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Specialization
The Secretary
Associate Committee on the National Building Code
National Research Council
Ottawa, Ontario
K1A 0R6
National Building Code
of Canada
1990

Issued by the
Associate Committee on the National Building Code
National Research Council of Canada
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Preface

The National Building Code of Canada (NBC) is prepared by the Associate Committee on the National Building Code (ACNBC) and is published by the National Research Council. It is prepared in the form of a recommended model code to permit adoption by an appropriate authority.

The NBC is essentially a code of minimum regulations for public health, fire safety and structural sufficiency with respect to the public interest. It establishes a standard of safety for the construction of buildings, including extensions or alterations, the evaluation of buildings undergoing a change of occupancy and upgrading of buildings to remove an unacceptable hazard.

The content of the NBC pertains primarily to the needs of health and safety. Requirements unrelated to health and safety are kept to a minimum; any requirements that would increase the scope of the Code are only considered after thorough consultation with regulatory authorities, provincial governments, other affected parties and Code users. Requirements for workmanship related to aesthetics only are not considered appropriate for the Code although requirements for quality and durability that affect health and safety are appropriate.

Under the terms of the Constitution Act, regulation of building in Canada is the responsibility of provincial and territorial governments. The Code has received wide use either as municipal bylaws or as the basis for provincial building codes. Liaison with provincial and territorial code authorities is maintained through the Provincial/Territorial Committee on Building Standards, established by these authorities to provide policy guidance to the Associate Committee.

Committees. The Code has been developed and continues to be developed through the voluntary assistance of many experts from coast to coast. The members of the Associate Committee are appointed by the National Research Council. They serve as individuals and not as designated appointees of any organization and are broadly representative of all major phases of construction in Canada. The Committee has direct responsibility under the National Research Council for the preparation and publication of the Code.

The Associate Committee is assisted in the technical aspects of code writing by standing committees, each of which is responsible for specific portions of the Code or its associated documents. The members of each standing committee are knowledgeable in the particular field for which the committee is responsible. Building and fire officials, architects, engineers, contractors, building owners and others share their experience in the national interest. These committees and their memberships are listed in the following pages.

The Associate Committee wishes to acknowledge the assistance provided by the many individuals who have contributed to the production of this edition of the Code and to express its appreciation to the standards writing organizations whose standards are referenced throughout the Code documents.

IRC Staff. The staff of the Institute for Research in Construction of the National Research Council
provides technical and administrative support at the direction of the Associate Committee. Technical problems revealed through the use of the Code are referred to the Institute for Research in Construction for study, to make available to the Associate Committee the most up-to-date information on building technology.

**Changes from the 1985 Edition.** Important editorial and technical changes have been included in this edition. The ring-binder format will facilitate desk-top use of the Code, as well as the inserting of revisions to the Code. The text is presented in two-column format, with bold-face headings to identify the principal subject of each article. The marginal notes that appeared in the 1985 and earlier editions of the Code have been replaced by Article headings to better assist the user in locating specific provisions. This process has resulted in the reorganization of certain requirements to ensure consistency between headings and related content.

In Part 3, requirements have been introduced governing contained use areas and impeded egress zones in correctional institutions. Permission is given under certain conditions to use additional combustible elements such as cladding, plastic water piping and plastic sprinkler piping in buildings required to be of noncombustible construction. Four-storey wood frame residential buildings are permitted to be constructed if sprinklered and within specific area limitations. Article 3.1.4.5 in the 1985 NBC has been extensively reorganized to make the requirements more easily understood. Another notable change relates to the method for calculating the capacity of egress facilities. The concept of “units of exit width” is replaced with a procedure that allows the actual width of the facility to be used in the calculations. Restrictions on the use of dead-end corridors are relaxed, with acceptance generally based on corridor length only. Provisions are also included governing the use of large-diameter automatic revolving doors.

The expression “barrier-free access” has been replaced with “barrier-free path of travel,” as the term barrier-free is now used as a concept in describing other building facilities such as a barrier-free washroom or a barrier-free elevator. Among the new requirements intended to improve usability of buildings by disabled persons are the provision of automatic entrance doors in certain occupancies and barrier-free telephone counters and drinking fountains. Section 3.7 has also been expanded to include assistive listening devices for hearing impaired persons in assembly occupancies.

In calculating the loads due to snow in Subsection 4.1.7. of the Code, the ground snow load has been separated into snow and rain components. The snow load factors such as those due to wind, slope and exposure are only applied to the snow component. The reduced tendency for snow loads to accumulate on unobstructed slippery sloping roofs has been recognized and therefore a separate slope reduction relationship has been introduced for these roofs. Changes in Subsection 4.1.9. represent the second stage of a major restructuring of the seismic loading provisions begun in the 1985 edition. This stage is primarily concerned with development of force modification factors to reflect the capability of structural systems to dissipate energy.

In Part 6, the Subsection covering chimneys has been rewritten to advise the code user where design requirements for chimneys can be found. The references to metal chimneys (smokestacks) have been replaced with a reference to an NFPA standard. Part 9 no longer contains detailed requirements regarding the design and installation of solid-fuel burning stoves, ranges and space heaters. This material has been deleted because it duplicates a newly referenced CSA standard. Several new subject areas are introduced into Part 9 such as measures intended to improve the resistance of dwelling units to unlawful entry, and requirements to reduce the likelihood of infiltration of radon gas.

Significant technical revisions to Part 9 include a rewriting of requirements for air and vapour barrier protection and residential ventilation. Span tables for joists, rafters and beams have been recalculated to
account for changes in wood engineering design methods and revised lumber properties determined from test data.

Appendix A has been expanded significantly, with additional explanatory material to assist users of the Code in understanding the technical requirements.

**Change Indication.** Where a technical change or addition to the 1985 edition has been made, the requirements affected are indicated by a vertical line in the margin. No indication is provided where requirements have been renumbered or deleted.

**Renumbering.** There is extensive renumbering due to additions, deletions and relocation of requirements. Care should be taken therefore in relating requirements in previous codes with the 1990 edition.

The content of Part 9 has been renumbered to reflect the Article/Sentence/Clause format of the remainder of the Code.

**Administration.** The separate document entitled Administrative Requirements for Use with the National Building Code of Canada 1985 is automatically adopted under Subsection 1.1.1. of the Code when the adopting authority has not provided other administrative requirements.

**Metric Conversion.** All values in the Code are given in metric units. The conversion table of imperial equivalents that was included in the 1985 edition of the Code for the most common units used in building design and construction is again located at the end of the document.

**Coordination with NFC.** An important feature of this Code is its close coordination with its companion document the National Fire Code, which is prepared under the direction of the Associate Committee on the National Fire Code. To avoid duplication of requirements in the two Codes, the National Building Code makes reference to appropriate requirements in the National Fire Code and vice versa.

Both Associate Committees have agreed that the two Codes should not only be developed but should also be administered as complementary documents, with both building and fire officials being involved in their enforcement. The relationship statement following this Preface takes on a special significance in light of the strong, continuing interest being shown by provincial and territorial governments in the use of these documents as the basis for uniform standards for building safety.

**Public Comment and Inquiries.** Comments and inquiries on the use of this Code and suggestions for its improvement are welcomed and should be submitted to: The Secretary, Associate Committee on the National Building Code, National Research Council of Canada, Ottawa, Ontario K1A 0R6.

As Code revisions are developed by the committees, they will be made available for public review and comment prior to the next edition of the Code being published.

**Related Documents** The National Research Council of Canada publishes other code-related documents that are of interest to code users.

**National Fire Code of Canada 1990** A model set of technical requirements designed to provide an acceptable level of fire protection and fire prevention within a community.

**Canadian Plumbing Code 1990** Contains detailed requirements for the design and installation of plumbing systems in buildings.

**Canadian Farm Building Code 1990** A model set of minimum requirements affecting human health, fire safety and structural sufficiency for farm buildings.

**Canadian Housing Code 1990 (NEW)** A compilation of all requirements from the National Building Code 1990 that apply to houses, including detached, semi-detached and row houses without shared egress.

**Supplement to the National Building Code 1990** Provides explanatory material on climatic loads, fire-performance ratings and measures for fire safety.
high buildings, as well as commentaries on the structural design requirements of Part 4 of the Code.

**Measures for Energy Conservation in New Buildings 1983** A set of minimum requirements that provide the basis for improving the energy use characteristics of new buildings.

**Commentary on Part 3 (Use and Occupancy) of the National Building Code 1990** Discusses the overall arrangement and the basic concepts and terminology of Part 3, and provides examples to illustrate and explain the more complicated requirements in that Part.

**Commentary on Part 9 (Housing and Small Buildings) of the National Building Code 1990 (NEW)** Describes the principles behind many of the requirements of Part 9 and some of the historical background where this will assist users in understanding the objectives of certain provisions.

**ACNBC Policies and Procedures 1990** Contains the terms of reference and operating procedures of the ACNBC and its standing committees, a statement on the supporting role of the Institute for Research in Construction of NRC and the membership matrices for the various standing committees.

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Ce document est également publié en français.
Relationship between the National Building Code and the National Fire Code

A special relationship exists between the National Building Code and the National Fire Code with respect to fire safety. The contents of both Codes must be considered in building design, construction and maintenance. The role of each Code with respect to fire safety can be summarized as follows:

National Building Code (NBC) — establishes a satisfactory standard of fire safety for the construction of new buildings, the reconstruction of buildings, including extensions, alterations, or changes in occupancy and upgrading of buildings to remove an unacceptable fire hazard.*

National Fire Code (NFC) — establishes a satisfactory standard for fire prevention, fire fighting and life safety in buildings in use, * including standards for the conduct of activities causing fire hazards, maintenance of fire safety equipment and egress facilities, standards for portable extinguishers, limitations on building contents and the establishment of fire safety plans, including the organization of supervisory staff for emergency purposes. In addition, the NFC establishes the standard for prevention, containment and suppression of fires originating outside buildings, which may present a hazard to a community, and sets standards for the storage and handling of flammable and combustible liquids.

The two Codes have been developed as complementary and coordinated documents in order to reduce to a minimum the possibility of conflict in their respective contents. To aid in their effective application, fire and building officials must be fully conversant with the fire safety standards of both Codes. Such officials should be involved both in the review and the approval of plans with respect to fire safety prior to granting a building permit and with the inspection of buildings for fire safety. This is the only way to determine that all known hazards have been considered and a satisfactory standard of fire safety has been achieved.

* The extent of application of the NBC and the NFC to the upgrading of buildings to remove an unacceptable fire hazard should be based on the judgement of the authority having jurisdiction, who must deal with each case on its merits.
A Guide to the Use of the Code

The National Building Code of Canada is essentially a set of minimum provisions for the safety of buildings with reference to public health, fire protection 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 throughout Canada.

The Code is drafted in such a way that it may be adopted or enacted for legal use by any jurisdictional authority in Canada. It is divided into 9 Parts. A decimal numbering system has been used throughout the Code. The first number indicates the Part of the Code; the second, the Section in the Part; the third, the Subsection and the fourth, the Article in the Subsection. An Article may be further broken down into Sentences (indicated by numbers in brackets), and the Sentence further divided into Clauses and Subclauses. They are illustrated as follows:

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<tr>
<th>3</th>
<th>3.5</th>
<th>3.5.2</th>
<th>3.5.2.1</th>
<th>3.5.2.1.(2)</th>
<th>3.5.2.1.(2)(a)</th>
<th>3.5.2.1.(2)(a)(i)</th>
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<tr>
<td>Part</td>
<td>Section</td>
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<td>Article</td>
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<td>Clause</td>
<td>Subclause</td>
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A summary of the contents of the Code follows:

**Part 1: Scope and Definitions**

Part 1 contains the definitions of all words throughout the Code that appear in italic type. This Part also contains a list of abbreviations used in the Code.

**Part 2: General**

Part 2 contains provisions of an administrative nature such as the use of referenced documents, climatic data, plans and specifications, provision for equivalent materials, systems, equipment, and procedures and the construction review process.

**Part 3: Use and Occupancy**

This Part 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 general features of fire protection. Sections that follow contain specific requirements relating to building size and occupancy, fire safety within floor areas, exit requirements, requirements for service spaces and health requirements. Section 3.7 contains specific requirements for those buildings required to be accessible to persons with physical or sensory disabilities.

**Part 4: Structural Design**

This Part is made up of 3 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 and aluminum and the structural design of air-supported structures. Section 4.3 contains only short performance requirements referring to the design methods outlined in detail in the relevant CSA standards.

**Part 5: Wind, Water and Vapour Protection**

This Part 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 is concerned with the safe functioning of heating, ventilating and air-conditioning equipment installed in a building. The requirements deal mainly with installation.

**Part 7: Plumbing**

This Part contains only the basic legal statements with reference to Scope, Application and Administration. All detailed technical requirements are contained in the Canadian Plumbing Code, which is published separately. This latter Code contains requirements for the size and quality of fixtures and related pipes and fittings for plumbing systems and, in its Appendix, has explanatory sketches and notes to further clarify these requirements.

**Part 8: Safety Measures at Construction and Demolition Sites**

Part 8 regulates the precautions that must be taken for fire safety and to protect the public at construction and demolition sites.

**Part 9: Housing and Small Buildings**

This Part provides detailed requirements for the construction of houses and small buildings up to 600 m² per floor and 3 storeys high, and applies to all occupancies except assembly, institutional and high hazard industrial.

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**Appendix A: Explanatory Information**

Appendix A contains additional explanatory information to assist Code users in understanding the intent of the requirements contained in Parts 1 to 9. It is not a mandatory section of the Code.
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H.W. Nichol\(^2\)

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\(^1\) Term completed during preparation of the 1990 Code  
\(^2\) IRC staff who provided assistance to the Committee  
\(^3\) IRC staff whose involvement with the Committee ended during the preparation of the 1990 Code.
### Standing Committee on Barrier-Free Design

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### Standing Committee on Plumbing Services

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(1) Term completed during preparation of the 1990 Code
(2) IRC staff who provided assistance to the Committee
(3) IRC staff whose involvement with the Committee ended during the preparation of the 1990 Code.
Standing Committee on Housing and Small Buildings

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K. Harris
G. Harvey
J.-C. Havard
E.D. Jones
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V.A. Presseau

W. Purchase
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J. Timusk
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D.C. Verge
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(1) Term completed during preparation of the 1990 Code
(2) IRC staff who provided assistance to the Committee
(3) IRC staff whose involvement with the Committee ended during the preparation of the 1990 Code.
(4) Deceased.

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Part 1
Scope and Definitions

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Part 1
Scope and Definitions

Section 1.1 General

1.1.1. Administration

1.1.1.1. This Code shall be administered in conformance with the appropriate provincial or municipal regulations or, in the absence of such regulations, in conformance with the ACNBC Administrative Requirements for Use with the National Building Code 1985.

1.1.2. Scope

1.1.2.1. This Code applies to the design, construction and occupancy of new buildings, and the alteration, reconstruction, demolition, removal, relocation and occupancy of existing buildings. (See Appendix A.)

1.1.3. Definitions of Words and Phrases

1.1.3.1. Definitions of words and phrases used in this Code that are not included in the list of definitions in this Part shall have the meanings which are commonly assigned to them in the context in which they are used in this Code, taking into account the specialized use of terms with the various trades and professions to which the terminology applies.

1.1.3.2. The words and terms in italics in this Code have the following meanings:

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.

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

Alarm signal means an audible signal transmitted throughout a zone or zones 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 (as applying to foundations) 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 (as applying to foundations) means the maximum load that may be safely applied to a foundation unit considered in design under expected loading and subsurface conditions.

Alteration means a change or extension to any matter or thing or to any occupancy regulated by this Code.

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.

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

Assembly occupancy means the occupancy or the use of a building, or part thereof, by a gathering of persons for civic, political, travel, religious, social, educational, recreational or like 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.
1.1.3.2.

**Authority having jurisdiction** means the governmental body responsible for the enforcement of any part of this Code or the official or agency designated by that body to exercise such a function.

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

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

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

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

**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** means any structure used or intended for supporting or sheltering any use or occupancy.

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

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

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

**Caisson** (see Pile).

**Chimney** means a primarily vertical shaft enclosing not less than 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.

**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 or 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 CAN4-S114, “Standard Method of Test for Determination of Non-Combustibility in Building Materials.”

**Combustible construction** means that type of construction that does not meet the requirements for non-combustible construction.

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

**Constructor** means a person who contracts with an owner or his authorized agent to undertake a project, and includes an owner who contracts with more than one person for the work on a project or undertakes the work on a project or any part thereof.

**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.

**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 bearing pressure** (as applying to foundations) means the pressure applied by a foundation unit to a soil or rock and which is not more than the allowable bearing pressure.

**Designer** means the person responsible for the design.

**Design load** (as applying to foundations) means the load applied to a foundation unit and which is not greater than the allowable load.

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

**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
Exit level (as applying to Subsection 3.2.6.) means the level of an enclosed exit stair at which an exterior exit door or exit corridor leads to the exterior.

Exit storey (as applying to Subsection 3.2.6.) means a storey having an exterior exit door.

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

Exterior cladding means those components of a building which 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 a building or part thereof which does not contain a residential occupancy and which is associated with and located on land devoted to the practice of farming, and 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 compartment means an enclosed space in a building that is separated from all other parts of the building by enclosing construction providing a fire separation having a required fire-resistance rating.

Fire damper means a closure which 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 which 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 (as applying to an occupancy) means 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 hours or fraction thereof 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 hours or fraction thereof 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 therefrom as prescribed in this Code.

Fire-retardant treated wood means wood or a wood product that has had its surface-burning characteristics, such as flame spread, rate of fuel contribution and density of smoke developed, reduced by impregnation with fire-retardant chemicals.

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

Fire stop flap means a device intended for use in horizontal assemblies required to have a fire-resistance rating and incorporating protective ceiling membranes, which 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 which subdivides a building or separates adjoining buildings to resist the spread of fire and which has a fire-resistance rating as prescribed in this Code and has structural
stability to remain intact under fire conditions for the required fire-rated time.

**First storey** means the uppermost storey having its floor level not more than 2 m above grade.

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

**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.

**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.

**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.

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

**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 or pile.

**Frost action** means the phenomenon that occurs when 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 the subsequent thawing that leads to loss of soil strength and increased compressibility.

**Furnace** means a space-heating appliance using warm air as the heating medium and usually having provision for the attachment of ducts.

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

**Grade** (as applying to the determination of building height) means the lowest of the average levels of finished ground adjoining each exterior wall of a building, except that localized depressions such as for vehicle or pedestrian entrances need not be considered in the determination of average levels of finished ground. (See First storey.)

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

**Groundwater level** (groundwater table) means the top surface of a free standing body of water in the ground.

**Guard** means a protective barrier 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. Such barrier may or may not have openings through it.

**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 by placing limitations on the sizes of wood structural members and on thickness and composition of wood floors and roofs and by the avoidance of concealed spaces under floors and roofs.

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

**Horizontal exit** means an exit from one building to another by means of a doorway, vestibule, walkway, bridge or balcony.

**Horizontal service space** means a space such as an attic, duct, ceiling, roof or crawl space oriented
essentially in a horizontal plane, concealed and generally inaccessible, through which building service facilities such as pipes, ducts and wiring may pass.

**Impeded egress zone** means a supervised area in which occupants have free movement but require the release, by security personnel, of security doors at the boundary before they are able to leave the area, but does not include a contained use area.

**Indirect service water heater** means a service water heater that derives its heat from a heating medium such as warm air, steam or hot water.

**Industrial occupancy** means the occupancy or use of a building or part thereof for the assembling, fabricating, manufacturing, processing, repairing or storing of goods and materials.

**Institutional occupancy** means the occupancy or use of a building or part thereof by persons who require special care or treatment because of mental or physical limitations or by persons who are under restraint for correctional purposes and are incapable of self preservation because of security measures not under their control.

**Interconnected floor space** means superimposed floor areas or parts of floor areas in which floor assemblies that are required to be fire separations are penetrated by openings that are not provided with closures.

**Limiting distance** means the distance from an exposing building face to a property line, the centre line of a street, lane or public thoroughfare, or to an imaginary line between 2 buildings or fire compartments on the same property, measured at right angles to the exposing building face.

**Live load** means the load other than dead load to be assumed in the design of the structural members of a building. It includes loads resulting from snow, rain, wind, earthquake and those due to occupancy.

**Loadbearing** (as applying to a building element) means subjected to or designed to carry loads in addition to its own dead load, excepting a wall element subjected only to wind or earthquake loads in addition to its own dead load.

**Low hazard industrial occupancy** (Group F, Division 3) means an industrial occupancy in which the combustible content is not more than 50 kg/m² or 1 200 MJ/m² of floor area.

**Major occupancy** means the principal occupancy for which a building or part thereof is used or intended to be used, and shall be deemed to include the subsidiary occupancies which are an integral part of the principal occupancy.

**Masonry or concrete chimney** means a chimney of brick, stone, concrete or masonry units constructed on site.

**Means of egress** means a continuous path of travel provided for the escape of persons from any point in a building or contained open space 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. **Means of egress** includes exits and access to exits.

**Medium hazard industrial occupancy** (Group F, Division 2) means an industrial occupancy in which the combustible content is more than 50 kg/m² or 1 200 MJ/m² of floor area and not classified as high hazard industrial occupancy.

**Mercantile occupancy** means the occupancy or use of a building or part thereof 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.

**Noncombustible** means that a material meets the acceptance criteria of CAN4-S114, “Standard Method of Test for Determination of Non-Combustibility in Building Materials.”

**Noncombustible construction** means that 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.

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

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

**Open air storey** means a storey in which at least 25 per cent 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.

**Owner** means any person, firm or corporation controlling the property under consideration.
Partition means an interior wall 1 storey or part-storey in height that is not loadbearing.

Party wall means a wall jointly owned and jointly used by 2 parties under easement agreement or by right in law, and erected at or upon a line separating 2 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.

Pile means a slender deep foundation unit, made of materials such as wood, steel or concrete or combination thereof, which is either premanufactured and placed by driving, jacking, jetting or screwing, or cast-in-place in a hole formed by driving, excavating or boring. (Cast-in-place bored piles are often referred to as caissons in Canada).

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

Plumbing system means a drainage system, a venting system and a water system or parts thereof.

Post-disaster building means a building essential to provide services in the event of a disaster, and includes hospitals, fire stations, police stations, radio stations, telephone exchanges, power stations, electrical substations, pumping stations (water and sewage) and fuel depot buildings.

Private sewage disposal system means a privately owned plant for the treatment and disposal of sewage (such as a septic tank with an absorption field).

Public corridor means a corridor that provides access to exit from more than one suite. (See Appendix A.)

Public way means a sidewalk, street, highway, square or other open space to which the public has access, as of right or by invitation, expressed or implied.

Range means a cooking appliance equipped with a cooking surface and one or more ovens.

Repair garage means a building or part thereof where facilities are provided for the repair or servicing of motor vehicles.

Residential occupancy means the occupancy or use of a building or part thereof by persons for whom sleeping accommodation is provided but who are not harboured or detained to receive medical care or treatment or are not involuntarily detained.

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.

Rock means that portion of the earth’s crust which is consolidated, coherent and relatively hard and is a naturally formed, solidly bonded, mass of mineral matter which cannot readily be broken by hand.

Sanitary drainage system means a drainage system that conducts sewage.

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.

Shallow foundation means a foundation unit which conducts sewage. Rock

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

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 upon 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 that portion of the earth’s crust which is fragmentary, or such that some individual particles of a dried sample may be readily separated by agitation in water; it includes boulders, cobbles, gravel, sand, silt, clay and organic matter.

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 intended for the supplying of heat to a room or space directly, such as a space heater, fireplace or unit heater, or to rooms or spaces of a building through a heating system such as a central furnace or boiler.

Sprinklered (as applying to a building or part thereof) means that the building or part thereof is equipped with a system of automatic sprinklers.
Stage means a space 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 which is traditionally, but not necessarily, separated from the audience by a proscenium wall and curtain opening.

Storage garage means a building or part thereof intended for the storage or parking of motor vehicles and which contains no provision for the repair or servicing of such vehicles.

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

Storey means that portion of a building which is situated between the top of any floor and the top of the floor next above it, and if there is no floor above it, that portion between the top of such floor and the ceiling above it.

Stove means an appliance intended for cooking and space heating.

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

Subsurface investigation means the appraisal of the general subsurface conditions at a building site by analysis of information gained by such methods 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, and includes dwelling units, individual guest rooms in motels, hotels, boarding houses, rooming houses and dormitories as well as 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.

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.

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

Unprotected opening (as applying to exposing building face) means a doorway, window or opening other than one equipped with a closure having the required fire-protection rating, or 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.

Unsafe condition means any condition that could cause undue hazard to life, limb or health of any person authorized or expected to be on or about the premises.

Vapour pressure means the pressure exerted by a liquid as determined by ASTM D323, “Test Method for Vapor Pressure of Petroleum Products (Reid Method).”

Vent connector (as applying to heating or cooling systems) means 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.

Vertical service space means a shaft oriented essentially vertically 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.

Walkway means a covered or roofed pedestrian thoroughfare used to connect 2 or more buildings in which the least horizontal dimension of the thoroughfare is less than 9 m.

1.1.4. Abbreviations

1.1.4.1. Abbreviations of Proper Names.
The abbreviations of proper names in this Code shall have the meanings assigned to them in this Article. The appropriate addresses are shown in brackets following the name.

ACNBC ........Associate Committee on the National Building Code (National Research Council of Canada, Ottawa, Ontario K1A 0R6)
ASHRAE .... American Society of Heating, Refrigerating and Air-Conditioning Engineers (1791 Tullie Circle N.E., Atlanta, Georgia 30329 U.S.A.)


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.)

CGA ............ Canadian Gas Association (55 Scarsdale Road, Don Mills, Ontario M3B 2R3)

CGSB .......... Canadian General Standards Board (Ottawa, Ontario K1A 1G6)

CLA .......... Canadian Lumbermen’s Association (27 Goulburn Avenue, Ottawa, Ontario K1N 8C7)

CSA .......... Canadian Standards Association (178 Rexdale Blvd., Rexdale, Ontario M9W 1R3)

HI ............ Hydronics Institute (35 Russo Place, Berkeley Heights, New Jersey 07922 U.S.A.)

HRAI ......... Heating, Refrigerating and Air-Conditioning Institute of Canada (5468 Dundas Street West, Islington, Ontario M9B 6E3)

NBC .......... National Building Code of Canada (National Research Council of Canada, Ottawa, Ontario K1A 0R6)

NFPA ............ National Fire Protection Association (Batterymarch Park, Quincy, Massachusetts 02269 U.S.A.)

NLGA ........... National Lumber Grades Authority (1460-1055 West Hastings Street, Vancouver, B.C. V6E 2G8)

SMACNA .... Sheet Metal and Air Conditioning Contractors National Association Inc. (8224 Old Courthouse Road, Vienna, Virginia 22180 U.S.A.)

ULC .......... Underwriters’ Laboratories of Canada (7 Crouse Road, Scarborough, Ontario M1R 3A9)

WCLIB ........ West Coast Lumber Inspection Bureau (6980 Southwest Varns Street, P.O.Box 23145, Portland, Oregon 97223 U.S.A.)

WWPA ........ Western Wood Products Association (1500 Yeon Building, Portland, Oregon 97204 U.S.A.)

1.1.4.2. Symbols and Other Abbreviations. The symbols and other abbreviations in this Code shall have the meanings assigned to them in this Article.

cm ................ centimetre(s)
db ................ decibel(s)
° ........................ degree(s)
°C .................. degree(s) Celsius
diam ................ diameter
g ........................ gram(s)
ga ...................... gauge
h ...................... hour(s)
Hz .................... hertz
Inc. ............... Incorporated
j ....................... joule(s)
kg .................. kilogram(s)
kN .................. kilonewton(s)
kPa ................ kilopascal(s)
kW ................ kilowatt(s)
L ................ litre(s)
lx................................. lux
m ..................................... metre(s)
max. ................................. maximum
min. ................................. minimum
min ..................................... minute(s)
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
s ......................................... second(s)
temp. ................................. temperature
T&G ................................. tongue and groove
W ....................................... watt(s)
wt ...................................... weight
## Part 2
### General Requirements

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Part 2
General Requirements

Section 2.1  Application

2.1.1  Parts 1, 2, 7 and 8

2.1.1.1  Scope. Except as provided in Subsection 2.1.5., Parts 1, 2, 7 and 8 apply to all buildings.

2.1.2  Parts 3, 4, 5 and 6

2.1.2.1  Scope

(1) Except as provided in Subsection 2.1.5., Parts 3, 4, 5 and 6 apply to
(a) all buildings used for major occupancies classified as
   (i) Group A, assembly occupancies,
   (ii) Group B, institutional occupancies, or
   (iii) Group F, Division 1, high hazard industrial occupancies, and
(b) all buildings exceeding 600 m² in building area or exceeding 3 storeys in building height used for major occupancies classified as
   (i) Group C, residential occupancies,
   (ii) Group D, business and personal services occupancies,
   (iii) Group E, mercantile occupancies, or
   (iv) Group F, Division 2 and 3, medium and low hazard industrial occupancies.

2.1.3  Part 9

2.1.3.1  Scope

(1) Except as provided in Subsection 2.1.5., Part 9 applies to buildings of 3 storeys or less in building height, having a building area not exceeding 600 m² and used for major occupancies classified as
(a) Group C, residential occupancies,
(b) Group D, business and personal services occupancies,
(c) Group E, mercantile occupancies, or
(d) Group F, Division 2 and 3, medium and low hazard industrial occupancies.

2.1.4  Site Assembled and Factory-Built Buildings

2.1.4.1  This Code applies both to site assembled and factory made buildings.

2.1.5  Farm Buildings

2.1.5.1  Farm buildings shall conform to the requirements in the ACNBC Canadian Farm Building Code 1990.

2.1.6  Building Size Determination

2.1.6.1  Buildings Divided by Firewalls. Where a firewall divides a building, each portion of the building so divided shall be considered as a separate building, except when this requirement is specifically modified in other parts of this Code. (See Appendix A.)

2.1.6.2  Buildings Divided by Vertical Fire Separations

(1) Except as permitted in Sentence (2), where portions of a building are completely separated by a vertical fire separation that has a fire-resistance rating of not less than 1 h and extends through all storeys and service spaces of the separated portions, each separated portion is permitted to be considered as a
separate building for the purpose of determining building height provided
(a) each separated portion is not more than 3 storeys in building height and is used only for residential occupancies, and
(b) the unobstructed path of travel for the fire fighter from the nearest street to one entrance of each separated portion is not more than 45 m.
(See Appendix A.)

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

Section 2.2 Climatic Data

2.2.1. General

2.2.1.1. Climatic Values

(1) The climatic values required for the design of buildings under this Code shall be in conformance with the values established by the authority having jurisdiction or, in the absence of such data, with Sentence (2) and the climatic values in Chapter 1 of the Supplement to the NBC 1990. (See Appendix A.)

(2) The outside winter design temperatures determined from Chapter 1 of the Supplement to the NBC 1990 shall be those listed for the January 2.5 per cent values. (See Appendix A.)

2.2.1.2. Depth of Frost Penetration. Depth of frost penetration shall be established on the basis of local experience.

Section 2.3 Plans, Specifications and Calculations

2.3.1. General

2.3.1.1. Required Information. Sufficient information shall be provided to show that the proposed work will conform to this Code and whether or not it may affect adjacent property.

2.3.1.2. Required Plans. Plans shall be drawn to scale and shall indicate the nature and extent of the work or proposed occupancy in sufficient detail to establish that, when completed, the work and the proposed occupancy will conform to this Code.

2.3.2. Site Plans

2.3.2.1. Reference to Survey. Site plans shall be referenced to an up-to-date survey and, when required to prove compliance with this Code, a copy of the survey shall be provided.

2.3.2.2. Information Required on Site Plans

(1) Site plans shall show
(a) by dimensions from property lines, the location of the proposed building,
(b) the similarly dimensioned location of every other adjacent existing building on the property,
(c) existing and finished ground levels to an established datum at or adjacent to the site, and
(d) the access routes for fire fighting.

2.3.3. Fire Protection Components

2.3.3.1. Information Required for Fire Protection Components

(1) Information shall be submitted to show the major components of fire protection including
(a) the division of the building by firewalls,
(b) the building area,
(c) the degree of fire separation of storeys, shafts and special rooms or areas, including the location and rating of closures in fire separations,
(d) the source of information for fire-resistance ratings of elements of construction (to be indicated on large-scale sections),
(e) the location of exits, and
(f) fire detection, suppression and alarm systems.

2.3.3.2. Plans of Sprinkler Systems. Before a sprinkler system is installed or altered, plans showing full details of the proposed sprinkler system and essential details of the building in which it is to be installed shall be drawn to an indicated scale.
2.3.4. **Structural and Foundation Drawings and Calculations**

2.3.4.1. **Application.** Requirements of this Subsection apply only to buildings falling within the scope of Part 4.

2.3.4.2. **Professional Seal and Signature of Designer.** Structural drawings and related documents submitted with the application to build shall be dated and shall bear the authorized professional seal and signature of the designer as defined in Sentence 4.1.1.2.(2).

2.3.4.3. **Information Required on Structural Drawings**

(1) Structural drawings and related documents submitted with the application to build shall indicate in addition to those items specified in Subsection 2.3.5. and Part 4 applicable to the specific material

- (a) the name and address of the person responsible for the structural design,
- (b) the date of issue of the Code and standards to which the design conforms,
- (c) the dimensions, location and size of all structural members in sufficient detail to enable the design to be checked,
- (d) sufficient detail to enable the loads due to materials of construction incorporated in the building to be determined, and
- (e) all effects and loads, other than dead loads, used for the design of the structural members and exterior cladding.

2.3.4.4. **Drawings of Parts or Components.** Structural drawings of parts or components including guards designed by a person other than the designer of the building shall be dated and shall bear the authorized professional seal and signature of the person responsible for the design of such parts or components.

2.3.4.5. **Design Calculations and Analysis.** The calculations and analysis made in the design of the structural members, including parts and components, of a building shall be available for inspection upon request.

2.3.4.6. **Information Required on Foundation Drawings**

(1) Foundation drawings submitted with the application to build or excavate shall be provided to indicate

- (a) the type and condition of the soil or rock, as well as the groundwater conditions, as determined by the subsurface investigation,
- (b) the allowable bearing pressures on the soil or rock, the allowable loads when applicable and the design loads applied to foundation units, and
- (c) the earth pressures and other loads applied to the supporting structures of supported excavations.

(2) When required, evidence that justifies the information on the drawings shall be submitted with the application to excavate or build.

2.3.4.7. **Altered Conditions.** Where conditions as described under Sentences 4.2.2.4.(1) and (2) are encountered, or where foundation units or their locations are altered, this information shall be recorded on appropriate drawings or new “as constructed” drawings.

2.3.5. **Heating, Ventilating and Air-Conditioning Drawings and Specifications**

2.3.5.1. **Application.** Requirements of this Subsection apply only to buildings falling within the scope of Part 6.

2.3.5.2. **Information Required on Architectural and HVAC Drawings.** The information shown on architectural plans and on plans for heating, ventilating and air-conditioning systems shall be clear and legible and shall contain all necessary details to demonstrate conformance with this Code. (See Appendix A.)
Section 2.4 Materials, Appliances, Systems and Equipment

2.4.1. General

2.4.1.1. Characteristics of Materials, Appliances, Systems and Equipment. 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.

2.4.1.2. Storage on the Building Site. All building materials, appliances and equipment on the building site shall be stored in such a way as to prevent deterioration or impairment of their essential properties.

2.4.1.3. Used Materials, Appliances and Equipment. Unless otherwise specified, used materials, appliances and equipment may be reused when they meet the requirements of this Code for new materials and are satisfactory for the intended use.

Section 2.5 Equivalents

2.5.1. General

2.5.1.1. Alternate Materials, Appliances, Systems and Equipment Permitted. The provisions of this Code are not intended to limit the appropriate use of materials, appliances, systems, equipment, methods of design or construction procedures not specifically described herein.

2.5.1.2. Evidence of Equivalent Performance. Any person desirous of providing an equivalent to satisfy one or more of the requirements of this Code shall submit sufficient evidence to demonstrate that the proposed equivalent will provide the level of performance required by this Code.

2.5.1.3. Equivalence Demonstrated by Past Performance, Test or Evaluation. Materials, appliances, systems, equipment, methods of design and construction procedures not specifically described herein, or which vary from the specific requirements in this Code, may be used if it can be shown that these alternatives are suitable on the basis of past performance, tests or evaluations.

2.5.2. Structural Equivalents

2.5.2.1. Structural Equivalents

(1) Provided the design is carried out by a person especially qualified in the specific methods applied and provided the design ensures 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, buildings and their structural components within the scope of Part 4 whose designs are not in conformance with Section 4.1 may be designed by:
   (a) analysis based on generally established theory,
   (b) evaluation of a full-scale structure or a prototype by a loading test, or
   (c) studies of model analogues.

2.5.3. Equivalent Test Standards

2.5.3.1. The results of tests based on test standards other than as described in this Code may be used provided such alternate test standards will provide comparable results.

Section 2.6 Review

2.6.1. General

2.6.1.1. Requirements of this Section apply only to buildings falling within the scope of Part 4, except that Subsection 2.6.5. applies to all buildings.
2.6.2. **Review of Construction**

2.6.2.1. Review of the construction of any building or part thereof shall be carried out by the designer or by another suitably qualified person to determine whether or not the construction conforms to the design.

2.6.3. **Review of Shop Drawings**

2.6.3.1. The designer or another suitably qualified person shall review all shop drawings and other related documents relevant to the design to determine conformance with the design.

2.6.4. **Workmanship and Materials**

2.6.4.1. Workmanship, materials and all reports of material tests shall be reviewed by the designer or other suitably qualified person during the process of construction.

2.6.5. **Off-Site Review**

2.6.5.1. Where a building or component of a building is assembled off the building site in such a manner that it cannot be reviewed on site, off-site reviews shall be provided to determine compliance with this Code.

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**Section 2.7 Referenced Documents**

2.7.1. **Application**

2.7.1.1. The provisions of referenced documents in this Code apply only to the extent that they relate to buildings.

2.7.2. **Conflicting Requirements**

2.7.2.1. In the case of conflict between the provisions of this Code and those of a referenced document, the provisions of this Code shall govern.

2.7.3. **Effective Date**

2.7.3.1. Unless otherwise specified herein, the documents referenced in this Code shall include all amendments, revisions and supplements effective to 30 June 1991.

2.7.3.2. Where documents are referenced in this Code, they shall be the editions designated in Column 2 of Table 2.7.3.A.

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**Table 2.7.3.A.**

Documents Referenced in the National Building Code of Canada 1990

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Part 3
Use and Occupancy
(See Appendix A)

Section 3.1 General

3.1.1. Scope

3.1.1.1. Scope. The scope of this Part shall be as described in Section 2.1.

3.1.1.2. Defined Words. Words that appear in italics are defined in Part 1.

3.1.1.3. Fire Protection Information. Information to be submitted regarding major components of fire protection shall conform to the requirements in Article 2.3.3.1.

3.1.2. Classification of Buildings or Parts of Buildings by Major Occupancy

(See Appendix A.)

3.1.2.1. Classification of Buildings

(1) Except as provided in Articles 3.1.2.3. to 3.1.2.5., every building or part thereof shall be classified according to its major occupancy as belonging to one of the Groups or Divisions described in Table 3.1.2.A.

(2) A building intended for use by more than one major occupancy, shall be classified according to all major occupancies for which it is used or intended to be used.

3.1.2.2. Occupancies of Same Classification. Any building is deemed to be occupied by a single major occupancy, notwithstanding its use for more than one major occupancy, provided that such occupancies are classified as belonging to the same Group classification or, where the Group is divided into Divisions, as belonging to the same Division classification in Table 3.1.2.A.

3.1.2.3. Arena Type Buildings. An arena type building intended for occasional use for trade shows and similar exhibition purposes shall be classified as Group A, Division 3 occupancy and, when the building area of such building is more than 1,500 m², the building shall be sprinklered. (See Appendix A.)

3.1.2.4. Police Stations. Police stations with detention quarters are permitted to be classified as Group B, Division 2 major occupancies provided such stations are not more than 1 storey in building height and 600 m² in building area.

