horizontal or near-horizontal members between balusters such that a ladder effect is achieved. This can be very tempting for young children to climb, thus exposing themselves to risk of falling over the guard. Such construction is not permitted for required guards in buildings of residential occupancy.

a2.1 A-9.8.9.6. Finish for Treads, Landings and Ramps.

A tactile indicator strip signals a warning to people with no or low vision that they are approaching a change in level. The strip is set back from the leading edge of the stair to provide sufficient warning of the change in level in advance. Also, see Appendix Note A-3.4.6.1.(2).

A-9.9.4.5.(1) Openings in Exterior Walls of Exits.

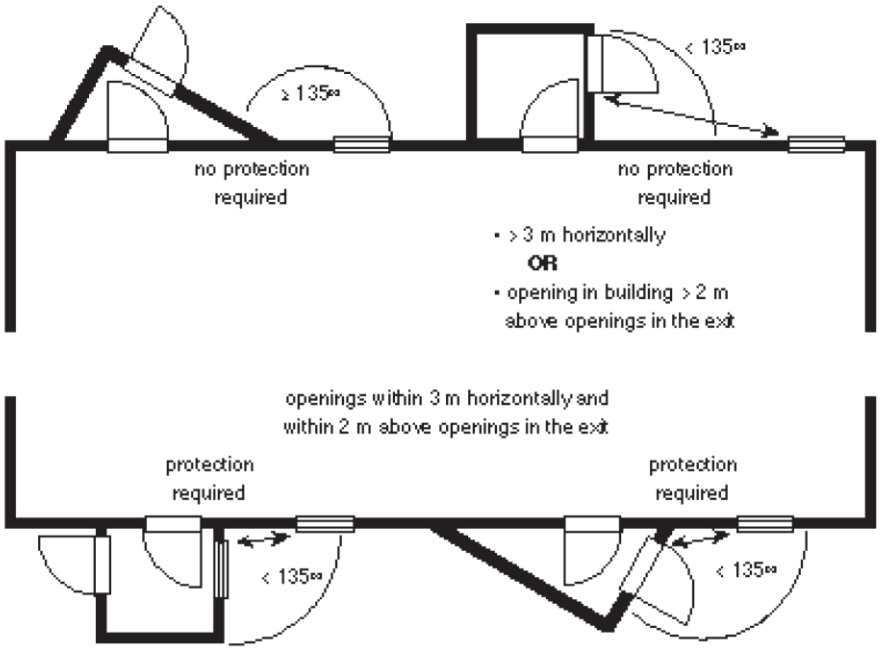


Figure A-9.9.4.5.(1)
Protection of Openings in Exterior Walls of Exits

A-9.9.8.4.(1) Independent and Remote Exits.

a10.1 Subsection 9.9.8. requires that some floor areas have more than one exit. The intent is to ensure that, if one exit is made untenable or inaccessible by a fire, or its exterior door is blocked by an exterior incident, one or more other exits will be available to permit the occupants to escape. However, if the exits are close together, all exits might be made untenable or inaccessible by the same fire. Sentence 9.9.8.4.(1), therefore, requires at least two of the exits to be located remotely from each other. This is not a problem in many buildings falling under Part 9. For instance, apartment buildings usually have exits located at either end of long corridors. However, in other types of buildings (e.g., dormitory and college residence buildings) this is often difficult to accomplish and problems arise in interpreting the meaning of the word “remote”. Article 3.4.2.3. is more specific, generally requiring the distance between exits to be one half the diagonal dimension of the floor area or at least 9 m. However, it is felt that such criteria would be too restrictive to impose on the design of all the smaller buildings which are governed by Part 9. Nevertheless, the exits should be placed as far apart as possible and the Part 3 criteria should be used as a target. Designs in which the exits are so close together that they will obviously both become contaminated in the event of a fire are not acceptable.

A-9.9.10.1.(1) Bedroom Window Opening Areas and Dimensions.

Although the minimum opening dimensions required for height and width are 380 mm, a window opening that is 380 mm by 380 mm would not comply with the minimum area requirements. (See Figure A-9.9.10.1.(1))

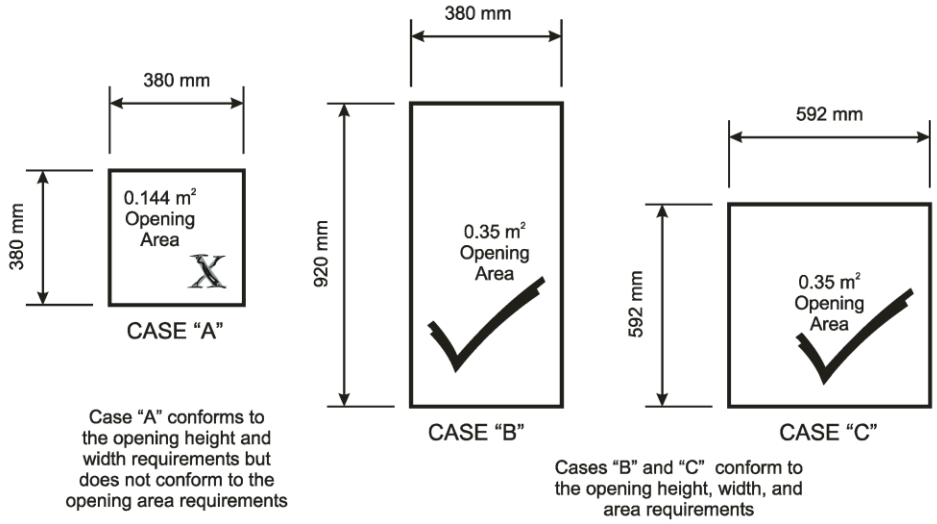


Figure A-9.9.10.1.(1)
Window Opening Areas and Dimensions

A-9.9.10.1.(2) Bedroom Window Height.