3.1.2.5. Convalescent and Children's Custodial Homes. Convalescent homes and children's custodial homes are permitted to be classified as Group C major occupancies provided that occupants are ambulatory and live as a single housekeeping unit in a dwelling unit with sleeping accommodation for not more than 10 persons.

3.1.3. Multiple Occupancy Requirements

3.1.3.1. Buildings with Multiple Occupancies

(1) The requirements restricting fire spread and collapse for a building of a single major occupancy classification are provided in Subsection 3.2.2. according to its building height and building area.
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Forming Part of Sentence 3.1.2.1(1)

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<td>A</td>
<td>4</td>
<td>Assembly occupancies in which provision is made for the congregation or gathering of persons for the purpose of participating in or viewing open air activities</td>
</tr>
<tr>
<td>B</td>
<td>1</td>
<td>Institutional occupancies in which persons are under restraint or are incapable of self preservation because of security measures not under their control</td>
</tr>
<tr>
<td>B</td>
<td>2</td>
<td>Institutional occupancies in which persons because of mental or physical limitations require special care or treatment</td>
</tr>
<tr>
<td>C</td>
<td>—</td>
<td>Residential occupancies</td>
</tr>
<tr>
<td>D</td>
<td>—</td>
<td>Business and personal services occupancies</td>
</tr>
<tr>
<td>E</td>
<td>—</td>
<td>Mercantile occupancies</td>
</tr>
<tr>
<td>F</td>
<td>1</td>
<td>High hazard industrial occupancies</td>
</tr>
<tr>
<td>F</td>
<td>2</td>
<td>Medium hazard industrial occupancies</td>
</tr>
<tr>
<td>F</td>
<td>3</td>
<td>Low hazard industrial occupancies</td>
</tr>
<tr>
<td>Col. 1</td>
<td>2</td>
<td>3</td>
</tr>
</tbody>
</table>

Note to Table 3.1.2.A.:
(1) See Appendix A.

(2) Where any building contains more than one major occupancy classified in more than one Group or Division, the requirements of Subsection 3.2.2 concerning building size and construction relative to occupancy shall apply according to Articles 3.1.3.2 to 3.1.3.5.

3.1.3.2. Applicable Building Height and Area. In determining the fire safety requirements of a building in relation to each of the major occupancies contained therein, the building height and building area of the entire building shall be used.

3.1.3.3. Construction Requirements. Except as provided in Articles 3.1.3.4. and 3.1.3.5., in any building containing more than one major occupancy, the requirements of Subsection 3.2.2. for the most restricted major occupancy contained shall apply to the whole building.

3.1.3.4. Superimposed Major Occupancies
(1) Except as permitted in Article 3.1.3.5., in any building in which one major occupancy is located entirely above another major occupancy, the requirements in Subsection 3.2.2. 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) Where one major occupancy is located above another, the fire-resistance rating of the floor assembly between such major occupancies shall be determined on the basis of the requirements in Subsection 3.2.2. for the lower major occupancy. (See also Article 3.1.3.6.)

3.1.3.5. Exceptions for Major Occupancies. In a building where the aggregate area of all major occupancies in a particular Group or Division
is not more than 10 per cent of the floor area of the storey on which they are located, these major occupancies need not be considered as major occupancies for the purposes of Subsection 3.2.2, provided they are not classified as Group F, Division 1 or 2 occupancies.

### 3.1.3.6. Separation of Major Occupancies

**1** Except as provided in Sentences (2) and (3), major occupancies shall be separated from adjoining major occupancies by fire separations having fire-resistance ratings conforming to Table 3.1.3.A.

**2** Where not more than 2 dwelling units are contained in a building with a Group E major occupancy not more than 3 storeys in building height, the fire-resistance rating of the fire separation between the 2 major occupancies need not be more than 1 h.

**3** In a building conforming to the requirements of Articles 3.2.8.2. to 3.2.8.9., the requirements of Sentence (1) for fire separations between major occupancies do not apply at the vertical plane around the perimeter of an opening through the horizontal fire separation.

### 3.1.3.7. 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** Not more than one suite of residential occupancy shall be contained within a building classified as a Group F, Division 2 major occupancy.

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**Table 3.1.3.A.**

Forming Part of Sentence 3.1.3.6.(1)

<table>
<thead>
<tr>
<th>Major Occupancy</th>
<th>Minimum Fire-Resistance Rating of Fire Separation, (h)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>A-1</td>
</tr>
<tr>
<td>A-1</td>
<td>—</td>
</tr>
<tr>
<td>A-2</td>
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<tr>
<td>A-3</td>
<td>1</td>
</tr>
<tr>
<td>A-4</td>
<td>1</td>
</tr>
<tr>
<td>B-1</td>
<td>2</td>
</tr>
<tr>
<td>B-2</td>
<td>2</td>
</tr>
<tr>
<td>C</td>
<td>1</td>
</tr>
<tr>
<td>D</td>
<td>1</td>
</tr>
<tr>
<td>E</td>
<td>2</td>
</tr>
<tr>
<td>F-1</td>
<td>(2)</td>
</tr>
<tr>
<td>F-2</td>
<td>3</td>
</tr>
<tr>
<td>F-3</td>
<td>1</td>
</tr>
</tbody>
</table>

**Notes to Table 3.1.3.A.:**

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 3.1.3.7.(1).
3. See Sentence 3.1.3.6.(2).
4. See Sentence 3.1.3.7.(2).
3.1.4. Combustible Construction

3.1.4.1. Combustible Materials Permitted.
Where a building is permitted to be of combustible construction, it is permitted to be constructed of combustible materials described in Part 9, with or without noncombustible components.

3.1.4.2. Protection of Foamed Plastics
(1) Foamed plastics which 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 assemblies, by
(a) one of the interior finishes described in Subsections 9.29.4. to 9.29.9.,
(b) sheet metal mechanically fastened to the supporting assembly independent of the insulation, not less than 0.38 mm thick and with a melting point not below 650°C provided the building does not contain a Group B or Group C major occupancy, or
(c) any thermal barrier that meets the requirements of Sentence 3.1.5.11. (2). (See Appendix A.)

3.1.4.3. Electrical Wires and Cables
(1) Electrical wires and cables installed in buildings 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 Clause 4.11.1. of CSA C22.2 No. 0.3, “Test Methods for Electrical Wires and Cables,” or
(b) be located in
   (i) totally enclosed noncombustible raceways (see Appendix A),
   (ii) masonry walls, or
   (iii) concrete slabs.
(See also Article 3.5.4.3.) (See Appendix A.)

3.1.4.4. Fire-Retardant Treated Wood
(1) Where fire-retardant treated wood is specified in this Part, such wood shall
(a) be pressure impregnated with fire-retardant chemicals in conformance with

CAN/CSA-O80-M, “Wood Preservation,” and
(b) have a flame-spread rating of not more than 25.

3.1.4.5. Heavy Timber Construction Alternative. Where combustible construction is permitted and is required to have a fire-resistance rating of not more than 45 min, heavy timber construction is permitted to be used provided the construction conforms to Article 3.1.4.6.

3.1.4.6. 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) The actual dimensions of solid-sawn lumber used in heavy timber construction in this Article shall conform to CSA O141, “Softwood Lumber.”
(3) Except as provided in Sentences (4) to (6), the minimum dimensions of wood elements in heavy timber construction shall conform to Table 3.1.4.A.
(4) Roof arches supported on the tops of walls or abutments, roof trusses, roof beams and roof girders shall be spliced where necessary with splice plates not less than 64 mm thick and be
(a) not less than 64 mm thick where 2 or more spaced members are used for the construction, with intervening spaces blocked solidly throughout or tightly closed by a continuous wood cover plate not less than 38 mm thick secured to the underside of the members, or
(b) not less than 64 mm thick when protected by automatic sprinklers under the roof deck.
(5) Floors shall be of glued-laminated or solid-sawn plank not less than 64 mm thick, splined or tongueed and grooved, or not less than 38 mm wide and 89 mm deep set on edge and well-spiked together
(a) laid so that no continuous line of end joints will occur except at points of support, and covered with tongueed and grooved flooring not less than 19 mm thick laid cross-wise or diagonally, or
   tongueed and grooved phenolic-bonded...
### 3.1.5.1. Noncombustible Construction

#### 3.1.5.1. Noncombustible Materials

Except as permitted in Articles 3.1.5.2. to 3.1.5.18., 3.1.13.4. and 3.2.2.13., where a building or part of a building is required to be of noncombustible construction, the

<table>
<thead>
<tr>
<th>Supported Assembly</th>
<th>Structural Element</th>
<th>Solid Sawn (width × depth), mm × mm</th>
<th>Glued-Laminated (width × depth), mm × mm</th>
<th>Round (diam), mm</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Columns</td>
<td>140 × 191</td>
<td>130 × 190</td>
<td>180</td>
</tr>
<tr>
<td>Roofs only</td>
<td>Arches supported on the tops of walls or abutments</td>
<td>89 × 140</td>
<td>80 × 152</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Beams, girders and trusses</td>
<td>89 × 140</td>
<td>80 × 152</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Arches supported at or near the floor line</td>
<td>140 × 140</td>
<td>130 × 152</td>
<td></td>
</tr>
<tr>
<td>Floors, floors plus roofs</td>
<td>Columns</td>
<td>191 × 191</td>
<td>175 × 190</td>
<td>200</td>
</tr>
<tr>
<td></td>
<td>Beams, girders, trusses and arches</td>
<td>140 × 241 or 191 × 191</td>
<td>130 × 228 or 175 × 190</td>
<td></td>
</tr>
</tbody>
</table>

- plywood, strandboard or waferboard not less than 12.5 mm thick, and
- laid not closer than 15 mm to the walls to provide for expansion, and the gap covered at the top or bottom.

(6) Roofs shall be of tongued and grooved phenolic-bonded plywood not less than 28 mm thick, or glued-laminated or solid-sawn plank that is
- not less than 38 mm thick, splined or tongued and grooved, or
- 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 shall be continuous or superimposed throughout all storeys.

(8) Superimposed wood columns shall be connected by
- reinforced concrete or metal caps with brackets,
- steel or iron caps with pintles and base plates, or
- timber splice plates fastened to the columns by metal connectors housed within the contact faces.

(9) Where beams and girders enter masonry, wall plates, boxes of the self-releasing type or hangers shall be used.

(10) Wood girders and beams shall be closely fitted around columns, and adjoining ends shall be connected by ties or caps to transfer horizontal loads across the joints.

(11) 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.
3.1.5.1. Minor Combustible Components

The following minor combustible components are permitted in a building required to be of noncombustible construction:

- paint,
- tightly adhering paper covering not more than 1 mm thick applied to a noncombustible backing provided the assembly has a flame-spread rating of 25 or less, (see Appendix A)
- mastics and caulking materials applied to provide flexible seals between the major components of exterior wall construction,
- fire stop materials conforming to Sentence 3.1.9.1.(1) and Article 3.1.11.7.,
- tubing for pneumatic controls provided it has an outside diameter not more than 10 mm,
- adhesives, vapour barriers and sheathing papers,
- electrical outlet and junction boxes, and
- similar minor components.

3.1.5.3. Combustible Roofing Materials

Combustible roofing which 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.

Combustible roof sheathing and roof sheathing supports installed above a concrete deck are permitted on a building required to be of noncombustible construction provided

- the concrete deck is not less than 50 mm thick,
- the height of the roof space above the deck is not more than 1 m,
- the roof space is divided into compartments by fire stops in conformance with Article 3.1.11.5.,
- openings through the concrete deck other than for noncombustible roof drains and plumbing piping are protected by masonry or concrete shafts constructed as fire separations having a fire-resistance rating of not less than 1 h and extending from the concrete deck to not less than 150 mm above the adjacent roof sheathing,
- 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
- except as permitted in Clause (d), the roof space does not contain any building services.

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.

Wood nailing 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

Combustible skylight assemblies are permitted in a building required to be of noncombustible construction provided the assemblies have a flame-spread rating of not more than

- 150 where the assemblies have an individual area not more than 9 m² and an aggregate horizontal projected area of the openings through the ceiling not more than 25 per cent of the area of the ceiling of the room or space in which they are located and are spaced not less than 2.5 m from adjacent assemblies and from required fire separations, or
- 75 where the assemblies have an individual area not more than 27 m² and an aggregate horizontal projected area of the openings through the ceiling not more than 33 per cent of the area of the ceiling of the room or space in which they are located and are spaced not less than 1.2 m from adjacent assemblies and from required fire separations.

(See Appendix A.)

Combustible vertical glazing installed no higher than the second storey is permitted in a building required to be of noncombustible construction provided the glazing has a flame-spread rating of not more than 75, except that the flame-spread rating is permitted to be not more than 150 where the aggre-
gate area of the glazing is not more than 25 per cent of the wall area of the \textit{storey} in which it is located, and

(a) the glazing is installed in a \textit{building} of 1 \textit{storey} in \textit{building height}, or
(b) the glazing in the first \textit{storey} is separated from the glazing in the second \textit{storey} by apron walls, spandrel walls or canopies conforming to Article 3.2.3.17.

(3) \textit{Combustible} window sash and frames are permitted in a \textit{building} required to be of \textit{noncombustible construction} provided

(a) each window in an exterior wall face is an individual unit separated by \textit{noncombustible} wall construction from every other opening in the wall,
(b) windows in exterior walls in contiguous \textit{storeys} are separated by not less than 1 m of \textit{noncombustible construction}, and
(c) the aggregate area of openings in an exterior wall face of a \textit{fire compartment} is not more than 40 per cent of the area of the wall face.

3.1.5.5. \textbf{Combustible Cladding}

(1) Except when \textit{noncombustible} cladding is required by Subsection 3.2.3., an exterior non-load-bearing \textit{wall assembly} that includes \textit{combustible} cladding components is permitted to be used in a \textit{building} required to be of \textit{noncombustible construction} that is not more than 3 \textit{storeys} in \textit{building height}, if not sprinklered, and not more than 6 \textit{storeys} in \textit{building height}, if sprinklered, provided the interior surfaces of the wall assembly are protected by a thermal barrier conforming to Sentence 3.1.5.11.(3) and the wall assembly satisfies the criteria of Sentences (5) and (6) when subjected to testing in conformance with Sentences (2) to (4). (See Appendix A.)

(2) The fire testing required by Sentence (1) shall be conducted on a wall assembly that

(a) is not less than 5 m wide and not less than 10 m high with an opening 2.5 ± 0.1 m wide by 1.4 ± 0.1 m high, located in the middle of the assembly not more than 3 m above the lowest edge,
(b) is representative of the exterior wall construction, except for the interior finish, and
(c) incorporates horizontal and vertical joints not more than 3 m vertically above the opening.

(3) The \textit{wall assembly} shall be exposed on its exterior face to a flame issuing from the opening that, on a \textit{noncombustible} wall having a density of not less than 700 kg/m$^3$ to a depth of 12 mm from the exposed surface, generates an average heat flux between

(a) 42 and 48 kW/m$^2$ measured 0.5 m above the opening, and
(b) 25 and 29 kW/m$^2$ measured 1.5 m above the opening.

(See A-3.1.5.5.(6) in Appendix A.)

(4) The duration of exposure to the flame specified in Sentence (3) shall be not less than 15 min following a 5 min gradual heat flux increase and preceding a 5 min gradual cooldown period after the flame exposure.

(5) Flaming on or in the \textit{wall assembly} shall not spread more than 5 m above the opening during or following the flame exposure of 25 min. (See Appendix A.)

(6) The heat flux during the flame exposure on a wall assembly shall be not more than 35 kW/m$^2$ measured 3.5 m above the opening. (See Appendix A.)

(7) A \textit{wall assembly} permitted by Sentence (1) that includes \textit{combustible cladding} of \textit{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, \textit{"Test Method for Accelerated Weathering of Fire-Retardant-Treated Wood for Fire Testing."}

(8) \textit{Wood decorative cladding} is permitted to be used on first floor exterior canopy fascias of a \textit{building} required to be of \textit{noncombustible construction} provided it is \textit{fire-retardant treated wood} that has been, before testing, conditioned in conformance with ASTM D2898, \textit{"Test Method for Accelerated Weathering of Fire-Retardant-Treated Wood for Fire Testing."}

3.1.5.6. \textbf{Nailing Elements.} \textit{Wood nailing elements} attached directly to or set into a continuous \textit{noncombustible} backing for the attachment of interior finishes, are permitted in a \textit{building} required to be of
3.1.5.6. **Noncombustible Construction** provided the concealed space created by the wood elements is not more than 50 mm thick.

3.1.5.7. **Combustible Millwork.** Combustible millwork including interior trim, doors and door frames, show windows together with their frames, aprons and backing, handrails, shelves, cabinets and counters are 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 300 mm high applied directly to or set into a noncombustible floor slab are permitted for the support of finished flooring in a building required to be of noncombustible construction provided the concealed spaces are fire stopped in conformance with Sentence 3.1.11.3.(2).

3. Combustible finished flooring is permitted in a building required to be of noncombustible construction.

3.1.5.9. **Combustible Stairs in Dwelling Units.** Combustible stairs are permitted in a dwelling unit in a building required to be of noncombustible construction.

3.1.5.10. **Combustible Interior Finish**

1. Combustible interior finish including paint, wallpaper, and other interior finishes 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, are permitted in a building required to be of noncombustible construction provided they
   (a) are not more than 25 mm thick, and
   (b) have a flame-spread rating of not more than 150 on any exposed surface, or any surface that would be exposed by cutting through the material in any direction.

3. Combustible interior ceiling finishes, other than foamed plastics, are permitted in a building required to be of noncombustible construction provided they
   (a) are not more than 25 mm thick, except for exposed fire-retardant treated wood battens, and
   (b) have a flame-spread rating of not more than 25 on any exposed surface or on any surface that would be exposed by cutting through the material in any direction or are of fire-retardant treated wood, except that not more than 10 per cent of the ceiling area within each fire compartment is permitted to have a flame-spread rating of not more than 150.

3.1.5.11. **Combustible Insulation and its Protection**

1. Combustible insulation, other than foamed plastics, is permitted in a building required to be of noncombustible construction provided that it has 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, where the insulation is not protected as described in Sentences (2) to (4),

2. Foamed plastic insulation having 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, 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 attic or roof spaces, crawl spaces, and 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,
   (d) concrete, or
   (e) any thermal barrier that meets the requirements of classification B when tested in conformance with CAN4-S124-M, “Standard Method of Test for the Evaluation of Protective Coverings for Foamed Plastic” (see Appendix A).
(3) Combustible insulation having a flame-spread rating of more than 25 but not more than 500 on an 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 provided the insulation is protected from adjacent space in the building, other than adjacent concealed spaces within attic or roof spaces, crawl spaces, and wall assemblies, by a thermal barrier as described in Sentence (2), except that in unsprinklered buildings more than 18 m high or in unsprinklered buildings regulated by the provisions of Subsection 3.2.6., the insulation is protected by a thermal barrier consisting of
   (a) 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) lath and plaster, mechanically fastened to a supporting assembly independent of the insulation,
   (c) masonry or concrete not less than 25 mm thick, or
   (d) any thermal barrier that, when tested in conformance with CAN4-S101-M, “Standard Methods of Fire Endurance Tests of Building Construction and Materials,” will not develop an average temperature rise of more than 140°C or a maximum temperature rise at any point of more than 180°C on its unexposed face within 10 min.

(See also Sentence 3.2.3.7.(3.)

(4) Combustible insulation having a flame-spread rating of 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 of 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 attic or roof spaces, crawl spaces, and wall assemblies, by a thermal barrier as described in Sentence (2), except that in unsprinklered buildings more than 18 m high or in unsprinklered buildings regulated by the provisions of Subsection 3.2.6., the insulation is protected by a thermal barrier consisting of
   (a) Type X gypsum board not less than 15.9 mm thick conforming to CSA A82.27-M, “Gypsum Board Products,” mechanically fastened to a supporting assembly independent of the insulation and with all joints either backed or taped and filled,
   (b) non-loadbearing masonry or concrete not less than 50 mm thick,
   (c) loadbearing masonry or concrete not less than 75 mm thick, or
   (d) any thermal barrier that, when tested in conformance with CAN4-S101-M, “Standard Methods of Fire Endurance Tests of Building Construction and Materials,” will not develop an average temperature rise of more than 140°C or a maximum temperature rise at any point of more than 180°C on its unexposed face within 20 min and will remain in place for not less than 40 min.

(5) Combustible insulation, including foamed plastics, installed above roof decks, outside of foundation walls below ground level and beneath concrete slabs-on-ground is permitted to be used in a building required to be of noncombustible construction.

(6) Thermosetting foamed plastic insulation having a flame-spread rating of not more than 500 which forms part of a factory-assembled exterior wall panel that does not incorporate an air space is permitted to be used in a building required to be of noncombustible construction provided
   (a) the foamed plastic is protected on both sides by sheet steel not less than 0.38 mm thick which will remain in place for not less than 10 min when the wall panel is tested in conformance with CAN4-S101-M, “Standard Methods of Fire Endurance Tests of Building Construction and Materials,”
   (b) the flame-spread rating of the wall panel, determined by subjecting a sample including an assembled joint to the appropriate test described in Subsection 3.1.12., is not more than the flame-spread rating permitted for the room or space which it bounds,
   (c) the building does not contain a Group B or Group C major occupancy, and
(d) the building is not more than 18 m high, measured between grade and the floor level of the uppermost storey.

3.1.5.12. Combustible Elements in Partitions

(1) Solid lumber partitions not less than 38 mm thick and wood framing in partitions, located in fire compartments not more than 600 m² in area or in sprinklered floor areas are permitted to be used in a building required to be of noncombustible construction provided the partitions:
   (a) are not required fire separations, and
   (b) are not located in Group B occupancies.

3.1.5.13. Storage Lockers in Residential Buildings. Storage lockers in storage rooms are permitted to be constructed of wood in buildings of residential occupancy required to be of noncombustible construction.

3.1.5.14. Combustible Ducts

(1) Except as permitted by Sentence 3.5.4.3.(1), combustible ducts, including plenums and duct connectors, are permitted to be used in a building required to be of noncombustible construction provided such ducts and duct connectors:
   (a) are used only in horizontal runs, and
   (b) are Class 1 conforming to Article 6.2.3.2.

(2) Combustible duct linings, duct coverings, duct insulation, vibration isolation connectors, duct tape, pipe insulation and pipe coverings are permitted to be used in buildings required to be of noncombustible construction provided they conform to the appropriate requirements in Section 6.2.

3.1.5.15. Combustible Piping Materials

(1) Except as permitted in Clause 3.1.5.2.(1)(e) and Sentence (2), combustible totally enclosed raceways, piping and tubing and associated adhesives are permitted to be used in a building required to be of noncombustible construction provided they:
   (a) have a flame-spread rating of not more than 25, except when concealed in a wall or a concrete floor slab, and
   (b) when used in buildings described in Subsection 3.2.6., have a smoke developed classification of not more than 50, except when concealed in a wall or a concrete floor slab.

(2) Combustible sprinkler piping is permitted to be used within a sprinklered floor area in a building required to be of noncombustible construction. (See also Article 3.2.5.14.)

3.1.5.16. Combustible Travelling Cables for Elevators. Combustible travelling cables are permitted on elevating devices in buildings required to be of noncombustible construction.

3.1.5.17. Electrical Wires and Cables

(1) Except as permitted in Article 3.1.5.16., electrical wires and cables with combustible insulation, jackets or sheathes are permitted to be used 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 4.1.1.4. of CSA C22.2 No. 0.3, “Test Methods for Electrical Wires and Cables,” or
   (b) the wires and cables are located in:
      (i) totally enclosed noncombustible raceways (see A-3.1.4.3.(1)(b)(i) in Appendix A),
      (ii) masonry walls,
      (iii) concrete slabs, and
      (iv) a service room separated from the remainder of the building by a fire separation having not less than a 1 h fire-resistance rating.

(See Appendix A.)

3.1.5.18. Combustible Plumbing Fixtures. Combustible plumbing fixtures, including wall and ceiling enclosures, shall be constructed of material having a flame-spread rating and smoke developed classification not more than that permitted for the wall surface of the room or space in which they are installed.

3.1.6. Tents and Air-Supported Structures

(See Appendix A.)

3.1.6.1. Means of Egress. Tents and air-supported structures shall conform to Sections 3.3 and 3.4.
3.1.6.2. Restrictions

(1) Air-supported structures shall not be located above the first storey on any building.

(2) Air-supported structures shall not be used for Groups B, C, or Group F, Division 1 major occupancies or for classrooms.

(3) Air-supported structures shall be designed as open floor space without interior walls, mezzanines, intermediate floors or similar construction.

3.1.6.3. Clearance to Other Structures

(1) Except as provided in Sentences (2), (3) and (4), every tent and air-supported structure shall conform to Subsection 3.2.3.

(2) Tents and air-supported structures shall not be erected closer than 3 m to other structures on the same property except as provided in Sentences (3) and (4), and shall be sufficiently distant from one another to provide an area to be used as a means of emergency egress.

(3) Tents and air-supported structures not occupied by the public need not be separated from one another, and are permitted to be erected less than 3 m from other structures on the same property where such closer spacing does not create a hazard to the public.

(4) Tents not more than 120 m² in ground area, located on fair grounds or similar open spaces, need not be separated from one another provided such closer spacing does not create a hazard to the public.

3.1.6.4. Clearance to Flammable Material.
The ground enclosed by a tent or air-supported structure and for not less than 3 m outside of such structure shall be cleared of all flammable material or vegetation that will carry fire.

3.1.6.5. Flame Resistance. Every tent and air-supported structure and all tarpaulins and decorative materials used in connection with such structures shall conform to CAN/ULC S-109-M, “Standard for Flame Tests of Flame-Resistant Fabrics and Films.”

3.1.6.6. Emergency Air Supply. An air-supported structure used as a place of assembly for more than 200 persons shall have either an automatic emergency engine-generator set capable of powering one blower continuously for 4 h, or a supplementary blower powered by an automatic internal combustion engine.

3.1.7. Fire-Resistance Ratings

3.1.7.1. Determination of Ratings

(1) Except as provided in Sentence (2) and Article 3.1.7.2., where a material, assembly of materials or a structural member is required to have a fire-resistance rating, the rating shall be determined on the basis of the results of tests conducted in conformance with CAN4-S101-M, “Standard Methods of 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 Chapter 2, “Fire Performance Ratings” of the Supplement to the NBC 1990.

3.1.7.2. Exception for Exterior Walls. The limitation 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 Article 3.2.3.12.

3.1.7.3. Lay-in Ceiling Panels. Where a ceiling construction has a suspended membrane ceiling with lay-in panels or tiles which contribute to the required fire-resistance rating of the assembly, hold-down clips or other means shall be provided to prevent the lifting of such panels or tiles in the event of a fire.

3.1.7.4. 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.

3.1.7.5. Minimum Fire-Resistance Rating. The use of materials or assemblies of materials having a greater fire-resistance rating than required shall entail no obligation to exceed in whole or in
part the minimum fire-resistance ratings required by this Part.

3.1.7.6. Rating of Supporting Construction

(1) Except as provided in Sentence (2) and in Articles 3.2.2.16. to 3.2.2.62. 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 of 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).

(3) Where 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 in Sentence (2), be constructed as a continuous element (see Appendix A), and
   (b) where required in this Part, have a fire-resistance rating as specified. (See Appendix A.)

(2) Openings in fire separations shall be protected with closures, shafts or other means in conformance with Articles 3.1.8.4. to 3.1.8.17. and with Subsections 3.1.9. and 3.2.8.

3.1.8.2. Combustible Construction Support. 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 provided in Sentence 3.5.4.2.(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, and the separation shall terminate so that a smoke-tight joint is provided at the point where it abuts on or intersects the floor and the roof slab or deck.

(2) Where a shaft, including exit enclosures, penetrates a fire separation, it shall extend through any horizontal service space or any other concealed space and shall terminate so that a smoke-tight joint is provided at the point where the shaft abuts on or intersects the floor and the roof slab or deck, except as provided in Subsection 3.5.3. where the shaft pierces through a roof assembly.

3.1.8.4. Determination of Ratings

(1) Except as provided in Sentences (2) and 3.1.8.14.(2), where an opening in a fire separation is required to be protected with a closure having a fire-protection rating, the fire-protection rating shall be determined on the basis of the results of tests conducted in conformance with the appropriate provisions in CAN4-S106-M, “Standard Method for Fire Tests of Window and Glass Block Assemblies,” CAN4-S104-M, “Standard Method for Fire Tests of Door Assemblies,” or CAN4-S112-M, “Standard Method of Fire Test of Fire Damper Assemblies.” (See Articles 3.1.8.15. to 3.1.8.17. for additional requirements for closures.)

(2) Except as provided in Sentence 3.1.8.10.(1), the fire-protection rating of closures shall conform to Table 3.1.8.A. for the required rating of the fire separation.

<table>
<thead>
<tr>
<th>Fire-Resistance Rating of Fire Separation</th>
<th>Required Fire-Protection Rating of Closure</th>
</tr>
</thead>
<tbody>
<tr>
<td>45 min</td>
<td>45 min</td>
</tr>
<tr>
<td>1 h</td>
<td>1 h</td>
</tr>
<tr>
<td>1.5 h</td>
<td>1.5 h</td>
</tr>
<tr>
<td>2 h</td>
<td>2 h</td>
</tr>
<tr>
<td>3 h</td>
<td>3 h</td>
</tr>
<tr>
<td>4 h</td>
<td>3 h</td>
</tr>
</tbody>
</table>

Table 3.1.8.A. Forming Part of Sentence 3.1.8.4.(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.

(2) Except as otherwise specified in this Part, every fire door, window assembly or glass block used as a closure in a required fire separation shall be installed in conformance with Chapters 2 to 14 of NFPA 80, "Fire Doors and Windows."

(3) Where 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 such damage.

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 m², with no dimension more than 3.7 m, when the fire compartments on both sides of the fire separation are 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 m², with no dimension more than 6 m, when the fire compartments on both sides of the fire separation are sprinklered.

3.1.8.7. Fire Dampers

(1) Except as permitted in Article 3.1.8.8., a duct that connects 2 fire compartments or that penetrates an assembly required to be a fire separation shall be equipped with a fire damper.

(2) A fire damper required in Sentence (1) or a fire damper used as a closure in a fire separation shall have a fire-protection rating conforming to Sentence 3.1.8.4.(2).

3.1.8.8. Fire Dampers Waived

(1) Fire dampers need not be provided in noncombustible branch ducts that have a melting point above 760°C and that penetrate a required fire separation provided such ducts

(a) serve only air-conditioning units or combined air-conditioning and heating units discharging air at not more than 1.2 m above the floor and have a cross-sectional area of not more than 130 cm², or

(b) are connected to exhaust duct risers that are under negative pressure and in which the air flow is upward as provided in Article 3.5.3.4. and are carried up inside the riser not less than 500 mm.

(2) A duct piercing a vertical fire separation not required to have a fire-resistance rating need not be equipped with a fire damper at the fire separation.

(3) A noncombustible duct piercing a horizontal fire separation not required to have a fire-resistance rating need not be equipped with a fire damper at the fire separation.

(4) Noncombustible ducts that penetrate a fire separation that separates a vertical service space from the remainder of the building need not be equipped with a fire damper at the fire separation provided the ducts have a melting point above 760°C and each individual duct exhausts directly to the outside at the top of the vertical service space.

(5) A continuous noncombustible duct having a melting point above 760°C that pierces a vertical fire separation as required in Sentence 3.3.1.1.(1) between suites of other than residential or institutional occupancy need not be equipped with a fire damper at the fire separation.

(6) A duct serving commercial cooking equipment and piercing a required fire separation need not be equipped with a fire damper at the fire separation. (See also Article 6.2.2.6.)

3.1.8.9. Installation of Fire Dampers

(1) Fire dampers shall conform to the requirements of this Article.

(2) Fire dampers shall be arranged to close automatically upon the operation of a fusible link conforming to ULC-S505, "Standard for Fusible Links for Fire Protection Service" or other heat- or smoke-actuated device.

(3) Heat-actuated devices in Sentence (2) shall be located where they are readily affected by an abnormal rise of temperature in the duct and shall 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.
3.1.8.9.

(4) Fire dampers shall be installed in the plane of the fire separation so as to stay in place should the duct be dislodged during a fire.

(5) Fire dampers tested in the vertical or horizontal position shall be installed in the manner in which they were tested.

(6) 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.)

3.1.8.10. Twenty-Minute Closures

(1) A door assembly having a fire-protection rating of 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, and
   (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 Windows” do not apply to doors described in Sentence (1).

(3) Doors described in Sentence (1) shall have a clearance of not more than 6 mm at the bottom and not more than 3 mm at the sides and top.

3.1.8.11. Self-Closing Devices

(1) Except as provided in Sentence (2), every door in a fire separation other than doors to freight elevators and dumbwaiters 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 that are located between
   (a) a corridor providing access to exit from classrooms and the adjacent classrooms in a building that is not more than 3 storeys in building height,
   (b) a public corridor and adjacent rooms of Group D occupancy in a building that is not more than 3 storeys in building height and where the doors are not located in a dead-end portion of the corridor, or
   (c) sleeping rooms, or a corridor and adjacent sleeping rooms, where the doors are within a fire compartment described in Sentence 3.3.3.7.(2).

3.1.8.12. Hold-Open Devices

(1) Hold-open devices are permitted on doors in required fire separations, other than exit doors in a building more than 3 storeys in building height and doors on vestibules required in Article 3.3.5.8., provided they are designed to release the door in conformance with Sentence (2).

(2) Hold-open devices permitted in Sentence (1) shall be designed to release
   (a) upon a signal from a smoke detector located as described in Appendix B of NFPA 80, “Fire Doors and Windows,” except that hold-open devices on doors other than exit doors, doors opening into a public corridor and egress doors referred to in Sentence 3.4.2.4.(2) are permitted to be released by a sprinkler system or a heat-actuated device provided the door does not serve a Group A, Group B or Group C occupancy and is not required to function as part of a smoke control system, and
   (b) upon a signal from the building fire alarm system where a fire alarm system is provided, except that this requirement does not apply to a hold-open device on a door located between a corridor used by the public and an adjacent sleeping room in hospitals and nursing homes or to a hold-open device that is designed to release by a heat-actuated device in conformance with Clause (a).

3.1.8.13. Door Latches. Except as permitted in Subsection 3.3.3., every 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 provided in Articles 3.1.8.15. to 3.1.8.17. for the separation of exits, an opening or openings in a fire separation having a fire-resistance rating of not more than 1 h may be protected with fixed wired glass assemblies or glass blocks installed in conformance with NFPA 80, "Fire Doors and Windows."

(2) Wired glass assemblies permitted in Sentence (1) which are used in vertical fire separations need not be tested in conformance with Sentence 3.1.8.4.(1) provided that 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 approximately 25 mm across the flats, using wire of not less than 0.45 mm diam, or approximately 13 mm across the flats, using wire of not less than 0.40 mm diam, the wire to be centrally embedded during manufacture and welded or intertwined at each intersection,
   (c) set in fixed steel frames having a minimum metal thickness of 1.35 mm 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 m², 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 m².
   (See Appendix A.)

(3) Where glass blocks are permitted in Sentence (1), they 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. Except as provided in 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, when tested in conformance with Sentence 3.1.8.4.(1), shall conform to Table 3.1.8.B. when used in the locations shown in the Table.

3.1.8.16. Area Limits for Wired Glass or Glass Block. Except as provided in Article 3.1.8.17., the maximum area of wired glass in a door and the maximum area of wired glass panels or glass block not in a door shall conform to Table 3.1.8.B. when used in the locations shown in the Table.

3.1.8.17. Temperature Rise and Area Limits Waived

(1) The temperature rise limits and glass area limits required in Articles 3.1.8.15. and 3.1.8.16. are waived for closures 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 of not less than 45 min,
   (b) the separation in 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.)

3.1.9. Building Services in Fire Separations and Fire Rated Assemblies

3.1.9.1. Fire Stopping of Service Penetrations

(1) Piping, tubing, ducts, chimneys, electrical wires and cables, totally enclosed noncombustible raceways, electrical outlet boxes and other similar building services that penetrate a membrane forming part of an assembly required to have a fire-resistance rating, or a fire separation, shall be
   (a) tightly fitted, or
   (b) sealed by a fire stop system that, when subjected to the fire test method in CAN4-S115-M, "Standard Method of Fire Tests of Firestop Systems," has an F rating not less than the fire-protection rating required for closures in the fire separation. (See A-9.10.9.6.(1) in Appendix A.) (See also Article 3.1.9.4. for penetrations involving combustible drain, waste and vent piping.)

(2) Piping, tubing, ducts, chimneys, electrical wires and cables, totally enclosed noncombustible raceways, electrical outlet boxes and other similar building services that penetrate a firewall or a horizontal fire separation that is required to have a fire-
Table 3.1.8.B.  
Forming Part of Articles 3.1.8.15. and 3.1.8.16.

<table>
<thead>
<tr>
<th>Location</th>
<th>Minimum Required Fire-Protection Rating of Door</th>
<th>Maximum Temperature Rise on Unexposed Side of Door, °C</th>
<th>Maximum Area of Glass in Door, cm²</th>
<th>Maximum Aggregate Area of Wired Glass Panels and Glass Block not in Door, cm²</th>
</tr>
</thead>
<tbody>
<tr>
<td>Between an exit enclosure and the remainder of the floor area in buildings not more than 3 storeys in building height</td>
<td>All ratings</td>
<td>No limit</td>
<td>8,000</td>
<td>8,000</td>
</tr>
<tr>
<td>Between an exit enclosure and the remainder of the floor area (except as permitted above) or 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</td>
<td>Less than 45 min</td>
<td>No limit</td>
<td>No limit</td>
<td>No limit</td>
</tr>
<tr>
<td></td>
<td>45 min</td>
<td>250 after 30 min</td>
<td>645</td>
<td>645</td>
</tr>
<tr>
<td></td>
<td>1.5 h</td>
<td>250 after 1 h</td>
<td>645</td>
<td>645</td>
</tr>
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<td></td>
<td>2 h</td>
<td>250 after 1 h</td>
<td>645</td>
<td>645</td>
</tr>
<tr>
<td>In a firewall</td>
<td>1.5 h</td>
<td>250 after 30 min</td>
<td>645</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>3 h</td>
<td>250 after 1 h</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Column 1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
</tbody>
</table>

resistance rating in conformance with Article 3.2.1.2., shall be sealed at the penetration by a fire stop system that, when subjected to the fire test method in CAN4-S115-M, “Standard Method of Fire Tests of Firestop Systems,” has an FT rating not less than the fire-resistance rating for the fire separation.

3.1.9.2. Combustibility of Service Penetrations. Except as permitted in Articles 3.1.9.3. and 3.1.9.4., pipes, ducts, electrical outlet boxes, totally enclosed noncombustible raceways or other similar service equipment that partly or wholly penetrate an assembly required to have a fire-resistance rating shall be noncombustible unless the assembly has been tested incorporating such equipment.

3.1.9.3. Penetration by Wires, Cables and Outlet Boxes

(1) Electrical or similar wiring in totally enclosed noncombustible raceways is 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 Article 3.1.9.2.
(2) Except as permitted by Sentence (3), electrical wires and cables, single or grouped, with combustible insulation, jackets or sheathes that conform to the requirements of Clause 3.1.5.17.(1)(a) and that are not installed in totally enclosed noncombustible raceways 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 Article 3.1.9.2. provided the overall diameter of the single or grouped wires or cables is not more than 25 mm.

(3) Single conductor metal sheathed cables that are not grouped, have combustible jacketing and 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 in Article 3.1.9.2.

(4) Combustible totally enclosed raceways which 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 Article 3.1.9.2.

(5) 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 Article 3.1.9.2. provided the opening through the membrane into the box is not more than 160 cm².

(6) Outlet boxes that penetrate opposite sides of a wall assembly shall be offset where necessary to maintain the integrity of the fire separation.

3.1.9.4. Combustible Piping Penetrations

(1) Combustible sprinkler piping is permitted to penetrate a fire separation provided the fire compartments on each side of the fire separation are sprinklered.

(2) Combustible water distribution piping that has an outside diameter not more than 30 mm is permitted to partly or wholly penetrate a vertical 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 Article 3.1.9.2.

provided the piping is sealed in conformance with 3.1.9.1.(1)(b).

(3) Except as permitted in Sentences (4) to (6), combustible piping shall not be used in a drain, waste and vent piping system where any part of that system partly or wholly penetrates a fire separation required to have a fire-resistance rating or penetrates a membrane that forms part of an assembly required to have a fire-resistance rating.

(4) Combustible drain, waste and vent piping 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

(a) the piping is sealed at the penetration by a fire stop system that has a F rating not less than the fire-resistance rating required for the fire separation when subjected to the fire test method in CAN4-S115-M, "Standard Method of 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, and

(b) the piping is not located in a vertical shaft.

(5) 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.

(6) Combustible drain, waste and vent piping is permitted on one side of a vertical fire separation provided it is not located in a vertical shaft.

3.1.9.5. Openings through Membrane Ceilings. A membrane ceiling forming a part of an assembly assigned a fire-resistance rating on the basis of Chapter 2, "Fire Performance Ratings" of the Supplement to the NBC 1990 is permitted to be pierced by openings leading into ducts within the ceiling space provided the ducts are sheet steel and the amount of openings and their protection conform to the requirements of Chapter 2, "Fire Performance Ratings."

3.1.9.6. Plenums. A ceiling assembly used as a plenum shall conform to Article 3.5.4.3.
3.1.10. Firewalls

3.1.10.1. Prevention of Firewall Collapse

(1) Except as permitted in Sentence (2), where structural framing members are connected to or supported on a firewall and such members have fire-resistance ratings less than that required for the firewall, the connections and supports for such members shall be designed so that the collapse of the framing members during a fire will not cause the collapse of the firewall.

(2) Sentence (1) does not apply when a firewall consists of two separate wall assemblies each tied to its respective building frame but not to each other provided each wall assembly is constructed as a fire separation having one half of the fire-resistance rating required for the firewall in Sentences 3.1.10.2.(1) and (2) and designed so that the collapse of one wall assembly will not cause collapse of the other.

(3) A firewall may be supported on the structural frame of the building in buildings of noncombustible construction provided such 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 collapse of the firewall.

3.1.10.2. Rating of Firewalls

(1) Every required 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 of 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) Every required firewall which 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 of not less than 2 h.

(3) Except for closures, the required fire-resistance rating of every firewall shall be provided by masonry or concrete.

3.1.10.3. Continuity of Firewalls

(1) Every firewall shall extend from the ground continuously through all storeys of a building or buildings so separated, except that where a firewall is located above a basement storage garage conforming to Article 3.2.1.2., the firewall is permitted to terminate at the floor assembly immediately above the storage garage. (See also Sentence 3.1.10.1.(3).)

(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 of not less than
       (i) 1 h if the firewall is required to have a fire-resistance rating of not less than 2 h, or
       (ii) 2 h if the firewall is required to have a fire-resistance rating of 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 provided in Sentences (2) and 3.1.10.3.(2), every 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 of not less than 2 h, and
   (b) 900 mm high for a firewall required to have a fire-resistance rating of not less than 4 h.

(2) Where a firewall separates 2 buildings with roofs at different elevations, the firewall need not extend above the upper roof surface to form a parapet where the difference in elevation between the roofs so separated is more than 3 m.

3.1.10.5. Maximum Openings. 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 per cent of the entire length of the firewall.
3.1.10.6. **Exposure Protection for Adjacent Walls.** Where the external walls of 2 buildings meet at a firewall at an angle of 135° or less, the requirements of Article 3.2.3.14. shall apply.

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. When buildings are separated by a firewall, combustible projections on the exterior of one building, such as 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. (See also Article 3.2.3.6.)

3.1.11. **Fire Stops in Concealed Spaces**

3.1.11.1. **Separation of Concealed Spaces.** 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 stops conforming to Article 3.1.11.7.

3.1.11.2. **Fire Stopping in Wall Assemblies**

1. Except as permitted in Sentence (2), fire stops 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 stops 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, or
   (c) the exposed construction materials and any insulation within the wall space have a flame-spread rating of 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 stops are installed so that the vertical distance between them is not more than 10 m.

3.1.11.3. **Fire Stopping between Nailing and Supporting Elements**

1. In buildings required to be of noncombustible construction, where the ceiling finish exposed within a concealed space has a flame-spread rating of more than 25, fire stops conforming to Article 3.1.11.7. shall be provided between wood nailing elements so that the maximum area of the concealed space is not more than 2 m².

2. In buildings required to be of noncombustible construction, fire stops conforming to Article 3.1.11.7. shall be provided in the concealed spaces created by the wood members permitted in Sentence 3.1.5.8.(2) so that the maximum area of a concealed space is not more than 10 m².

3.1.11.4. **Fire Stopping between Vertical and Horizontal Spaces**

1. Fire stops 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 of 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 of more than 25.

3.1.11.5. **Fire Stopping of Roof Spaces, Balconies and Canopies**

1. Every unsprinklered concealed space within a ceiling or roof assembly of combustible construction, including attic spaces, shall be separated by construction conforming to Article 3.1.11.7. into compartments not more than
   (a) 600 m² in area with no dimension more than 60 m where the exposed construction materials within the space have a flame-
spread rating of not more than 25, and
(b) 300 m² in area with no dimension more
than 20 m where the exposed construction
materials within the space have a flame-
spread rating of more than 25.

(2) Every concealed space in exterior cornices,
mansard style roofs, balconies and canopies in which
the exposed construction materials within the space
have a flame-spread rating of more than 25 shall be
separated by construction conforming to Article
3.1.11.7.
(a) at the points where such concealed spaces
extend across the ends of required vertical
fire separations, and
(b) so that the maximum dimension in any
concealed space is not more than 20 m.

3.1.11.6. Fire Stopping of Crawl Spaces.
Every unsprinklered crawl space not considered as a
basement in Article 3.2.2.5. shall be separated by
construction conforming to Article 3.1.11.7. into
compartments not more than 600 m² in area with no
dimension more than 30 m.

3.1.11.7. Fire Stop Materials
(1) Except as provided in Sentences (2) to (4),
materials used to separate concealed spaces into
compartments shall remain in place and prevent the
passage of flames for a period of not less than 15 min
when subjected to the standard fire exposure in
CAN4-S101-M, “Standard Methods of Fire Endur-
ance 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 buildings required to be of noncom-
bustible construction, wood nailing elements described
in Article 3.1.5.6. need not be tested in conformance
with Sentence (1).
(4) In buildings permitted to be of combustible
construction and in combustible roof systems permitted
by Sentence 3.1.5.3.(2), materials used to separate
concealed spaces into compartments are permitted to be
(a) solid lumber not less than 38 mm thick,
(b) phenolic bonded plywood, waferboard, or
strandboard not less than 12.5 mm thick
with joints supported, or
(c) 2 thicknesses of lumber each not less than
19 mm thick with joints staggered, where
the width or height of the concealed space
is such that more than one piece of lumber
not less than 38 mm thick is necessary to
block off the space.
(5) Openings through materials referred to in
Sentences (1) to (4) shall be protected to maintain the
integrity of the construction.
(6) Where materials referred to in Sentences
(1) to (4) are penetrated by construction elements or
by service equipment, fire stop materials shall be
used to seal the penetration.

3.1.12. Flame-Spread Rating and
Smoke Developed
Classification

3.1.12.1. Determination of Ratings
(1) Except as provided in Sentences (2) and
(3), the flame-spread rating and smoke developed
classification of a material, assembly of materials or
structural member shall be determined on the basis
of not less than 3 tests conducted in conformance
with CAN/ULC-S102-M, “Standard Method of Test
for Surface Burning Characteristics of Building
Materials and Assemblies.”
(2) The flame-spread rating and smoke devel-
oped classification of a material or assembly of
materials shall be determined on the basis of not less
than 3 tests conducted in conformance with CAN/
ULC-S102.2-M, “Standard Method of Test for Surface
Burning Characteristics of Flooring, Floor Covering,
and Miscellaneous Materials and Assemblies,” where
the material or assembly of materials
(a) is designed for use in a relatively horizon-
tal 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 of materials or a
structural member is permitted to be assigned a
flame-spread rating and smoke developed classification
on the basis of Chapter 2, “Fire Performance
Ratings” of the Supplement to the NBC 1990.
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, such as
   (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, when such floor is not intended as the finished floor.

3.1.13.2. Flame-Spread Rating

(1) Except as otherwise provided in 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.A.

(2) Except as permitted in 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 of not more than 200. (See Appendix A.)

(3) Doors within dwelling units need not conform to Sentences (1) and (2).

(4) Where a wall or ceiling finish is required to have a flame-spread rating of less than 150 in Sentence (1), up to 10 per cent of the total wall area and 10 per cent of the total ceiling area is permitted to have a flame-spread rating of not more than 150, except that up to 25 per cent of the total wall area of lobbies described in Sentence 3.4.4.2.(2) is permitted to have a flame-spread rating of 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. Bathrooms in Residential Suites. The flame-spread rating of interior wall and ceiling finishes for bathrooms within suites of Group C occupancy shall be not more than 200.

Table 3.1.13.A.
Forming Part of Sentence 3.1.13.2.(1)

<table>
<thead>
<tr>
<th>Occupancy, Location or Element</th>
<th>Maximum Flame-Spread Rating for Walls and Ceilings</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sprinklered</td>
<td>Unsprinklered</td>
</tr>
<tr>
<td>Group A, Division 1 occupancies, including doors, skylights, glazing and light diffusers and lenses</td>
<td>150</td>
</tr>
<tr>
<td>Group B occupancies</td>
<td>150</td>
</tr>
<tr>
<td>Exits(1)</td>
<td>25</td>
</tr>
<tr>
<td>Lobbies described in Sentence 3.4.4.2.(2)</td>
<td>25</td>
</tr>
<tr>
<td>Covered vehicular passageways, except for roof assemblies of heavy timber construction in such passageways</td>
<td>25</td>
</tr>
<tr>
<td>Vertical service spaces</td>
<td>25</td>
</tr>
</tbody>
</table>

Note to Table 3.1.13.A.:
(1) See Articles 3.1.13.8. and 3.1.13.10.

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 occupancies is permitted to be more than the flame-spread rating limits required elsewhere in this Subsection provided the light diffusers and lenses have a flame-spread rating of not more than 250 and a smoke developed classification of not more than 600 when tested in conformance with CAN/ULC-S102.2-M, "Standard Method of Test for Surface Burning Characteristics of Flooring, Floor Covering, and Miscellaneous Materials and Assemblies."
3.1.13.4.

(b) fall to the bottom of the test apparatus before igniting when tested in conformance with ULC-S102.3-M, "Standard Method of 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 corridors that are required to be separated from the remainder of the building by a fire separation or in exit shafts unless individual diffusers or lenses are not more than 1 m² in area and are not less than 1.2 m apart.

3.1.13.5. Skylights. Individual combustible skylights in corridors that are required to be separated from the remainder of the building by a fire separation shall be not more than 1 m² in area and not less than 1.2 m apart.

3.1.13.6. Corridors

(1) Except where the building is sprinklered, the interior wall finish of public corridors, corridors used by the public in assembly and institutional occupancies and corridors serving classrooms or sleeping rooms in institutional occupancies, including occupancies in such corridors, shall have a maximum flame-spread rating of not more than

(a) 75, or
(b) 25 on the upper half of the wall and 150 on the lower half of the wall.

(2) Except where the building is sprinklered, the interior ceiling finish of corridors and occupancies in Sentence (1) shall have a flame-spread rating of not more than 25.

3.1.13.7. High Buildings

(1) Except as permitted in Sentences (2) to (4), 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 Article 3.1.13.2. and to the flame-spread rating and smoke developed classification values in Table 3.1.13.B.

(2) Except for buildings of Group B major occupancy and elevator cars, the flame-spread rating

<table>
<thead>
<tr>
<th>Maximum Location or Element</th>
<th>Maximum Flame-Spread Rating</th>
<th>Maximum Smoke Developed Classification</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Wall Surface</td>
<td>Ceiling Surface</td>
</tr>
<tr>
<td>Exit stairways, vestibules to exit stairs and lobbies described in Sentence 3.4.4.2.(2)</td>
<td>25</td>
<td>25</td>
</tr>
<tr>
<td>Corridors not within suites</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>Elevator cars and vestibules</td>
<td>25</td>
<td>25</td>
</tr>
<tr>
<td>Service spaces and service rooms</td>
<td>25</td>
<td>25</td>
</tr>
<tr>
<td>Other locations and elements</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>Column 1</td>
<td>2</td>
<td>3</td>
</tr>
</tbody>
</table>

Note to Table 3.1.13.B.:  
(1) See Sentence 3.1.13.4.(1) for lighting elements.
and smoke developed classification of interior wall, floor and ceiling finishes need not conform to the values in Table 3.1.13.B. provided the building is sprinklered and the sprinkler system is electrically supervised in conformance with Sentence 3.2.6.4(1).

(3) Trim and millwork in exit stairways, vestibules to exit stairways, lobbies described in Sentence 3.4.4.2.(2) and corridors not within suites need not conform to the flame-spread rating and smoke developed classification requirements in Sentence (1) provided

(a) they have a flame-spread rating of not more than 150 and a smoke developed classification of not more than 300, and

(b) their aggregate area is not more than 10 per cent of the area of the wall or ceiling on which they occur.

(4) Doors in exit stairways, vestibules to exit stairways, lobbies described in Sentence 3.4.4.2.(2) and corridors not within suites need not conform to the flame-spread rating and smoke developed classification requirements in Sentence (1) provided

(a) they have a flame-spread rating of not more than 200 and a smoke developed classification of not more than 300, and

(b) their aggregate area is not more than 10 per cent of the area of the wall in which they occur.

3.1.13.8. Noncombustible Construction

(1) In buildings required to be of noncombustible construction,

(a) the flame-spread ratings in 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 sprinklered buildings and fire-retardant treated wood.

3.1.13.9. Underground Walkways. Except for paint, the interior wall and ceiling finishes of an underground walkway shall be of noncombustible materials.


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 flame-spread rating of not more than 25, except that a flame-spread rating of not more than 150 is permitted for up to 10 per cent of the total wall area and for up to 10 per cent of the total ceiling area.

3.1.14. Roof Assemblies

3.1.14.1. Fire-Retardant Treated Wood Roof Systems

(1) Where 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-M, “Standard Method of 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 thereof.

3.1.14.2. Metal Roof Deck Assemblies

(1) Except as permitted in Sentence (2), a metal roof deck assembly shall meet the conditions of acceptance of CAN/ULC S126-M, “Standard Method of 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 for noncombustible construction in Sentences 3.2.2.16.(2), 3.2.2.17.(2), 3.2.2.21.(2), 3.2.2.25.(2), 3.2.2.31.(2), 3.2.2.40.(2), 3.2.2.41.(2), 3.2.2.42.(2), 3.2.2.44.(2), 3.2.2.52.(2), 3.2.2.57.(2), 3.2.2.58.(2) or 3.2.2.59.(2).

(2) The requirements of Sentence (1) are waived provided

(a) the combustible material above the roof deck is protected by a thermal barrier.
conforming to Clause 3.1.5.1(2)(e) that is located
(i) on its underside, or
(ii) beneath the roof deck,
(b) the building is sprinklered in accordance with Sentence 3.2.2.12.(1), or
(c) the roof assembly has a fire-resistance rating of not less than 45 min.

3.1.15. Roof Covering

3.1.15.1. Roof Covering Classification.
Where a roof covering is required to be a Class A, B or C roof covering, such classification shall be determined in conformance with CAN/ULC-S107-M, “Standard Methods of Fire Tests of Roof Coverings.” (See Article 3.2.3.18.)

3.1.16. Occupant Load

3.1.16.1. Occupant Load Determination
(1) The occupant load of a floor area or part of a floor area shall be based on
(a) the number of seats in assembly occupancies having fixed seats,
(b) 2 persons per sleeping room in dwelling units, and
(c) the number of persons for which the area is designed, but not less than that determined from Table 3.1.16.A. for occupancies other than those described in Clauses (a) and (b) unless it can be shown that the area will be occupied by fewer persons.

(2) Where a floor area or part thereof has been designed for an occupant load other than that determined from Table 3.1.16.A., 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) Where a room or group of rooms is intended for 2 or more occupancies at different times, the value to be used from Table 3.1.16.A. shall be the value which gives the greatest number of persons for the occupancies concerned.

Table 3.1.16.A
Forming Part of Article 3.1.16.1

<table>
<thead>
<tr>
<th>Type of Use of Floor Area or Part Thereof</th>
<th>Area per Person, m²</th>
</tr>
</thead>
<tbody>
<tr>
<td>Assembly uses</td>
<td></td>
</tr>
<tr>
<td>space with fixed seats</td>
<td>See Clause (1)(a)</td>
</tr>
<tr>
<td>space with nonfixed seats</td>
<td>0.75</td>
</tr>
<tr>
<td>stages for theatrical performances</td>
<td>0.75</td>
</tr>
<tr>
<td>space with nonfixed seats and tables</td>
<td>0.95</td>
</tr>
<tr>
<td>standing space</td>
<td>0.40</td>
</tr>
<tr>
<td>stadia and grandstands</td>
<td>0.60</td>
</tr>
<tr>
<td>bowling alleys, pool and billiard rooms</td>
<td>9.30</td>
</tr>
<tr>
<td>classrooms</td>
<td>1.85</td>
</tr>
<tr>
<td>school shops and vocational rooms</td>
<td>9.30</td>
</tr>
<tr>
<td>reading or writing rooms or lounges</td>
<td>1.85</td>
</tr>
<tr>
<td>dining, beverage and cafeteria space</td>
<td>1.20</td>
</tr>
<tr>
<td>laboratories in schools</td>
<td>4.60</td>
</tr>
<tr>
<td>Institutional uses</td>
<td></td>
</tr>
<tr>
<td>treatment and sleeping room areas</td>
<td>10.00</td>
</tr>
<tr>
<td>detention quarters</td>
<td>11.60</td>
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<tr>
<td>Residential uses</td>
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<tr>
<td>dwelling units</td>
<td>See Clause (1)(b)</td>
</tr>
<tr>
<td>dormitories</td>
<td>4.60</td>
</tr>
<tr>
<td>Business and personal services uses</td>
<td></td>
</tr>
<tr>
<td>personal service shops</td>
<td>4.60</td>
</tr>
<tr>
<td>offices</td>
<td>9.30</td>
</tr>
<tr>
<td>Mercantile uses</td>
<td></td>
</tr>
<tr>
<td>basements and first storeys</td>
<td>3.70</td>
</tr>
<tr>
<td>second storeys having a principal</td>
<td></td>
</tr>
<tr>
<td>entrance from a pedestrian</td>
<td></td>
</tr>
<tr>
<td>thoroughfare or a parking area</td>
<td>3.70</td>
</tr>
<tr>
<td>other storeys</td>
<td>5.60</td>
</tr>
<tr>
<td>Industrial uses</td>
<td></td>
</tr>
<tr>
<td>manufacturing or process rooms</td>
<td>4.60</td>
</tr>
<tr>
<td>storage garages</td>
<td>46.00</td>
</tr>
<tr>
<td>storage spaces (warehouse)</td>
<td>28.00</td>
</tr>
<tr>
<td>aircraft hangars</td>
<td>46.00</td>
</tr>
<tr>
<td>Other uses</td>
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</tr>
<tr>
<td>cleaning and repair goods</td>
<td>4.60</td>
</tr>
<tr>
<td>kitchens</td>
<td>9.30</td>
</tr>
<tr>
<td>storage</td>
<td>46.00</td>
</tr>
<tr>
<td>public corridors intended for occupancies in addition to pedestrian travel</td>
<td>3.70 (1)</td>
</tr>
</tbody>
</table>

Column 1

2

Note to Table 3.1.16.A.:
(1) See A-3.3.1.4.(1) in Appendix A.
Section 3.2 Size and Occupancy Requirements for Fire Safety

3.2.1. General

3.2.1.1. Exceptions to Building Height in Storeys

(1) Roof-top enclosures provided for elevator machinery, stairways and 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.

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

(3) Except as provided in Sentences (4) and (5), a mezzanine shall not be considered as a storey in calculating the building height provided

(a) the aggregate area of the mezzanine floor is not more than 40 per cent of the area of the storey in which it is located,
(b) it is used as an open floor area except as provided in Sentence 3.3.2.11.(2), and
(c) the space above the mezzanine floor and the space above the floor beneath it has no visual obstructions more than 1,070 mm above such floors.

(See Appendix A.)

(4) Except as provided in Sentence (5), a mezzanine shall not be required to be considered as a storey in calculating building height need not conform to Sentence (3) where the aggregate area of the mezzanine floor is not more than 10 per cent of the area of the storey in which it is located. (See A-3.2.1.1.(3) in Appendix A.)

(5) Where more than one level of mezzanine is provided in a storey, each level additional to the first shall be considered as a storey in calculating the building height.

(6) When a mezzanine is required to be considered as a storey in determining building height, its floor assembly shall be constructed in conformance with the fire separation requirements for floor assemblies in Articles 3.2.2.16. to 3.2.2.62.

(7) 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 3.3.1.22., and Sentences 3.2.4.19.(2), 3.2.7.3.(2), 3.3.1.3.(7), 3.4.2.4.(3) and 3.4.4.4.(8). (See Appendix A.)

3.2.1.2. Storage Garage Considered as a Separate Building. 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 Subsection 3.2.2. 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.

3.2.1.3. Roof Considered as a Wall. 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 adjoins a space intended for occupancy within a building shall be considered as part of an external wall of the building.

3.2.1.4. Floor Assembly over Basement

(1) A floor assembly immediately above a basement shall be constructed as a fire separation having a fire-resistance rating conforming to the requirements for floor assemblies in Articles 3.2.2.16. to 3.2.2.62., 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 in Sentence (1) for the floor assembly.

3.2.1.5. Fire Containment in Basements

(1) Except as provided in Sentences (2) and 3.2.2.11.(2), basements shall be sprinklered or shall be subdivided into fire compartments not more than 600 m² 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).
3.2.2. Building Size and Construction Relative to Occupancy

3.2.2.1. Application. Except as provided in Article 3.2.2.3., buildings shall be constructed in conformance with this Subsection to prevent fire spread and collapse caused by the effects of fire. (See Subsection 3.1.3. for fire separations between major occupancies.)

3.2.2.2. Special and Unusual Structures. Structures which cannot be identified with the descriptions of buildings in Articles 3.2.2.16. to 3.2.2.62. shall be protected against fire spread and collapse in conformance with good fire protection engineering practice, such as described in the NFPA Fire Protection Handbook, Sixteenth Edition. (See A-3, A-3.2.2.2. and A-3.2.5.13.1 in Appendix A.)

3.2.2.3. Exceptions to Structural Fire Protection

(1) Fire protection is not required for
(a) steel lintels over openings not more than 2 m wide in loadbearing walls and not more than 3 m wide in non-loadbearing walls,
(b) steel lintels over openings greater than those in Clause (a) provided such 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 shaft doorways, steel for the support of elevator and dumbwaiter guides, counterweights and other such equipment, when entirely enclosed in a shaft and not a part of the structural frame of a building,
(e) steel members of stairways, including escalators, which are not a part of the structural frame of a building,
(f) steel members of porches, exterior balconies, exterior stairways, fire escapes, cornices, marquises and other similar appurtenances provided they are outside an exterior wall of a building, and
(g) loadbearing steel or concrete members wholly or partially outside of a building face in buildings not more than 4 storeys in building height and classified as Group A, B, C, D or F, Division 3 major occupancy provided such members are not less than 1 m away from any unprotected opening in an exterior wall, or shielded from heat radiation in the event of a fire within a 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. (See also Sentence 3.2.3.8.(2).)

3.2.2.4. Lesser Restrictions. When the building height or the building area could be regulated by more than one of Articles 3.2.2.16. to 3.2.2.62. for the same occupancy classification of the building, the least restrictive Article is permitted to be used.

3.2.2.5. 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 when it is more than 1.8 m high between the lowest part of the floor assembly and the ground or other surface below or is used
(a) for any occupancy,
(b) for the passage of flue pipes, or
(c) 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 considered as a basement in Sentence (1).

3.2.2.6. Streets

(1) Every building shall face a street located in conformance with the requirements for access routes in Articles 3.2.5.5. and 3.2.5.6.

(2) For the purposes of Subsections 3.2.2. and 3.2.5. an access route conforming to Articles 3.2.5.5. and 3.2.5.6. is permitted to be considered as a street.

(3) A building is considered to face 2 streets when not less than 50 per cent of the building perimeter is located within 15 m of the street or streets.
A building is considered to face 3 streets when not less than 75 per cent of the building perimeter is located within 15 m of the street or streets.

Enclosed spaces, tunnels, bridges and similar structures even though used for vehicular or pedestrian traffic are not considered as streets for the purpose of this Part.

3.2.2.7. Exterior Balconies. Exterior balconies shall be constructed in accordance with the type of construction required in Articles 3.2.2.16. to 3.2.2.62., as applicable to the occupancy classification of the building.

3.2.2.8. Exterior Passageways. Elevated exterior passageways used as part of a means of egress shall conform to the requirements in Articles 3.2.2.16. to 3.2.2.62. for mezzanines.

3.2.2.9. Occupancy on Roof. Where a portion of a roof supports an occupancy, that portion shall be constructed in conformance with the fire separation requirements for floor assemblies in Articles 3.2.2.16. to 3.2.2.62.

3.2.2.10. Roof-Top Enclosures

(1) Roof-top enclosures provided for elevator machinery and service rooms, used for no purpose other than for service to the building, shall be constructed in accordance with the type of construction required in Articles 3.2.2.16. to 3.2.2.62., except that where such enclosure is not more than 1 storey, it is not required to have a fire-resistance rating.

(2) Roof-top enclosures for stairways including exit stairways shall be constructed in conformance with Articles 3.2.2.16. to 3.2.2.62., except that such enclosures need not have a fire-resistance rating nor be constructed as a fire separation.

3.2.2.11. Storeys below Ground

(1) Where a building is erected entirely below the adjoining finished ground level and does not extend more than 1 storey below such ground level, the minimum precautions against fire spread and collapse shall be the same as are required for basements under a building of 1 storey in building height having the same occupancy and building area.

(2) Where a building or portion thereof is erected entirely below the adjoining finished ground level and extends more than 1 storey below such ground level, the following minimum precautions against fire spread and collapse shall be taken:

(a) except as provided in Sentence (3), basements shall be sprinklered,

(b) floor assemblies below such ground level shall be constructed as a

(i) fire separation with a fire-resistance rating of not less than 3 h where the basements are occupied by Group E or Group F, Division 1 or 2 occupancies, and

(ii) fire separation with a fire-resistance rating of not less than 2 h where the basements are not occupied by Group E or Group F, Division 1 or 2 occupancies, and

(c) all loadbearing walls, columns and arches shall have a fire-resistance rating not less than that required for the construction that they support.

(3) The storey immediately below the first storey need not be sprinklered as required by Clause (2)(a) where

(a) it contains only residential occupancies, and

(b) not less than one unobstructed access opening conforming to Sentence 3.2.5.1.2 is installed on that storey for each 15 m of wall length in not less than one wall required to face a street in Subsection 3.2.2.

3.2.2.12. Sprinklers in Lieu of Roof Assembly Rating

(1) The requirements in Articles 3.2.2.16. to 3.2.2.62. for roof assemblies to have a fire-resistance rating are permitted to be waived provided

(a) the building is sprinklered,

(b) the sprinkler system in Clause (a) is electrically supervised in conformance with Sentence 3.2.4.16.(5), and

(c) the operation of the sprinkler system in Clause (a) will cause a signal to be transmitted to the fire department in conformance with Sentence 3.2.4.7.(3).

(See Appendix A.)

(See Article 3.2.2.9. for roofs intended for occupancy.)

3.2.2.13. Heavy Timber Roof Permitted.

For the purposes of Articles 3.2.2.16. to 3.2.2.62., roof assemblies in buildings up to 2 storeys in building
3.2.2.13.

Height are permitted to be of heavy timber construction regardless of building area provided the building is sprinklered and the sprinkler system conforms to Clauses 3.2.2.12.(1)(b) and (c).

3.2.2.14. Ratings Waived for Arena Type Building Roof

(1) The requirements for a roof assembly to have a fire-resistance rating are permitted to be waived for gymnasiums, swimming pools, arenas, and rinks if no part of the roof assembly is less than 6 m above the main floor or balcony and the roof carries no loads other than normal roof loads, including permanent access walks, and ventilating, sound and lighting equipment, except that the restriction concerning minimum distance shall not apply to:
   (a) an inclined and stepped floor ascending from the main floor which is used for seating purposes only, or
   (b) a balcony used for seating purposes only.

3.2.2.15. Buildings Containing Impeded Egress Zones

(1) A building, containing an impeded egress zone and not more than 1 storey in building height, conforming to the appropriate requirements of Articles 3.2.2.16. to 3.2.2.62., is not required to conform to the requirements for a Group B, Division 1 major occupancy provided:
   (a) the building is sprinklered,
   (b) the building does not include:
      (i) a contained use area
      (ii) sleeping accommodation,
      (iii) a high hazard industrial occupancy, or
      (iv) a mercantile occupancy,
   (c) the building area is not more than 6 400 m² if the building includes a medium hazard industrial occupancy,
   (d) the impeded egress zone does not extend beyond the boundaries of the fire compartment in which it is located, and
   (e) the occupant load of the impeded egress zone is not more than 100.

3.2.2.16. Assembly Buildings, Division 1, 1 Storey

(1) A building classified as Group A, Division 1 shall conform to Sentence (2) provided the building:
   (a) is not more than 1 storey in building height,
   (b) has no part of the auditorium floor more than 5 m above or below grade,
   (c) has no occupancy above or below the auditorium other than one which serves it or is dependent on it, and
   (d) is one in which the occupant load of the auditorium floor is not more than 300 persons.

(2) The building shall be of combustible or noncombustible construction used either singly or in combination, and
   (a) floor assemblies shall be fire separations with a fire-resistance rating of not less than 45 min,
   (b) mezzanines shall have, if of combustible construction, a fire-resistance rating of not less than 45 min,
   (c) roof assemblies shall have, if of combustible construction, a fire-resistance rating of not less than 45 min, and
   (d) all loadbearing walls, columns and arches supporting an assembly required to have a fire-resistance rating shall have a fire-resistance rating of not less than 45 min or shall be of noncombustible construction, except that such members and assemblies supporting a fire separation shall have a fire-resistance rating not less than that required for the supported assembly.

(See also Article 3.2.2.17.)

3.2.2.17. Assembly Buildings, Division 1, 1 Storey

(1) A building classified as Group A, Division 1 shall conform to Sentence (2) provided the building:
   (a) is not more than 1 storey in building height,
   (b) has less than 40 percent of the area of the building as 2 stores for the purpose of:
      (i) development of productions including preparation of scenery and costumes and rehearsal of performers,
      (ii) organization of performers, scenery and sound equipment before and during a performance,
      (iii) preparation by performers for a
(iv) managerial functions of policy making and administration, or
(v) public facilities such as toilets and rest rooms,
(c) has no occupancy above or below the auditorium other than one which serves or is dependent on it,
(d) is not more than 600 m² in building area, and
(e) is one in which the occupant load is not more than 600 persons.

(2) The building shall be of heavy timber or noncombustible construction used either singly or in combination, and
(a) floor assemblies shall be fire separations with a fire-resistance rating of not less than 45 min, and
(b) all loadbearing walls, columns and arches shall have a fire-resistance rating not less than that required for the supported assembly.

(See also Article 3.2.2.16.)

3.2.2.18. Assembly Buildings, Division 1, Any Height, Any Area

(1) A building classified as Group A, Division 1 shall conform to Sentence (2) provided the building
(a) is not limited in building height, and
(b) is not limited in building area.

(2) The building shall be of noncombustible construction, and
(a) floor assemblies shall be fire separations with a fire-resistance rating of not less than 2 h,
(b) mezzanines shall have a fire-resistance rating of not less than 1 h,
(c) roof assemblies shall have a fire-resistance rating of 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.

3.2.2.19. Assembly Buildings, Division 2, 1 Storey

(1) A building classified as Group A, Division 2 shall conform to Sentences (2) and (3) provided the building
(a) is not more than 1 storey in building height,
(b) if unsprinklered, has a building area not more than
   (i) 400 m² if facing 1 street,
   (ii) 500 m² if facing 2 streets, or
   (iii) 600 m² if facing 3 streets, and
(c) if sprinklered, is not more than twice the area limits of Clause (b).

(2) The building shall be of combustible or noncombustible construction used either singly or in combination.

(3) In buildings without basements the limiting areas are permitted to be doubled provided a fire separation with a fire-resistance rating of not less than 1 h is used to separate the building into fire compartments, each one of which does not exceed the area limits of Clause (1)(b) or (1)(c).

3.2.2.20. Assembly Buildings, Division 2, 1 and 2 Storeys, Sprinklered

(1) A building classified as Group A, Division 2 shall conform to Sentence (2) provided the building
(a) is not more than 2 storeys in building height,
(b) is sprinklered, and
(c) has a building area not more than
   (i) 400 m² if facing 1 street,
   (ii) 500 m² if facing 2 streets, or
   (iii) 600 m² if facing 3 streets.

(2) The building shall be of combustible or noncombustible construction used either singly or in combination.

3.2.2.21. Assembly Buildings, Division 2, 1 and 2 Storeys

(1) A building classified as Group A, Division 2 shall conform to Sentence (2) provided the building
(a) is not more than 2 storeys in building height, and
(b) if unsprinklered, has a building area not more than
   the value in Table 3.2.2.A., and
(c) if sprinklered, is not more than twice the area limits of Clause (b).

(2) The building shall be of combustible or noncombustible construction used either singly or in combination, and
Table 3.2.2.A.
Forming Part of Sentence 3.2.2.21.(1)

<table>
<thead>
<tr>
<th>No. of Storeys</th>
<th>Unsprinklered Maximum Area, m²</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Facing 1 Street</td>
</tr>
<tr>
<td>1</td>
<td>1 600</td>
</tr>
<tr>
<td>2</td>
<td>800</td>
</tr>
</tbody>
</table>

(a) floor assemblies shall be fire separations and, if of combustible construction, shall have a fire-resistance rating of not less than 45 min,
(b) mezzanines shall have, if of combustible construction, a fire-resistance rating of not less than 45 min,
(c) roof assemblies shall have, if of combustible construction, a fire-resistance rating of not less than 45 min, except that in buildings not more than 1 storey in building height, the fire-resistance rating is permitted to be waived provided that the roof assembly is constructed as a fire-retardant treated wood roof system conforming to Article 3.1.14.1., and
(i) if unsprinklered, the building area is not more than
   800 m² if facing 1 street,
   1 000 m² if facing 2 streets, or
   1 200 m² if facing 3 streets, and
(ii) if sprinklered, the building area is not more than twice the area limits of Subclause (i) (see Article 3.2.2.12. for supervised sprinkler systems), and
(d) all loadbearing walls, columns and arches supporting an assembly required to have a fire-resistance rating shall have a fire-resistance rating of not less than 45 min or shall be of noncombustible construction.

3.2.2.22. Assembly Buildings, Division 2, up to 5 Storeys, Any Area

(1) A building classified as Group A, Division 2 shall conform to Sentences (2) or (3) provided the building

(a) is not more than 5 storeys in building height, and
(b) is not limited in building area.

(2) Except as provided in Sentence (3), the building shall be of noncombustible construction, and
(a) floor assemblies shall be fire separations with a fire-resistance rating of not less than 1 h,
(b) mezzanines shall have a fire-resistance rating of not less than 1 h,
(c) except as provided in Sentence (3), roof assemblies shall have a fire-resistance rating of not less than 1 h, and
(d) except as provided in Sentence (3), all loadbearing walls, columns and arches shall have a fire-resistance rating not less than that required for the supported assembly.

(3) 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 m² if unsprinklered, or 6 400 m² if sprinklered, is permitted to be constructed with a roof of heavy timber construction and have columns of heavy timber construction.

3.2.2.23. Assembly Buildings, Division 2, Any Height, Any Area

(1) A building classified as Group A, Division 2 shall conform to Sentence (2) provided the building

(a) is not limited in building height, and
(b) is not limited in building area.

(2) The building shall be of noncombustible construction, and
(a) floor assemblies shall be fire separations with a fire-resistance rating of not less than 2 h,
(b) mezzanines shall have a fire-resistance rating of not less than 1 h,
(c) roof assemblies shall have a fire-resistance rating of 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.
3.2.2.24. Assembly Buildings, Division 3, 1 Storey

(1) A building classified as Group A, Division 3 shall conform to Sentence (2) provided the building
   (a) is not more than 1 storey in building height,
   (b) if unsprinklered, has a building area not more than
      (i) 1 000 m² if facing 1 street,
      (ii) 1 250 m² if facing 2 streets, or
      (iii) 1 500 m² if facing 3 streets, and
   (c) if sprinklered, is not more than twice the area limits of Clause (b).

(2) The building shall be of combustible or noncombustible construction used either singly or in combination.

(See also Article 3.2.2.25.)

3.2.2.25. Assembly Buildings, Division 3, 1 Storey

(1) A building classified as Group A, Division 3 shall conform to Sentence (2) provided the building
   (a) is not more than 1 storey in building height,
   (b) if unsprinklered, has a building area not more than
      (i) 2 400 m² if facing 1 street,
      (ii) 3 000 m² if facing 2 streets, or
      (iii) 3 600 m² if facing 3 streets, and
   (c) if sprinklered, is not more than twice the area limits of Clause (b).

(2) The building shall be of combustible or noncombustible construction used either singly or in combination, and
   (a) mezzanines shall have, if of combustible construction, a fire-resistance rating of not less than 45 min,
   (b) roof assemblies shall have, if of combustible construction, a fire-resistance rating of not less than 45 min, except that the fire-resistance rating is permitted to be waived provided that the roof assembly is constructed as a fire-retardant treated wood roof system conforming to Article 3.1.14.1., and
   (i) if unsprinklered, the building area is not more than
      1 200 m² if facing 1 street,
      1 500 m² if facing 2 streets, or
   (ii) if sprinklered, the building area is not more than twice the area limits of Subclause (i) (see Article 3.2.2.12. for supervised sprinkler systems), and
   (c) all loadbearing walls, columns and arches supporting an assembly required to have a fire-resistance rating shall have a fire-resistance rating of not less than 45 min or shall be of noncombustible construction.

(See also Article 3.2.2.24.)

3.2.2.26. Assembly Buildings, Division 3, 1 and 2 Storeys

(1) A building classified as Group A, Division 3 shall conform to Sentence (2) provided the building
   (a) is not more than 2 storeys in building height,
   (b) if unsprinklered, has a building area not more than the value in Table 3.2.2.B., and
   (c) if sprinklered, is not more than twice the area limits of Clause (b).

Table 3.2.2.B.
Forming Part of Sentence 3.2.2.26.(1)

<table>
<thead>
<tr>
<th>No. of Storeys</th>
<th>Unsprinklered Maximum Area, m²</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Facing 1 Street</td>
</tr>
<tr>
<td>1</td>
<td>4 000</td>
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<tr>
<td>2</td>
<td>2 000</td>
</tr>
<tr>
<td>Column 1</td>
<td>2</td>
</tr>
</tbody>
</table>

(2) Except as provided in Clauses (c) and (d), the building shall be of noncombustible construction, and
   (a) floor assemblies shall be fire separations with a fire-resistance rating of not less than 1 h,
   (b) mezzanines shall have a fire-resistance rating of not less than 1 h,
   (c) roof assemblies shall have a fire-resistance rating of not less than 45 min or be of heavy timber construction, and
   (d) all loadbearing walls, columns and arches shall have a fire-resistance rating not less
3.2.2.26. than that required for the supported assembly, except that arches are permitted to be of heavy timber construction.

3.2.2.27. Assembly Buildings, Division 3, Any Height, Any Area
(1) A building classified as Group A, Division 3 shall conform to Sentence (2) provided the building
   (a) is not limited in building height, and
   (b) is not limited in building area.
(2) The building shall be of noncombustible construction, and
   (a) floor assemblies shall be fire separations with a fire-resistance rating of not less than 2 h,
   (b) mezzanines shall have a fire-resistance rating of not less than 1 h,
   (c) roof assemblies shall have a fire-resistance rating of 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.