Sentence 9.9.10.1.(2) requires every floor level which contains a bedroom to have at least one window or door to the exterior that is large enough and easy enough to open that it can be used as an exit in case of a fire. However, Article 9.9.10.1. does not set a maximum sill height for such a window in a basement area. It is recommended that the sills of windows intended for use as emergency exits from basement bedroom areas be not higher than 1.5 m above the floor. Sometimes it is difficult to avoid having the sill higher than this; e.g., skylights, windows in basement bedrooms. In these cases, it is recommended that access to the window be improved by some means such as built-in furniture installed below the window. (See Figure A-9.9.10.1.(2))

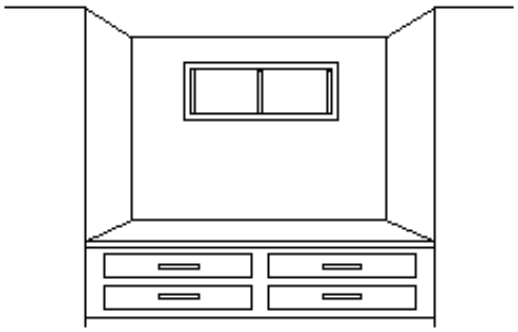


Figure A-9.9.10.1.(2)
Built-in Furniture to Improve Access to a Window

	Acceptable Solutions	Objectives and Functional Statements
	3.3.1.12.	**Doors and Door Hardware**
r11.1	(1)	(a), (b) [F10, F12-OS3.7]
		(c) [F30-OS3.1] [F10-OS3.7]
		(d) [F10-OS3.7]
	(2)	[F10-OS3.7]
	(3)	[F10-OS3.7]
	(4)	[F10-OS3.7]
	(5)	[F10-OS3.7]
		[F73-OA1]
	(6)	
	(7)	[F12-OS3.7]
	(8)	[F12-OS3.7]
	(9)	[F12-OS3.7]
	(10)	
	(11)	
	3.3.1.13.	**Ramps and Stairways**
	(1)	
	(2)	
	3.3.1.14.	**Exterior Passageways**
	(1)	
r11.2	**3.3.1.15.**	**Tapered Treads in a Curved Flight**
	(1)	
	(2) to (4)	[F30-OS3.1] [F10-OS3.7]
	3.3.1.16.	**Capacity of Access to Exits**
	(1)	
	(2)	[F10-OS3.7]
	(3)	[F10-OS3.7]
	(4)	
	(5)	
r11.1	(6)	[F10-OS3.7]
	3.3.1.17.	**Guards**
	(1)	[F30-OS3.1]
	(2)	[F30-OS3.1]
	(3)	
	(4)	[F30-OS3.1]
	(5)	[F30-OS3.1]
	(6)	
	3.3.1.18.	**Transparent Doors and Panels**
	(1)	[F30-OS3.1] [F10-OS3.7]
r11.1	(1.1)	[F30-OS3.1] [F10-OS3.7]
	(2)	[F20-OS3.1]
	(3)	[F30-OS3.1] [F10-OS3.7]
	(4)	
r11.1	(4.1)	[F30-OS3.1][F10-OS3.7]
	(5)	
	(6)	[F30-OS3.1]
r11.1	**3.3.1.19.**	**Exhaust Ventilation and Explosion Venting**
	(1)	[F01-OS1.1]
	(2)	[F02-OP1.2]
		[F02-OS1.2]
	(3)	
	(4)	[F02-OP1.3] Applies to the requirement for explosion-relief devices and vents.
		[F02-OS1.3] Applies to the requirement for explosion-relief devices and vents.

Acceptable Solutions	Objectives and Functional Statements
3.3.1.20.	**Janitors' Rooms**
(1)	[F03-OP1.2]
	[F03-OS1.2]
(2)	
(3)	[F02-OP1.2]
	[F02-OS1.2]
3.3.1.21.	**Common Laundry Rooms**
(1)	[F03-OP1.2]
	[F03-OS1.2]
(2)	
(3)	[F02-OP1.2]
	[F02-OS1.2]
3.3.1.22.	**Obstructions**
(1)	[F10-OS3.7]
3.3.1.23.	**Signs in Service Spaces**
(1)	[F10-OS3.7]
3.3.1.24.	**Welding and Cutting**
(1)	[F02, F03-OP1.2]
	[F02, F03-OS1.2]
(2)	
3.3.2.1.	**Scope**
(1)	
3.3.2.2.	**Fire Separations**
(1)	[F03-OS1.2]
(2)	
(3)	[F03-OS1.2] Applies where space under tiers of seats is *sprinklered.*
	[F03-OS1.2] Applies where space under tiers of seats is not *sprinklered.*
(4)	[F03-OS1.2]
	[F03-OP1.2]
(5)	[F03-OS1.2]
	[F03-OP1.2]
(6)	
(7)	[F03-OS1.2]
	[F03-OP1.2]
(8)	[F03-OS1.2]
(9)	[F03-OS1.2]
	[F03-OP1.2]
3.3.2.3.	**Fixed Seats**
(1)	[F30-OS3.1] [F10-OS3.7]
(2)	
(3)	[F10-OS3.7]
(4)	
(5)	
(6)	
3.3.2.4.	**Aisles**
(1)	
(2)	
(3)	[F10-OS3.7]
(4)	[F10-OS3.7]
(5)	[F10-OS3.7]
(6)	
e6.1 (7) to (10)	[F10-OS3.7]