3.2.2.28. Assembly Buildings, Division 4
(1) A building classified as Group A, Division 4 shall conform to Sentence (2).
(2) The building shall be of noncombustible construction, and
   (a) the roof assemblies are permitted to be of heavy timber construction, and
   (b) the building is permitted to be of combustible construction provided
      (i) the occupant load is less than 1 500 persons, and
      (ii) the building has a limiting distance of not less than 6 m.

3.2.2.29. Institutional Buildings, Division 1
(1) A building classified as Group B, Division 1 shall conform to Sentence (2).
(2) The building shall be of noncombustible construction, and
   (a) floor assemblies shall be fire separations with a fire-resistance rating of not less than 2 h,
   (b) mezzanines shall have a fire-resistance rating of not less than 1 h,
   (c) roof assemblies shall have a fire-resistance rating of 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.

3.2.2.30. Institutional Buildings, Division 2, 1 Storey
(1) A building classified as Group B, Division 2 shall conform to Sentence (2) provided the building
   (a) is not more than 1 storey in building height,
   (b) if unsprinklered, has a building area not more than 250 m²,
   (c) if sprinklered, is not more than 500 m².
(2) The building shall be of combustible or noncombustible construction used either singly or in combination.

3.2.2.31. Institutional Buildings, Division 2, 1 and 2 Storeys
(1) A building classified as Group B, Division 2 shall conform to Sentence (2) provided the building
   (a) is not more than 2 storeys in building height, and
   (b) has a building area not more than the value in Table 3.2.2.C.

Table 3.2.2.C.
Forming Part of Sentence 3.2.2.31.(1)

<table>
<thead>
<tr>
<th>No. of Storeys</th>
<th>Unsprinklered Maximum Area, m²</th>
<th>Sprinklered Maximum Area, m²</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1 000</td>
<td>2 400</td>
</tr>
<tr>
<td>2</td>
<td>500</td>
<td>1 600</td>
</tr>
<tr>
<td>Column 1</td>
<td>2</td>
<td>3</td>
</tr>
</tbody>
</table>

(2) The building shall be of combustible or noncombustible construction used either singly or in combination, and
   (a) floor assemblies shall be fire separations with a fire-resistance rating of not less than 45 min,
   (b) mezzanines shall have, if of combustible construction, a fire-resistance rating of not
less than 45 min,
(c) roof assemblies shall have, if of combustible construction, a fire-resistance rating of not less than 45 min, and
(d) all loadbearing walls, columns and arches shall have a fire-resistance rating not less than that required for the supported assembly.

3.2.2.32. Institutional Buildings, Division 2, up to 3 Storeys, Sprinklered

(1) A building classified as Group B, Division 2 shall conform to Sentence (2) provided the building
   (a) is not more than 3 storeys in building height,
   (b) is sprinklered, and
   (c) has a building area not more than the value in Table 3.2.2.D.

<table>
<thead>
<tr>
<th>No. of Storeys</th>
<th>Sprinklered Maximum Area, m²</th>
</tr>
</thead>
<tbody>
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<td>1</td>
<td>unlimited</td>
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<tr>
<td>2</td>
<td>12 000</td>
</tr>
<tr>
<td>3</td>
<td>8 000</td>
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<td>Column 1</td>
<td>2</td>
</tr>
</tbody>
</table>

(2) The building shall be of noncombustible construction, and
   (a) floor assemblies shall be fire separations with a fire-resistance rating of not less than 1 h,
   (b) mezzanines shall have a fire-resistance rating of not less than 1 h,
   (c) roof assemblies shall have a fire-resistance rating of not less than 1 h (see Article 3.2.2.12. for supervised sprinkler systems), and
   (d) all loadbearing walls, columns and arches shall have a fire-resistance rating not less than that required for the supported assembly.

3.2.2.33. Institutional Buildings, Division 2, Any Height, Any Area

(1) A building classified as Group B, Division 2 shall conform to Sentence (2) provided the building
   (a) is not limited in building height, and
   (b) is not limited in building area.

(2) The building shall be of noncombustible construction, and
   (a) floor assemblies shall be fire separations with a fire-resistance rating of not less than 2 h,
   (b) mezzanines shall have a fire-resistance rating of not less than 1 h,
   (c) roof assemblies shall have a fire-resistance rating of 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.

3.2.2.34. Residential Buildings, up to 3 Storeys

(1) A building classified as Group C shall conform to Sentences (2), (3) and (4) provided the building
   (a) is not more than 3 storeys in building height,
   (b) if unsprinklered, has a building area not more than the value in Table 3.2.2.E., and
   (c) if sprinklered, is not more than twice the area limits of Clause (b).

<table>
<thead>
<tr>
<th>No. of Storeys</th>
<th>Unsprinklered Maximum Area, m²</th>
</tr>
</thead>
<tbody>
<tr>
<td>Facing 1 Street</td>
<td>Facing 2 Streets</td>
</tr>
<tr>
<td>1</td>
<td>1 800</td>
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<tr>
<td>2</td>
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<tr>
<td>3</td>
<td>600</td>
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<tr>
<td>Column 1</td>
<td>2</td>
</tr>
</tbody>
</table>
The building shall be of combustible or noncombustible construction used either singly or in combination, and
(a) floor assemblies shall be fire separations with a fire-resistance rating of not less than 45 min,
(b) mezzanines shall have, if of combustible construction, a fire-resistance rating of not less than 45 min, and
(c) all loadbearing walls, columns and arches shall have a fire-resistance rating not less than that required for the supported assembly.

When buildings contain dwelling units consisting of more than 1 storey, the provisions of Sentences (1) and (2) shall apply, except that subject to the provision of Sentence 3.3.4.2.(2), the floor assemblies, including floors over basements, which are entirely contained within such dwelling units, shall have a fire-resistance rating of not less than 45 min and need not be constructed as fire separations.

In a building in which there is no dwelling unit above another, the fire-resistance rating for the floor assemblies within the dwelling unit is waived.

### Residential Buildings, up to 3 Storeys, Increased Area

A building classified as Group C shall conform to Sentences (2), (3) and (4) provided the building
(a) is not more than 3 storeys in building height,
(b) if sprinklered, is not more than the building area value in Table 3.2.2.F., and
(c) if unsprinklered, is not more than twice the area limits of Clause (b).

### Table 3.2.2.F.
Forming Part of Sentence 3.2.2.35.(1)

<table>
<thead>
<tr>
<th>No. of Storeys</th>
<th>Unsprinklered Maximum Area, m²</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Facing 1 Street</td>
</tr>
<tr>
<td>1</td>
<td>2 400</td>
</tr>
<tr>
<td>2</td>
<td>1 200</td>
</tr>
<tr>
<td>3</td>
<td>800</td>
</tr>
<tr>
<td>Column 1</td>
<td>2 3 4</td>
</tr>
</tbody>
</table>

### Residential Buildings, 4 Storeys, Sprinklered

A building classified as Group C shall conform to Sentences (2), (3) and (4) provided the building
(a) is not more than 4 storeys in building height,
(b) is sprinklered, and
(c) is not more than the building area value in Table 3.2.2.G.

### Table 3.2.2.G.
Forming Part of Sentence 3.2.2.36.(1)

<table>
<thead>
<tr>
<th>No. of Storeys</th>
<th>Sprinklered Maximum Area, m²</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Facing 1 Street</td>
</tr>
<tr>
<td>4</td>
<td>1 200</td>
</tr>
<tr>
<td>Column 1</td>
<td>2 3 4</td>
</tr>
</tbody>
</table>
The building shall be of combustible or noncombustible construction used either singly or in combination, and

(a) floor assemblies shall be fire separations with a fire-resistance rating of not less than 1 h,
(b) mezzanines shall have a fire-resistance rating of not less than 1 h,
(c) roof assemblies shall have a fire-resistance rating of 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.

In a building containing dwelling units consisting of more than 1 storey, the provisions of Sentences (1) and (2) shall apply, except that, subject to the provisions of Sentence 3.3.4.2.(2), floor assemblies that are entirely contained within these dwelling units, including a floor over a basement, shall have a fire-resistance rating of not less than 1 h but need not be constructed as fire separations.

In a building in which there is no dwelling unit above another dwelling unit, the fire-resistance rating for floor assemblies entirely within the dwelling unit is waived provided collapse of these floor assemblies would not lead to the collapse of a fire separation to an adjacent dwelling unit.

### Table 3.2.2.H.
Forming Part of Sentence 3.2.2.37.(1)

<table>
<thead>
<tr>
<th>No. of Storeys</th>
<th>Unsprinklered Maximum Area, m²</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Facing 1 Street</td>
</tr>
<tr>
<td>1</td>
<td>unlimited</td>
</tr>
<tr>
<td>2</td>
<td>6 000</td>
</tr>
<tr>
<td>3</td>
<td>4 000</td>
</tr>
<tr>
<td>4</td>
<td>3 000</td>
</tr>
<tr>
<td>5</td>
<td>2 400</td>
</tr>
<tr>
<td>6</td>
<td>2 000</td>
</tr>
</tbody>
</table>

(d) all loadbearing walls, columns and arches shall have a fire-resistance rating not less than that required for the supported assembly.

In a building containing dwelling units consisting of more than 1 storey, the provisions of Sentences (1) and (2) shall apply, except that subject to the provisions of Sentence 3.3.4.2.(2), floor assemblies, that are entirely contained within these dwelling units, including a floor over a basement, shall have a fire-resistance rating of not less than 1 h but need not be constructed as fire separations.

### 3.2.2.38. Residential Buildings, Any Height, Any Area

(1) A building classified as Group C shall conform to Sentences (2) and (3) provided the building

(a) is not limited in building height, and
(b) is not limited in building area.

(2) The building shall be of noncombustible construction, and

(a) floor assemblies shall be fire separations with a fire-resistance rating of not less than 1 h,
(b) mezzanines shall have a fire-resistance rating of not less than 1 h,
(c) roof assemblies shall have a fire-resistance rating of 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.

(3) In a building containing dwelling units consisting of more than 1 storey, the provisions of Sentences (1) and (2) shall apply, except that subject to the provisions of Sentence 3.3.4.2.(2), floor assemblies, that are entirely contained within these dwelling units, including a floor over a basement, shall have a fire-resistance rating of not less than 1 h but need not be constructed as fire separations.

3.2.2.39. Business and Personal Services Buildings, 1 and 2 Storeys

(1) A building classified as Group D shall conform to Sentence (2) provided the building
(a) is not more than 2 storeys in building height,
(b) if unsprinklered, has a building area not more than the value in Table 3.2.2.I., and
(c) if sprinklered, is not more than twice the area limits of Clause (b).

Table 3.2.2.I.
Forming Part of Sentence 3.2.2.39.(1)

<table>
<thead>
<tr>
<th>No. of Storeys</th>
<th>Unsprinklered Maximum Area, m²</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Facing 1 Street</td>
</tr>
<tr>
<td>1</td>
<td>1 000</td>
</tr>
<tr>
<td>2</td>
<td>800</td>
</tr>
<tr>
<td>Column 1</td>
<td>2</td>
</tr>
</tbody>
</table>

(2) The building shall be of combustible or noncombustible construction used either singly or in combination, and
(a) floor assemblies shall be fire separations and, if of combustible construction, shall have a fire-resistance rating of not less than 45 min,
(b) mezzanines shall have, if of combustible construction, a fire-resistance rating of not less than 45 min,
(c) roof assemblies shall have, if of combustible construction, a fire-resistance rating of not less than 45 min, except that in buildings not more than 1 storey in building height, the fire-resistance rating is permitted to be waived provided that the roof assembly is constructed as a fire-retardant treated wood roof system conforming to Article 3.1.14.1. and
(i) if unsprinklered, the building area is not more than
   2 400 m² if facing 1 street,
   3 000 m² if facing 2 streets, or
   3 600 m² if facing 3 streets, and

3.2.2.40. Business and Personal Services Buildings, up to 3 Storeys

(1) A building classified as Group D shall conform to Sentence (2) provided the building
(a) is not more than 3 storeys in building height,
(b) if unsprinklered, has a building area not more than the value in Table 3.2.2.J., and
(c) if sprinklered, is not more than twice the area limits of Clause (b).

Table 3.2.2.J.
Forming Part of Sentence 3.2.2.40.(1)

<table>
<thead>
<tr>
<th>No. of Storeys</th>
<th>Unsprinklered Maximum Area, m²</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Facing 1 Street</td>
</tr>
<tr>
<td>1</td>
<td>4 800</td>
</tr>
<tr>
<td>2</td>
<td>2 400</td>
</tr>
<tr>
<td>3</td>
<td>1 600</td>
</tr>
<tr>
<td>Column 1</td>
<td>2</td>
</tr>
</tbody>
</table>
(ii) if sprinklered, the building area is not more than twice the area limits of Subclause (i) (see Article 3.2.2.12. for supervised sprinkler systems), and

(d) all loadbearing walls, columns and arches supporting an assembly required to have a fire-resistance rating shall have a fire-resistance rating of not less than 45 min or shall be of noncombustible construction.

3.2.2.41. Business and Personal Services Buildings, up to 6 Storeys

(1) A building classified as Group D shall conform to Sentence (2) provided the building

(a) is not more than 6 storeys in building height,

(b) if unsprinklered, has a building area not more than the value in Table 3.2.2.K., and

(c) if sprinklered, is not more than twice the area limits of Clause (b).

Table 3.2.2.K.
Forming Part of Sentence 3.2.2.41.(1)

<table>
<thead>
<tr>
<th>No. of Storeys</th>
<th>Unsprinklered Maximum Area, m²</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Facing 1 Street</td>
</tr>
<tr>
<td>1</td>
<td>unlimited</td>
</tr>
<tr>
<td>2</td>
<td>7 200</td>
</tr>
<tr>
<td>3</td>
<td>4 600</td>
</tr>
<tr>
<td>4</td>
<td>3 600</td>
</tr>
<tr>
<td>5</td>
<td>2 800</td>
</tr>
<tr>
<td>6</td>
<td>2 400</td>
</tr>
<tr>
<td>Column 1</td>
<td>2</td>
</tr>
</tbody>
</table>

(2) The building shall be of noncombustible construction, and

(a) floor assemblies shall be fire separations with a fire-resistance rating of not less than 2 h,

(b) mezzanines shall have a fire-resistance rating of not less than 1 h,

(c) roof assemblies shall have a fire-resistance rating of not less than 1 h, except that in buildings of 1 storey in building height this requirement is waived, and

(d) all loadbearing walls, columns and arches shall have a fire-resistance rating not less than that required for the supported assembly.

3.2.2.42. Business and Personal Services Buildings, Any Height, Any Area

(1) A building classified as Group D shall conform to Sentence (2) provided the building

(a) is not limited in building height, and

(b) is not limited in building area.

(2) The building shall be of noncombustible construction, and

(a) floor assemblies shall be fire separations with a fire-resistance rating of not less than 2 h,

(b) mezzanines shall have a fire-resistance rating of not less than 1 h,

(c) roof assemblies shall have a fire-resistance rating of not less than 1 h, except that in buildings of 1 storey in building height this requirement is waived, and

(d) all loadbearing walls, columns and arches shall have a fire-resistance rating not less than that required for the supported assembly.

3.2.2.43. Mercantile Buildings, 1 and 2 Storeys

(1) A building classified as Group E shall conform to Sentence (2) provided the building

(a) is not more than 2 storeys in building height,

(b) if unsprinklered, has a building area not more than the value in Table 3.2.2.L., and

(c) if sprinklered, is not more than twice the area limits of Clause (b).

Table 3.2.2.L.
Forming Part of Sentence 3.2.2.43.(1)

<table>
<thead>
<tr>
<th>No. of Storeys</th>
<th>Unsprinklered Maximum Area, m²</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Facing 1 Street</td>
</tr>
<tr>
<td>1</td>
<td>1 000</td>
</tr>
<tr>
<td>2</td>
<td>600</td>
</tr>
<tr>
<td>Column 1</td>
<td>2</td>
</tr>
</tbody>
</table>
3.2.2.43.

(2) The building shall be of combustible or noncombustible construction used either singly or in combination, and
(a) floor assemblies shall be fire separations with a fire-resistance rating of not less than 45 min, and
(b) all loadbearing walls, columns and arches shall have a fire-resistance rating not less than that required for the supported assembly.

3.2.2.44. Mercantile Buildings, up to 3 Storeys

(1) A building classified as Group E shall conform to Sentence (2) provided the building
(a) is not more than 3 storeys in building height, and
(b) has a building area not more than the value in Table 3.2.2.M.

<table>
<thead>
<tr>
<th>Table 3.2.2.M.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Forming Part of Sentence 3.2.2.44.(1)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>No. of Storeys</th>
<th>Unsprinkled Maximum Area, m²</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Facing 1 Street</td>
</tr>
<tr>
<td>1</td>
<td>1 500</td>
</tr>
<tr>
<td>2</td>
<td>1 200</td>
</tr>
<tr>
<td>3</td>
<td>800</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Sprinklered Maximum Area, m²</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
</tr>
<tr>
<td>2</td>
</tr>
<tr>
<td>3</td>
</tr>
</tbody>
</table>

(2) The building shall be of combustible or noncombustible construction used either singly or in combination, and
(a) floor assemblies shall be fire separations with a fire-resistance rating of not less than 45 min,
(b) mezzanines shall have, if of combustible construction, a fire-resistance rating of not less than 45 min,
(c) roof assemblies shall have a fire-resistance rating of not less than 45 min, except that in buildings not more than 1 storey in building height, the fire-resistance rating is permitted to be waived provided the roof assembly is of noncombustible construction or is constructed as a fire-retardant treated wood roof system conforming to Article 3.1.14.1., and
(i) if unsprinklered, the building area is not more than 1 500 m², and
(ii) if sprinklered, the building area is not more than 2 400 m² if facing 1 street, 3 000 m² if facing 2 streets, or 3 600 m² if facing 3 streets (see Article 3.2.2.12. for supervised sprinkler systems), and
(d) all loadbearing walls, columns and arches supporting an assembly required to have a fire-resistance rating shall have a fire-resistance rating of not less than 45 min or shall be of noncombustible construction, except that such members and assemblies supporting a fire separation shall have a fire-resistance rating not less than that required for the supported assembly.

3.2.2.45. Mercantile Buildings, up to 6 Storeys

(1) A building classified as Group E shall conform to Sentence (2) provided the building
(a) if unsprinklered, is not more than 3 storeys in building height and has a building area not more than 1 500 m², and
(b) if sprinklered, is not more than 6 storeys in building height and has a building area not more than the value in Table 3.2.2.N.

<table>
<thead>
<tr>
<th>Facing 2 Streets</th>
<th>Facing 3 Streets</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>4 800</td>
</tr>
<tr>
<td>2</td>
<td>2 400</td>
</tr>
<tr>
<td>3</td>
<td>1 600</td>
</tr>
</tbody>
</table>

(2) The building shall be of noncombustible construction, and
(a) floor assemblies shall be fire separations with a fire-resistance rating of not less than 2 h,
(b) mezzanines shall have a fire-resistance rating of not less than 1 h,
(c) roof assemblies shall have a fire-resistance rating of not less than 1 h, and
(d) all loadbearing walls, columns and arches shall have a fire-resistance rating not less
Table 3.2.2.N.
Forming Part of Sentence 3.2.2.45.(1)

<table>
<thead>
<tr>
<th>No. of Storeys</th>
<th>Sprinklered Maximum Area, m²</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Facing 1 Street</td>
</tr>
<tr>
<td>1</td>
<td>unlimited</td>
</tr>
<tr>
<td>2</td>
<td>7 500</td>
</tr>
<tr>
<td>3</td>
<td>5 000</td>
</tr>
<tr>
<td>4</td>
<td>3 750</td>
</tr>
<tr>
<td>5</td>
<td>3 000</td>
</tr>
<tr>
<td>6</td>
<td>2 500</td>
</tr>
<tr>
<td>Column 1</td>
<td>2</td>
</tr>
</tbody>
</table>

than that required for the supported assembly.

3.2.2.46. Mercantile Buildings, Any Height, Any Area, Sprinklered

(1) A building classified as Group E shall conform to Sentence (2) provided the building
(a) is not limited in building height,
(b) is sprinklered, and
(c) is not limited in building area.

(2) The building shall be of noncombustible construction, and
(a) floor assemblies shall be fire separations with a fire-resistance rating of not less than 3 h,
(b) mezzanines shall have a fire-resistance rating of not less than 1.5 h,
(c) roof assemblies shall have a fire-resistance rating of not less than 1.5 h (see Article 3.2.2.12. for supervised sprinkler systems), and
(d) all loadbearing walls, columns and arches shall have a fire-resistance rating not less than that required for the supported assembly.

3.2.2.47. Industrial Buildings, Division 1, 1 and 2 Storeys

(1) A building classified as Group F, Division 1 shall conform to Sentence (2) provided the building
(a) is not more than 2 storeys in building height,
(b) if unsprinklered, has a building area not more than the value in Table 3.2.2.O., and
(c) if sprinklered, is not more than twice the area limits of Clause (b).

Table 3.2.2.O.
Forming Part of Sentence 3.2.2.47.(1)

<table>
<thead>
<tr>
<th>No. of Storeys</th>
<th>Unsprinklered Maximum Area, m²</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Facing 1 Street</td>
</tr>
<tr>
<td>1</td>
<td>800</td>
</tr>
<tr>
<td>2</td>
<td>400</td>
</tr>
<tr>
<td>Column 1</td>
<td>2</td>
</tr>
</tbody>
</table>

(2) The building shall be of combustible or noncombustible construction used either singly or in combination, and
(a) floor assemblies shall be fire separations, and if of combustible construction, shall have a fire-resistance rating of not less than 45 min, and
(b) all loadbearing walls, columns and arches supporting an assembly required to have a fire-resistance rating shall have a fire-resistance rating of not less than 45 min or shall be of noncombustible construction.

3.2.2.48. Industrial Buildings, Division 1, up to 3 Storeys, Sprinklered

(1) A building classified as Group F, Division 1 shall conform to Sentence (2) provided the building
(a) is not more than 3 storeys in building height,
(b) is sprinklered, and
(c) has a building area not more than the value in Table 3.2.2.P.

(2) The building shall be of heavy timber or noncombustible construction used either singly or in combination, and
(a) floor assemblies shall be fire separations with a fire-resistance rating of not less than 45 min, and
(b) all loadbearing walls, columns and arches shall have a fire-resistance rating not less than that required for the supported assembly.
### 3.2.2.49.  Industrial Buildings, Division 1, up to 4 Storeys

**Table 3.2.2.P.**  Forming Part of Sentence 3.2.2.48.(1)

<table>
<thead>
<tr>
<th>No. of Storeys</th>
<th>Sprinklered Maximum Area, m²</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Facing 1 Street</td>
<td>Facing 2 Streets</td>
</tr>
<tr>
<td>1</td>
<td>2 400</td>
<td>3 000</td>
</tr>
<tr>
<td>2</td>
<td>1 200</td>
<td>1 500</td>
</tr>
<tr>
<td>3</td>
<td>800</td>
<td>1 000</td>
</tr>
<tr>
<td>Column 1</td>
<td>2</td>
<td>3</td>
</tr>
</tbody>
</table>

(d) all loadbearing walls, columns and arches shall have a fire-resistance rating not less than that required for the supported assembly.

### 3.2.2.50.  Industrial Buildings, Division 1, up to 4 Storeys, Sprinklered

**Table 3.2.2.R.**  Forming Part of Sentence 3.2.2.50.(1)

<table>
<thead>
<tr>
<th>No. of Storeys</th>
<th>Sprinklered Maximum Area, m²</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Facing 1 Street</td>
<td>Facing 2 Streets</td>
</tr>
<tr>
<td>1</td>
<td>6 000</td>
<td>7 500</td>
</tr>
<tr>
<td>2</td>
<td>3 000</td>
<td>3 750</td>
</tr>
<tr>
<td>3</td>
<td>2 000</td>
<td>2 500</td>
</tr>
<tr>
<td>4</td>
<td>1 500</td>
<td>1 875</td>
</tr>
<tr>
<td>Column 1</td>
<td>2</td>
<td>3</td>
</tr>
</tbody>
</table>

### 3.2.2.49.  Industrial Buildings, Division 1, up to 4 Storeys

(1) A building classified as Group F, Division 1 shall conform to Sentence (2) provided the building
(a) is not more than 4 storeys in building height,
(b) if unsprinklered, has a building area not more than the value in Table 3.2.2.Q., and
(c) if sprinklered, is not more than twice the area limits of Clause (b).

(2) The building shall be of noncombustible construction, and
(a) floor assemblies shall be fire separations with a fire-resistance rating of not less than 2 h,
(b) mezzanines shall have a fire-resistance rating of not less than 1 h,
(c) roof assemblies shall have a fire-resistance rating of not less than 1 h, and

### Table 3.2.2.Q.

**Forming Part of Sentence 3.2.2.49.(1)**

<table>
<thead>
<tr>
<th>No. of Storeys</th>
<th>Unsprinklered Maximum Area, m²</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Facing 1 Street</td>
<td>Facing 2 Streets</td>
</tr>
<tr>
<td>1</td>
<td>2 400</td>
<td>3 000</td>
</tr>
<tr>
<td>2</td>
<td>1 200</td>
<td>1 500</td>
</tr>
<tr>
<td>3</td>
<td>800</td>
<td>1 000</td>
</tr>
<tr>
<td>4</td>
<td>600</td>
<td>750</td>
</tr>
<tr>
<td>Column 1</td>
<td>2</td>
<td>3</td>
</tr>
</tbody>
</table>
### 3.2.2.51. Industrial Buildings, Division 2, 1 and 2 Storeys

1. A building classified as Group F, Division 2 shall conform to Sentence (2) provided the building
   (a) is not more than 2 storeys in building height, and
   (b) has a building area not more than the value in Table 3.2.2.S.

#### Table 3.2.2.S.
Forming Part of Sentence 3.2.2.51.(1)

<table>
<thead>
<tr>
<th>No. of Storeys</th>
<th>Unsprinklered Maximum Area, m²</th>
<th>Sprinklered Maximum Area, m²</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Facing 1 Street</td>
<td>Facing 2 Streets</td>
</tr>
<tr>
<td>1</td>
<td>1 000</td>
<td>1 250</td>
</tr>
<tr>
<td>2</td>
<td>600</td>
<td>750</td>
</tr>
<tr>
<td>Column 1</td>
<td>2</td>
<td>3</td>
</tr>
</tbody>
</table>

2. The building shall be of combustible or noncombustible construction used either singly or in combination, and
   (a) floor assemblies shall be fire separations with a fire-resistance rating of not less than 45 min,
   (b) mezzanines shall have, if of combustible construction, a fire-resistance rating of not less than 45 min,
   (c) roof assemblies shall have, if of combustible construction, a fire-resistance rating of not less than 45 min, except that in buildings not more than 1 storey in building height, the fire-resistance rating is permitted to be waived provided that the roof assembly is constructed as a fire-retardant treated wood roof system conforming to Article 3.1.14.1., and
   (i) if unsprinklered, the building area is not more than
       1 600 m² if facing 1 street,
       2 000 m² if facing 2 streets, or
       2 400 m² if facing 3 streets, and
   (ii) if sprinklered, the building area is not more than twice the area limits of Subclause (i) (see Article 3.2.2.12. for supervised sprinkler systems), and
   (d) all loadbearing walls, columns and arches supporting an assembly required to have a fire-resistance rating shall have a fire-resistance rating of not less than 45 min or shall be of noncombustible construction, except that such members and assemblies

### 3.2.2.52. Industrial Buildings, Division 2, up to 4 Storeys

1. A building classified as Group F, Division 2 shall conform to Sentence (2) provided the building
   (a) is not more than 4 storeys in building height,
   (b) if unsprinklered, has a building area not more than the value in Table 3.2.2.T., and
   (c) if sprinklered, is not more than twice the area limits of Clause (b).

#### Table 3.2.2.T.
Forming Part of Sentence 3.2.2.52.(1)

<table>
<thead>
<tr>
<th>No. of Storeys</th>
<th>Unsprinklered Maximum Area, m²</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Facing 1 Street</td>
</tr>
<tr>
<td>1</td>
<td>3 200</td>
</tr>
<tr>
<td>2</td>
<td>1 600</td>
</tr>
<tr>
<td>3</td>
<td>1 070</td>
</tr>
<tr>
<td>4</td>
<td>800</td>
</tr>
<tr>
<td>Column 1</td>
<td>2</td>
</tr>
</tbody>
</table>
supporting a fire separation shall have a fire-resistance rating not less than that required for the supported assembly. (See also Article 3.2.2.53.)

3.2.2.53. Industrial Buildings, Division 2, up to 4 Storeys

(1) A building classified as Group F, Division 2 shall conform to Sentence (2) provided the building
(a) is not more than 4 storeys in building height,
(b) if unsprinklered, has a building area not more than the value in Table 3.2.2.U., and
(c) if sprinklered, is not more than twice the area limits of Clause (b).

Table 3.2.2.U.
Forming Part of Sentence 3.2.2.53.(1)

<table>
<thead>
<tr>
<th>No. of Storeys</th>
<th>Unsprinklered Maximum Area, m²</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Facing 1 Street</td>
</tr>
<tr>
<td>1</td>
<td>6 000</td>
</tr>
<tr>
<td>2</td>
<td>3 000</td>
</tr>
<tr>
<td>3</td>
<td>2 000</td>
</tr>
<tr>
<td>4</td>
<td>1 500</td>
</tr>
<tr>
<td>Column 1</td>
<td>2</td>
</tr>
</tbody>
</table>

(2) The building shall be of noncombustible construction, and
(a) floor assemblies shall be fire separations with a fire-resistance rating of not less than 2 h,
(b) mezzanines shall have a fire-resistance rating of not less than 1 h,
(c) roof assemblies shall have a fire-resistance rating of 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.
(See also Article 3.2.2.52.)

3.2.2.54. Industrial Buildings, Division 2, up to 6 Storeys

(1) A building classified as Group F, Division 2 shall conform to Sentence (2) provided the building
(a) is not more than 6 storeys in building height,
(b) if unsprinklered, has a building area not more than the value in Table 3.2.2.V., and
(c) if sprinklered, is not more than twice the area limits of Clause (b).

Table 3.2.2.V.
Forming Part of Sentence 3.2.2.54.(1)

<table>
<thead>
<tr>
<th>No. of Storeys</th>
<th>Unsprinklered Maximum Area, m²</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Facing 1 Street</td>
</tr>
<tr>
<td>1</td>
<td>9 000</td>
</tr>
<tr>
<td>2</td>
<td>4 500</td>
</tr>
<tr>
<td>3</td>
<td>3 000</td>
</tr>
<tr>
<td>4</td>
<td>2 250</td>
</tr>
<tr>
<td>5</td>
<td>1 800</td>
</tr>
<tr>
<td>6</td>
<td>1 500</td>
</tr>
<tr>
<td>Column 1</td>
<td>2</td>
</tr>
</tbody>
</table>

(2) The building shall be of noncombustible construction, and
(a) floor assemblies shall be fire separations with a fire-resistance rating of not less than 2 h,
(b) mezzanines shall have a fire-resistance rating of not less than 1 h,
(c) roof assemblies shall have a fire-resistance rating of 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.

3.2.2.55. Industrial Buildings, Division 2, Any Height, Any Area, Sprinklered

(1) A building classified as Group F, Division 2 shall conform to Sentence (2) provided the building
(a) is not limited in building height,
(b) is sprinklered, and
(c) is not limited in building area.

(2) The building shall be of noncombustible construction, and
(a) floor assemblies shall be fire separations with a fire-resistance rating of not less than 3 h,
(b) mezzanines shall have a fire-resistance rating of not less than 1.5 h,
(c) roof assemblies shall have a fire-resistance rating of not less than 1.5 h (see Article 3.2.2.12. for supervised sprinkler systems), and
(d) all loadbearing walls, columns and arches shall have a fire-resistance rating not less than that required for the supported assembly.

3.2.2.56. Industrial Buildings, Division 3, 1 and 2 Storeys

(1) A building classified as Group F, Division 3 shall conform to Sentence (2) provided the building
(a) is not more than 2 storeys in building height, and
(b) has a building area not more than the value in Table 3.2.2.W.

(2) The building shall be of combustible or noncombustible construction used either singly or in combination, and
(a) floor assemblies shall be fire separations and, if of combustible construction, shall have a fire-resistance rating of not less than 45 min, and
(b) all loadbearing walls, columns and arches supporting an assembly required to have a fire-resistance rating shall have a fire-resistance rating of not less than 45 min or shall be of noncombustible construction.

3.2.2.57. Industrial Buildings, Division 3, up to 4 Storeys

(1) A building classified as Group F, Division 3 shall conform to Sentence (2) provided the building
(a) is not more than 4 storeys in building height,
(b) if unsprinklered, has a building area not more than the value in Table 3.2.2.X., and
(c) if sprinklered, is not more than twice the area limits of Clause (b).

Table 3.2.2.W.
Forming Part of Sentence 3.2.2.56.(1)

<table>
<thead>
<tr>
<th>No. of Storeys</th>
<th>Unsprinklered Maximum Area, m²</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Facing 1 Street</td>
</tr>
<tr>
<td>1</td>
<td>1 600</td>
</tr>
<tr>
<td>2</td>
<td>800</td>
</tr>
</tbody>
</table>

Sprinklered Maximum Area, m²

<table>
<thead>
<tr>
<th>No. of Storeys</th>
<th>Unsprinklered Maximum Area, m²</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Facing 1 Street</td>
</tr>
<tr>
<td>1</td>
<td>4 800</td>
</tr>
<tr>
<td>2</td>
<td>1 600</td>
</tr>
</tbody>
</table>

Table 3.2.2.X.
Forming Part of Sentence 3.2.2.57.(1)

<table>
<thead>
<tr>
<th>No. of Storeys</th>
<th>Unsprinklered Maximum Area, m²</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Facing 1 Street</td>
</tr>
<tr>
<td>1</td>
<td>4 800</td>
</tr>
<tr>
<td>2</td>
<td>1 600</td>
</tr>
</tbody>
</table>

(2) The building shall be of combustible or noncombustible construction used either singly or in combination, and
(a) floor assemblies shall be fire separations and, if of combustible construction, shall have a fire-resistance rating of not less than 45 min,
(b) mezzanines shall have, if of combustible construction, a fire-resistance rating of not less than 45 min,
(c) roof assemblies shall have, if of combustible construction, a fire-resistance rating of not less than 45 min, except that in buildings not more than 1 storey in building height, the fire-resistance rating is permitted to be
waived provided that the roof assembly is constructed as a fire-retardant treated wood roof system conforming to Article 3.1.14.1., and
   (i) if unsprinklered, the building area is not more than
       2 400 m² if facing 1 street,
       3 000 m² if facing 2 streets, or
       3 600 m² if facing 3 streets, and
   (ii) if sprinklered, the building area is not more than twice the area limits of Subclause (i) (see Article 3.2.2.12. for supervised sprinkler systems), and
   (d) all loadbearing walls, columns and arches supporting an assembly required to have a fire-resistance rating shall have a fire-resistance rating of not less than 45 min or shall be of noncombustible construction.

3.2.2.58. Industrial Buildings, Division 3, 1 Storey

   (1) A building classified as Group F, Division 3 shall conform to Sentence (2) provided the building
       (a) is not more than 1 storey in building height, and
       (b) if unsprinklered, has a building area not more than the value in Table 3.2.2.Y., and
       (c) if sprinklered, is not more than twice the area limits of Clause (b).

   (2) The building shall be of heavy timber or noncombustible construction used either singly or in combination.

Table 3.2.2.Y.
Forming Part of Sentence 3.2.2.58. (1)

<table>
<thead>
<tr>
<th>No. of Storeys</th>
<th>Unsprinklered Maximum Area, m²</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Facing 1 Street</td>
</tr>
<tr>
<td>1</td>
<td>5 600</td>
</tr>
<tr>
<td>Column 1</td>
<td>2</td>
</tr>
</tbody>
</table>

3.2.2.59. Industrial Buildings, Division 3, 1 Storey, Any Area, Low Fire Load Occupancy

   (1) A building classified as Group F, Division 3 shall conform to Sentence (2) provided the building
       (a) is not more than 1 storey in building height,
       (b) is used solely for low fire load occupancies such as
           (i) power generating plants, or
           (ii) plants for the manufacture or storage of noncombustible materials such as asbestos, brick, cement, concrete or steel, and
       (c) is not limited in building area.

   (2) The building shall be of noncombustible construction.

3.2.2.60. Industrial Buildings, Division 3, Storage Garages up to 22 m High

   (1) A building used as a storage garage with all storeys constructed as open-air storeys and having no other occupancy above it is permitted to have its floor, wall, ceiling and roof assemblies constructed without a fire-resistance rating provided the building is
       (a) of noncombustible construction,
       (b) not more than 22 m high, measured between grade and the ceiling level of the top storey,
       (c) not more than 10 000 m² in building area, and
       (d) designed so that every portion of each floor area is within 60 m of an exterior wall opening.

3.2.2.61. Industrial Buildings, Division 3, up to 6 Storeys

   (1) A building classified as Group F, Division 3 shall conform to Sentence (2) provided the building
       (a) is not more than 6 storeys in building height,
       (b) if unsprinklered, has a building area not more than the value in Table 3.2.2.Z., and
       (c) if sprinklered, is not more than twice the area limits of Clause (b).
Table 3.2.2.Z.
Forming Part of Sentence 3.2.2.61.(1)

<table>
<thead>
<tr>
<th>No. of Storeys</th>
<th>Facing 1 Street</th>
<th>Facing 2 Streets</th>
<th>Facing 3 Streets</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>unlimited</td>
<td>unlimited</td>
<td>unlimited</td>
</tr>
<tr>
<td>2</td>
<td>7 200</td>
<td>9 000</td>
<td>10 800</td>
</tr>
<tr>
<td>3</td>
<td>4 800</td>
<td>6 000</td>
<td>7 200</td>
</tr>
<tr>
<td>4</td>
<td>3 600</td>
<td>4 500</td>
<td>5 400</td>
</tr>
<tr>
<td>5</td>
<td>2 880</td>
<td>3 600</td>
<td>4 320</td>
</tr>
<tr>
<td>6</td>
<td>2 400</td>
<td>3 000</td>
<td>3 600</td>
</tr>
</tbody>
</table>

(2) The building shall be of noncombustible construction, and
(a) floor assemblies shall be fire separations with a fire-resistance rating of not less than 1 h,
(b) mezzanines shall have a fire-resistance rating of not less than 1 h,
(c) roof assemblies shall have a fire-resistance rating of 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.

3.2.2.62. Industrial Buildings, Division 3, Any Height, Any Area

(1) A building classified as Group F, Division 3 shall conform to Sentence (2) provided the building
(a) is not limited in building height, and
(b) is not limited in building area.

(2) The building shall be of noncombustible construction, and
(a) floor assemblies shall be fire separations with a fire-resistance rating of not less than 2 h, except that such floor assemblies are permitted to be reduced to fire separations with a fire-resistance rating of not less than 1 h in a storage garage with all storeys constructed as open-air storeys,
(b) mezzanines shall have a fire-resistance rating of not less than 1 h,
(c) roof assemblies shall have a fire-resistance rating of 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.

3.2.3. Spatial Separation and Exposure Protection of Buildings

3.2.3.1. Limiting Distance and Area of Unprotected Openings

(1) Except as provided in Articles 3.2.3.9. to 3.2.3.11., the area of unprotected openings shall not be more than that set forth in Tables 3.2.3.A. or 3.2.3.B. for the limiting distance applicable to the exposing building face under consideration. (See A-3, Fire Fighting Assumptions in Appendix A.)

(2) The area of the unprotected openings in an exposing building face shall be the aggregate area of unprotected openings expressed as a percentage of the area of the exposing building face in Tables 3.2.3.A. and 3.2.3.B. (See Sentence 3.2.3.2.(1).)