Acceptable Solutions	Objectives and Functional Statements
(11)	[F10-OS3.7]
(12)	[F10-OS3.7]
(13)	[F03-OS1.2]
	[F10-OS3.7]
(14)	[F03-OS1.2]
	[F10-OS3.7]
(15)	[F10-OS3.7]
(16)	[F10-OS3.7]
(17)	[F10-OS3.7]
(18)	[F30-OS3.1] [F10-OS3.7]
(19)	[F30-OS3.1] [F10-OS3.7]
(20)	[F30-OS3.1] [F10-OS3.7]
(21)	[F30-OS3.1] [F10-OS3.7]
(22)	[F30-OS3.1] [F10-OS3.7]
(23)	[F30-OS3.1] [F10-OS3.7]
(24)	[F30-OS3.1] [F10-OS3.7]
(25)	[F30-OS3.1] [F10-OS3.7]
(26)	[F30-OS3.1] [F10-OS3.7]
(27)	
3.3.2.5.	**Corridors**
(1)	[F06-OS1.2] [F03, F05, F06-OS1.5]
	[F03, F06-OP1.2]
(2)	
(3)	[F06-OS1.2] [F03, F05, F06-OS1.5]
	[F03, F06-OP1.2]
(4)	[F10-OS3.7]
3.3.2.6.	**Doors**
(1)	[F10-OS3.7]
3.3.2.7.	**Fixed Bench-Type Seats without Arms**
(1)	[F10-OS3.7]
	[F10-OS3.7]
(2)	
(3)	
3.3.2.8.	**Guards**
(1)	
(2)	
(3)	
(4)	
r11.2 **3.3.2.8A.**	**Handrails in Aisles with Steps**
(1), (2)	[F30-OS3.1] [F10-OS3.7]
3.3.2.9.	**Outdoor Places of Assembly**
(1)	[F10-OS3.7]
(2)	[F10-OS3.7]
(3)	[F10-OS3.7]
(4)	
(5)	[F10-OS3.7]
3.3.2.10.	**Bleachers**
(1)	[F30-OS3.1] [F10-OS3.7]
(2)	[F30-OS3.1] [F10-OS3.7]
(3)	
(4)	[F30-OS3.1] [F10-OS3.7]
(5)	[F30-OS3.1]

Acceptable Solutions	Objectives and Functional Statements
3.3.2.11.	**Libraries**
(1)	[F03-OP1.2]
	[F03-OS1.2]
(2)	[F02-OP1.2]
	[F02-OS1.2]
(3)	
3.3.2.12.	**Stages for Theatrical Performances**
(1)	[F02-OP1.2]
	[F02-OS1.2]
(2)	[F03-OP1.2]
	[F03-OS1.2]
(3)	[F03-OP1.2]
	[F03-OS1.2]
(4)	[F03-OP1.2]
	[F03-OS1.2]
(5)	[F02, F06-OS1.2] [F06-OS1.5]
	[F02, F06-OP1.2]
(6)	[F03-OP1.2]
	[F03-OS1.2, OS1.5]
3.3.2.13.	**Risers for Stairs**
(1)	[F30-OS3.1]
3.3.2.14.	**Storage Rooms**
(1)	[F12-OP1.2]
	[F12-OS1.2]
3.3.3.1.	**Scope**
(1)	
3.3.3.2.	**Fire Separations**
(1)	[F03-OS1.2]
	[F44-OS3.4]
(2)	[F03-OS1.2]
	[F03-OP1.2]
(3)	[F03-OS1.5]
	[F03-OP1.2]
(4)	
(5)	
3.3.3.3.	**Corridors**
(1)	[F10-OS3.7]
(2)	[F10, F12-OS3.7]
(3)	[F10-OS1.5]
	[F10, F12-OS3.7]
(4)	(a) [F10-OS3.7]
	(b) [F10, F12-OS3.7]
(5)	
3.3.3.4.	**Doorway Width**
(1)	[F10, F12-OS3.7]
3.3.3.5.	**Hospitals and Nursing Homes**
(1)	
(2)	[F06-OS1.2] [F05, F06-OS1.5]
	[F06-OP1.2]
(3)	
(4)	[F03, F06-OP1.2]
	[F05, F06-OS1.2] [F06-OS1.5]

Acceptable Solutions	Objectives and Functional Statements
3.3.5.4.	**Repair and Storage Garages**
(1)	
(2)	[F30-OS3.1] [F10, F12-OS3.7]
(3)	
(4)	
(5)	[F30-OS3.1]
(6)	[F30-OS3.1]
r11.2 (6.1)	
(7)	[F02-OP1.2]
	[F02-OS1.2]
(8)	
3.3.5.5.	**Repair Garage Separation**
(1)	[F03-OP1.2]
	[F03-OS1.2]
3.3.5.6.	**Storage Garage Separation**
(1)	[F03-OP1.2]
	[F03-OS1.2]
3.3.5.7.	**Vestibules**
(1)	
(2)	
(3)	[F44-OS1.1]
	[F44-OS3.4]

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	Acceptable Solutions	Objectives and Functional Statements
	3.3.5.8.	**Toe-Boards Required**
	(1)	[F30-OS3.1]
r11.2	**3.3.5.9.**	**Guards**
	(1)	
	3.3.6.1.	**Application**
	(1)	
r11.1	**3.3.6.2.**	**Storage of Dangerous Goods**
	(1)	[F03-OS1.2]
		[F03-OP1.2]
	(2)	[F03-OS1.2]
		[F03-OP1.2]
	(3)	[F01, F02, F03, F81-OS1.1, OS1.2]
		[F01, F02, F03, F81-OP1.1, OP1.2]
	3.3.6.3.	**Indoor Storage of Compressed Gases**
	(1)	(a) [F03-OS1.2] [F44-OS1.1]
		(a) [F03-OP1.2]
		(a) [F44-OS1.2, OS1.5, OS1.1] Applies to gas-tight fire separations.
		(b) [F12-OS1.2] [F01-OS1.1] [F02-OS1.3]
		(b) [F02-OP1.3]
		(c) [F12-OS1.1]
		(e) [F02-OS1.1]
		(e) [F02-OP1.1]
		(f) (g) [F01-OS1.1]
		(f) (g) [F01-OP1.1]
	(2)	[F44-OS1.1]
	(3)	(a) [F03-OS1.2] [F44-OS1.1]
		(a) [F03-OP1.2]
		(a) [F44- OS1.2, OS1.5, OS1.1] Applies to gas-tight fire separations.
		(b) [F12-OS1.2] [F02-OS1.3]
		(b) [F02-OP1.3]
	(4)	[F44-OS1.1]
		[F44-OP1.1]
		[F50-OH1.1]
	(5)	[F44, F01-OS1.1]
		[F44, F01-OP1.1]
	(6)	
	(7)	
	3.3.6.4.	**Storage and Dispensing Rooms for Flammable Liquids and Combustible Liquids**
	(1)	[F03-OS1.2]
		[F03-OP1.2]
	(2)	[F02-OS1.3]
		[F02-OP1.3]
	(3)	
	(4)	[F02-OS1.3]
		[F02-OP1.3]
	(5)	
	(6)	[F10-OS1.5]
	(7)	[F05, F10-OS1.5]
	(8)	[F10-OS1.5]
	3.3.6.5.	**Tire Storage**
	(1)	[F03-OS1.2]
		[F03-OP1.2]

Acceptable Solutions	Objectives and Functional Statements
3.3.6.6.	**Ammonium Nitrate Storage**
(1)	(a) [F01-OS1.1] [F02,F12-OS1.2]
	(a) [F01-OP1.1] [F02,F12-OP1.2]
	(b) (c) [F03-OS1.2][F01-OS1.1]
	(b) (c) [F03-OP1.2][F01-OP1.1]
	(c) [F44-OH5]
	(d) [F01-OS1.1][F02-OS1.2]
	(d) [F43-OS3.4]
	(e) [F01,F81-OS1.1]
	(f) [F12,F02-OS1.1]
	(f) [F12,F02-OP1.2]
3.3.6.7.	**Flooring Material**
(1)	[F43-OS3.4]
	[F44-OH5]
	[F01-OS1.1]
3.3.6.8.	**Fire Separations in Process Plants**
(1)	[F03-OP1.2]
	[F03-OS1.2]
3.3.6.9.	**Basements and Pits**
(1)	[F01-OS1.1]
	[F01-OP1.1]
3.4.1.1.	**Scope**
(1)	
3.4.1.2.	**Separation of Exits**
(1)	[F05, F06, F10, F12-OS3.7]
	[F06, F12-OP1.2]
	[F06, F12-OS1.2, OS1.5]
(2)	[F10-OS3.7]
3.4.1.3.	**Access to Exits**
(1)	
3.4.1.4.	**Types of Exit**
(1)	
3.4.1.5.	**Exterior Exit Passageways**
(1)	[F10-OS3.7]
(2)	
3.4.1.6.	**Restricted Use of Horizontal Exits**
(1)	[F10-OS3.7]
(2)	[F05, F10-OS3.7]
(3)	
3.4.1.7.	**Slide Escapes**
(1)	[F10-OS3.7]
3.4.1.8.	**Transparent Doors and Panels**
(1)	
3.4.1.9.	**Mirrors near Exits**
(1)	[F30-OS3.1] [F10-OS3.7]
3.4.1.10.	**Combustible Glazing in Exits**
(1)	[F03, F06-OP1.2]
	[F05, F06-OS1.2] [F06-OS1.5]
3.4.1.11.	**Exterior Stairway for Nursing Home**
(1)	[F10-OS3.1, OS3.7]