(3) For the purposes of determining the type of construction and cladding and the fire-resistance rating of an exterior wall, the exposing building face shall be taken as the projection of the exterior wall onto a vertical plane located so that no portion of the exterior wall of the building or of a fire compartment, if the fire compartment complies with the requirements of Sentence 3.2.3.2.(1), is between the vertical plane and the line to which the limiting distance is measured and, for these purposes, the area of unprotected openings shall be determined from Table 3.2.3.A. or Table 3.2.3.B.

(4) For the purposes of determining the actual percentage of unprotected openings permitted in an exterior wall, the location of the exposing building face is permitted to be taken at a vertical plane located so that there are no unprotected openings between the vertical plane and the line to which the limiting distance is measured. (See Appendix A.)

(5) Where fire fighting facilities cannot reach the building within 10 min of the alarm being received, the limiting distance shall be doubled.
### Table 3.2.3.A.
Forming Part of Subsection 3.2.3.

<table>
<thead>
<tr>
<th>Exposing Building Face</th>
<th>Area of Unprotected Opening for Groups A, B, C, D and F, Division 3 Occupancies, Per Cent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Max. Area, m²</td>
<td>Ratio (L/H or H/L)</td>
</tr>
<tr>
<td>-----------------</td>
<td>-----------------</td>
</tr>
<tr>
<td>0</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>Less than 3:1</td>
</tr>
<tr>
<td></td>
<td>3:1 to 10:1</td>
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<tr>
<td></td>
<td>Over 10:1</td>
</tr>
<tr>
<td>15</td>
<td>Less than 3:1</td>
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<tr>
<td></td>
<td>3:1 to 10:1</td>
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<tr>
<td></td>
<td>Over 10:1</td>
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<tr>
<td>20</td>
<td>Less than 3:1</td>
</tr>
<tr>
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<td>3:1 to 10:1</td>
</tr>
<tr>
<td></td>
<td>Over 10:1</td>
</tr>
<tr>
<td>25</td>
<td>Less than 3:1</td>
</tr>
<tr>
<td></td>
<td>3:1 to 10:1</td>
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<td>Over 10:1</td>
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<td>30</td>
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<td>3:1 to 10:1</td>
</tr>
<tr>
<td></td>
<td>Over 10:1</td>
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<td>40</td>
<td>Less than 3:1</td>
</tr>
<tr>
<td></td>
<td>3:1 to 10:1</td>
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<tr>
<td></td>
<td>Over 10:1</td>
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<td></td>
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<tr>
<td>100</td>
<td>Less than 3:1</td>
</tr>
<tr>
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<td>3:1 to 10:1</td>
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<tr>
<td></td>
<td>Over 10:1</td>
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<tr>
<td>150</td>
<td>Less than 3:1</td>
</tr>
<tr>
<td></td>
<td>3:1 to 10:1</td>
</tr>
<tr>
<td></td>
<td>Over 10:1</td>
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<td>250</td>
<td>Less than 3:1</td>
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<td>3:1 to 10:1</td>
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<tr>
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<tr>
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<td></td>
<td>Over 10:1</td>
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<tr>
<td></td>
<td>3:1 to 10:1</td>
</tr>
<tr>
<td></td>
<td>Over 10:1</td>
</tr>
</tbody>
</table>

Note to Table 3.2.3.A.
L = Length of Exposing Building Face
H = Height of Exposing Building Face
(Apply whichever ratio is greater)
### Table 3.2.3.B.
Forming Part of Subsection 3.2.3.

<table>
<thead>
<tr>
<th>Max Area, ( m^2 )</th>
<th>Ratio (L/H or H/L)(^{(1)} )</th>
<th>Limiting Distance, m</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Less than 3 : 1</td>
<td>0</td>
<td>4</td>
</tr>
<tr>
<td>3 : 1 to 10 : 1</td>
<td>0</td>
<td>4</td>
</tr>
<tr>
<td>Over 10 : 1</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Less than 3 : 1</td>
<td>0</td>
<td>4</td>
</tr>
<tr>
<td>3 : 1 to 10 : 1</td>
<td>0</td>
<td>4</td>
</tr>
<tr>
<td>Over 10 : 1</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Less than 3 : 1</td>
<td>0</td>
<td>4</td>
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<tr>
<td>3 : 1 to 10 : 1</td>
<td>0</td>
<td>4</td>
</tr>
<tr>
<td>Over 10 : 1</td>
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<td>0</td>
</tr>
<tr>
<td>Less than 3 : 1</td>
<td>0</td>
<td>4</td>
</tr>
<tr>
<td>3 : 1 to 10 : 1</td>
<td>0</td>
<td>4</td>
</tr>
<tr>
<td>Over 10 : 1</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

\( \text{Note to Table 3.2.3.B.} \)

\( L = \text{Length of Exposing Building Face} \)

\( \text{H = Height of Exposing Building Face} \)

\(? \text{Apply whichever ratio is greater}\)

\(^{(1)} \text{L = Length of Exposing Building Face}\)

\(^{(2)} \text{H = Height of Exposing Building Face}\)

\(^{(3)} \text{Apply whichever ratio is greater}\)
3.2.3.2. Area of Exposing Building Face

(1) 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, except that where 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 such fire separations

(a) in Group A, B, C, D or Group F, Division 3 occupancy have a fire-resistance rating not less than that required for the floor assembly, but shall not be less than 45 min and need not be more than 1 h, and

(b) in Group E or Group F, Division 1 or 2 occupancy have a fire-resistance rating not less than that required for the floor assembly, but not less than 45 min.

3.2.3.3. Wall Enclosing Attic or Roof Space. Where an exterior wall enclosing an attic or roof space is located above an exposing building face, the wall shall be constructed in conformance with the requirements for the exposing building face.

3.2.3.4. Party Wall. Every wall that is a party wall shall be constructed as a firewall.

3.2.3.5. Wall with Limiting Distance Less Than 1.2 m. Openings in every wall that has a limiting distance of less than 1.2 m shall be protected by closures of other than wired glass or glass block, whose fire-protection rating is in conformance with the fire-resistance rating required for the wall.

3.2.3.6. Combustible Projection Restrictions. Except for buildings containing 1 or 2 dwelling units only, combustible projections on the exterior of a wall that are more than 1 m above ground level, such as balconies, platforms, canopies, eave projections and stairs, and that could expose an adjacent building to fire spread, shall not be permitted within 1.2 m of a property line or the centreline of a public way, or within 2.4 m of a combustible projection on another building on the same property.

3.2.3.7. Construction of Exposing Building Face

(1) Except as permitted in Articles 3.2.3.9. and 3.2.3.10., where a limiting distance shown in Table

3.2.3.A. for a Group A, B, C, D or Group F, Division 3 occupancy classification is such as to permit an exposing building face to have unprotected openings of

(a) not more than 10 per cent of the exposing building face, the exposing building face shall be of noncombustible construction having a fire-resistance rating of not less than 1 h and be clad with noncombustible cladding,

(b) more than 10 per cent but not more than 25 per cent of the exposing building face, the exposing building face shall have a fire-resistance rating of not less than 1 h and be clad with noncombustible cladding, and

(c) more than 25 per cent but less than 100 per cent of the exposing building face, the exposing building face shall have a fire-resistance rating of not less than 45 min.

(2) Except as permitted in Article 3.2.3.9., where a limiting distance shown in Table 3.2.3.B. for a Group E, or Group F, Division 1 or 2 occupancy classification is such as to permit an exposing building face to have unprotected openings of

(a) not more than 10 per cent of the exposing building face, the exposing building face shall be of noncombustible construction having a fire-resistance rating of not less than 2 h and be clad with noncombustible cladding,

(b) more than 10 per cent but not more than 25 per cent of the exposing building face, the exposing building face shall have a fire-resistance rating of not less than 2 h, and be clad with noncombustible cladding, and

(c) more than 25 per cent but less than 100 per cent of the exposing building face, the exposing building face shall have a fire-resistance rating of not less than 1 h.

(3) In addition to the requirements of Sentences (1) and (2), foamed plastic insulation used in an exterior wall of a building more than 3 storeys in building height shall be protected on the exterior surface by

(a) concrete or masonry not less than 25 mm thick,

(b) material that is permitted for use in noncombustible construction in Article 3.1.5.5. (see Appendix A), or

(c) noncombustible material that will remain in place for not less than 15 min when tested
in conformance with CAN4-S101-M, 

3.2.3.8. Protection of Structural Members
(1) Structural members, such as beams, columns and arches placed wholly or partly outside an exterior face of a building and 3 m or more from the property line or centreline of a public thoroughfare need not be protected from exterior fires.

(2) Structural members in Sentence (1) that are less than 3 m from the property line or centreline of a public thoroughfare shall be protected from exterior fire by fire protection having a fire-resistance rating not less than that required for their protection from inside fires in conformance with Articles 3.2.2.16. to 3.2.2.62., or by fire protection having a fire-resistance rating of not less than 1 h, whichever is the greater.

(3) Structural members of heavy timber construction such as beams, columns and arches placed wholly or partly outside an exterior face of a building and 3 m or more from the property line or centreline of a public thoroughfare need not be covered with noncombustible cladding.

3.2.3.9. Unlimited Unprotected Openings
(1) An exposing building face in a storage garage with all storeys constructed as open-air storeys is permitted to have unlimited unprotected openings provided it has a limiting distance of not less than 3 m.

(2) The exposing building face of a storey that faces a street and is at the same level as the street is permitted to have unlimited unprotected openings if the limiting distance is not less than 9 m.

3.2.3.10. Low Fire Load, 1 Storey Building
(1) For any building of Group F, Division 3 occupancy, any non-loadbearing wall comprising an exposing building face is permitted to be of noncombustible construction without a fire-resistance rating provided the building
(a) is not more than 1 storey in building height,
(b) is used for low fire load occupancies such as described in Sentence 3.2.2.59.(1), and
(c) is located so that the limiting distance is not less than 3 m.

3.2.3.11. Increased Openings Permitted
(1) The maximum area of unprotected openings in any exposing building face is permitted to be doubled where the building is sprinklered.

(2) The maximum area of unprotected openings in any exposing building face is permitted to be doubled where such openings are glazed with glass block or with wired glass conforming to the requirements of Article 3.1.8.14. (See Appendix A.)

3.2.3.12. Equivalent Opening Factor.
Where the surface temperature on the unexposed surface of a wall assembly exceeds the limitation of a standard fire test as permitted in Article 3.1.7.2., an allowance shall be made for the radiation from the hot unexposed wall surface by adding an equivalent area of unprotected opening to the area of actual openings as follows:
\[ A_C = A + (A_F \times F_{EO}) \]

where
\[ A_C = \text{corrected area of unprotected openings including actual and equivalent openings,} \]
\[ A = \text{actual area of unprotected openings,} \]
\[ A_F = \text{area of exterior surface of the exposing building face exclusive of openings on which the temperature limitation of the standard test is exceeded, and} \]
\[ F_{EO} = \text{an equivalent opening factor derived from the following expression:} \]
\[ F_{EO} = \frac{(T_u + 273)^4}{(T_e + 273)^4} \]

where
\[ T_u = \text{average temperature in degrees Celsius of the unexposed wall surface at the time the required fire-resistance rating is reached under test conditions, and} \]
\[ T_e = 892^\circ C \text{for a fire-resistance rating of not less than 45 min, } 927^\circ C \text{for a fire-resistance rating of not less than 1 h, and } 1010^\circ C \text{for a fire-resistance rating of not less than 2 h.} \]
3.2.3.13. Protection of Exit Facilities

(1) Except as required in Sentence (3), where an exit enclosure has exterior walls that may be exposed to fire from openings in the exterior walls of the building it serves, the openings in either the exterior walls of the exit or the exterior walls of the building shall be protected with wired glass in fixed steel frames or glass block conforming to Article 3.1.8.14. where the openings in the exterior walls of the building are within 3 m horizontally and
   (a) less than 10 m below openings in the exterior walls of the exit, or
   (b) less than 2 m above openings in the exterior walls of the exit.

(2) Where an unenclosed exterior exit stair or ramp may be exposed to fire from openings in the exterior walls of the building it serves, the openings in the exterior walls of the building shall be protected with wired glass in fixed steel frames or glass block conforming to Article 3.1.8.14. where the openings in the exterior walls of the building are within 3 m horizontally and
   (a) less than 10 m below the exit stair or ramp, or
   (b) less than 5 m above the exit stair or ramp.

(3) Except as provided in Sentence 3.4.4.3.(1), where an exterior exit door in one fire compartment is within 3 m horizontally of an unprotected opening in another fire compartment and the exterior walls of these fire compartments intersect at an exterior angle of less than 135°, the opening shall be protected with wired glass in fixed steel frames or glass block conforming to Article 3.1.8.14.

3.2.3.14. Wall Exposed to Another Wall

(1) Except as provided in Sentences 3.2.3.13.(1) and 3.2.3.20.(4), where an opening in an exterior wall of a fire compartment is exposed to an opening in the exterior wall of another fire compartment, and the planes of the 2 walls are parallel or at an angle of 135° or less, measured from the exterior of the building, the openings in the 2 fire compartments shall be separated by a distance of not less than \( D_o \) where

\[
    D_o = 2D - \left( \frac{\theta}{90} \times D \right), \text{ but in no case less than } 1 \text{m},
\]

where

\[
    D = \text{the greater required limiting distance for the exposing building faces of the 2 fire compartments, and}
\]

\[
    \theta = \text{the angle made by the intersecting planes of the exposing building faces of the 2 fire compartments (in the case where the exterior walls are parallel and face each other, } \theta = 0^\circ). \text{ (See Appendix A.)}
\]

(2) The exterior wall of each fire compartment in Sentence (1) within the distance, \( D_o \), shall have a fire-resistance rating not less than that required for the interior vertical fire separation between the compartment and the remainder of the building.

3.2.3.15. Wall Exposed to Adjoining Roof. Except as permitted in Sentence 3.2.3.20.(4), 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, and the exposed wall contains windows within 3 storeys vertically and 5 m horizontally of such roof, the roof shall contain no skylights within 5 m of the exposed wall.

3.2.3.16. Protection of Soffits

(1) Where there is a common attic or roof space above more than 2 suites of residential occupancy or above more than 2 patients’ sleeping rooms, and the common attic or roof space projects beyond the exterior wall of the building, the soffit and any opening in the soffit or other surface of the projection located within 2.5 m of a window or door opening shall be protected by
   (a) noncombustible material not less than 0.38 mm thick and having a melting point not below 650°C,
   (b) plywood not less than 11 mm thick,
   (c) strandboard or waferboard not less than 12.5 mm thick, or
   (d) lumber not less than 11 mm thick.

(2) The soffit protection required in Sentence (1) shall extend the full width of the opening and to not less than 1.2 m on either side of it, with no unprotected opening into the soffit within this limit.

(3) Where an eave overhang is completely separated from the remainder of the attic or roof space by fire stopping, the requirements in Sentence (1) do not apply.
3.2.3.17. Apron, Canopy or Spandrel Protection for Vertically Separated Openings.
Where any storey of a building classified as a Group E or Group F, Division 1 or 2 major occupancy is required to be separated from the storey above or below by a fire separation, every opening in an exterior wall located vertically above another opening shall be separated by apron or spandrel walls not less than 1 m high or by a canopy not less than 1 m wide at each floor level and the apron, spandrel or canopy shall have a fire-resistance rating not less than that of the construction required for the floor assembly but need not be more than 1 h, except as required elsewhere in this Subsection.

3.2.3.18. Roof Coverings
(1) Except as provided in Sentence (2), every building shall have a Class A, B or C roof covering as described in Subsection 3.1.15.
(2) Roof coverings are not required to have a Class A, B or C rating for
   (a) tents and air-supported structures, and
   (b) buildings of Group A, Division 2 occupancy not more than 2 storeys in building height and not more than 1 000 m² in building area provided the roof covering is underlaid with noncombustible material.

3.2.3.19. Covered Vehicular Passageway
(1) A covered vehicular passageway shall be of noncombustible construction when constructed below grade, and
   (b) be separated from every building or part of a building adjoining it by a fire separation having a fire-resistance rating of not less than 1.5 h where it is designed as a receiving or shipping area.

3.2.3.20. Walkway between Buildings
(1) Except as provided in Sentence 3.2.3.21.(2), where buildings are connected by a walkway, each building shall be separated from the walkway by a fire separation with a fire-resistance rating of not less than 45 min.
(2) Except as provided in Sentence (3), a walkway connected to a building required to be of noncombustible construction shall also be of noncombustible construction.

3.2.3.21. Underground Walkway
(1) An underground walkway shall not be designed or used for any purpose other than pedestrian travel unless such other purpose is acceptable to the authority having jurisdiction and any space in the walkway containing an occupancy is sprinklered.
(2) Buildings connected by an underground walkway shall be separated from the walkway by a fire separation with a fire-resistance rating of not less than 1 h.
(3) An underground walkway shall be of noncombustible construction suitable for underground location.
(4) Smoke barrier doors shall be installed in underground walkways at intervals of not more than 100 m, or 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 for any of the adjacent occupancies as prescribed in Sentence 3.4.2.5.(1).

3.2.4. Fire Alarm and Detection Systems
(See Appendix A.)

3.2.4.1. Determination of Requirement for a Fire Alarm System
(1) Except as provided in Sentences (2) to (4), a fire alarm system shall be installed when the occupant load in Table 3.2.4.A. for any major occupancy is exceeded, and in buildings containing
   (a) a contained use area,
   (b) an impeded egress zone,
   (c) an interconnected floor space required to conform to Articles 3.2.8.3. to 3.2.8.9.,
(d) more than 3 storeys, including storeys below grade,

(e) a total occupant load of more than 300, other than in open air seating areas,

(f) an occupant load of more than 150 above or below the first storey, other than in open air seating areas, or

(g) a child care facility, including a day care facility, with an occupant load of more than 40.

Table 3.2.4.A.

<table>
<thead>
<tr>
<th>Major Occupancy Classification</th>
<th>Occupant Load Above which a Fire Alarm System Is Required</th>
</tr>
</thead>
<tbody>
<tr>
<td>Group A, Division 2 (licensed beverage establishments and restaurants only)</td>
<td>150</td>
</tr>
<tr>
<td>Group A, Division 2 (schools and colleges only)</td>
<td>40</td>
</tr>
<tr>
<td>Group A, Division 4</td>
<td>300 below the seating area</td>
</tr>
<tr>
<td>Group B, Division 2</td>
<td>10 receiving care or treatment</td>
</tr>
<tr>
<td>Group C</td>
<td>10 having sleeping accommodation</td>
</tr>
<tr>
<td>Group F, Division 1</td>
<td>25</td>
</tr>
<tr>
<td>Group F Division 2 and 3</td>
<td>75 above or below the first storey</td>
</tr>
</tbody>
</table>

(2) A fire alarm system is not required in apartment buildings where not more than 4 dwelling units share a common means of egress, or in buildings 3 storeys or less in building height where each dwelling unit is served by an exterior exit facility leading to ground level.

(3) A fire alarm system is not required in hotels or motels 3 storeys or less in building height where each suite is served by an exterior exit facility leading to ground level.

(4) A fire alarm system is not required in a storage garage conforming to Article 3.2.2.60. provided there are no other occupancies in the building.

3.2.4.2. Continuity of Fire Alarm System

(1) Where 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 provided in Sentence (4), where 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 provided in Sentence (4), where a fire alarm system is required in any portion of a building, it shall be installed throughout the building.

(4) Except as provided in Sentence (5), in a building not more than 3 storeys in building height, where a vertical fire separation having a fire-resistance rating of not less than 1 h separates a portion of the building from the remainder of the building and there are no openings through the fire separation, other than those for piping, tubing, wiring and totally enclosed noncombustible raceways, the requirements in this Subsection are permitted to be applied to each portion so separated as if it were a separate building.

(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.

3.2.4.3. Types of Fire Alarm Systems

(1) Fire alarm systems shall be

(a) single stage systems in Group F, Division 1 occupancies,

(b) 2 stage systems in Group B occupancies other than those described in Clause (c),

(c) single or 2 stage systems in buildings 3 storeys or less in building height used for children’s custodial homes, convalescent homes or orphanages, and

(d) single or 2 stage systems 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 appliances in the system. (See Appendix A.)

(2) A 2 stage fire alarm system shall
(a) cause an alert signal to sound upon the operation of any manual pull station or fire detector,
(b) automatically cause an alarm signal to sound if the alert signal is not acknowledged within 5 min of its initiation, and
(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.
(See Appendix A.)

(3) Fire alarm systems in Sentences (1) and (2) are permitted to be zone coded so that, upon the operation of any manual pull station or fire detector,
(a) a coded alarm signal is sounded for a single stage system or a coded alert signal is sounded for a 2 stage system indicating the zone of alarm initiation,
(b) the coded alert signal or alarm signal is repeated in its entirety not less than 4 times, and
(c) a continuous alert signal or alarm signal is sounded upon completion of the coded signals in Clause (b) and Sentence (4).

(4) When a second manual pull station or fire detector is operated in a system in Sentence (3), in a zone other than that for which the first alert signal or alarm signal was sounded, the coded alert signal or alarm signal for the first zone shall be completed before the coded alert signal or alarm signal for the second zone is repeated not less than 4 times.

3.2.4.7. Signals to Fire Department

(1) Where 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 (3) that an alarm signal has been initiated in
(a) Group A occupancies having an occupant load of more than 300,
(b) Group B occupancies,
(c) Group F, Division 1 occupancies,
(d) buildings regulated by the provisions of Subsection 3.2.6., or
(e) buildings containing interconnected floor space required to conform to Articles 3.2.8.3. to 3.2.8.9.

(2) Where a fire alarm system is required to be installed and a 2 stage system is provided, the system shall be designed to notify the fire department in conformance with Sentence (3) that an alert signal has been initiated.

(3) Except as permitted in Sentence (4), signals to the fire department shall be by way of
(a) the municipal fire alarm system,
(b) an independent central station conforming to NFPA-71, “Installation, Maintenance, and Use of Central Station Signaling Systems,” or
(c) a proprietary control centre conforming to NFPA-72D, “Installation, Maintenance, and Use of Proprietary Protective Signaling Systems.”

(4) When the facilities in Sentence (3) are not available in the municipality in which the building is to be built, an independent system is permitted to be used to transmit signals to the fire department.

(5) Where a required fire alarm system has been installed with no provisions to transmit a signal to the fire department as indicated in Sentences (2), (3) and (4), a legible, permanently-mounted notice
3.2.4.7.

shall be posted at each manual pull station requesting that the fire department be notified and including the telephone number of that department.

3.2.4.8. Annunciator and Zone Indication

(1) Except as permitted in Sentences (2) to (5), an annunciator shall be installed in close proximity to a building entrance that faces a street or an access route for fire department vehicles that complies with Sentence 3.2.5.6.(1) and the annunciator shall have separate zone indicators of the actuation of the alarm initiating devices in each

(a) floor area so that the area of coverage for each zone is not more than 2 000 m²,
(b) fire compartment required to be separated by vertical fire separations having a fire-resistance rating of not less than 2 h, other than dwelling units described in Subsection 3.3.4,
(c) shaft required to be equipped with fire detectors,
(d) air handling system required to be equipped with smoke detectors,
(e) contained use area, and
(f) impeded egress zone.

(See Appendix A.)

(2) An annunciator need not be provided for a fire alarm system when not more than one zone indicator is required in Sentence (1).

(3) When an annunciator is not installed as part of a required fire alarm system in conformance with Sentence (1), a visual and audible trouble signal device shall be provided inside the main entrance of the building.

(4) The requirements in Sentence (1) are waived in a building that has an aggregate area for all storeys of not more than 2 000 m² and is not more than 3 storeys in building height.

(5) Where a sprinkler system is used in lieu of heat detectors in conformance with Article 3.2.4.16., the requirements for zone indication in Clauses (1)(a) and (b) are waived provided the actuation of the alarm initiating devices is indicated on the annunciator in conformance with the zone indication requirements for the sprinkler system. (See Appendix A.)

3.2.4.9. Electrical Supervision. Electrical supervision shall be provided for required fire alarm systems.

3.2.4.10. Fire Detectors

(1) Fire detectors required in this Article shall be connected to the fire alarm system.

(2) Except as provided in Article 3.2.4.16., where a fire alarm system is required, fire detectors shall be installed in

(a) storage rooms not within dwelling units,
(b) service rooms not within dwelling units,
(c) janitors’ rooms,
(d) elevator and dumbwaiter shafts, and
(e) rooms where hazardous products are to be used or stored.

3.2.4.11. Heat Detectors

(1) Except as provided in Article 3.2.4.16., where a fire alarm system is required, heat detectors shall be installed

(a) in every room in portions of buildings classified as Group A, Division 1 or Group B major occupancy other than sleeping rooms, and
(b) 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. (See also Article 3.2.4.21. for smoke alarms.)

3.2.4.12. Smoke Detectors

(1) Where a fire alarm system is required, smoke detectors shall be installed in

(a) every sleeping room and every corridor serving as part of a means of egress from sleeping rooms in portions of buildings classified as Group B major occupancy,
(b) every room in a contained use area and corridors serving those rooms,
(c) every corridor in portions of buildings classified as Group A, Division 1 major occupancy,
(d) every public corridor in portions of buildings classified as Group C major occupancy,
(e) every exit stair shaft, and
(f) the vicinity of draft stops required by Article 3.2.8.7. (See Appendix A.)
3.2.4.13. Prevention of Smoke Circulation

(1) Where a fire alarm system is required, every recirculating air handling system shall be designed to prevent the circulation of smoke upon a signal from a duct-type smoke detector where the air handling system

(a) serves more than one storey,
(b) serves more than one suite in a storey,
(c) serves more than one zone required in Sentence 3.3.3.6.(6), or
(d) serves more than one fire compartment required in Sentence 3.3.3.7.(2).

3.2.4.14. Vacuum Cleaning System Shutdown. Central vacuum cleaning systems in buildings required to be 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 in Sentence (3), in buildings 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 detectors are actuated, the elevators will automatically return directly to an alternate floor level. (See A-3.2.6.8.(6)(a) in Appendix A.)

(2) Smoke detectors required in Sentence (1) shall be designed as part of the building fire alarm system.

(3) The alternate floor recall feature specified in Sentence (1) is not required if the floor area containing the recall level is sprinklered.

3.2.4.16. Sprinklers in Lieu of Heat Detectors

(1) Heat detectors in Articles 3.2.4.10. and 3.2.4.11. need not be provided where an automatic sprinkler system conforming to Sentences (2) to (5) and Article 3.2.5.13. is installed throughout the floor area.

(2) If an annunciator is required by Article 3.2.4.8., automatic sprinkler systems referred to in Sentence (1) shall be equipped with flow detecting devices so that each device serves

(a) not more than one 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."

(3) Waterflow detecting devices required by Sentence (2) shall be connected to initiate an alert signal or an alarm signal on the fire alarm system. (See A-3.2.4.8.(5) in Appendix A.)

(4) The actuation of each waterflow detecting device required by Sentence (2) shall be indicated separately on the fire alarm system annunciator.

(5) The sprinkler system referred to in Sentence (1) shall be electrically supervised to indicate a trouble signal on the building fire alarm system annunciator for each of the following:

(a) movement of a control valve handle,
(b) loss of excess water pressure required to prevent false alarms in a wet pipe system,
(c) loss of air pressure in a dry pipe system,
(d) loss of air pressure in a pressure tank,
(e) a significant change in water level in any water storage container used for fire fighting purposes,
(f) loss of electrical power to any automatically starting electrical fire pump (see Appendix A), and
(g) a temperature approaching the freezing point in any dry pipe valve enclosure or water storage container used for fire fighting purposes.

3.2.4.17. Manual Pull Stations. A manual pull station shall be installed in every floor area near every required exit. (See Appendix A.)

3.2.4.18. Alert and Alarm Signals

(1) Alert signals and alarm signals shall be readily distinguishable from each other and from other signals which may be sounded in the building.

(2) In a 2-stage fire alarm system described in Sentence 3.2.4.4.(2), the same audible signal appliances are permitted to be used to sound the alert signals and the alarm signals.

(3) If audible signal appliances with voice reproduction capabilities are intended for paging and similar voice message use, other than during a fire emergency, they shall be installed so that alert signals and alarm signals take priority over all other signals.
(4) Audible signal appliances forming part of a fire alarm or voice communication system shall not be used for playing music or background noise.

(5) In a building or portion thereof intended for use primarily by persons with hearing impairments, visual signal appliances shall be installed in addition to audible signal appliances.

3.2.4.19. Audibility of Alarm Systems

(1) Audible signal appliances forming part of a required fire alarm system shall be installed in a building so that alert signals, alarm signals and voice messages can be heard intelligibly throughout the floor area in which they are installed.

(2) If a fire alarm system is required, audible signal appliances shall be located in a service space referred to in Sentence 3.2.1.1.(7) and shall be connected to the fire alarm system.

3.2.4.20. Visual Signals

(1) Visual signal appliances required in Sentence 3.2.4.18.(5) shall be installed in a building so that the signal from not less than one appliance is visible throughout the floor area or portion thereof in which they are installed.

(2) In addition to the requirements for fire alarm and detection systems in this Subsection, visual signals from smoke detectors required in sleeping rooms of Group B occupancy shall be provided so that staff serving those rooms can easily identify the room or location of fire alarm initiation. (See Appendix A.)

3.2.4.21. Smoke Alarms

(1) Smoke alarms conforming to CAN/ULC-S531-M, "Standard for Smoke Alarms" shall be installed in each dwelling unit and, except for institutional occupancies required to have a fire alarm system, in each sleeping room not within a dwelling unit.

(2) Smoke alarms within dwelling units shall be installed between each area containing sleeping rooms and the remainder of the dwelling unit, and where the sleeping rooms are served by hallways, the smoke alarms shall be installed in the hallways.

(3) Smoke alarms shall be installed on or near the ceiling.

(4) Smoke alarms shall be installed with permanent connections to an electrical circuit and shall have no disconnect switches between the overcurrent device and the smoke alarm.

(5) Where more than one smoke alarm is required in a dwelling unit, they shall be wired so that the actuation of one alarm will cause all alarms within the dwelling unit to sound.

3.2.4.22. Voice Communication Systems

(1) A voice communication system required in Subsection 3.2.6. shall consist of

(a) a 2-way communication system in each floor area, with connections to the central alarm and control facility and to the mechanical control centre, and

(b) loudspeakers operated from the central alarm and control facility which are designed and located so as to be audible in all parts of the building, except that this requirement does not apply to elevator cars.

(2) The voice communication system referred to in Sentence (1) shall include provision for silencing the alarm signal in a single stage fire alarm system when voice messages are being transmitted, but only after the alarm signal has sounded initially for not less than 1 min.

(3) The voice communication system referred to in Sentence (1) shall include provision for silencing the alert signal and the alarm signal in a 2 stage fire alarm system when voice messages are being transmitted, but only after the alert signal has sounded initially for not less than 1 min.

(4) The voice communication system referred to in Clause (1)(b) shall be designed so that voice instructions can be transmitted selectively to any zone or zones while maintaining an alert signal or alarm signal to the other zones in the building.

(5) The 2-way communication system referred to in Clause (1)(a) shall be installed so that emergency telephones are located in each floor area near exit stair shafts.

3.2.5. Provisions for Fire Fighting

(See A-3, Fire Fighting Assumptions, in Appendix A.)
3.2.5.1. Access to Above Grade Storeys

(1) Except for storeys below the first storey, direct access for fire fighting shall be provided from the outdoors to every storey having its floor level less than 25 m above grade by not less than one unobstructed window or access panel for each 15 m of wall in each wall required to face a street in Subsection 3.2.2.

(2) An opening for access required in Sentence (1) shall be 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.

(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 not less than one street shall be provided from the outdoors to each basement having a horizontal dimension more than 25 m.

(2) The access required by Sentence (1) is permitted to be provided by doors, windows or other means that provide an opening at least 1 100 mm high and 550 mm wide, the sill of which shall be not higher than 900 mm above the inside floor, or by an interior stairway immediately accessible from the outdoors.

3.2.5.3. Waiver for Access to Sprinklered Storeys. The requirements of Articles 3.2.5.1. and 3.2.5.2. need not apply to any storey, including basements, that is sprinklered.

3.2.5.4. Roof Access. On buildings 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 stairway or by a hatch not less than 550 mm by 900 mm with a suitable fixed ladder.

3.2.5.5. Access Routes

(1) Every building which is more than 3 storeys in building height or more than 600 m² in building area shall be provided with access routes for fire department vehicles

- (a) to the building face having a principal entrance, and
- (b) except for Group B, Division 1 major occupancies, to each building face having access openings for fire fighting as required in Articles 3.2.5.1. and 3.2.5.2. (See Appendix A.)

3.2.5.6. Location of Access Routes

(1) Access routes required by Article 3.2.5.5. 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 every building so that

- (a) for buildings provided with a fire department connection, a fire department pumper vehicle can be located adjacent to the hydrants described in Article 3.2.5.16.,
- (b) for buildings 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 fire fighter from the vehicle to the building is not more than 90 m, and
- (c) the unobstructed path of travel for the fire fighter from the vehicle to the building is not more than 45 m.

(3) The unobstructed paths of travel for the fire fighter 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 where no such connection is provided, the paths of travel shall be measured to the principal entrance of the building.

(4) Where 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 such portion is not more than 45 m.

3.2.5.7. Access Route Design

(1) A portion of a roadway or yard provided as a required access route for fire department use shall
3.2.5.7. (a) have a clear width of not less than 6 m, unless it can be shown that lesser widths are satisfactory,
(b) have a centreline radius of not less than 12 m,
(c) have an overhead clearance of not less than 5 m,
(d) have a change of gradient of not more than 1 in 12.5 over a minimum distance of 15 m,
(e) be designed to support the expected loads imposed by fire fighting 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,
(g) be connected with a public thoroughfare. (See Appendix A.)

3.2.5.8. Water Supply. An adequate water supply for fire fighting shall be provided for every building.

3.2.5.9. Standpipe and Hose Systems

(1) Except as provided in Sentence 3.2.5.10.(4), a standpipe and hose system shall be installed in every building that is
(a) more than 3 storeys in building height or more than 14 m high measured between grade and the ceiling of the uppermost storey, or
(b) greater in building area than the area shown in Table 3.2.5.A. for the applicable building height shown in the Table where the building is not sprinklered and is not more than 14 m high measured between grade and the ceiling of the top storey.

3.2.5.10. Standpipe and Hose System Design

(1) Except as provided in Sentences (2) to (6) and Articles 3.2.5.11. and 3.2.5.12., where standpipe and hose systems are required, the design, construction, installation and testing of such standpipe and hose systems shall be in conformance with NFPA 14, “Installation of Standpipe and Hose Systems.”

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<tr>
<th>Table 3.2.5.A. Forming Part of Sentence 3.2.5.9.(1)</th>
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(2) Dry standpipes that are not connected to a water supply shall not be considered as fulfilling the requirements of this Article.

(3) Where more than one standpipe is provided, the total water supply need not be more than 30 L/s.

(4) A standpipe need not be installed in a storage garage conforming to Article 3.2.2.60. provided the building is not more than 15 m high.

(5) Where a standpipe and hose system is required, 64 mm diam hose connections shall be provided, except that in buildings 25 m or less in height, measured between grade and the ceiling level of the top storey and having a building area of 4 000 m² or less, the hose connections are permitted to be 38 mm diam.

(6) The residual water pressure at the design flow rate at the topmost outlet of a standpipe and hose system that is required to be installed in a building is permitted to be less than 450 kPa provided that
(a) the building is sprinklered in conformance with the requirements of Sentence 3.2.5.13.(1),
(b) the water supply at the base of the sprinkler riser is capable of meeting the design flow rate and pressure demand of the sprinkler system, including the inside and outside hose allowance, and
3.2.5.11. Hose Stations and Cabinets

1. Required hose stations shall be located in or near exits, and where a pressurized vestibule is provided adjacent to exit stairs, the hose station shall be located within the pressurized vestibule.

2. A hose station located on one side of a horizontal exit shall be considered to serve only the floor area on that side of such exit.

3. Every hose cabinet shall be located so that its door, when fully opened, will not obstruct the required width of a means of egress.

4. Hose connections shall be provided with sufficient clearance to permit the use of a standard fire department hose key.

5. Fire hose stations in a Group B, Division 1 major occupancy are permitted to be located in secure areas, or in lockable cabinets 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.

3.2.5.12. Trouble Signal Annunciation for Valves. In buildings where a fire alarm system is required to have an annunciator by Sentence 3.2.4.8.(1), except for hose valves, all valves controlling water supplies in a standpipe and hose system shall be equipped with an electrically supervised switch for transmitting a trouble signal to the annunciator in the event of movement of the valve handle.

3.2.5.13. Automatic Sprinkler Systems

1. Except as provided in Sentences (2) and (3), where a sprinkler system is required, it shall be designed, constructed, installed and tested in conformance with NFPA 13, “Installation of Sprinkler Systems.” (See Appendix A.)

2. Where a building contains fewer than 9 sprinklers, the water supply for such 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.

3. Where a water supply serves both a sprinkler system and a system serving other equipment, control valves shall be provided so that either system can be shut off independently.

4. Open grid and translucent ceilings located below sprinkler systems shall be installed in conformance with NFPA 13, “Installation of Sprinkler Systems,” paragraphs 4-4.14 and 4-4.15.

3.2.5.14. Combustible Sprinkler Piping

1. Combustible sprinkler piping shall be used only for wet systems in residential occupancies and other light hazard occupancies. (See Appendix A.)

2. Combustible sprinkler piping shall meet the requirements of ULC C199P-M, “Combustible Piping for Sprinkler Systems.”

3. 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, lath and plaster, gypsum board not less than 9.5 mm thick, plywood not less than 13 mm thick, or a suspended membrane ceiling with lay-in panels or tiles and steel suspension grids, with the lay-in panels or tiles having a mass of at least 1.7 kg/m².

4. Where combustible sprinkler piping is located above a ceiling, an opening through the ceiling that is not protected in conformance with Sentence (3) shall be located so that the distance between the edge of the opening and the nearest sprinkler is not more than 300 mm.

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.(7) 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 one story.

3. The waterflow detecting devices required by Sentence (2) shall be connected to the fire alarm system, if required, to
3.2.5.15.

(a) initiate an alert signal or an alarm signal, and
(b) indicate separately on the fire alarm system annunciator the actuation of each device.

3.2.5.16. Fire Department Connections

(1) Fire department connections for standpipe and hose systems shall be located so that the distance from a fire department connection to a hydrant is not more than 45 m and is unobstructed.

(2) Fire department connections for sprinkler systems shall be located so that the distance from a fire department connection to a hydrant is not more than 45 m and is unobstructed.

3.2.5.17. Portable Fire Extinguishers

(1) Portable extinguishers shall be provided and installed in accordance with the appropriate provincial, territorial or municipal regulations or, in the absence of such regulations, the National Fire Code of Canada 1990.

(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 that
(a) identical keys for all cabinets are located at all guard stations, or
(b) electrical remote devices are provided and are connected to an emergency power supply.

3.2.5.18. Protection from Freezing. 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 adequately protected from freezing.

3.2.6. Additional Requirements for High Buildings

(See Appendix A.)

3.2.6.1. Application

(1) This Subsection applies to
(a) every building 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) every building 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 or every building containing a floor area or part of a floor area located above the third storey designed or intended as a Group B, Division 2 occupancy, and
(c) every building containing a Group C major occupancy whose floor level is more than 18 m above grade.

3.2.6.2. Limits to Smoke Movement

(1) Every building shall be designed to limit the danger to occupants and fire fighters from exposure to smoke in a building fire, as provided in Sentences (2) to (4) and Articles 3.2.6.3. to 3.2.6.7.

(2) Except as provided in Articles 3.2.6.4. to 3.2.6.6., every building 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 per cent by volume of contaminated air from the fire floor, assuming an outdoor temperature equal to the January design temperature on a 2.5 per cent basis determined in conformance with Subsection 2.2.1. (See Appendix A.)

(3) Except as provided in Articles 3.2.6.4. and 3.2.6.6., every building shall be designed so that during 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.

(See Appendix A.)

(4) Except as provided in Articles 3.2.6.4. and 3.2.6.6., every building shall be designed so that during 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 fire fighters, as required by Article 3.2.6.9. (See Appendix A.)

### 3.2.6.3. Areas of Refuge

**1** Except in buildings of Group B major occupancy classification, the requirements of Sentence 3.2.6.2.(2) are waived in buildings where occupants above the first storey can enter and be safely accommodated in floor areas or parts of floor areas that

- **a** are designated as areas of refuge on the plans and are identified as such in the building,
- **b** are located on every fifth storey, except that in buildings of Group C major occupancy classification that are more than 75 m high, measured between grade and the floor level of the top storey, are located on every storey,
- **c** provide not less than 0.5 m² of floor space per ambulatory occupant and 1.5 m² 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,
- **f** during a period of 2 h after the start of a fire do not contain more than 1 per cent by volume of contaminated air from the fire floor, assuming an outdoor temperature equal to the January design temperature on a 2.5 per cent basis determined in conformance with Subsection 2.2.1.

(See Appendix A.)

### 3.2.6.4. Sprinklered Buildings

**1** The requirements of Sentences 3.2.6.2.(2) and (4), and Clause 3.2.6.2.(3)(a) are waived when a building is sprinklered, and

- **a** the sprinkler system is equipped with a workflow and supervisory signal system that will
  - **i** transmit automatically a workflow signal directly to the fire department, or through an independent central station,
  - **ii** transmit automatically other supervisory signals to a proprietary control centre or to an independent central station, and
  - **iii** actuate a signal at the central alarm and control facility described in Article 3.2.6.12.,

- **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** except for exhaust fans in kitchens, washrooms and bathrooms in dwelling units, and except for fans used for smoke venting in Article 3.2.6.10., 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.

(See Appendix A.)

### 3.2.6.5. Exception for Lower Buildings

**1** The requirements of Sentence 3.2.6.2.(2) are waived in a building of Group A, C, D, E or F 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.

(See Appendix A.)

### 3.2.6.6. Residential Building Balconies

**1** The requirements of Sentences 3.2.6.2.(2) and (4), and Clause 3.2.6.2.(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
(i) is not less than 1.5 m deep from the
outside face of the exterior wall to the
inside edge of the balcony, and
(ii) provides not less than 0.5 m² of
balcony space for each occupant of
the suite,
(b) where 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) where measures are taken to limit move-
ment 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.

(See Appendix A.)

3.2.6.7. Connected Buildings. Where a
building described in Sentence 3.2.6.1.(i) is connected
to any other building, measures shall be taken to limit
movement of contaminated air from one building into
another during a fire. (See Appendix A.)

3.2.6.8. Emergency Operation of Elevators

(1) Manual emergency recall shall be pro-
vided for all elevators serving storeys above the first
storey.

(2) Key-operated switches for emergency
recall described in Sentence (1) shall be provided in a
conspicuous location at each elevator lobby on the
recall level and at the central alarm and control
facility required in Article 3.2.6.12.

(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 provided in a suitably
identified box conspicuously located on the outside
of an elevator shaft near the central alarm and control
facility required by Article 3.2.6.12., and an addi-
tional key, or keys, shall be kept at the central alarm
and control facility.

(5) Automatic emergency recall shall be
provided for all elevators serving storeys above the
first storey in unsprinklered buildings.

(6) The automatic emergency recall feature
required in Sentence (5) shall be actuated by
(a) smoke detectors installed in each elevator
lobby on each storey (see Appendix A) or
(b) the building fire alarm system.

(7) Smoke detectors required in Sentence (6)
shall be designed as part of the building fire alarm system.

3.2.6.9. Elevator for Use by Fire Fighters

(1) Not less than one elevator shall be pro-
vided for use by fire fighters in conformance with
Sentences (2) to (5).

(2) The elevator required in Sentence (1) shall
have a useable platform area not less than 2.2 m² and
shall be capable of carrying a load of 900 kg from a
street floor landing to the top floor that it serves in
1 min.

(3) Except when Measure K of Chapter 3,
"Measures for Fire Safety in High Buildings" of the
Supplement to the NBC 1990 is used, each elevator
for use by fire fighters shall
(a) be provided with a closure at each shaft
opening so that the interlock mechanism
and associated wiring is operational for a
period of not less than 1 h when the
assembly is subjected to the standard fire
exposure described in CAN4-S104-M,
"Standard Method for 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 separa-
tion having a fire-resistance rating of not
less than 45 min, or
(c) be protected with a corridor containing no
occupancy and separated from the remain-
der of the building by a fire separa-
tion having a fire-resistance rating of not less
than 1 h.

(4) Except as provided in Sentence (5), an
elevator required in Sentence (1) shall be capable of
providing transportation from the street floor to every
floor normally served by the elevator system that is
above grade in the building.
(5) Where 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 from a street floor to any floor in the building.

(6) Electrical conductors for the operation of the elevator referred to in Sentence (1) shall be
(a) installed in service spaces conforming to Section 3.5 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 CAN4-S101-M, “Standard Methods of Fire Endurance Tests of Building Construction and Materials.” (See Appendix A.)

3.2.6.10. Venting to Aid Fire Fighting

(1) Means of venting each floor area to the outdoors shall be provided by windows, wall panels or smoke shafts, except that in a sprinklered floor area, the floor area is permitted to be vented by the building exhaust system.

(2) Venting described in Sentence (1) shall conform to the requirements in Section 3 of Chapter 3, “Measures for Fire Safety in High Buildings” of the Supplement to the NBC 1990.

(3) Fixed glass windows shall not be used for venting described in Sentence (1) where the breaking of such windows may endanger pedestrians below.

(4) Openable windows used for venting described in Sentence (1) shall be permanently marked so that they are easily identifiable.

(5) Elevator shafts shall not be designed for venting described in Sentence (1).

3.2.6.11. Sprinklers

(1) The following spaces shall be sprinklered:
(a) every storey, or part thereof, intended for a Group E or Group F, Division 1 or Division 2 occupancy,
(b) every restaurant or licensed beverage establishment,
(c) every storey or part thereof intended for the storage or handling of hazardous substances (see Sentence 3.3.1.2.(1)), and
(d) every floor area more than 1 000 m², except when the floor area is divided into fire compartments not more than 1 000 m² in area and separated from the remainder of the floor area by fire separations having a fire-resistance rating of not less than 1 h. (See also Article 3.2.2.11.)

3.2.6.12. Central Alarm and Control Facility

(1) On the street entrance floor, a central alarm and control facility shall be provided
(a) in a location that is readily accessible to fire fighters entering the building, and
(b) that 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 3.2.6.13., and provisions to enable Article 3.2.6.13., to all loudspeakers simultaneously and to individual floor areas and 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 3.2.4.8.,
(e) means to transmit alert signals and alarm signals to the fire department in conformance with Article 3.2.4.7.,
(f) means to release hold-open devices on doors to vestibules,
(g) means to manually actuate alarm signals in the building and to silence these signals in conformance with Sentences 3.2.4.22.(2) and (3), and
(h) means to actuate auxiliary equipment or means to communicate with a continually
staffed auxiliary equipment control centre, as appropriate to the measure for fire safety provided in the building.

3.2.6.13. Voice Communication System. When the height of a building, measured between grade and the floor of the top storey, is more than 36 m, or in buildings containing a floor area or part of a floor area located above the third storey and designed or intended as a Group B, Division 2 occupancy, a voice communication system or systems conforming to Article 3.2.4.22. shall be provided.

3.2.6.14. Protection of Electrical Conductors

(1) Where installed in service spaces containing combustible material, electrical conductors used in connection with fire alarm systems and emergency equipment described in Articles 3.2.6.2. to 3.2.6.13. shall be separated from the remainder of the space by a fire separation having a fire-resistance rating of not less than 1 h, or shall be protected against fire exposure from the source of power supply to the branch circuits serving the equipment to ensure continued operation for a period of not less than 1 h.

(2) Where the central alarm and control facility and the fire alarm control unit are in different fire compartments, the electrical conductors connecting the fire alarm control unit to the central alarm and control facility shall be protected against fire exposure to ensure continued operation for a period of not less than 1 h.

3.2.6.15. Testing. The systems for control of smoke movement and mechanical venting required in Articles 3.2.6.2. and 3.2.6.10. shall be tested to ensure satisfactory operation in accordance with the procedures described in Appendix C to Chapter 3, “Measures for Fire Safety in High Buildings” of the Supplement to the NBC 1990.

3.2.7. Lighting and Emergency Power Systems

3.2.7.1. Minimum Lighting Requirements

(1) Every exit, public corridor and corridor providing access to exit for the public or serving patients’ sleeping rooms or classrooms 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) Rooms and spaces used by the public shall be illuminated as described in Article 9.34.27.

(3) Lighting outlets in a building of residential occupancy shall be provided in conformance with Subsection 9.34.2.

3.2.7.2. Recessed Lighting Fixtures. Recessed lighting fixtures shall not be located in insulated ceilings unless the fixture is designed for such an installation.

3.2.7.3. Emergency Lighting

(1) Emergency lighting shall be provided to average levels of 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,
(c) corridors used by the public,
(d) corridors serving patients’ sleeping rooms,
(e) corridors serving classrooms,
(f) underground walkways,
(g) public corridors, and
(h) floor areas or parts thereof where the public may congregate in
   (i) Group A, Division 1 occupancies, or
   (ii) Group A, Division 2 and 3 occupancies having an occupant load of 60 persons or more.

(2) Emergency lighting to provide an average level of illumination at floor or catwalk level of not less than 10 lx shall be included in a service space referred to in Sentence 3.2.1.1.(7).

3.2.7.4. Emergency Power for Lighting

(1) An emergency power supply shall be 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 be so designed and installed that upon failure of the regular power supply it will assume the electrical load automatically for a period of

(a) 2 h for all buildings within the scope of Subsection 3.2.6.,
(b) 1 h for buildings of Group B major occupancy classification that are not within the scope of Subsection 3.2.6., and
(c) 30 min for buildings of all other occupancies.

(2) Where self-contained emergency lighting units are used, they shall conform to CSA C22.2 No. 141, “Unit Equipment for Emergency Lighting.”

3.2.7.5. Emergency Power Supply Installation. Except as provided in Articles 3.2.7.6. and 3.2.7.7., emergency power systems shall be installed in conformance with CAN/CSA-C282-M, “Emergency Electrical Power Supply for Buildings.” (See Sentence 3.2.7.8.(5) for emergency power supply for voice communication systems.)

3.2.7.6. Emergency Power for Hospitals and Nursing Homes. Except as provided in Article 3.2.7.7., emergency electrical power systems for emergency equipment required in this Part for hospitals and nursing homes shall be installed in conformance with CAN/CSA-Z32.4, “Essential Electrical Systems for Hospitals.” (See Appendix A.)

3.2.7.7. Fuel Supply Shut-off Valves. Where 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, such fuel supply shall be provided with a suitably-identified separate shut-off valve outside the building.

3.2.7.8. Emergency Power Supply

(1) An emergency power supply conforming to Sentences (2), (3) and (4) shall be provided for required fire alarm systems.

(2) The emergency power supply required in Sentence (1) shall be from
(a) a generator conforming to Article 3.2.7.4.,
(b) batteries, or
(c) a combination thereof.

(3) The emergency power supply required in Sentence (1) shall be capable of providing supervisory power for not less than 24 h and emergency power under full load for not less than
(a) 2 h for buildings required to conform to Subsection 3.2.6.,
(b) 1 h for buildings classified as Group B major occupancy that are not within the scope of Subsection 3.2.6.,
(c) 5 min for buildings not required to be equipped with an annunciator, and
(d) 30 min for all other buildings.

(4) The emergency power supply required in Sentence (1) shall be designed so that there will be automatic transfer to emergency power in the event of a failure of the normal power source.

(5) An emergency power supply shall be provided for the voice communication system required by Article 3.2.6.13. and shall be capable of maintaining operation of the system for not less than 2 h.

(6) The emergency power supply for the voice communication system required by Sentence (5) shall be capable of full operation immediately upon the failure of the normal source of power.

(7) If the emergency power supply required by Sentence (5) is provided by batteries, the batteries shall be sized to provide the total energy consumed by the maximum possible electrical supervision current plus the trouble signal current for a period of 24 h followed by 30 min of continuous voice communication.

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 fire fighters in conformance with Sentence (2),
(b) water supply for fire fighting in conformance with Article 3.2.5.8., when the supply is dependent on electrical power supplied to the building,
(c) fans and other electrical equipment that are installed to maintain the air quality specified in Article 3.2.6.2., and
(d) fans required for venting in Article 3.2.6.10.

(2) Except as permitted in Sentence (3), the emergency power supply for elevators required in
Clause (1)(a) shall be capable of operating all elevators for fire fighters plus one additional elevator simultaneously.

(3) Sentence (2) does not apply when the time to recall all elevators, each from its most remote storey to the street floor or transfer lobby, under emergency power supply, is not more than 5 min.

3.2.8. Mezzanines and Openings through Floor Assemblies

3.2.8.1. Application

(1) Except as provided in Article 3.2.8.2. and Sentence 3.3.4.2.(2), the portions of a floor area or 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 in Articles 3.2.8.3. to 3.2.8.9.

(2) The penetration of floor assemblies by exits or vertical service spaces shall conform to the requirements of Sections 3.4 and 3.5.

(3) Floor areas containing sleeping rooms in buildings of Group B, Division 2 major occupancy shall not be constructed with interconnected floor space.

3.2.8.2. Exceptions to Special Protection

(1) A mezzanine need not terminate at a vertical fire separation nor be protected in conformance with the requirements in Articles 3.2.8.3. to 3.2.8.9, where the mezzanine
(a) serves a Group A, Division 1 major occupancy,
(b) serves a Group A, Division 3 major occupancy in a building not more than 2 storeys in building height, or
(c) serves a Group A, C, D, E or F major occupancy and
   (i) is 500 m² or less in area,
   (ii) has an aggregate area not more than 40 per cent of the storey in which it is located,
   (iii) is not subdivided by partitions or walls where the mezzanine is more than 10 per cent of the area of the storey in which it is located, and
   (iv) has no visual obstruction, except for open bookshelves, more than 1070 mm above the floor of the mezzanine or above the floor of the space below it where the mezzanine is more than 10 percent of the area of the storey in which it is located.

(2) Except for floors described in Sentence 3.1.10.3.(1) and Article 3.2.1.2., openings through horizontal fire separations for vehicular ramps in storage garages are not required to be protected with closures and need not conform to this Subsection.

(3) Where a closure in an opening in a fire separation would disrupt the nature of a manufacturing process, such as a continuous flow of material from storey to storey, the closure for the opening is permitted to be omitted provided precautions are taken to offset the resulting hazard. (See Appendix A.)

(4) An interconnected floor space in a Group B, Division 1 occupancy need not conform to the requirements of Articles 3.2.8.3. to 3.2.8.9 provided the interconnected floor space does not interconnect more than 2 adjacent storeys.

(5) Except as provided in Sentence (6), openings for escalators and inclined moving walkways need not conform to the requirements in Articles 3.2.8.3. to 3.2.8.9 provided
(a) the opening for each escalator or walkway does not exceed 10 m²,
(b) the building is sprinklered, and
(c) the building is classified as Group A, Division 1 or 2, Group D or Group E major occupancy.

(6) An interconnected floor space need not conform to the requirements of Articles 3.2.8.3. to 3.2.8.9 provided
(a) the interconnected floor space consists of the first storey and the storey next above or below it, but not both,
(b) the openings through the floor are used only for stairways, escalators or moving walkways or the interconnected floor space is sprinklered, (see Appendix A).
(c) the interconnected floor space contains only Group A, Division 1 or 2, Group D, Group E or Group F, Division 3 major occupancies, and

(d) the building area is not more than one half of the area permitted in Subsection 3.2.2.

(7) Openings permitted by Sentence (6) through a floor assembly in a sprinklered interconnected floor space are not required to conform to the requirements in Section 4-4.8.2.3. of NFPA 13, "Installation of Sprinkler Systems."

3.2.8.3. Construction Requirements. Buildings constructed in conformance with Articles 3.2.8.4. to 3.2.8.9. shall be of noncombustible construction, except that heavy timber construction is permitted where Subsection 3.2.2. permits buildings to be constructed of combustible construction.

3.2.8.4. Vestibules
(1) Exits opening into interconnected floor space shall be protected at each floor level in the interconnected floor space by vestibules
(a) with doorways that are not less than 1.8 m apart,
(b) which are separated from the remainder of the floor area by a fire separation which is not required to have a fire-resistance rating (See A-3.1.8.1.(1)(b) in Appendix A), and
(c) which are designed to limit the passage of smoke so that the level of contamination in exit stair shafts does not exceed the limits described in Measure E in Chapter 3, "Measures for Fire Safety in High Buildings" of the Supplement to the NBC 1990.

(2) Exits opening into interconnected floor space shall conform to Sentence 3.4.3.4.(2).

(3) Where an elevator shaft opens into an interconnected floor space and into storeys above such space, either the elevator doors opening into the interconnected floor space or the elevator doors opening into the storeys above the interconnected floor space shall be protected by vestibules conforming to Sentence (1).

3.2.8.5. Protected Floor Space
(1) For the purposes of this Subsection, the term protected floor space applies to that part of a floor area separated from the interconnected floor space by a fire separation having a fire-resistance rating not less than that required for the floor assembly of the storey on which it is located and in which openings through such vertical fire separation are protected by vestibules conforming to Sentence 3.2.8.4.(1).

(2) Protected floor space defined in Sentence (1) shall be designed so that it is not necessary to enter the interconnected floor space to reach an exit.

3.2.8.6. Sprinklers
(1) Buildings containing interconnected floor space shall be sprinklered.

(2) In buildings containing interconnected floor space
(a) operation of waterflow detecting devices for sprinkler systems shall cause a signal to be transmitted to the fire department in conformance with Sentence 3.2.4.7.(3), and
(b) sprinkler systems shall be electrically supervised as required in Sentence 3.2.4.16.(5).

3.2.8.7. Draft Stops. Buildings with interconnected floor space shall be provided with a draft stop at each floor level, immediately adjacent to and surrounding the opening, that is not less than 500 mm deep measured from ceiling level down to the underside of the draft stop.

3.2.8.8. Mechanical Exhaust System
(1) A mechanical exhaust system shall be provided to remove air from the interconnected floor space at a rate of 4 air changes per hour. (See Appendix A.)

(2) The mechanical exhaust system required in Sentence (1) shall be actuated by a switch located on the street entrance floor near the annunciator for the fire alarm system.

3.2.8.9. Combustible Content Limits. An interconnected floor space shall be designed so that the combustible contents, excluding interior finishes, in those parts of a floor area in which the ceiling is more than 8 m above the floor, are limited to not more than 16 g of combustible material for each cubic metre of volume of the interconnected floor space.
3.3.1.1.

Section 3.3 Safety Requirements within Floor Areas
(See Appendix A.)

3.3.1. Requirements Applying to All Floor Areas
3.3.1.1. Separation of Suites
(1) Except as permitted by Sentence (2), 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 of not less than 1 h, except that a fire-resistance rating of not less than 45 min is permitted where the fire-resistance rating of the floor assembly is not required in Subsection 3.2.2. to be more than 45 min. (See also Subsection 3.3.3. for institutional occupancies, Article 3.3.4.2. for residential occupancies and Article 3.1.8.7. for fire dampers.)
(2) In sprinklered buildings, suites of business and personal services occupancy and mercantile occupancy that are served by public corridors conforming with Clause 3.3.1.4.(1)(c) are not required to be separated from each other by fire separations.

3.3.1.2. Hazardous Substances, Equipment and Processes
(1) Where hazardous substances are used in connection with the activities of any occupancy other than as provided in Subsection 3.3.5. for a Group F, Division 1 occupancy, the storage, handling and use of such substances shall be in conformance with the appropriate provincial, territorial or municipal regulations or, in the absence of such regulations, in conformance with the National Fire Code of Canada 1990. (See Appendix A.)
(2) In kitchens containing commercial cooking equipment used in processes producing grease-laden vapours, the equipment shall be designed and installed in conformance with Part 6.
(3) Fuel-fired appliances shall not be installed in any corridor serving as access to exit.

3.3.1.3. Means of Egress
(1) An access to exit shall be provided from every roof which is intended for occupancy, and from every podium, terrace, platform or contained open space.
(2) Access to exits within floor areas shall conform to Subsections 3.3.2. to 3.3.5. in addition to the requirements of this Subsection.
(3) Where a roof is used or intended for an occupant load of more than 60 persons, at least 2 separate means of egress shall be provided from the roof to stairs, designed in conformance with the requirements for exit stairs, located so that the distance between such stairs conforms to the requirements in Article 3.4.2.3. for exits.
(4) Where a podium, terrace, platform or contained open space is provided, egress requirements shall conform to the appropriate requirements for rooms and suites in Sentence 3.3.1.5.(1).
(5) A roof top enclosure shall be provided with an access to exit that leads to an exit at the roof level or to an exit on the storey immediately below the roof.
(6) A roof top enclosure which is more than 200 m² in area shall be provided with not less than 2 means of egress.
(7) Two points of egress shall be provided from a service space referred to in Sentence 3.2.1.1.(7) if the area of the service space is more than 200 m², and the travel distance measured from any point in the service space to a point of egress is more than 25 m.
(8) Except as permitted in Sentences 3.3.4.4.(5) and (6), each suite in a floor area that contains more than one suite shall have an exterior exit doorway or a doorway into a public corridor or to an exterior passageway.
(9) Except as permitted in this Section and in Sentence 3.4.2.1.(2), at the point where a doorway referred to in Sentence (8) opens to a public corridor or exterior passageway, it shall be possible to go in opposite directions to each of 2 separate exits.

3.3.1.4. Public Corridor Separations
(1) Except as otherwise required in this Part, public corridors shall be separated from the remainder of the building by a fire separation having a fire-resistance rating of not less than 1 h, except that
(a) the fire-resistance rating need not be more than 45 min when the fire-resistance rating of the floor assembly is not required to be more than 45 min,
(b) no fire-resistance rating is required when the floor area is sprinklered and the corridor does not serve an institutional occupancy or a residential occupancy,
(c) no fire separation is required where the corridor is more than 5 m in unobstructed width, the floor area is sprinklered and the corridor does not serve an institutional occupancy or a residential occupancy, and
(d) a floor assembly above a crawl space that conforms to Sentence 3.2.2.5.(2) is not required to be a fire separation.
(See A-3.1.8.1.1(b) and A-3.3.1.4.(1) in Appendix A.)

(2) The sprinkler system referred to in Clauses (1)(b) and (c) shall be electrically supervised in conformance with Sentence 3.2.4.16.(5) and, upon operation, shall cause a signal to be transmitted to the fire department in conformance with Sentence 3.2.4.7.(3) when the corridor serves a Group E or Group F, Division 1 or 2 occupancy.

3.3.1.5. Egress Doorways

(1) Every room and every suite shall have 2 egress doorways placed in such a manner that one doorway could provide egress from the room or suite as required in Article 3.3.1.3. if the other doorway becomes inaccessible to the occupants due to a fire which might originate in the room or suite
(a) where the occupancy is classified as Group F, Division 1,
(b) which is intended for an occupant load of more than 60 persons, or
(c) where, except for dwelling units, the area of a room or suite, or the distance measured from any point within the room or suite to the nearest egress doorway is more than the values shown in Table 3.3.1.A.

3.3.1.6. Travel Distance. Where more than one egress doorway is required from a room or suite referred to in Sentence 3.3.1.5.(1), the travel distance within the room or suite to the nearest egress doorway shall not exceed the maximum travel distances described in Article 3.4.2.5. for exits.

3.3.1.7. Protection on Floor Areas with a Barrier-Free Path of Travel

(1) Where a barrier-free path of travel is provided above or below the first storey in a building that is not sprinklered, every floor area having a barrier-free path of travel shall
(a) be served by an elevator conforming to Sentences 3.2.6.9.(4) to (6), protected against fire in conformance with Clauses 3.2.6.9.(3)(b) and (c) and, in a building over 3 storeys in building height, protected against smoke movement in conformance with Sentence 3.2.6.2.(4),
(b) be divided into not less than 2 zones by fire separations conforming to Sentences 3.3.6.8.(8) and (9) so that
(i) persons with physical disabilities can be accommodated in each zone, and
(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,
(c) in the case of residential occupancies, be provided with balconies conforming to Sentence 3.2.6.6.(1), except on the storey containing the access entrance described in Article 3.7.1.2., or

<table>
<thead>
<tr>
<th>Occupancy of Room or Suite</th>
<th>Maximum Area of Room or Suite, m²</th>
<th>Maximum Distance to Egress Doorway, m</th>
</tr>
</thead>
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<tr>
<td>Group A</td>
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<td>15</td>
</tr>
<tr>
<td>Group B, Division 1</td>
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<tr>
<td>Group B, Division 2 sleeping rooms</td>
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<tr>
<td>Group B, Division 2 other than sleeping rooms</td>
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<td>Group C</td>
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<td>Group F, Division 3</td>
<td>200</td>
<td>15</td>
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</tbody>
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Column 1: 2 3
3.3.1.7.

(d) have an exterior exit at ground level or a ramp leading to ground level.

(See Appendix A.)

3.3.1.8. Headroom Clearance. Except within the floor area of a storage garage, the minimum headroom clearance in every access to exit shall conform to the requirements in Article 3.4.3.7. for exits. (See also Sentence 3.3.5.5.(5).)

3.3.1.9. Corridors

(1) The minimum width of every public corridor shall be 1 100 mm.

(2) Except as provided in Sentence 3.3.3.3.(2), the minimum unobstructed width of every corridor used by the public and every corridor serving classrooms or patients’ sleeping rooms shall be 1 100 mm.

(3) Except as provided in Sentence (4), obstructions located within 1 980 mm of the floor shall not project more than 100 mm horizontally into exit passageways, public corridors, corridors used by the public or corridors serving classrooms or patients’ sleeping rooms in a manner that would create a hazard for visually impaired persons traveling adjacent to walls.

(4) The horizontal projection of an obstruction described in Sentence (3) is permitted to be more than 100 mm where it extends to less than 680 mm above the floor. (See Appendix A.)

(5) Where a public corridor, corridor used by the public or a corridor serving classrooms or patients’ sleeping rooms contains an occupancy, such 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, the occupancy shall be located so that there is an unobstructed width for pedestrian travel of not less than 3 m at all times adjacent and parallel to all rooms and suites that front onto the public corridor and the combined area of all occupancies in a public corridor shall be not more than 15 per cent of the area of the public corridor.

(7) Except for a dead end corridor that is entirely within a suite or as permitted in Sentence 3.3.4.4.(6), a dead end corridor is permitted provided it is not more than 6 m long.

3.3.1.10. Door Swing

(1) Except as provided in Article 3.3.1.11., every door that opens into a corridor or other facility providing access to exit from a suite or room not located within a suite shall swing on a vertical axis, and where a room or suite is used or intended for an occupant load of more than 60 persons or for a Group F, Division 1 occupancy, the door shall swing in the direction of exit travel.

(2) Every door that divides a corridor where such corridor is required to be separated from the remainder of the floor area by a fire separation shall swing on a vertical axis in the direction of exit travel.

3.3.1.11. Sliding Doors

(1) Except as permitted in Sentence (2), a sliding door provided in the locations described in Sentence 3.3.1.10.(1) shall

(a) be designed and installed to swing on the vertical axis in the direction of exit travel 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 which are open during normal working hours and used to separate a public corridor from an adjacent Group D or E occupancy need not conform to Sentences (1) and 3.3.1.10.(1).

3.3.1.12. Doors

(1) Every door that opens into or is located within a public corridor or other facility that provides access to exit from a suite shall

(a) be not less than 810 mm wide where there is only one door leaf,

(b) have no single leaf in any multiple leaf door less than 610 mm wide,

(c) not open onto a step, and

(d) 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 doors serving a contained use area, or an impeded egress zone.
provided the locking devices conform to Sentence (2).

(2) Egress doors in an access to exit serving a contained use area or an impeded egress zone are permitted to be equipped with locking devices that can be released either locally or remotely provided
(a) local locking devices are operable by a key from both sides of the door,
(b) controls for the remote release of door locking devices are located in an area readily available to security personnel, and
(c) electrical release devices are designed to operate on emergency power and are also manually operable by security personnel.

3.3.1.13. Ramps, Stairways and Passageways

(1) Except as provided in Sentence (2), Articles 3.3.4.8. and 3.3.1.14., and Subsection 3.3.2., ramps, stairways and passageways used as access to exit shall conform to the dimensional, guard and handrail requirements in Section 3.4 for exit ramps, stairways and passageways.

(2) Ramps and stairways that do not conform to the requirements of Sentence (1) are permitted to serve service rooms and service spaces and in industrial occupancies, provided the ramps and stairways are intended only for occasional use for servicing equipment and machinery.

3.3.1.14. Exterior Passageways. Exterior passageways leading to a required exit shall conform to the requirements in Section 3.4 for exterior exit passageways.

3.3.1.15. Curved or Spiral Stairs. A curved or spiral stair having treads with a minimum run of not less than 150 mm, a minimum average run of not less than 200 mm and having risers in conformance with Sentence 3.4.6.7.(2) is permitted in a stairway not required as an exit.

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 gradient of not more than 1 in 8, doorways, corridors and passageways 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 gradient of 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 in a Group B, Division 2 occupancy the required width of corridors, doorways, passageways and ramps shall be based on not less than 18.4 mm per person.

(5) Stairs in an access to exit shall conform to the requirements for stairs in Article 3.4.3.5. (See Article 3.3.1.9. for minimum widths in an access to exit.)

3.3.1.17. Guards

(1) 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 described in Subsection 3.2.6. that are less than 1 070 mm above the floor, and
(c) at each raised floor, mezzanine, balcony, gallery and at other locations where the difference in floor elevations is more than 600 mm.

(2) The height of guards on stairs used by the public but not forming part of a required exit shall be not less than 920 mm measured vertically to the top of the guard from a line drawn through the outside edges of the stair nosings and shall be not less than 1 070 mm around landings.

(3) Except as provided in Sentence 3.3.2.8.(4), the size of any opening through a required guard serving a room, stairway or space to which the public is admitted or serving an exterior balcony shall be such as to prevent the passage of a spherical object having a diameter of 100 mm in residential occupancies, daycare centres, nurseries or other similar type occupancies where children may be present and 200 mm in other occupancies, unless it can be shown that the location and size of openings that exceed these limits do not present a hazardous condition.

3.3.1.18. Transparent Doors and Panels

(1) Except as provided in Sentence (4), every glass or transparent door shall be designed and
3.3.1.18.

constructed so that the existence and position of such door is readily apparent by attaching thereto non-transparent hardware, bars or other permanent fixtures.

(2) Glass doors shall be constructed of safety glass of the laminated or tempered type conforming to CAN2-12.1-M, “Glass, Safety, Tempered or Laminated” or wired glass conforming to CAN2-12.11-M, “Glass, Wired, Safety.”

(3) Except as provided in Sentence (4), transparent panels used in an access to exit which because of their physical configuration or design could be mistaken as a means of egress shall be made inaccessible by barriers or railings.

(4) Sliding glass partitions which separate a public corridor or mall from an adjacent occupancy and which are open during normal working hours need not conform to Sentences (1) and (3), except that such partitions shall be suitably marked to indicate their existence and position.

(5) Glass in doors and sidelights that could be mistaken for doors within or at the entrances to dwelling units and in public areas shall conform to the requirements in Article 9.6.5.2.

(6) Windows in public areas that extend to less than 1 m from the floor and are located above the second storey in buildings of residential occupancy shall be protected by barriers or railings to not less than 1 m above the floor, or the windows shall be non-openable and designed to withstand the lateral design loads for balcony guards in Article 4.1.10.1.

3.3.1.19. Exhaust Ventilation

(1) Every building or part of a building in which there may be or may develop, by reason of use or occupancy, dust, fumes, gases, vapour or other various impurities or contaminants that may create a fire or explosion hazard, shall be provided with an exhaust ventilation system designed in conformance with the appropriate requirements of Part 6.

(2) When substances or conditions that may create an explosion hazard are present as a result of the principal use of a building space, such space shall be provided with explosion relief devices, vents or other protective measures in conformance with Subsection 6.2.2.

3.3.1.20. Janitors' Rooms. A room or space for the storage of janitorial supplies shall be separated from the remainder of the building by a fire separation having a fire-resistance rating of not less than 1 h, except that the fire-resistance rating is permitted to be not less than 45 min if the fire-resistance rating of the floor assembly of the room or space is permitted to be less than 1 h.

3.3.1.21. Posts or Turnstiles. In a mercantile occupancy no obstructions such as posts or turnstiles shall be placed so as to restrict the width of a normal means of egress from a floor area or part of a floor area to less than 750 mm unless an alternative means of egress is provided adjacent to and is plainly visible from the restricted egress.

3.3.1.22. Signs in Service Spaces. Illuminated signs conforming to Sentences 3.4.5.1(3) and (5) shall be provided to indicate the direction to egress points in a service space referred to in Sentence 3.2.1.1(7).

3.3.2. Assembly Occupancy

3.3.2.1. Scope. This Subsection applies to floor areas or parts thereof used or intended for use as assembly Occupancies.

3.3.2.2. Fire Separations

(1) The seating area of a Group A, Division 1 occupancy shall be separated from adjacent occupancies by a fire separation having a fire-resistance rating of not less than 1 h where the occupant load in the seating area exceeds 200 persons, except that a fire separation having a fire-resistance rating of not less than 45 min is permitted to be used where the floor assembly is not required to have a fire-resistance rating of more than 45 min.

(2) Where usable space exists under tiers of seats in arena type buildings, a fire separation with a fire-resistance rating of not less than 45 min shall be provided between such space and the seats or the space shall be sprinklered.

3.3.2.3. Fixed Seats

(1) Except for bench-type seats as provided in Articles 3.3.2.7., 3.3.2.9. and 3.3.2.10., in places of assembly with fixed seats, such seats shall be

(a) attached or secured to the floor, platform or platform riser,
(b) provided with arms and back, and
(c) arranged in rows having an unobstructed passage of not less than 400 mm measured horizontally between plumb lines from the backs of the seats in one row and the edges of the furthest forward projection of the seats in the next row in the unoccupied position.

(2) Except as provided in Sentence (3), aisles on the main floor and in balconies shall be located so that there are not more than 7 seats between any seat and the nearest aisle.

(3) The requirements of Sentence (2) do not apply where
(a) egress doorways are provided to serve both ends of rows of seats,
(b) each doorway referred to in Clause (a) serves not more than 3 rows of seats, and
(c) each row contains not more than 100 seats.

3.3.2.4. Aisles

(1) Except as required in Articles 3.3.2.7., 3.3.2.9. and 3.3.2.10., aisles leading to exits shall be provided in places of assembly which contain fixed seats in conformance with Sentences (2) to (10).

(2) The minimum clear width of aisles shall be not less than 1 100 mm, except that the width is permitted to be reduced to not less than
(a) 750 mm when serving not more than 60 seats, and
(b) 900 mm when serving seats on one side only.

(3) Except in the case of bleacher seats, the minimum clear width of aisles referred to in Sentence (2) shall be measured at the point farthest from an exit, cross aisle or foyer and shall be increased by 25 mm for each metre of distance toward the exit, cross aisle or foyer.

(4) Aisles shall terminate in a cross aisle, foyer or exit, and the width of such cross aisle, foyer or exit shall be not less than the required width of the widest aisle plus 50 per cent of the total required width of the remaining aisles that it serves.

(5) Dead-end aisles shall be not more than 6 m long.

(6) The length of travel to an exit door by any aisle shall not be more than 45 m.

(7) Side aisles shall be not less than 1 100 mm wide when seating is provided in conformance with Sentence 3.3.2.3.(3).

(8) The floor of every aisle shall have a gradient of not more than 1 in 8.

(9) Steps shall not be placed in any aisle unless the gradient is more than 1 in 8 and
(a) the passageway between rows of seats is level at right angles to the line of travel,
(b) the riser height is not less than 110 mm,
(c) the riser height is not more than 200 mm,
(d) where variations in riser height occur
(i) the heights of adjacent risers do not vary more than 6 mm, and
(ii) treads or any part of a platform extend not less than 430 mm,
(e) treads have a run of not less than 230 mm exclusive of nosing and a tread width of not less than 250 mm,
(f) aisle platforms that extend not less than 430 mm in the direction of exit travel slope not more than 1 in 50,
(g) an unobstructed platform not less than 800 mm square is provided adjacent to an aisle where a step is used at the entry to a row of seats,
(h) the location of every riser is made apparent from both directions of travel by strategically placed lighting or contrasting marking stripes,
(i) the steps extend to the adjacent rows of seats in a manner that will not create a hazard from tripping, and
(j) the finish of treads and platforms conforms to Sentence 3.4.6.1.(1).

(10) Except as provided in Sentence 3.3.2.3.(3), aisles shall be located so that there are not more than 7 seats with backs or 20 seats without backs between every seat and the nearest aisle.

3.3.2.5. Corridors

(1) Corridors used by the public in assembly occupancies or serving classrooms as access to exits shall be separated from the remainder of the building by a fire separation having a fire-resistance rating of not less than 1 h, except that
(a) the fire-resistance rating need be not more than 45 min if the fire-resistance rating of
3.3.2.5. The floor or roof assembly is not required to be more than 45 min, no fire-resistance rating is required if the floor area is sprinklered, and no fire separation is required for corridors serving classrooms where the distance from any point in the floor area to an exit measured along the path of exit travel does not exceed the travel distances in Article 3.4.2.5.

3.3.2.6. Doors. Every door equipped with a latching mechanism in an access to exit from a room or suite of Group A occupancy containing an occupant load of more than 100 persons 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 3.7.3.3.(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) Where 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 where back rests are provided, and not less than 550 mm where back rests are not provided.
(3) There shall be a space of not less than 300 mm between the back of each seat and the front of the seat immediately behind it.

3.3.2.8. Guards
(1) Except as required in 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 760 mm in front of the seats and not less than 920 mm when 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 600 mm, except that such guards need not be provided where 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 1.2 m 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) The size of any opening in a guard required in Sentences (2) and (3) shall be such as to prevent the passage of a spherical object more than 300 mm diam.

3.3.2.9. Outdoor Places of Assembly
(1) Any Group A, Division 4 occupancy and each tier or balcony thereof that has a capacity of more than
   (a) 1,000 persons shall have not less than 3 separate exits, or
   (b) 4,000 persons shall have not less than 4 separate exits.
(2) In every 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
   (d) an opening through the seating deck structure such as a portal or vomitory.
(3) Exits from outdoor stadia or grandstands shall be located not more than 25 m apart.
(4) The capacity of means of egress for Group A, Division 4 occupancies shall conform to the requirements of Sentence 3.4.3.5.(3).
(5) Aisles in Group A, Division 4 occupancies
(a) shall be located so that there are not more
than 20 seats between any seat and the
nearest aisle,
(b) shall be not less than 1200 mm wide,
except that an aisle serving less than 60
persons is permitted to be 750 mm wide,
and
(c) shall not have steps unless the gradient of
the aisle is more than 1 in 8.
(6) Except as provided in Sentences
3.3.2.10.(1) and (2), where steps are provided in
aisles, such steps shall
(a) extend the full width of the aisles,
(b) have risers not more than 230 mm high,
and
(c) have treads with a run of not less than
250 mm.
3.3.2.10. Bleachers
(1) Where steps are provided in aisles of
bleachers of the telescopic type, such steps shall
(a) have risers not more than 250 mm high,
and
(b) have treads with a run of not less than
280 mm.
(2) When 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 2 equal
risers between platforms and, when the vertical
distance between seating platforms is more than
450 mm, 2 intermediate steps shall be provided the
full width of the aisle so that there are 3 equal risers
between platforms.
(3) Where the passageway between rows of
seats is not a closed deck, footboards shall be pro-
vided 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.
3.3.2.11. Libraries
(1) Where a library book storage room, that is
not normally accessible to the public, is more than
250 m² in area, or where the book stacks in such
storage room are more than 10 m high or penetrate
more than one floor assembly,
(a) the book storage room shall be separated
from the remainder of the building by a fire
separation with a fire-resistance rating of not
less than 2 h, or
(b) the book storage room shall be sprinklered.
(2) Open book shelves are permitted above
and below a mezzanine floor in a library building
provided the height of such book shelves is not more
than 2.1 m or 75 per cent of the floor-to-ceiling height
of the space above or below the mezzanine floor
assembly.
3.3.2.12. Bowling Alleys
(1) Any portion of a building in which 3 or
more bowling lanes are located shall be separated
from other occupancies by a fire separation with a fire-
resistance rating of not less than 1 h.
(2) Subsidiary occupancies such as offices,
cocktail lounges and lunch counters operated in
connection with 3 or more bowling lanes shall be
separated by a fire separation with a fire-resistance
rating of not less than 1 h where the combined area of
these subsidiary occupancies is more than 150 m².
3.3.2.13. Stages for Theatrical
Performances
(1) Stages for theatrical performances and
ancillary spaces, such as workshops, dressing rooms
and storage areas, shall be sprinklered.
(2) A fire separation with a fire-resistance
rating of not less than 1 h shall be provided between
every stage for theatrical performances and ancillary
spaces, such as workshops, dressing rooms and
storage areas.
(3) Every stage for theatrical performances
and ancillary spaces, such as workshops, dressing
rooms and storage areas, shall be separated from the
seating space by a fire separation having a fire-resis-
tance rating of not less than 1 h, except for a prosce-
nium opening which shall be protected with
(a) a sprinkler deluge system conforming to
the requirements of paragraph 4-4.20 of
NFPA 13 "Standard for the Installation of
Sprinkler Systems,"

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3.3.2.13.