	Acceptable Solutions	Objectives and Functional Statements
	3.4.5.1.	**Exit Signage**
	(1)	[F10-OS3.7]
	(2)	[F10-OS3.7]
	(3)	[F10,F81-OS3.7]
	(4)	[F10, F81-OS3.7]
e6.1	(5) to (9)	[F10-OS3.7]
	(10)	
	3.4.5.2.	**Signs within Exit Facilities**
	(1)	[F10-OS3.7]
	(2)	[F10-OS3.7]
r4	**3.4.6.1.**	**Surface Finish of Ramps and Stairs**
	(1)	(a), (b) [F30-OS3.1] [F10-OS3.7]
r5	(2)	[F73-OA1]
	(3)	[F12-OS1.2, OS1.5]
		[F30-OS3.1] [F10, F12-OS3.7]
		[F12-OP1.2]
	3.4.6.2.	**Minimum Number of Risers**
	(1)	[F30-OS3.1]
	3.4.6.3.	**Maximum Vertical Rise of Stair Flights and Required Landings**
	(1)	[F10-OS3.7]
	(2)	[F10-OS3.7] [F30-OS3.1]
	(3)	
r11.2	**3.4.6.4.**	**Dimensions of Landings**
	(1), (2)	[F30-OS3.1] [F10, F12-OS3.7]
		[F12-OP1.2]
		[F12-OS1.2, OS1.5]
	(3)	
	(4)	[F30-OS3.1] [F10, F12-OS3.7]
	(5)	[F30-OS3.1] [F10, F12-OS3.7]
	(6)	
r11.2	**3.4.6.5.**	**Handrails**
	(1) to (5)	[F30-OS3.1] [F10-OS3.7]
	(6)	
	(7)	[F30-OS3.1] [F10-OS3.7]
	(8)	
	(9)	[F30-OS3.1] [F10-OS3.7]
	(10)	[F30-OS3.1] [F10-OS3.7]
		[F73-OA1]
	(11)	[F30-OS3.1] [F10-OS3.7]
	(12)	[F30-OS3.1] [F10-OS3.7]
		[F73-OA1]
	(13)	[F30-OS3.1][F10-OS3.7]
	(14)	
	(15)	[F30-OS3.1][F10-OS3.7]
	(16)	[F30-OS3.1] [F10-OS3.7]
		[F73-OA1]
	3.4.6.6.	**Guards**
	(1)	[F30-OS3.1] [F10-OS3.7]
	(2)	[F30-OS3.1] [F10-OS3.7]
	(3)	[F30-OS3.1] [F10-OS3.7]
r11.2	(4)	[F30-OS3.1] [F10-OS3.7]
	(5)	[F30-OS3.1]

	Acceptable Solutions	Objectives and Functional Statements
	(6)	
	(7)	[F30-OS3.1]
	(8)	[F30-OS3.1]
	3.4.6.7.	**Ramp Slope**
	(1)	[F30-OS3.1] [F10-OS3.7]
	3.4.6.8.	**Treads and Risers**
	(1)	[F30-OS3.1] [F10-OS3.7]
	(2)	[F30-OS3.1] [F10-OS3.7]
r11.2	(2.1)	[F30-OS3.1] [F10-OS3.7]
		[F73-OA1]
	(3)	[F30-OS3.1] [F10-OS3.7]
	(4)	[F30-OS3.1] [F10-OS3.7]
	(5)	[F30-OS3.1] [F10-OS3.7]
r11.2	(6)	
	(7)	[F30-OS3.1] [F10-OS3.7]
	(8)	[F30-OS3.1]
	(9)	[F10-OS3.7][F30-OS3.1]
	(10)	[F30-OS3.1]
r11.2	**3.4.6.9.**	**Curved Flights in Exits**
	(1) to (4)	[F30-OS3.1] [F10-OS3.7]
	3.4.6.10.	**Horizontal Exits**
	(1)	[F10-OS3.7]
	(2)	[F10-OS3.7]
	(3)	
	(4)	[F10, F73-OS3.7]
	(5)	[F10-OS3.7]
	(6)	
	(7)	[F10-OS1.5]
	3.4.6.11.	**Doors**
	(1)	[F30-OS3.1] [F10-OS3.7]
r11.1	(1.1)	[F30-OS3.1] [F10-OS3.7]
	(2)	[F30-OS3.1] [F10-OS3.7] Applies to portion of Code text: "No *exit* door shall open directly onto a step..."
		[F10, F81-OS3.7] Applies where there is a danger of blockage from ice or snow.
	(3)	[F10-OS3.7]
	(4)	[F10, F12-OS3.7]
r11.1	(5)	[F10-OS3.7]
	3.4.6.12.	**Direction of Door Swing**
	(1)	[F10-OS3.7]
	(2)	[F10-OS3.7]
	(3)	
r11.1	(4)	
	3.4.6.13.	**Self-Closing Devices**
	(1)	[F06-OS1.2] [F05, F06-OS1.5]
		[F03, F06-OP1.2]
	3.4.6.14.	**Sliding Doors**
	(1)	
	(2)	[F12-OS3.7]
	3.4.6.15.	**Revolving Doors**
	(1)	(a) [F30-OS3.1] [F10-OS3.7]
		(b) [F10, F12-OS3.7]
		(c) [F10-OS3.7]
		(d) [F30-OS3.1] [F10-OS3.7]
		(e) [F20-OS3.1]