(b) an unframed fire curtain when the opening is not more than 20 m wide, or
(c) a semi-rigid fire curtain when the opening is more than 20 m wide.

(4) Every fire curtain required by Sentence (3) shall be of a type acceptable to the authority having jurisdiction and designed to close
   (a) automatically by heat-actuated devices,
   (b) automatically upon the actuation of the sprinkler system,
   (c) automatically upon actuation of the fire alarm system, and
   (d) manually by remote control devices located at the curtain control panel and at each side of the stage.

(5) Not less than 2 vents for the purpose of venting fire and smoke to the outside of a building shall be provided above every stage designed for theatrical performances and shall
   (a) have an aggregate area of not less than one eighth of the area of the stage behind the proscenium opening, and
   (b) be arranged to open automatically by means of
      (i) heat-actuated devices, or
      (ii) actuation of the sprinkler system.

3.3.3. Institutional Occupancy

3.3.3.1. Scope. This Subsection applies to floor areas or parts thereof used or intended for use as institutional occupancies. (See Appendix A.)

3.3.3.2. Separations between Institutional Occupancies and Repair Garages. The fire separation required between an institutional occupancy and a repair garage shall have no openings.

3.3.3.3. Corridors

(1) Corridors used by the public or serving patients’ sleeping rooms shall have no dead-end portions unless the area served by the dead-end has a second and separate means of egress.

(2) Every corridor in which it may be necessary to move patients in beds shall be not less than 2 400 mm wide.

(3) Paired doors in corridors described in Sentence (2) 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.

3.3.3.4. Separation of Rooms. Except as permitted in Sentence 3.3.3.6.(2) and Article 3.3.3.7., sleeping rooms shall be separated from adjacent rooms by a fire separation having a fire-resistance rating of 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.

3.3.3.5. Doorway Width. The minimum clear width of doorways through which it is necessary to move patients in bed shall be 1 050 mm. (See Appendix A.)

3.3.3.6. Unsprinklered Hospitals and Nursing Homes

(1) Except as provided in Article 3.3.3.7., floor areas containing sleeping rooms in hospitals and nursing homes shall conform to Sentences (2) to (11). (See Appendix A.)

(2) Where 2 or more intercommunicating rooms such as patients’ sleeping rooms and adjacent bathrooms are provided, the fire separation required in Article 3.3.3.4. does not apply to the wall between the intercommunicating rooms provided the total number of patients served by the intercommunicating rooms is not more than 5.

(3) Corridors used by the public or serving patients’ sleeping rooms in hospitals and nursing homes shall be separated from the adjacent rooms or spaces by a fire separation having a fire-resistance rating of 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) Corridors referred to in Sentence (3) shall contain no occupancy other than for nursing stations and related spaces not normally used by patients.

(5) The requirement for latches in Article 3.1.8.13. is permitted to be waived for doors between patients’ sleeping rooms and corridors provided the doors are equipped with roller latches.

(6) Except as provided in Sentence (7), every floor area used or intended to be used for patients in a hospital or nursing home shall be divided into 2 or
more zones, separated by a fire separation, in such a manner that the occupants in every zone have access to 2 exits either directly or through adjacent zones. (See Appendix A.)

(7) The floor area on either side of a horizontal exit conforming to Article 3.4.6.9. is permitted to be considered as a zone in applying the requirements of this Article.

(8) Fire separations required between zones referred to in Sentence (6) shall have a fire-resistance rating of not less than 1 h, except that a fire separation with a fire-resistance rating of not less than 45 min is permitted where the fire-resistance rating of the floor assembly is not required to be more than 45 min.

(9) Doors acting as closures in fire separations between zones referred to in Sentence (6) shall be weatherstripped or otherwise designed and installed to retard the passage of smoke. (See Appendix A.)

(10) Every zone referred to in Sentence (6) shall accommodate, in addition to its own occupants, the occupants of the largest adjacent zone based on a clear floor space of 2.5 m² per patient in the adjacent zone.

(11) The travel distance from any point within each zone referred to in Sentence (6) to an adjacent zone shall be not more than 30 m.

3.3.3.7. Sprinklered Hospitals and Nursing Homes

(1) Floor areas containing patients’ sleeping rooms in hospitals and nursing homes need not conform to Articles 3.3.3.4. and 3.3.3.6. provided the building is sprinklered and the floor areas conform to Sentences (2) to (10). (See Appendix A.)

(2) Except as provided in Sentence (3), floor areas containing patients’ sleeping rooms in hospitals and nursing homes shall be divided into not less than 2 fire compartments not more than 1 000 m² in area.

(3) The floor area on either side of a horizontal exit conforming to Article 3.4.6.9. is permitted to be considered as a fire compartment in applying the requirements of this Article.

(4) Fire separations separating fire compartments required in Sentence (2) shall have a fire-resistance rating of 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.

(5) Doors serving as closures in fire separations between fire compartments referred to in Sentence (2) shall be weatherstripped or otherwise designed and installed to retard the passage of smoke. (See A-3.3.3.6.(9) in Appendix A.)

(6) The travel distance from any point within each fire compartment referred to in Sentence (2) to a door referred to in Sentence (5) shall be not more than 45 m.

(7) 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 m² per patient in the adjacent fire compartment.

(8) Except as permitted in Sentence (9), walls between patients’ sleeping rooms and adjacent rooms and walls between corridors serving patients’ sleeping rooms and adjacent rooms within a fire compartment referred to in Sentence (2) shall be constructed as fire separations. (See A-3.1.8.1(1)(b) in Appendix A.)

(9) Doors in fire separations required in Sentence (8) are permitted to be equipped with roller latches.

(10) Doors in fire separations required in Sentence (8) shall not contain any grilles, louvres or other openings.

3.3.3.8. Areas of Refuge

(1) Compartments containing rooms such as operating rooms, recovery rooms, delivery rooms and intensive 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 of 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, such compartments will not contain more than 1 per cent by volume of contaminated air from the fire area.
3.3.3.9. 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 of not less than 1 h.

(3) Except as permitted by Sentence (5), a contained use area shall be sprinklered.

(4) The actuation of the sprinkler system required by Sentence (3) shall initiate an alert signal or an alarm signal on the fire alarm system.

(5) A contained use area is not required to be sprinklered as required by Sentence (3) if
   (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 per cent 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 per cent by volume of contaminated air from the fire in the other part of the building,
   (c) all doors are designed to be remotely released in conformance with Sentence 3.3.1.12.(2), and
   (d) the contained use area does not contain any rooms lined with combustible padding.

3.3.4. Residential Occupancy

3.3.4.1. Scope. This Subsection applies to floor areas or parts thereof used or intended for use as residential occupancies.

3.3.4.2. Fire Separations

(1) 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 of not less than 1 h, except that
   (a) a fire-resistance rating of not less than 45 min is permitted where the fire-resistance rating of the floor assembly above the floor area, or the floor assembly below the floor area if there is no floor assembly above, is not required to be more than 45 min, and
   (b) no fire separation is required for a floor assembly conforming to Sentence 3.2.2.5.(2).

(2) Floor assemblies within a dwelling unit need not be constructed as fire separations provided the distance between the lowest floor level and the uppermost floor level within the dwelling unit is not more than 6 m and provided that the dwelling unit is separated from the remainder of the building by a fire separation having a fire-resistance rating of not less than
   (a) 45 min where the building is sprinklered and is not more than 3 storeys in building height,
   (b) 1 h where the building is sprinklered or is not more than 6 storeys in building height, or
   (c) 2 h where the building is not sprinklered and is more than 6 storeys in building height.

3.3.4.3. Storage Rooms. Storage rooms not contained within a suite, for the use of tenants in residential occupancies, shall be sprinklered and separated from the remainder of the building by a fire separation having a fire-resistance rating of not less than 1 h, except that a fire-resistance rating of not less than 45 min is permitted where the fire-resistance rating of the floor assembly is not required to be more than 45 min.

3.3.4.4. Egress from Dwelling Units

(1) Single storey dwelling units in apartment buildings 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 provided in Sentences (3) and (4), every 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 the floor level of each such storey is served by an exit or egress door located not more than 1.5 m above or below the 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 where that storey is served by a stairway that
(a) leads to a public access to exit,
(b) has no direct access to any other storey in the dwelling unit, and
(c) 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.

(5) In buildings 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 such dwelling unit has a second and separate means of egress.

(6) A doorway from a dwelling unit is permitted to open onto an interior corridor served by a single exit, or an exterior balcony served by a single exit stairway, or an exterior passageway served by a single exit stairway provided each dwelling unit has a second and separate means of egress.

3.3.4.5. Automatic Locking Prohibition.
Except for hotels and motels, a door opening onto a public corridor which provides access to exit from a suite shall be designed not to lock automatically. (See Appendix A.)

3.3.4.6. Sound Transmission. Dwelling units shall be designed and constructed to restrict sound transmission in conformance with Article 9.11.2.1.

3.3.4.7. Guards for Residential Occupancies. Guards around balconies in buildings of residential occupancy shall be designed so that no member, attachment, or opening located between 100 mm and 900 mm above the balcony will facilitate climbing.

3.3.4.8. Stairs, Handrails and Guards for Dwelling Units. Stairs, handrails and guards within dwelling units shall conform to the appropriate requirements in Section 9.8.

3.3.5. Industrial Occupancy
3.3.5.1. Scope. This Subsection applies to floor areas or parts thereof used or intended for use as industrial occupancies.

3.3.5.2. Fire Extinguishing Systems. In addition to other requirements in this Code for the installation of automatic fire extinguishing systems, in a Group F, Division 1 major occupancy, an appropriate automatic fire extinguishing system shall be installed in every floor area to provide protection if required by provincial, territorial or municipal regulations or, in the absence of regulations, if required by the National Fire Code of Canada 1990.

3.3.5.3. Basements
(1) Basements 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 basements and rooms containing building services in a building where the storage, manufacture or handling of volatile materials can generate explosive air-vapour mixtures or where processes that produce explosive dusts can occur shall be separate from the remainder of the building.

(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. Cutting and Welding. Where a room in other than a Group F major occupancy is used for cutting and welding operations, it shall be separated from the remainder of the building by a fire separation having a fire-resistance rating of not less than 1 h, except that this requirement does not apply to a room that is protected by an automatic fire extinguishing system.

3.3.5.5. Repair and Storage Garages
(1) Where access is provided from a storage garage to a stair tower or elevator serving occupancies above the level of the storage garage, such access shall be through a vestibule conforming to Sentence 3.3.5.8.(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) Mechanical storage garages of not more than 4 storeys in building height, where 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) Every 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) 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 1070 mm high shall be provided at every garage floor opening and around the perimeter of every floor where the exterior walls are omitted.

(7) Only 2 exits located remote from each other need be provided in storage garages conforming to Article 3.2.2.60. provided persons other than parking attendants are not permitted above the street floor level.

(8) Except for open-air storeys, every storey of a storage garage or repair garage located below grade shall be sprinklered.

3.3.5.6. Repair Garage Separation. A repair garage or 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 of not less than 2 h.

3.3.5.7. Storage Garage Separation. A storage garage shall be separated from other occupancies by a fire separation with a fire-resistance rating of not less than 1.5 h.

3.3.5.8. Vestibules. Where access is provided through a fire separation between a storage garage and a Group A, Division 1 or Group B occupancy, such access shall be through a vestibule conforming to Sentence (3).

(2) In buildings more than 3 storeys in building height, where access is provided through a fire separation between a storage garage and a Group A, Division 2, 3 or 4, or a Group C occupancy, such access shall be through a vestibule conforming to Sentence (3).

(3) Where access is provided through a vestibule, as required in Sentences (1), (2) and 3.3.5.5.(1), the vestibule shall
   (a) be not less than 1.8 m long,
   (b) be naturally ventilated to outside air by a vent that has an unobstructed area of not less than 0.1 m² for each door that opens into the vestibule but not less than 0.4 m², or be mechanically ventilated at a rate of 14 m³/h for each square metre of vestibule floor surface area, and
   (c) have the openings between the vestibule and an adjoining occupancy provided with self-closing doors having no hold-open devices.

3.3.5.9. Dispensing of Fuel

(1) Facilities for the dispensing of fuel having a flash point below 37.8°C shall not be installed above any space intended for occupancy.

(2) Facilities for the dispensing of fuel having a flash point below 37.8°C shall not be installed in any building, except that this requirement does not apply to a canopy which is open on not less than 75 per cent of its perimeter.

Section 3.4 Requirements for Exits

3.4.1. General Requirements

3.4.1.1. Scope. Exit facilities complying with this Section shall be provided from every floor area which is intended for occupancy. (See Appendix A.)

3.4.1.2. Separation of Exits

(1) Except as permitted by the requirements of Sentence (2), where more than one exit is required from a floor area, each exit shall be separate from every other exit leading from that floor area.
Where more than 2 exits are provided from a floor area, exits are permitted to converge in conformance with Sentence 3.4.3.2.(2), provided the cumulative capacity of the converging exits does not contribute more than 50 per cent of the total required exit width for the floor area.

3.4.1.3. Access to Exits. Access to exits shall conform to Section 3.3.

3.4.1.4. Types of Exit

(1) Subject to the requirements of this Section, an exit from any floor area shall be one of the following used singly or in combination

(a) an exterior doorway,
(b) an exterior passageway,
(c) an exterior ramp,
(d) an exterior stairway,
(e) a fire escape (as described in Subsection 3.4.7.),
(f) a horizontal exit,
(g) an interior passageway,
(h) an interior ramp, or
(i) an interior stairway.

3.4.1.5. Exterior Exit Passageways. Access to exterior exit passageways from a floor area shall be through exit doors at the floor level.

3.4.1.6. Restricted Use of Horizontal Exits

(1) Except as provided in Sentence (2), horizontal exits shall not comprise more than one half of the required number of exits from any floor area.

(2) In a hospital or nursing home, horizontal exits serving patients' sleeping rooms shall not comprise more than two thirds of the required number of exits from any floor area.

(See Appendix A.)

3.4.1.7. Slide Escapes. A slide escape shall not be erected on any building as a required exit, but is permitted to be provided as an additional egress facility where unusual hazards may exist.

3.4.1.8. Transparent Doors and Panels. Glass and transparent panels in an exit shall conform to the appropriate requirements in Article 3.3.1.18, for glass and transparent panels in an access to exit.

3.4.1.9. Mirrors near Exits. No mirrors shall be placed in or adjacent to any exit in such a manner as to confuse the direction of exit.

3.4.2. Number and Location of Exits from Floor Areas

3.4.2.1. Minimum Number of Exits

(1) Except as provided in Sentences (2) to (4), every floor area as regulated in Article 3.4.1.1. shall be served by not less than 2 exits.

(2) In buildings not more than 2 storeys in building height, a floor area is permitted to be served by one exit provided the floor area and travel distance requirements conform to Table 3.4.2.A. and the total occupant load served by the exit is not more than 60.

Table 3.4.2.A.
Forming Part of Sentence 3.4.2.1.(2)

<table>
<thead>
<tr>
<th>Occupancy of Floor Area</th>
<th>Maximum Floor Area, m²</th>
<th>Maximum Travel Distance, m</th>
</tr>
</thead>
<tbody>
<tr>
<td>Group A</td>
<td>150</td>
<td>15</td>
</tr>
<tr>
<td>Group B</td>
<td>75</td>
<td>10</td>
</tr>
<tr>
<td>Group C</td>
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<td>15</td>
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<tr>
<td>Group D</td>
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<td>25</td>
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<tr>
<td>Group E</td>
<td>150</td>
<td>15</td>
</tr>
<tr>
<td>Group F, Division 2</td>
<td>150</td>
<td>10</td>
</tr>
<tr>
<td>Group F, Division 3</td>
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<td>15</td>
</tr>
<tr>
<td>Column 1</td>
<td>2</td>
<td>3</td>
</tr>
</tbody>
</table>

(3) Except as provided in Sentence (4), where a single exit is permitted in Sentence (2) from a floor area classified as Group B or Group C occupancy, the exit shall be an exterior doorway not more than 1.5 m above adjacent ground level.

(4) A floor area containing only dwelling units having access to exit conforming to Sentences 3.3.4.4.(1) to (4) need not comply with Sentence (1).

(5) Exits are not required directly from roof top enclosures that are provided with access to exits in conformance with Sentences 3.3.1.3.(5) and (6).

3.4.2.2. Mezzanine Exiting

(1) Except as permitted in Sentence (2), mezzanines shall be provided with exits on the same basis as required for floor areas in this Section.
(2) Mezzanines need not conform to Sentence (1) provided
(a) they are not required to terminate at a vertical fire separation in Article 3.2.8.1.,
(b) they are not intended for an occupant load of more than 60,
(c) the area of the mezzanine does not exceed the area limits for rooms and suites in Table 3.3.1.A., and
(d) the distance limits in Table 3.3.1.A. are not exceeded when measured from any point on the mezzanine to
(i) the egress door from the room in which the mezzanine is located where that room has a single egress door, or
(ii) an egress stair leading from the mezzanine where the room in which the mezzanine is located has 2 egress
doors provided in conformance with Subsection 3.3.1.

3.4.2.3. Distance between Exits
(1) Except where a floor area is divided by a fire separation so that it is necessary to pass through it to travel from one exit to another exit, the least distance between 2 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.

(2) The minimum distance between exits referred to in Sentence (1) shall be the shortest distance that smoke would have to travel between the required exits, assuming that the smoke will not penetrate an intervening fire separation.

3.4.2.4. Travel Distance
(1) Except as provided in 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 exit travel.

(2) Where a room or suite is separated from the remainder of the floor area by a fire separation having a fire-resistance rating of not less than 45 min or in a sprinklered building by a fire separation which is not required to have a fire-resistance rating, the travel distance is permitted to be measured from an egress door of the room or suite to the nearest exit.

(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.(7).

3.4.2.5. Location of Exits
(1) Except as provided in Sentences (2), (3) and 3.3.2.4.(6), where more than one exit is required from a floor area, such exits shall be located so that the travel distance to not less than one exit as described in Article 3.4.2.4. shall be not more than
(a) 25 m in any Group F, Division 1 occupancy,
(b) 45 m in any sprinklered floor area that contains an occupancy other than Group F, Division 1,
(c) 40 m in any Group D occupancy,
(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 has a width of not less than 9 m,
(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 when 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 3.2.2.60., and
(f) 30 m in any other occupancy.

(2) Except for a Group F, Division 1 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) Where more than one exit is required, every exit shall be considered as contributing not more than one half of the required exit width.
3.4.3. Exit Width

3.4.3.1. Exit Width

(1) The aggregate width of required exits shall be not less than the value determined in conformance with Sentence (2) and Articles 3.4.3.2. to 3.4.3.5.

(2) The required width of an exit shall be not less than:
   (a) 1100 mm for corridors and passageways, and
   (b) 900 mm for stairs and ramps that serve not more than 3 storeys above grade or not more than 1 storey below grade,
   (c) 1650 mm for stairs and ramps serving patients’ sleeping rooms,
   (d) 1050 mm for doorways serving patients’ sleeping rooms, and
   (e) 790 mm for doorways not serving patients’ sleeping rooms.

3.4.3.2. Exit Width Based on Occupant Load

(1) For the purpose of determining aggregate width of required exits, the occupant load of every room or floor area of the building to be considered shall be determined in conformance with Subsection 3.1.16.

(2) Except as provided in Article 3.4.3.3., the required exit width shall be cumulative where 2 or more exits converge.

3.4.3.3. Cumulative Exit Width. Except as provided in Article 3.4.3.4., the required exit width is not required to be cumulative in an exit serving 2 or more floor areas located one above the other.

3.4.3.4. Exits from Interconnected Floor Space

(1) The required exit width for an exit stair in an assembly hall or theatre serving more than one balcony level shall conform to Sentence (2).

3.4.3.5. Exit Capacity

(1) Except as permitted by Sentence (3), the aggregate required width of exits serving floor areas intended for Groups A, C, D, E and F occupancies shall be determined by multiplying the occupant load of the area served by
   (a) 6.1 mm per person for ramps with a gradient of not more than 1 in 8, doorways, corridors and passageways, or
   (b) 9.2 mm per person for ramps with a gradient of more than 1 in 8 and stairs.

(2) The aggregate required width of exits serving floor areas intended for Group B occupancy shall be determined by multiplying the occupant load of the area served by 18.4 mm per person.

(3) The required 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.

3.4.3.6. Exit Width Reduction

(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.
3.4.3.6.

(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.

3.4.3.7. Headroom Clearance

(1) Except as provided in Sentences (2) to (4), every exit shall have a headroom clearance of not less than 2100 mm.

(2) The headroom clearance for stairways measured vertically above any landing or the nosing of any stair tread shall be not less than 2050 mm.

(3) The headroom clearance for doorways shall be not less than 2030 mm.

(4) No device such as a door closer shall be installed so as to reduce the headroom clearance of a doorway to less than 1980 mm.

3.4.4. Required Fire Separation for Exits

3.4.4.1. Fire-Resistance Rating of Exit Separations

(1) Except as provided in Article 3.4.4.3. and Sentences (2), 3.3.5.5.(3) and 3.4.4.2.(2), every exit shall be separated from each adjacent floor area by a fire separation having a fire-resistance rating not less than that required for the floor assembly above the floor area and, where there is no floor assembly above, not less than that required by Subsection 3.2.2. for the floor assembly below, but in no case shall the fire-resistance rating be less than 45 min.

(2) The fire-resistance rating of the fire separation in Sentence (1) need not be more than 2 h.

(3) Where 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).

3.4.4.2. Exits through Lobbies

(1) Except as provided in Sentence (2), an exit from any floor area above or below the first storey shall not 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 Group C or F occupancy,
(d) the lobby is not located within an interconnected floor space other than as described in Sentence 3.2.8.2.(6), and
(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, and
(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 when the lobby and adjacent occupancies are sprinklered.

(See Appendix A.)

3.4.4.3. Exterior Passageway Exceptions

(1) The requirements in 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 per cent 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, and
(e) wired glass and glass block as permitted in Article 3.1.8.14.

(2) Exit stairways that are contiguous such as scissors stairs 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) Fuel-fired appliances shall not be installed in any 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) Service rooms and ancillary rooms, such as storage rooms, washrooms, toilet rooms and laundry rooms, shall not open directly into an exit.

(8) Service spaces referred to in Sentence 3.2.1.1.(7) shall not open directly into an exit.

3.4.5. Exit Signs

3.4.5.1. Exit Signage

(1) Every exit door other than the main entrance to a room or building shall have an exit sign placed over or adjacent to it where the exit serves

(a) a building exceeding 2 storeys in building height,
(b) a building having an occupant load greater than 150, or
(c) a room or floor area that has a fire escape as part of a required means of egress.

(2) Every exit sign shall

(a) be visible from the exit approach,
(b) have the word EXIT or SORTIE displayed in plain legible letters, and
(c) be illuminated continuously while the building is occupied.

(3) Exit signs shall consist of

(a) red letters on a contrasting background or a red background with contrasting letters, with the letters not less than 114 mm high and having a 19 mm stroke, when the sign is internally illuminated, and
(b) white letters on a red background or red letters on a white background, with the letters not less than 150 mm high and having a 19 mm stroke, when the sign is externally illuminated.

(4) Where illumination of an exit sign is provided from an electrical circuit, that circuit shall

(a) serve no equipment other than emergency equipment, and
(b) be connected to an emergency power supply as described in Sentence 3.2.7.4.(1) where emergency lighting is required in Sentence 3.2.7.3.(1).

(5) Where necessary, signs shall be provided to indicate the direction of egress in public corridors and passageways, and shall have the word EXIT or SORTIE with a suitable arrow or pointer indicating the direction of egress, and the size of lettering shall conform to Sentence (3).

(6) Except for egress doors described in Sentence 3.3.2.3.(3) and except for the main entrance door, an exit sign conforming to Sentences (2), (3) and (4) shall be placed over or adjacent to every egress door from rooms with an occupant load of 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 that which would provide easy identification of the egress door.

3.4.5.2. Signs for Basement Stairs and Ramps. In buildings over 2 storeys in building height, any part of an exit ramp or stair that continues past an exterior exit door down to a basement shall be clearly marked by a sign indicating that it does not lead to an exit.

3.4.6. Types of Exit Facilities

(See Appendix A.)

3.4.6.1. Slip Resistance of Stairs and Ramps

(1) Treads and landings of interior and exterior stairs and ramps accessible to the public shall have a slip-resistant finish or be provided with slip-resistant strips which extend not more than 1 mm above the surface of the tread, landing or ramp.
3.4.6.1.

(2) Treads and landings of exterior exit stairs more than 10 m high shall be designed to be free of ice and snow accumulations.

3.4.6.2. Minimum Number of Risers. Every flight of interior stairs shall have not less than 3 risers.

3.4.6.3. Landings and Maximum Vertical Rise of Stair Flights

(1) No flight of stairs shall have a vertical rise of more than 3.7 m between floors or landings, except that flights of stairs serving as exits in a Group B, Division 2 occupancy shall have a vertical rise of not more than 2.4 m between floors or landings.

(2) The length and width of landings shall be at least the width of stairways in which they occur, except that in a straight run the length of a landing need not be more than 1100 mm.

(3) Where a doorway or stairway 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, excepting one side when it abuts on an end wall.

(4) Where a door or stairway empties through an end wall onto a ramp, there shall be a level area across the full width of the ramp and along its length for not less than 900 mm.

3.4.6.4. Handrails

(1) Every exit such as a ramp, stairway or passageway shall have a wall or a well-secured guard on each side.

(2) Except as provided in Sentence (4), the height of guards on exit stairs shall be not less than 920 mm measured vertically to the top of the guard from a line drawn through the outside edges of the stair nosings and 1070 mm around landings.

(3) The height of guards on exit ramps and their landings shall be not less than 1070 mm measured vertically to the top of the guard from the ramp surface.

(4) The height of guards of exterior stairs and landings more than 10 m above adjacent ground level shall not be less than 1500 mm measured vertically to the top of the guard from a line drawn through the outside edges of the stair nosings.

(5) The size of any opening through guards for exits shall be such as to prevent the passage of a spherical object having a diameter of 100 mm in buildings of residential occupancy and in day care centres, nurseries, and similar type occupancies, and 200 mm in buildings of other occupancy, except where the location and size of the openings that are more than this limit do not present a hazardous condition.

(6) Windows in exit stairways that extend to less than 1070 mm above the landing shall be protected by a barrier or railing located approximately 1070 mm above such landing.

(7) At least one handrail at the side of a stairway or ramp shall extend horizontally not less than 300 mm beyond the top and bottom of the stairway or ramp. (See A-3.4.6.4.(5) in Appendix A.)

Handrails shall be terminated in a manner which will not obstruct pedestrian travel or create a hazard. (See A-3.4.6.4.(5) in Appendix A.)

(8) A clearance of not less than 40 mm shall be provided between every handrail and any wall to which it is fastened.

3.4.6.5. Guards

(1) Every exit such as a ramp, stairway or passageway shall have a wall or a well-secured guard on each side.

(2) Except as provided in Sentence (4), the height of guards on exit stairs shall be not less than 920 mm measured vertically to the top of the guard from a line drawn through the outside edges of the stair nosings and 1070 mm around landings.

(3) The height of guards on exit ramps and their landings shall be not less than 1070 mm measured vertically to the top of the guard from the ramp surface.

(4) The height of guards of exterior stairs and landings more than 10 m above adjacent ground level shall not be less than 1500 mm measured vertically to the top of the guard from a line drawn through the outside edges of the stair nosings.

(5) The size of any opening through guards for exits shall be such as to prevent the passage of a spherical object having a diameter of 100 mm in buildings of residential occupancy and in day care centres, nurseries, and similar type occupancies, and 200 mm in buildings of other occupancy, except where the location and size of the openings that are more than this limit do not present a hazardous condition.

(6) Windows in exit stairways that extend to less than 1070 mm above the landing shall be protected by a barrier or railing located approximately 1070 mm above such landing.
3.4.6.6. Ramp Gradients

(1) The maximum gradient of ramps shall be
(a) 1 in 10 in any Group A, B or C occupancy,
(b) 1 in 6 in rooms or floor areas classified as Group E or Group F occupancy,
(c) 1 in 8 from any other floor area, and
(d) 1 in 10 for every exterior ramp.

(See also Article 3.7.3.4.)

3.4.6.7. Stair Treads and Risers

(1) Except as otherwise permitted for fire escapes in Sentence 3.4.7.5.1, treads in every exit stair shall have a run of not less than 230 mm and not more than 355 mm exclusive of nosings.

(2) Stairs referred to in Sentence (1) shall have a rise between successive treads of not less than 125 mm and not more than 200 mm.

(3) Treads and risers in every exit stair, except a fire escape stair, shall have uniform run and rise in any one flight, and shall not alter significantly in run and rise in successive flights in any stair system.

(4) Where the run of any tread in an exit stair is less than 250 mm, a nosing of not less than 25 mm shall be provided beyond the face of the riser, or an equivalent back slope on the riser shall be provided.

(5) The front edge of stair treads in exits and public access to exits shall be at right angles to the direction of exit travel.

3.4.6.8. Curved Stairs

(1) Except as permitted in Sentence (2), tapered treads shall not be used in an exit.

(2) Where a curved stair is used as an exit it 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 3.4.6.7, 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.

3.4.6.9. Horizontal Exits

(1) 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 m² of clear floor space per person, except that 1.5 m² shall be provided for each person in a wheelchair and 2.5 m² for each bedridden patient.

(2) Where vestibules, enclosed balconies or bridges are used as parts of any horizontal exit, their clear width shall be at least 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 any horizontal exit where there is a difference in level between the connected floor areas, gradients not exceeding those specified for ramps in Article 3.4.6.6. are permitted to be used.

(4) No stairs or steps shall be used in a horizontal exit.

(5) Where 2 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 and swing in opposite directions, and
(b) signs shall be provided on each side of the exit to indicate the door that swings in the direction of travel from that side.

(6) Where horizontal exits utilize bridges between buildings or outside balconies, such bridges or balconies shall conform to Article 3.2.3.20.

3.4.6.10. 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.

(2) No exit door shall open directly onto a step except that, where 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) Every door leaf in an exit doorway where more than one leaf is provided shall be not less than 610 mm wide.

3.4.6.11. Direction of Door Swing. Every exit door shall open in the direction of exit travel except for doors serving a single dwelling unit, and shall swing on its vertical axis.
3.4.6.12. Self-Closing Devices. Every exit door that is normally required to be kept closed shall be provided with a reliable self-closing mechanism, and shall not at any time be secured in an open position except as specified in Sentence 3.1.8.12.(1).

3.4.6.13. Sliding Doors

(1) Exit doors leading directly to outdoors at ground level are permitted to be sliding doors provided they conform to 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.

3.4.6.14. Revolving Doors

(1) Except as permitted by Sentence (3), where revolving doors are used, they shall

(a) be collapsible,
(b) have hinged doors providing equivalent exiting capacity located adjacent to them,
(c) be used as an exit from the ground floor level only, and
(d) not be used at the foot of any stairway.

(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 3.4.6.15.(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 1000 and 1500 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 CAN2-12.1-M, “Glass, Safety, Tempered or Laminated” or to CAN2-12.11-M, “Glass, Wired, Safety.”

3.4.6.15. Door Release Hardware

(1) Where 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 exit travel shall be installed on

(a) every exit door from a floor area containing a Group A occupancy having an occupant load of more than 100 persons,
(b) every door leading to an exit lobby from an exit stair shaft, and every exterior door leading from an exit stair shaft in buildings having an occupant load of more than 100 persons, and
(c) every exit door from a floor area containing a Group F, Division 1 occupancy.

(2) Except as required by Sentence 3.7.3.3.(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.

(3) Locking, latching and other fastening devices on any required exit door shall be such that the door can be readily opened from the inside without requiring keys, special devices or specialized knowledge of the door opening mechanism, except that this requirement does not apply to locking, latching and other fastening devices described in Sentence (4) or to doors designed to be remotely released in conformance with Article 3.3.1.12. serving a contained use area or an impeded egress zone.

(See Appendix A.)

(4) 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 leading directly from a Group F, Division 1 occupancy provided
3.4.6.16. Emergency Access to Floor Areas

(1) In buildings more than 6 storeys in building height,
(a) doors providing access to floor areas from exit stairs shall not have locking devices to prevent entry into
   (i) any floor area designated as an area of refuge, and
   (ii) any floor area from which the travel distance up or down to an unlocked door is more than 2 storeys,
(b) doors required in Clause (a) that provide access into the floor area shall be identified by a sign on the stairway side to indicate that they are openable from that side, and
(c) a master key to fit all door locking devices that are intended to prevent entry into a floor area from an exit stair shall be provided in a designated location accessible to fire fighters, or the door shall be provided with a wired glass panel not less than 645 cm² in area and located not more than 300 mm from the door opening hardware.

(2) Where access to floor areas through unlocked doors is required in Clause (1)(a), it shall be possible for a person entering such floor area to have access through unlocked doors within the floor area to at least one other exit.

3.4.6.17. Floor Numbering

(1) Arabic numerals indicating the assigned floor number shall
   (a) be mounted permanently on the stair side of the wall at the latch 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 not more than 300 mm from the door, and
   (d) be contrasting in colour with the surface on which they are applied. (See Appendix A.)

3.4.7. Fire Escapes

3.4.7.1. Scope

(1) Except as provided in Sentence (2), fire escapes shall not be erected on buildings.

(2) Where it is impracticable to provide one or more of the exit facilities in Article 3.4.1.4., fire escapes conforming to Articles 3.4.7.2. to 3.4.7.6. are permitted to serve floor areas in existing buildings provided the floor areas served are not more than
   (a) 2 storeys above ground level in Group B occupancies, and
   (b) 5 storeys above ground level in other occupancies.

3.4.7.2. Fire Escape Construction. 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
of 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) Where doors open onto fire escape balconies, such balconies shall have a clear area of not less than 1 m².

3.4.7.4. Protection of Fire Escapes. Where a fire escape serves any storey above the second, openings, 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. where they are located within 3 m horizontally of, 3 storeys or 10 m below, or 1.8 m above any balcony, platform or stairway of a fire escape.

3.4.7.5. Stairs

(1) Stairs shall be inclined at an angle of not more than 45° with the horizontal, and 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 Sentence 3.4.3.1.(1), except that the fire escape shall be not less than 550 mm wide when serving

(a) not more than 3 storeys, and
(b) not more than 15 persons.

(4) Where the flight of stairs leading to the ground at the foot of a fire escape is not fixed in position, it shall be held in the raised position without a latch or locking device, and shall be fitted with a counterbalancing device that will permit it to be easily and quickly brought into position for use.

3.4.7.6. Guards and Railings

(1) The open sides of every platform, balcony and stairway shall be protected by guards not less than 920 mm high measured vertically above the nosing of any tread or platform.

(2) Two equally spaced rails not more than 460 mm apart, parallel to stair stringers and to platform edges, shall be the minimum protection provided, and the top rail is permitted to serve as a handrail if free from obstructions which could break a hand hold.

(3) A wall handrail shall be installed where the fire escape is more than 550 mm wide.

Section 3.5 Service Facilities

3.5.1. General

3.5.1.1. Scope. The provisions of this Section apply to attic, duct, crawl and shaft spaces and service rooms, mechanical penthouses and facilities contained therein.

3.5.1.2. Electrical Wiring and Equipment. Electrical wiring and electrical equipment shall be installed in conformance with the requirements of the appropriate provincial, territorial, or municipal legislation or, in the absence of such legislation, to the requirements of CSA C22.1, “Canadian Electrical Code, Part I.”

3.5.1.3. Storage Use Prohibition. Service spaces provided to contain service facilities shall not be designed to facilitate subsequent use as storage space.

3.5.2. Service Rooms

3.5.2.1. Fire Separations around Service Rooms

(1) Except as provided in Article 3.5.2.2., fuel-fired appliances shall be located in a service room separated from the remainder of the building by a fire separation having a fire-resistance rating of not less than

(a) 2 h in buildings classified as Group B or Group F, Division 1 occupancy where such buildings are more than 2 storeys in building height or 400 m² in building area, and
(b) 1 h in buildings other than as described in Clause (a).

(See Appendix A.)

(2) A solid-fuel fired appliance shall not be located in a repair garage, a storage garage or any other location where the appliance could be exposed to flammable vapours or gases unless

(a) it is enclosed in a service room which is

(i) separated from the remainder of the
3.5.2.9.

building in conformance with Sentence (1), and
(ii) supplied with combustion air directly from outside the building, and
(b) the heat generated by the appliance is supplied indirectly to the space served by means of ducts or piping.

(3) Except as provided in Article 3.5.2.2., service rooms used for purposes other than those described in Sentences (1) and (2) and Articles 3.5.2.6. and 3.5.2.7. 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 such rooms is not sprinklered.

(4) Where a service room is intended to contain equipment that uses a liquid having a flash point below 93.3°C, the requirements in Sentence (1) shall apply.

(5) Sentence 3.5.2.2.(3) shall not apply to a room that contains electrical equipment that is required to be located in a service room in conformance with CSA C22.1, “Canadian Electrical Code, Part I.”

3.5.2.2. Waiver of Fire Separations

(1) No fire separation is required for fireplaces or for roof-top appliances.

(2) Except for buildings classified as Group B or Group F, Division 1 major occupancy, the fire separations required in Sentence 3.5.2.1.(1) need not be provided for fuel-fired appliances, other than fuel-fired appliances referred to in Sentence 3.5.2.1.(2), that serve
(a) not more than one room or suite, or
(b) a building with a building area of not more than 400 m² and a building height of not more than 2 storeys.

(3) Where a room contains a limited quantity of service equipment, and the service equipment does not constitute a fire hazard, the requirements for a fire separation or sprinklering described in Sentence 3.5.2.1.(3) shall not apply.

3.5.2.3. Elevator Machine Rooms. A room containing elevator machinery need not be separated from the elevator hoistway connected to it provided the room is separated from all other parts of the building by a fire separation having a fire-resistance rating not less than that required for the vertical service space containing the elevator hoistway.

3.5.2.4. Service Rooms under Exits. Service rooms containing service equipment subject to possible explosion such as boilers operating in excess of 100 kPa (gauge) and some types of refrigerating machinery and transformers shall not be located directly under required exits.

3.5.2.5. Service Equipment. Service rooms containing space heating, space cooling and service water heating appliances are permitted to contain other service equipment such as electrical service equipment.

3.5.2.6. Incinerator Rooms

(1) Service rooms containing an incinerator 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) Service rooms containing an incinerator shall not contain other fuel-fired appliances.

3.5.2.7. Combustible Refuse Storage. Except as provided in Sentence 3.5.3.3.(9), rooms for the temporary storage of combustible refuse such as garbage or waste paper shall be separated from the remainder of the building by a fire separation with a fire-resistance rating of not less than 1 h and be sprinklered.