	Acceptable Solution	Objectives and Functional Statements
	4.1.5.13.	**Helicopter Landing Areas**
	(1)	[F20-OS2.1]
		[F20-OP2.1] [F22-OP2.4]
r11.2	**4.1.5.14.**	**Loads on Guards and Handrails**
	(1), (2)	[F20-OS2.1]
	(3)	[F20-OS2.1, OS2.4]
	(4)	[F22-OS2.4]
	(5)	
	(6), (7)	[F20-OS2.1]
	4.1.5.15.	**Loads on Vehicle Guardrails**
	(1)	[F20-OS2.1]
r11.2	(2)	
	4.1.5.16.	**Loads on Walls Acting as Guards**
	(1)	[F20-OS2.1]
	4.1.5.17.	**Firewalls**
	(1)	[F20-OS1.2]
		[F20-OP1.2]
		[F20-OP3.1]
	(2)	[F04-OS1.2]
		[F04-OP1.2]
		[F04-OP3.1]
	4.1.6.1.	**Specified Load Due to Rain or to Snow and Associated Rain**
	(1)	
	4.1.6.2.	**Specified Snow Load**
	(1)	[F20-OS2.1]
		[F20-OP2.1] [F22-OP2.4]
	(2)	[F20-OS2.1]
		[F20-OP2.1] [F22-OP2.4]
	(3)	[F20-OS2.1]
		[F20-OP2.1] [F22-OP2.4]
	(4)	
	(5)	[F20-OS2.1]
		[F20-OP2.1] [F22-OP2.4]
	(6)	[F20-OS2.1]
		[F20-OP2.1] [F22-OP2.4]
	(7)	[F20-OS2.1]
		[F20-OP2.1] [F22-OP2.4]
r11.1	(8)	[F20-OS2.1] Applies to portion of Code text: “The accumulation factor, Ca, shall be 1.0, …”
		[F20-OP2.1] [F22-OP2.4] Applies to portion of Code text: “The accumulation factor, Ca, shall be 1.0,…”
		(a) to (f) [F20-OS2.1] Applies to roof shapes and configurations that call for a higher accumulation factor.
		(a) to (f) [F20-OP2.1] [F22-OP2.4] Applies to roof shapes and configurations that call for a higher accumulation factor.
r11.1	(9)	[F20-OS2.1]
		[F20-OP2.1] [F22-OP2.4]
	4.1.6.3.	**Full and Partial Loading**
	(1)	[F20-OS2.1]
		[F20-OP2.1] [F22-OP2.4]
	(2)	[F20-OS2.1]
		[F20-OP2.1] [F22-OP2.4]
	4.1.6.4.	**Specified Rain Load**
	(1)	[F20-OS2.1]
		[F20-OP2.1] [F22-OP2.4]

	Acceptable Solution	Objectives and Functional Statements
	(2)	[F20-OS2.1]
		[F20-OP2.1] [F22-OP2.4]
	(3)	
	(4)	[F20-OS2.1]
		[F20-OP2.1] [F22-OP2.4]
r11.1	**4.1.6.5.**	**Multi-Level Roofs**
	(1)	[F20-OS2.1]
		[F20-OP2.1] [F22-OP2.4]
	(2)	[F20-OS2.1]
		[F20-OP2.1] [F22-OP2.4]
	(3)	[F20-OS2.1]
		F20-OP2.1] [F22-OP2.4]
	(4)	[F20-OS2.1]
		[F20-OP2.1] [F22-OP2.4]
r11.1	**4.1.6.6.**	**Horizontal Gap Between a Roof and a Higher Roof**
	(1)	[F20-OS2.1]
		[F20-OP2.1] [F22-OP2.4]
r11.1	**4.1.6.7.**	**Areas Adjacent to Roof Projections**
	(1)	[F20-OS2.1]
		[F20-OP2.1] [F22-OP2.4]
	(2)	
	(3)	
r11.1	**4.1.6.8.**	**Snow Drift at Corners**
	(1)	[F20-OS2.1]
		[F20-OP2.1] [F22-OP2.4]
	(2)	[F20-OS2.1]
		[F20-OP2.1] [F22-OP2.4]
r11.1	**4.1.6.9.**	**Gable Roofs**
	(1)	[F20-OS2.1]
		[F20-OP2.1] [F22-OP2.4]
	(2)	[F20-OS2.1]
		[F20-OP2.1] [F22-OP2.4]
	(3)	
	(4)	[F20-OS2.1]
		[F20-OP2.1] [F22-OP2.4]
r11.1	**4.1.6.10.**	**Arch Roofs, Curved Roofs and Domes**
	(1)	[F20-OS2.1]
		[F20-OP2.1] [F22-OP2.4]
	(2)	[F20-OS2.1]
		[F20-OP2.1] [F22-OP2.4]
	(3)	[F20-OS2.1]
		[F20-OP2.1] [F22-OP2.4]
	(4)	[F20-OS2.1]
		[F20-OP2.1] [F22-OP2.4]
	(5)	[F20-OS2.1]
		[F20-OP2.1] [F22-OP2.4]
	(6)	[F20-OS2.1]
		[F20-OP2.1] [F22-OP2.4]

Acceptable Solution	Objectives and Functional Statements
(3) (Cont'd)	[F34-OS4.1]
(4)	[F20, F22-OS2.3]
	[F30-OS3.1]
	[F20, F61-OH1.1, OH1.2]
	[F34-OS4.1]
(5)	
9.7.3.2.	**Heat Transfer Performance**
(1)	[F51, F63-OH1.1, OH1.2]
	[F63-OS2.3]
(2)	
9.7.3.3.	**Thermal Characteristics of Windows, Doors and Skylights**
(1)	[F63-OH1.1, OH1.2, OH1.3]
	[F63-OS2.3]
(2)	F63-OS2.3]
	F63-OH1.1, OH1.2]
(3)	[F63-OH1.1, OH1.2, OH1.3]
	[F63-OS2.3]
(4)	[F63-OH1.1, OH1.2, OH1.3]
	[F63-OS2.3]
	[F63-OS3.1]
9.7.4.1.	**Application**
(1)	
9.7.4.2.	**General**
(1)	[F20, F55, F61, F62, F63-0H1.1] [F81-OH1.1] Applies to windows that provide required non-heating season ventilation. [F54, F55, F61, F62, F63-OH1.2] [F63, F20, F61, F62-OH1.3]
	[F20, F21, F61-OS2.3]
	[F10-OS1.5] Applies where windows, doors or skylights serve bedrooms, except bedrooms that have direct access to the exterior through an *exit* door or bedrooms that are in *sprinklered* suites.
9.7.4.3.	**Performance Requirements**
(1)	[[F20, F55, F61-OH1.1]
	[F55-OH1.2] [F20, F61, F62-OH1.3]
(2)	
(3)	
(4)	[F40, F61, F42-OH1.1] [F51, F54-OH1.2]
	[F61, F42-OS2.3]
	[F80-OS3.7]
	[F80-OS4.1]
	[F42-OH2.5]
9.7.5.1.	**Application and Compliance**
(1)	
(2)	
9.7.5.2.	**Resistance to Forced Entry for Doors**
(1)	
(2)	[F34-OS4.1]
(3)	[F20-OS4.1]
(4)	[F34-OS4.1]
(5)	[F34-OS4.1]
(6)	[F20-OS4.1]
(7)	[F20-OS4.1]
(8)	[F34-OS4.1]
(9)	[F20-OS4.1]

	Acceptable Solution	Objectives and Functional Statements
	9.7.5.3.	**Resistance to Forced Entry for Windows**
	(1)	[F34-OS4.1]
	9.7.6.1.	**Installation of Windows, Doors and Skylights**
	(1)	[F20, F54, F55, F61, F63-OH1.1, OH1.2, OH1.3]
		[F20, F61, F63-OS2.3]
	(2)	[F54, F55, F61, F63-OH1.1, OH1.2, OH1.3]
		[F61, F63-OS2.3]
	(3)	[F55, F61, F63-OS2.3]
		[F55, F61, F63-OH1.1, OH1.2]
	9.7.6.2.	**Sealants, Trim and Flashing**
	(1)	[F61, F63-OH1.1, OH1.3] [F61, F51, F54, F63-OH1.2]
		[F61,F63-0S2.3]
	(2)	
	(3)	
	(4)	[F80-OS2.1, OS2.3]
		[F80-OP2.1, OP2.3]
		[F80-OH1.1, OH1.2,OH1.3]
	9.8.1.1.	**General**
	(1)	
	9.8.1.2.	**Stairs, Ramps, Landings, Handrails and Guards in Garages**
	(1)	
	9.8.1.3.	**Exit Stairs, Ramps and Landings**
	(1)	
	9.8.1.4.	**Escalators and Moving Walks**
	(1)	
r11.2	**9.8.2.1.**	**Stair Width**
	(1) to (4)	[F30-OS3.1] [F10-OS3.7]
r11.2	**9.8.2.2.**	**Height Over Stairs**
	(1)	
	(2)	[F30-OS3.1] [F10-OS3.7]
	(3)	[F30-OS3.1] [F10-OS3.7]
r11.2	**9.8.3.1.**	**Straight and Curved Runs in Stairs**
	(1)	[F30-OS3.1] [F10-OS3.7]
	(2)	[F10-OS3.7]
	(3)	[F30-OS3.1] [F10-OS3.7]
	(4)	[F30-OS3.1] [F10-OS3.7]
	9.8.3.2	**Minimum Number of Risers**
	(1)	[F30-OS3.1] [F10-OS3.7]
r11.2	**9.8.3.3.**	**Maximum Height of Flights**
	(1)	[F30-OS3.1]
	9.8.4.1.	**Dimensions for Risers**
	(1)	[F30-OS3.1] [F10-OS3.7]
r11.2	**9.8.4.2.**	**Dimensions for Runs and Rectangular Treads**
	(1), (2)	[F30-OS3.1] [F10-OS3.7]
r11.2	**9.8.4.3.**	**Dimensions for Tapered Treads**
	(1)	[F30-OS3.1] [F10-OS3.7]
	(2)	
	(3)	[F30-OS3.1] [F10-OS3.7]
r11.2	**9.8.4.4.**	**Uniformity and Tolerances for Risers, Runs and Treads**
	(1) to (5)	[F30-OS3.1] [F10-OS3.7]
r11.2	**9.8.4.4A.**	**Uniformity of Runs in Flights with Mixed Treads within a House or Dwelling Unit**
	(1), (2)	[F30-OS3.1] [F10-OS3.7]

	Acceptable Solution	Objectives and Functional Statements
	9.8.4.5.	**Winders**
	(1)	[F30-OS3.1] [F10-OS3.7]
	(2)	[F30-OS3.1] [F10-OS3.7]
r11.2	**9.8.4.5A.**	**Spiral Stairs**
	(1)	[F30-OS3.1]
	(2)	
	(3)	[F30-OS3.1]
	9.8.4.6.	**Leading Edges of Treads**
	(1)	[F30-OS3.1] [F10-OS3.7]
	9.8.4.7.	**Interior Stairs Extending Through the Roof**
	(1)	[F30-OS3.1] [F10-OS3.7]
	9.8.5.1.	**Application**
	(1)	
	(2)	
r11.2	**9.8.5.2.**	**Ramp Width**
	(1), (2)	[F30-OS3.1] [F10-OS3.7]
	9.8.5.3.	**Height Over Ramps**
	(1)	[F30-OS3.1] [F10-OS3.7]
r11.2	**9.8.5.4.**	**Ramp Slope**
	(1)	[F30-OS3.1] [F10-OS3.7]
	9.8.5.5.	**Maximum Rise**
	(1)	[F30-OS3.1]
	9.8.6.1.	**Application**
e4	(1) to (3)	
	9.8.6.2.	**Required Landings**
	(1)	[F30-OS3.1] [F10-OS3.7]
	(2)	
	(3)	
r6	(3.1)	
	(4)	
r11.2	**9.8.6.3.**	**Dimensions of Landings**
	(1)	[F30-OS3.1] [F10-OS3.7]
	(2)	[F30-OS3.1] [F10-OS3.7]
	(3)	
	(4)	[F30-OS3.1] [F10-OS3.7]
	(5)	[F30-OS3.1] [F10-OS3.7]
	(6)	[F30-OS3.1] [F10-OS3.7]
	(7)	[F30-OS3.1] [F10-OS3.7]
	9.8.6.4.	**Height Over Landings**
	(1)	[F30-OS3.1] [F10-OS3.7]
	9.8.7.1.	**Required Handrails**
	(1)	[F30-OS3.1] [F10-OS3.7]
	(2)	[F30-OS3.1] [F10-OS3.7]
	(3)	
	(4)	
r11.2	(5)	[F30-OS3.1] [F10-OS3.7]
	9.8.7.2.	**Continuity of Handrails**
	(1)	[F30-OS3.1] [F10-OS3.7]
	(2)	[F30-OS3.1] [F10-OS3.7]
	9.8.7.3.	**Termination of Handrails**
	(1)	[F30-OS3.1] [F10-OS3.7]
	(2)	[F30-OS3.1] [F10-OS3.7]

	Acceptable Solution	Objectives and Functional Statements
r11.2	**9.8.7.4.**	**Height of Handrails**
	(1)	
	(2)	[F30-OS3.1] [F10-OS3.7]
	(3)	
	9.8.7.5.	**Ergonomic Design**
	(1)	[F30-OS3.1] [F10-OS3.7]
	(2)	[F30-OS3.1] [F10-OS3.7]
	9.8.7.6.	**Projections into Stairs and Ramps**
	(1)	[F30-OS3.1] [F10-OS3.7]
	9.8.7.7.	**Design and Attachment of Handrails**
	(1)	[F20-OS2.1]
		[F20-OS3.1, OS3.7]
	(2)	[F20-OS2.1]
		[F20-OS3.1, OS3.7]
	9.8.8.1.	**Required Guards**
	(1)	[F30-OS3.1] [F10-OS3.7]
	(2)	
r11.2	(3)	
	(4)	[F30-OS3.1] [F10-OS3.7]
	(5)	[F30-OS3.1]
	(6)	
	(7)	[F30-OS3.1] [F10-OS3.7]
	(8)	[F30-OS3.1] [F10-OS3.7]
	(9)	[F30-OS3.1]
	9.8.8.2.	**Loads on Guards**
	(1)	[F20-OS2.1]
	(2)	
	(3)	
	(4)	
	(5)	
	9.8.8.3.	**Height of Guards**
	(1)	[F30-OS3.1] [F10-OS3.7]
	(2)	[F30-OS3.1] [F10-OS3.7]
	(3)	[F30-OS3.1] [F10-OS3.7]
	(4)	[F30-OS3.1] [F10-OS3.7]
r11.2	(5)	
	(6)	[F30-OS3.1] [F10-OS3.7]
	(7)	
	9.8.8.4.	**Guards for Floors and Ramps in Garages**
	(1)	[F10-OS3.1]
r11.2	(2)	[F20-OS2.1]
	9.8.8.5.	**Openings in Guards**
	(1)	[F30-OS3.1]
	(2)	[F30-OS3.1]
	(3)	[F30-OS3.1]
	9.8.8.6.	**Guards Designed not to Facilitate Climbing**
	(1)	[F30-OS3.1]
	(2)	[F30-OS3.1]
	9.8.8.7.	**Glass in Guards**
	(1)	[F20-OS2.1]
		[F20-OS3.1, OS3.7]