3.5.2.8. Door Swing for Service Rooms. Swing-type doors from a service room such as a boiler or incinerator room shall swing outward from such rooms, except that the door shall swing inward when the door opens on a corridor or any room for assembly purposes. (See also Sentence 3.4.4.4.(7).)

3.5.2.9. Electrical Equipment Vaults

(1) Where an electrical equipment vault is required by appropriate provincial, territorial, or municipal regulations or, in the absence of such regulations, by the provisions of CSA C22.1, “Canadian Electrical Code, Part I,” the electrical equipment vault shall be separated from the remainder of the building 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 which will actuate the building fire alarm system in the event of a fire in the vault.

(3) 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.

(4) 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.(2).

(5) 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.

(6) The vault ventilation system required in Sentence (5) shall be separate from the system for the remainder of the building and shall be designed so that it is automatically shut off in the event of a fire in the vault.

(7) 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.

3.5.2.10. Sprinkler Temperature Rating.

In buildings that are required to be sprinklered, sprinklers in elevator machine rooms shall have a temperature rating not less than that required for an intermediate temperature classification and be protected with guards. (See Appendix A.)

3.5.3. Vertical Service Spaces and Service Facilities

3.5.3.1. Fire Separations for Vertical Service Spaces

(1) Except as provided in Sentence (2), every vertical service space shall be separated from each adjacent floor area by a fire separation having a fire-resistance rating conforming to Table 3.5.3.A. for the fire-resistance rating required for the floor assembly above the floor area and, where there is no floor assembly above, conforming to that required by Subsection 3.2.2. for the floor assembly below.

Table 3.5.3.A.

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<tbody>
<tr>
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<td>45 min</td>
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<td>2 h</td>
<td>1 h</td>
<td>1.5 h</td>
</tr>
<tr>
<td>3 h</td>
<td>1.5 h</td>
<td>2 h</td>
</tr>
</tbody>
</table>

(2) Vertical service spaces containing elevators for use by fire fighters required in Articles 3.2.6.9. and 3.3.1.7. shall be separated from each adjacent floor area by a fire separation having a fire-resistance rating not less than that required for the floor assembly above the floor area and, where there is no floor assembly above, not less than that required for the floor assembly below, but in no case shall the fire-resistance rating be less than 45 min.

(3) Every 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 service space walls.
(4) Every 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 service space walls.

(5) Vents from vertical service spaces 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 service space walls.

(6) Only openings that are necessary for the use of the vertical service space shall be permitted in the service space enclosure.

3.5.3.2. Foamed Plastic Protection.
Foamed plastic insulation in vertical service spaces shall be protected in conformance with Article 3.1.5.11.

3.5.3.3. Linen and Refuse Chutes
(1) Every linen 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) Every shaft containing a linen or refuse chute shall have a fire-resistance rating conforming to Sentence 3.5.3.1.(1), but not less than
(a) 1 h where 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 where no closure is provided at the chute outlet into the discharge room.

(3) Every interior linen or refuse chute shall extend not less than 1 m above the roof and shall be vented above the roof with a vent which
(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 linen or refuse chutes shall
(a) have an area not more than 60 per cent 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 linen or refuse chutes 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 of 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 and 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 of not less than 1 h.

(8) Every 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 of 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) Rooms into which refuse chutes discharge shall contain no service equipment that is not related to refuse handling and disposal.

3.5.3.4. Exhaust Duct Negative Pressure.
When 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, and such individual fire compartments shall not have individual fans that exhaust directly into the duct in the vertical service space.
3.5.4. Horizontal Service Spaces and Service Facilities

3.5.4.1. Scope. This applies to horizontal service spaces and service facilities, including ceiling spaces, duct spaces, crawl spaces and attic or roof spaces.

3.5.4.2. Fire Separations for Horizontal Service Spaces

(1) 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) 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 at the fire separation as required in Article 3.1.8.3. provided the construction between such space and the space below is constructed as a fire separation at least equivalent to that required for the vertical fire separation, except that where the vertical fire separation is not required to have a fire-resistance rating of more than 45 min, the fire-resistance rating is permitted to be not less than 30 min. (See Appendix A.)

3.5.4.3. Plenum Requirements

(1) The concealed space between the ceiling and floor or ceiling and roof used as a plenum need not conform to Sentence 3.1.5.14.(1) and Article 6.2.3.2. provided

(a) all materials within the ceiling space have a flame-spread rating of not more than 25 and a smoke developed classification of not more than 50, except for

(i) tubing for pneumatic controls,

(ii) 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-M, “Test Methods for Electrical Wires and Cables,” and

(iii) electrical wires and cables that are located in totally enclosed noncombustible raceways (see A-3.1.4.3.(1)(b)(i) in Appendix A), and

(b) the supports for the ceiling membrane are of noncombustible material having a melting point not below 760°C.

(2) When the 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 which 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, and

(c) conform to the appropriate requirements of Chapter 2, “Fire Performance Ratings” of the Supplement to the NBC 1990.

3.5.4.4. Attic or Roof Space Access. Every 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.

3.5.4.5. Horizontal Service Space Access. Horizontal service spaces consisting of ceiling and duct spaces which are more than 1 200 mm high and 600 mm wide shall have access doors not less than 600 mm in both horizontal and vertical dimensions, or 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.

3.5.4.6. Crawl Space Access. Every crawl space shall have at least one access opening not less than 550 mm by 900 mm.

3.5.5. Elevators, Dumbwaiters and Escalators

3.5.5.1. Elevator, Dumbwaiter and Escalator Standards

(1) The design, construction, installation and alteration of every elevator, dumbwaiter and escalator shall conform to appropriate provincial, territorial, or municipal requirements or, in the absence of such

(2) Before being placed in service, every elevator, dumbwaiter or escalator installation, including safety and control devices, shall be inspected and tested in accordance with appropriate provincial, territorial, or municipal requirements or, in the absence of such requirements, in conformance with CAN3-B44-M, “Safety Code for Elevators, Escalators, Dumbwaiters, Moving Walks and Freight Platform Lifts.”

(3) Elevators in buildings within the scope of Subsection 3.2.6. shall conform to Articles 3.2.6.8. and 3.2.6.9.

3.5.5.2. Floor Numbering. Arabic numerals indicating the assigned floor number shall be mounted permanently on both jambs of passenger elevator hoistway entrances in conformance with Appendix E of CAN3-B44-M, “Safety Code for Elevators, Escalators, Dumbwaiters, Moving Walks and Freight Platform Lifts.”

Section 3.6 Health Requirements

3.6.1. Height and Area of Rooms

3.6.1.1. Room and Space Height

(1) The height of every room and space shall be such that adequate light and air may be provided for the intended occupancy, and that no obstruction to movement or activities below is caused by the ceiling or ceiling fixtures.

(2) The unobstructed height in dwelling units shall conform to Subsection 9.5.2.

3.6.1.2. Residential Room Dimensions. The areas and width of rooms in dwelling units, dormitories, boarding houses and rooming houses shall conform to Section 9.5.

3.6.2. Windows

3.6.2.1. Window Areas. Every sleeping room in any building, and every principal room such as living room, dining room or combination thereof in dwelling units, shall be provided with windows having areas conforming to Subsection 9.7.1. (See Appendix A.)

3.6.3. Ventilation

3.6.3.1. Ventilation shall conform to Part 6.

3.6.4. Plumbing Facilities

(See also Section 3.7 for plumbing facility requirements for persons with disabilities.)

3.6.4.1. Plumbing and Drainage Systems

(1) 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 toilet 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.

3.6.4.2. Water Closets

(1) Water closets shall be provided for each sex in accordance with the anticipated proportion of each sex in the occupancy when this can be determined with reasonable accuracy, except that when such a determination cannot be made with reasonable accuracy, it shall be assumed that the occupancy is equally divided between the sexes.

(2) Where water closets are required in this Subsection, urinals may be substituted for two thirds of the required number of water closets and may be counted as water closets, except that where only 2 water closets are required, one urinal may be substituted for one of the water closets.

(3) The number of water closets required for Group A, Division 1, 3, and 4 occupancies and for auditoria, gymnasium, lecture halls, secondary schools, nonresidential colleges and similar occupancies shall conform to Table 3.6.4.A.

(4) Except as provided in Sentence (11), the number of water closets required for Group D occupancies and for restaurants, nonresidential clubs, bowling alleys, community halls, lodge rooms,
passenger stations and depots, art galleries, exhibition halls, libraries, museums, courtrooms and similar occupancies shall conform to Table 3.6.4.B.

Table 3.6.4.B.
Forming Part of Sentence 3.6.4.2.(4)

<table>
<thead>
<tr>
<th>Number of Persons of Each Sex</th>
<th>Minimum Number of Water Closets for Each Sex</th>
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</thead>
<tbody>
<tr>
<td></td>
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</tr>
<tr>
<td>26 — 50</td>
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<td>2</td>
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<td>101 — 150</td>
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<td>151 — 200</td>
<td>4</td>
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<td>5</td>
</tr>
<tr>
<td>301 — 400</td>
<td>6</td>
</tr>
<tr>
<td>Over 400</td>
<td>7 plus 1 for each additional increment of 200 males in excess of 400</td>
</tr>
<tr>
<td></td>
<td>Female</td>
</tr>
<tr>
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<td></td>
<td>8</td>
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<tr>
<td></td>
<td>9 plus 1 for each additional increment of 150 females in excess of 400</td>
</tr>
</tbody>
</table>

Column 1                       | 2                                          | 3

Table 3.6.4.C.
Forming Part of Sentence 3.6.4.2.(10)

<table>
<thead>
<tr>
<th>Number of Persons of Each Sex</th>
<th>Minimum Number of Water Closets for Each Sex</th>
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</thead>
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<tr>
<td></td>
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<tr>
<td>76 — 100</td>
<td>5</td>
</tr>
<tr>
<td>Over 100</td>
<td>6 plus 1 for each additional increment of 30 persons of each sex in excess of 100</td>
</tr>
</tbody>
</table>

Column 1                       | 2                                          |

(5) The number of water closets required for primary schools and day-care centres shall be at least one fixture for each 30 males and one fixture for each 25 females.

(6) The number of water closets required for places of worship and undertaking premises shall be at least one fixture for each 150 persons of each sex.

(7) The number of water closets required for institutional occupancies shall be determined on the basis of the special needs of such occupancies.

(8) Except as provided in Sentence (11), the number of water closets required for residential occupancies shall be at least one fixture for each 10 persons of each sex, except that dwelling units shall conform to the requirements in Part 9.

(9) Except as provided in Sentence (11), the number of water closets required for mercantile occupancies shall be at least one fixture for each 300 males and one fixture for each 150 females.

(10) Except as provided in Sentence (11), the number of water closets required for industrial occupancies shall conform to Table 3.6.4.C.

(11) Where the occupant load in an occupancy described in Sentences (4), (8), (9) and (10) is not more than 10 persons, or where the total area in a Group E occupancy is not more than 100 m², both sexes may be served by one water closet.

3.6.4.3. Lavatories

(1) Except as provided in Sentence (2), at least one lavatory shall be provided in a room containing 1 or 2 water closets or urinals, and at least one additional lavatory shall be provided for each additional 2 such fixtures.
Wash fountains in circular form may be provided in lieu of lavatories required in Sentence (1) provided each 500 mm of circumference is considered to be the equivalent of one lavatory.

3.6.4.4. Mobile Home Facilities

(1) Where mobile homes do not have individual sanitary facilities connected to a central water supply and drainage system, a service building shall be provided for public use and shall contain at least one water closet for each sex where the facilities serve not more than 10 mobile homes, and where the facilities serve more than 10 mobile homes, an additional water closet for each sex shall be provided for each additional 10 mobile homes.

(2) Where a service building is required by Sentence (1), it shall contain lavatories as required in Sentence 3.6.4.3.(1) and at least
   (a) one laundry tray or similar facility, and
   (b) one bathtub or shower for each sex.

3.6.4.5. Safety Glass. Glass, other than safety glass, shall not be used for a shower or bathtub enclosure.

3.6.4.6. Surface Protection near Urinals.
Wall and floor surfaces below the uppermost surfaces of urinals shall be protected from deterioration for a distance from the urinal to a point not less than 900 mm from the projected outline of the urinal on to the wall or floor by impervious and durable material.

3.6.4.7. Floor Drains. A floor drain shall be installed in a washroom containing urinals equipped with automatic flushing devices.

3.6.4.8. Grab Bar Installation. Grab bars that are installed shall resist the minimum loads specified in Subclause 3.7.3.8.(1)(d)(iv).

3.6.5. Medical Gas Piping Systems

3.6.5.1. Medical Gas Piping. Non-flammable medical gas piping systems shall be installed in conformance with CSA Z305.1-M, “Non-Flammable Medical Gas Piping Systems.”

Section 3.7 Barrier-Free Design

3.7.1. General

3.7.1.1. Application

(1) The requirements of this Section apply to all buildings except
   (a) houses, including semi-detached, duplexes, triplexes, town houses, row houses and boarding houses,
   (b) buildings of Group F, Division 1 major occupancy, and
   (c) buildings which are not intended to be occupied on a daily or full time basis, including automatic telephone exchanges, pumphouses and substations.

(See Appendix A.)

3.7.1.2. Entrances

(1) Except as required in Sentence (2), every building referred to in Article 3.7.1.1. shall have at least one entrance intended for general use by the public or the occupants designed in conformance with Article 3.7.3.3. and opening to the outdoors at sidewalk level or to a ramp conforming to Article 3.7.3.4. leading to a sidewalk. (See Appendix A.)

(2) Where a suite of Group A, D or E occupancy is located in the first storey of a building or in a storey to which a barrier-free path of travel is provided and is completely separated from the remainder of the building so that there is no access to the remainder of the building, such suite shall have at least one barrier-free entrance in conformance with Sentence (1).

3.7.1.3. Barrier-Free Path of Travel

(1) Except as permitted in Subsection 3.7.3., every barrier-free path of travel shall provide an unobstructed width of not less than 920 mm for the passage of wheelchairs.

(2) Floor surfaces along a barrier-free path of travel shall have no opening that will permit the passage of a sphere more than 13 mm diam.
A barrier-free path of travel is permitted to include ramps, elevators or other platform elevating devices where there exists a difference in elevation.

3.7.1.4. Storeys Served by Escalators.
Where escalators provide access to storeys above or below the first storey, a barrier-free path of travel shall be provided to those storeys served by the escalators. (See Appendix A.)

3.7.1.5. Controls.
Except as provided in Article 3.7.3.5. for elevators, controls for the operation of building services or safety devices, located in a barrier-free path of travel and intended to be operated by an occupant, including electrical switches, thermostats and intercom switches, shall be accessible to a person in a wheelchair and shall be mounted not more than 1400 mm above the floor.

3.7.2. Occupancy Requirements

3.7.2.1. Areas Requiring Barrier-Free Path of Travel

(1) A barrier-free path of travel shall be provided in the entrance storey and in each storey served by a passenger elevator or other platform equipped passenger elevating device from the entrance described in Article 3.7.1.2.
(a) into each suite,
(b) into 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,
(c) into rooms or areas for student use in assembly occupancies,
(d) into general work areas, including office areas,
(e) into general use or general service areas, including shared laundry areas in residential occupancies, recreational areas, cafeterias, lounge rooms, lunch rooms and infirmaries,
(f) into sleeping rooms in hospitals and nursing homes,
(g) into at least one passenger elevator or elevating device conforming to Article 3.7.3.5.,
(h) into washrooms described in Article 3.7.2.3.,
(i) to any facility required by this Section to be designed to accommodate disabled persons,
(j) onto every balcony provided in conformance with Sentence 3.3.1.7.(1), and
(k) to all service counters used by the general public (see Appendix A).

See Appendix A.

3.7.2.2. Access to Parking Areas

(1) A barrier-free path of travel shall be provided from the entrance described in Article 3.7.1.2. to
(a) an exterior parking area, where exterior parking is provided (see Appendix A), and
(b) at least one parking level, where a passenger elevator serves an indoor parking level.
3.7.2.3. Washrooms Required to be Barrier-Free

(1) Except as permitted in Sentence (2), where washrooms are provided in a storey to which a barrier-free path of travel is required in conformance with Article 3.7.2.1., these washrooms shall be barrier-free in conformance with the appropriate requirements in Articles 3.7.3.8. to 3.7.3.11.

(2) Washrooms need not conform to the requirements in Sentence (1) provided
   (a) they are located within suites of residential occupancy,
   (b) other barrier-free washrooms are provided on the same floor area within 45 m, or
   (c) they are located in an individual suite having an area of less than 500 m² in buildings where such suite is completely separated from the remainder of the building so that there is no access to the remainder of the building.

(3) In buildings where a washroom is required in accordance with Subsection 3.6.4., a barrier-free washroom shall be provided in the entrance storey, except if a barrier-free path of travel is provided to a barrier-free washroom in another storey.

(4) Where alterations are made to existing buildings, special washrooms conforming to Article 3.7.3.11. are permitted to be provided in lieu of facilities for disabled persons in washrooms used by the general public.

(5) Except as permitted in Sentence (6), the door for the entrance described in Article 3.7.1.2. shall be equipped with a power door operator in
   (a) hotels,
   (b) buildings of Group B, Division 2 major occupancy, and
   (c) buildings of Group A, D or E major occupancy more than 500 m² in building area.

(6) The requirements in Sentence (5) do not apply to an individual suite having an area of less than 500 m² in buildings having only suites of Group A, D or E occupancy where such suite is completely separated from the remainder of the building so that there is no access to the remainder of the building.

3.7.3. Design Standards

3.7.3.1. Accessibility Signs

(1) Where a building is required to have an entrance to accommodate disabled persons, signs incorporating the international symbol of accessibility for disabled persons shall be installed where necessary to indicate the location of that entrance.

(2) Where a washroom, elevator or parking area is required to accommodate disabled persons, it shall be identified by a sign consisting of the international symbol of accessibility for disabled persons and such other graphic or written directions as are needed to indicate clearly the type of facility available.

(3) Where a washroom is not designed to accommodate disabled persons in a storey to which a barrier-free path of travel is required, signs shall be provided to indicate the location of barrier-free facilities.

(See Appendix A.)

3.7.3.2. Exterior Walks

(1) Exterior walks that form part of a barrier-free path of travel shall
   (a) have a slip-resistant, continuous and even surface,
   (b) be not less than 1 100 mm wide, and
   (c) have a level area adjacent to the entrance doorway conforming to Clause 3.7.3.4.(1)(c).

3.7.3.3. Doorways and Doors

(1) Every doorway that is located in a barrier-free path of travel shall have a clear width of not less than 800 mm when the door is in the open position.

(2) The doorway to at least one bathroom within a suite of residential occupancy shall have a clear width of not less than 760 mm when the door is in the open position. (See Appendix A.)

(3) Door operating devices shall be of a design which does not require tight grasping and twisting of the wrist as the only means of operation. (See Appendix A.)

(4) Thresholds for doorways referred to in Sentences (1) and (2) shall be not more than 13 mm higher than the finished floor surface and shall be bevelled to facilitate the passage of wheelchairs.

(5) Except as permitted in Sentence (6), the door for the entrance described in Article 3.7.1.2. shall be equipped with a power door operator in
   (a) hotels,
   (b) buildings of Group B, Division 2 major occupancy, and
   (c) buildings of Group A, D or E major occupancy more than 500 m² in building area.

(See Appendix A.)

(6) The requirements in Sentence (5) do not apply to an individual suite having an area of less than 500 m² in buildings having only suites of Group A, D or E occupancy where such suite is completely separated from the remainder of the building so that there is no access to the remainder of the building.
3.7.3.3.

(7) Except as permitted in Sentence (8) and except for doors with power door 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 s 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.)

(10) Every door equipped with a closer in a barrier-free path of travel shall have a clear space beyond the latch side of not less than
   (a) 600 mm where the door swings towards the approach side, and
   (b) 300 mm where the door swings away from the approach side.

(See Appendix A.)

(11) Vestibules located in a barrier-free path of travel shall be arranged to allow the movement of wheelchairs between doors and shall provide a distance between 2 doors in series of not less than 1 200 mm plus the width of any door that swings into the space in the path of travel from one door to another.

3.7.3.4. Ramps

(1) Ramps located in a barrier-free path of travel shall
   (a) have a width of not less than 870 mm between handrails,
   (b) have a gradient of not more than 1 in 12 (see Appendix A),
   (c) have a level area not less than 1 500 by 1 500 mm at the top and bottom and at intermediate levels of a ramp leading to a door, so that the level area extends not less than 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 not less than 1 200 mm long and at least the same width as the ramp
      (i) at intervals of not more than 9 m along its length, and
      (ii) where there is an abrupt change in the direction of the ramp, and
   (e) except as provided in Sentence (2) be equipped with handrails and guards conforming to Articles 3.4.6.4. and 3.4.6.5.

(2) Where a ramp serves as an aisleway for fixed seating, the requirement for handrails in Clause 3.7.3.4.(1)(e) need not apply.

(3) Floors or walks in a barrier-free path of travel having a slope steeper than 1 in 20 shall be designed as ramps.

3.7.3.5. Elevators

(1) Passenger elevators which are required to be barrier-free shall conform to Appendix E of CAN3-B44-M, “Safety Code for Elevators, Escalators, Dumbwaiters, Moving Walks and Freight Platform Lifts.”

(2) The passenger elevating device referred to in Article 3.7.2.1. shall conform to CAN/CSA-B355-M, “Elevating Devices for the Handicapped.”

3.7.3.6. Spaces in Seating Area

(1) Spaces designated for wheelchair use referred to in Sentence 3.7.2.1.(2) shall be
   (a) clear and level, or level with removable seats,
   (b) not less than 840 mm wide and 1 525 mm long to permit wheelchairs to enter from a side approach and 1 220 mm long where the wheelchair enters from the front or rear of the space,
   (c) arranged so that at least 2 designated spaces are side by side,
   (d) located adjoining a barrier-free path of travel without infringing on egress from any row of seating or any aisle requirements, and
3.7.3.7. Assisted Listening Devices

(1) Except as permitted in Sentence (2), in buildings of assembly occupancy, all classrooms, auditoria, meeting rooms and theatres with an area of more than 100 m² shall be equipped with an assistive listening system encompassing the entire seating area.

(2) Where the assistive listening system required in Sentence (1) is an induction loop system, only half the seating area in the room need be encompassed.

(See Appendix A.)

3.7.3.8. Water Closet Stalls

(1) Where a washroom is required by Article 3.7.2.3. to be barrier-free, at least one water closet stall or enclosure shall

(a) be not less than 1,500 mm wide by 1,500 mm deep,

(b) be equipped with a door which shall

(i) be capable of being locked from the inside,

(ii) provide a clear opening of not less than 760 mm with the door in the open position,

(iii) swing outward, unless sufficient room is provided within the stall or enclosure to permit the door to be closed without interfering with the wheelchair,

(iv) be provided on the inside with a door pull not less than 140 mm long located so that its midpoint is not less than 200 mm and not more than 300 mm from the hinged side of the door and not less than 900 mm and not more than 1,000 mm from the floor (see Appendix A), and

(v) be provided with a door pull on the outside, near the latch side of the door,

(c) have a water closet located so that its centreline is not less than 460 mm and not more than 480 mm from an adjacent side wall on one side,

(d) be equipped with grab bars which shall

(i) be mounted horizontally on the side wall closest to the water closet and shall extend not less than 450 mm in both directions from the forward-most point of the water closet,

(ii) be mounted on the wall behind the water closet so that it extends the full width of the toilet bowl where the water closet does not have a water tank,

(iii) be mounted not less than 840 mm and not more than 920 mm above the floor,

(iv) be installed to resist a load of not less than 1.3 kN applied vertically or horizontally,

(v) be not less than 30 mm and not more than 40 mm in diameter, and

(vi) have a clearance of not less than 35 mm and not more than 45 mm from the wall,

(e) be equipped with a coat hook mounted not more than 1,400 mm above the floor on a side wall and projecting not more than 25 mm from the wall,

(f) have a clearance of not less than 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.

(See Appendix A.)

3.7.3.9. Water Closets

(1) Water closets for disabled persons shall

(a) be equipped with seats located at not less than 400 mm and not more than 460 mm above the floor,

(b) be equipped with hand-operated flushing controls that are easily accessible to a wheelchair user,

(c) be equipped with a back support such as a seat lid, and

(d) not have a spring-actuated seat.

(See Appendix A.)

3.7.3.10. Lavatories

(1) Barrier-free washrooms shall be provided with a lavatory which shall
(a) be located so that the distance between the centreline of the fixture and the side wall is not less than 460 mm,
(b) have a top surface height of not more than 865 mm,
(c) have a clearance beneath of not less than
(i) 735 mm at the front edge of the lavatory,
(ii) 685 mm at a point 205 mm back from the front edge, and
(iii) 230 mm over the distance from a point 280 mm to a point 430 mm back from the front edge,
(see Appendix A)
(d) have insulated waste pipes where these pipes present a burn hazard,
(e) be equipped with faucet handles of the lever type without spring loading, and
(f) have soap or towel dispensers located not more than 1,200 mm above the floor in an area that is accessible to persons in wheelchairs.

(2) Shelves or other projections above lavatories shall be located so they will not present a hazard to visually impaired persons.

3.7.3.11. Special Washrooms

(1) Where a special washroom is provided primarily for the use of disabled persons of both sexes in lieu of facilities for disabled persons in washrooms used by the general public, such washrooms shall
(a) be equipped with a door capable of being locked from the inside and released from the outside in case of emergency and which has
(i) graspable latch operating and locking mechanisms located not less than 900 mm and not more than 1,000 mm from the floor, and
(ii) on outward swinging doors, a door pull not less than 140 mm long located on the inside so that its midpoint is not less than 200 mm and not more than 300 mm from the hinged side of the door and not less than 900 mm and not more than 1,000 mm from the floor (see A-3.7.3.8.(1)(b)(iv) in Appendix A),
(b) be provided with a lavatory conforming to Article 3.7.3.10.,
(c) be equipped with a water closet conforming to Article 3.7.3.9.,
(d) be equipped with grab bars conforming to Clause 3.7.3.8.(1)(d),
(e) have no dimension less than 1,700 mm,
(f) have fixture clearances conforming to the fixture clearances described in Articles 3.7.3.8. to 3.7.3.10.,
(g) be equipped with a coat hook conforming to Clause 3.7.3.8.(1)(e) and a shelf located not more than 1,200 mm above the floor, and
(h) have a doorway conforming to Article 3.7.3.3.
(See Appendix A.)

3.7.3.12. Showers

(1) Where showers are provided in buildings of assembly occupancy, at least one shower stall shall be barrier-free and 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 a slip-resistant floor surface,
(d) have a bevelled threshold not more than 13 mm higher than the finished floor,
(e) be equipped with a hinged seat that is not spring-loaded or a fixed seat that is
(i) not less than 450 mm wide and 400 mm deep,
(ii) mounted approximately 450 mm above the floor, and
(iii) designed to carry a minimum load of 1.3 kN,
(f) be equipped with a horizontal grab bar which shall
(i) be not less than 900 mm long,
(ii) be mounted approximately 850 mm above the floor,
(iii) be located on the wall opposite the entrance to the shower so that not
less than 300 mm of its length is at one side of the seat, and
(iv) conform to Subclauses 3.7.3.8.(1)(d)(iv), (v) and (vi) (see Appendix A),
(g) be equipped with a pressure-equalizing or thermostatic mixing valve controlled by a lever or other device operable with a closed fist from the seated position,
(h) be equipped with a hand-held shower head with not less than 1 500 mm of flexible hose located so that it can be reached from the seated position and equipped with a support so that it can operate as a fixed shower head, and
(i) have fully recessed soap holders which can be reached from the seated position.

3.7.3.13. Counters

(1) All counters more than 2 m long serving the public shall have at least one barrier-free section in conformance with Sentences (2) and (3).

(2) Barrier-free counter surfaces shall be not more than 865 mm above the floor.

(3) Knee space beneath barrier-free counters intended to be used as work surfaces shall be not less than
(a) 760 mm wide,
(b) 685 mm high, and
(c) 485 mm deep.
(See A-3.7.2.1.(1)(k) in Appendix A.)

3.7.3.14. Shelves or Counters for Telephones

(1) Where built-in shelves or counters are provided for public telephones, they shall be level and shall
(a) be not less than 350 mm deep, and
(b) have, for each telephone provided, a clear space not less than 250 mm wide having no obstruction within 250 mm above the surface.

(2) The top surface of a section of the shelf or counter described in Sentence (1) serving at least one telephone shall be not more than 865 mm above the floor.

(3) Where a wall-hung telephone is provided above the shelf or counter section described in Sentence (2), it shall be located so that the receiver and coin slot are not more than 1 200 mm above the floor.
(See Appendix A.)

3.7.3.15. Drinking Fountains

(1) Where drinking fountains are provided, at least one shall be barrier-free and shall
(a) have a spout located near the front of the unit not more than 915 mm above the floor, and
(b) be equipped with controls that are easily operable from a wheelchair using one hand with a force of not more than 22 N.
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### Structural Design

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Part 4
Structural Design

Section 4.1  Structural Loads and Procedures

4.1.1.  General

4.1.1.1.  Scope.  The scope of this Part shall be as described in Section 2.1.

4.1.1.2.  Definitions

(1) Words that appear in italics in this Part are defined in Part 1.

(2) The designer shall be a professional engineer or architect as appropriate under provincial or territorial legislation. (See Appendix A.)

4.1.1.3.  Design Requirements

(1) Buildings and their structural members including formwork and falsework shall be designed to have sufficient structural capacity and structural integrity to resist safely and effectively all loads and 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) 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.

(3) Falsework shall be designed in conformance with CSA S269.1, “Falsework for Construction Purposes.”

(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.  Buildings and their structural members shall be designed in conformance with Parts 4 and 5. (See Subsection 2.5.2. for other methods of design.)

4.1.1.5.  Deflections

(1) In proportioning structural members to limit deflection, consideration shall be given to

(a) the intended use of the building or member,

(b) limiting damage to non-structural members and materials whose physical properties are known at the time of the design, and

(c) limiting damage to the structure itself.  (See Appendix A.)

(2) 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.

(3) Deflections listed in Sentence (1) shall be taken into account in all structures and structural members made of material susceptible to deflections, deformations or changes in load distribution due to creep, shrinkage or other effects in the materials of which they are composed.

(4) The lateral deflection of buildings due to design wind and gravity loads shall be checked to ensure that nonstructural elements whose nature is known at the time the structural design is carried out will not be damaged.
4.1.1.5.

(5) Except as provided in Sentence (6), the total drift per storey under specified 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.)

(6) The deflection limits required in Sentence (5) do not apply to industrial buildings or sheds if it is known by experience that greater movement will have no significantly adverse effect on the strength and function of the building.

4.1.1.6. Vibrations

(1) Floor systems susceptible to vibrations shall be designed so that there will be no significantly adverse effects on the intended occupancy of the building from vibrations. (See Appendix A.)

(2) Unusually flexible buildings and buildings whose ratio of height to minimum effective width exceeds 4 to 1 shall be designed so that there will be no significantly adverse effects on the intended occupancy of the building from vibrations under dynamic wind load. (See Appendix A.)

4.1.1.7. Stability. Provision shall be made to ensure adequate stability of a structure as a whole, and adequate lateral, torsional and local stability of all structural parts.

4.1.1.8. Structural Drawings and Related Documents. Structural drawings and related documents shall conform to the appropriate requirements of Part 2. (See Subsection 2.3.4.)

4.1.2. Specified Loads and Effects

4.1.2.1. Loads, Forces and Effects

(1) Except as provided for in Article 4.1.2.2., the following specified loads, forces and effects shall be considered in the design of a building and its structural members and connections:

- **D** — *dead loads* as provided for in Subsection 4.1.5.
- **L** — *live load* due to intended use and occupancy (includes vertical loads due to cranes; snow, ice and rain; earth and hydrostatic pressure; horizontal components of static or inertia forces;
- **Q** — *live load* due to wind or earthquake, whichever produces the more unfavourable effect,
- **T** — loads due to contraction or expansion caused by temperature changes, shrinkage, moisture changes, creep in component materials, movement due to differential settlement or combination thereof.

(See Appendix A.)

(2) Minimum specified values of these loads, as set forth in Subsections 4.1.5. to 4.1.10., shall be increased to account for dynamic effects where applicable.

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.

(2) If it can be shown by engineering principles, or if it is known from experience, that neglect of some or all of the effects due to T does not affect the structural safety and serviceability, they need not be considered in the calculations.

4.1.2.3. Structural Design. Structural design shall be carried out in accordance with Subsection 4.1.3., Working Stress Design or Subsection 4.1.4., Limit States Design.

4.1.3. Working Stress Design

4.1.3.1. Load Combinations

(1) In designing buildings and their structural members, all of the loads listed in Article 4.1.2.1. shall be considered to act in the following combinations, whichever combination produces the most unfavourable effects in the building, foundation or structural member concerned, when appropriately reduced according to Article 4.1.3.2.:

- (a) **D**
- (b) **D + L**
- (c) **D + Q**
- (d) **D + T**
- (e) **D + L + Q**
- (f) **D + L + T**
- (g) **D + Q + T**
- (h) **D + L + Q + T**
in which Q is the specified wind load or two-thirds of the specified earthquake load.

4.1.3.2. Load Combination Factors

(1) The total of the combined load effects may be multiplied by the following load combination factors:
   (a) 1.0 for the combinations in Clauses 4.1.3.1.(l)(a) to (d),
   (b) 0.75 for the combinations in Clauses 4.1.3.1.(l)(e) to (g), and
   (c) 0.66 for the combination in Clause 4.1.3.1.(l)(h).

4.1.3.3. Stress Reversal. When loads other than D counteract D in a structural member or joint, special caution shall be exercised by the designer to ensure adequate safety for possible stress reversal. (See Appendix A.)

4.1.3.4. Overturning and Sliding

(1) A building shall be proportioned to resist an overturning moment and sliding force of not less than twice that due to the loads acting on the structure when the structure is considered as an entire unit acting on or anchored to its bearing stratum or supporting structure.

(2) The resistance to overturning shall be calculated as the sum of the stabilizing moment of the dead load only, plus the ultimate resistance of any anchoring devices.

4.1.4. Limit States Design

(See Appendix A.)

4.1.4.1. Definitions

(1) In this Subsection, the term
   (a) limit states means those conditions of a building structure in which the building ceases to fulfil the function for which it was designed,
   (Those states concerning safety are called ultimate limit states and include exceeding the load carrying capacity, overturning, sliding, fracture and fatigue, while those states which restrict the intended use and occupancy of the building are called serviceability limit states, and include deflection, vibration, permanent deformation and cracking.)

   (b) specified loads (D, L, Q and T) mean those loads defined in Article 4.1.2.1. and given in this Section,
   (c) load factor, α, means a factor in Sentence 4.1.4.2.(4) applied to a specified load which, for the limit states under consideration, takes into account the variability of the loads and load patterns and analysis of their effects,
   (d) factored load means the product of a specified load and its load factor,
   (e) load combination factor, γ, means a factor in Sentences 4.1.4.2.(5) and (6) applied to the factored loads other than dead load to take into account the reduced probability of a number of loads from different sources acting simultaneously,
   (f) importance factor, η, means a factor in Sentence 4.1.4.2.(7) applied to the factored loads other than dead load to take into account the consequences of collapse as related to the use and occupancy of the building,
   (g) resistance, R, of a member, connection or structure is based on the dimensions and on the specified properties of the structural materials,
   (h) resistance factor, φ, means a factor applied to a specified material property or to the resistance of a member, connection or structure which 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
   (i) factored resistance means the product of resistance and the applicable resistance factor.

4.1.4.2. Safety Check for Strength and Stability

(1) A building and its structural components shall be designed to have sufficient strength and stability so that the factored resistance is greater than or equal to the effect of factored loads, as required in Sentence (3).

(2) In cases of overturning, uplift and sliding, anchorage is required if the effect of loads tending to
cause overturning, uplift or sliding, multiplied by load factors greater than 1.0 given in Sentence (4), is greater than the stabilizing effect of dead load multiplied by a load factor of 0.85 as given in Sentence (4).

(3) The effect of factored loads is the structural effect due to the specified loads multiplied by load factors, \( \alpha \), in Sentence (4), a load combination factor, \( \psi \), in Sentences (5) and (6) and an importance factor, \( \gamma \), in Sentence (7), and the factored load combinations shall be taken as

\[
\alpha_\psi D + \gamma \left( \alpha_L L + \alpha_Q Q + \alpha_T T \right)
\]

(4) The load factors, \( \alpha \), shall be equal to

(a) \( \alpha_L = 1.25 \), except that when the dead load resists overturning, uplift or reversal of load effect, \( \alpha_L = 0.85 \),
(b) \( \alpha_Q = 1.5 \),
(c) \( \alpha_Q = 1.5 \) for wind or 1.0 for earthquake, and
(d) \( \alpha_T = 1.25 \).

(5) The load combination factor, \( \psi \), shall be equal to

(a) 1.0 when only one of the loads, \( L \), \( Q \) and \( T \) in Sentence 4.1.2.1.(1) acts,
(b) 0.70 when 2 of the loads, \( L \), \( Q \) and \( T \) in Sentence 4.1.2.1.(1) act, and
(c) 0.60 when all of the loads, \( L \), \( Q \) and \( T \) in Sentence 4.1.2.1.(1) act.

(6) The most unfavourable effect shall be determined by considering the loads \( L \), \( Q \) and \( T \) in Sentence 4.1.2.1.(1) acting alone with \( \psi = 1.0 \) or in combination with \( \psi = 0.70 \) or 0.60.

(7) The importance factor, \( \gamma \), shall be not less than 1.0 for all buildings, except that for buildings where it can be shown that collapse is not likely to cause injury or other serious consequences, it shall be not less than 0.8.

4.1.4.3. Serviceability and Fatigue

(1) A building and its structural components shall be checked for serviceability limit states as defined in Clause 4.1.4.1.(1)(a) and fatigue under the effect of the specified loads as required in the standards described in Section 4.3.

(2) Where more than one load contributes to the stress in a member, the combination of loads shall be assumed to be

\[
D + \psi \left[ L + Q + T \right]
\]

where \( \psi \) is in conformance with Sentences 4.1.4.2.(5) and (6).

4.1.5. Dead Loads

4.1.5.1. 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) forces due to prestressing.

(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 as provided in Clause 2.3.4.3.(1)(d).

(5) In cases where the dead load is counteractive, the load allowances as provided in Sentences (2) and (3) shall not be included in the design calculations.

4.1.6. Live Loads Due to Use and Occupancy

4.1.6.1. Loads Due to Use of Floors and Roofs. The specified live load on an area of floor or roof depends on the intended use and occupancy, and
shall not be less than the uniformly distributed load patterns in Article 4.1.6.3., the loads resulting from the intended use or the concentrated loads in Article 4.1.6.10., whichever produces the most critical effect.

4.1.6.2. Uses Not Stipulated

(1) Where the use of an area of floor or roof is not provided for in Article 4.1.6.3., the specified live loads due to the use and occupancy of the area shall be determined from an analysis of the loads resulting from

(a) the weight of the probable assembly of persons,
(b) the weight of the probable accumulation of equipment and furnishings, and
(c) the weight of the probable storage of materials.

4.1.6.3. Full and Partial Loading. The uniformly distributed load shall be not less than the value listed in Table 4.1.6.A., reduced as may be provided for in Article 4.1.6.9., applied uniformly over the entire area, or on any portions of the area, whichever produces the most critical effects in the members concerned.

4.1.6.4. Loads for Occupancy Served.

Corridors, lobbies and aisles not more than 1,200 mm in width, all upper floor corridors of residential areas of apartments, hotels and motels and interior balconies and mezzanines shall be designed to carry not less than the specified load required for the occupancy they serve provided they can not be used for the assembly of people as a viewing area.

4.1.6.5. Loads on Exterior Areas

(1) Exterior areas accessible to vehicular traffic shall be designed for their intended use, including the weight of fire fighting equipment, but not less than the live loads due to snow, ice and rain prescribed in Subsection 4.1.7.

(2) Exterior areas accessible to pedestrian traffic, but not vehicular traffic, shall be designed for their intended use, but not less than

(a) the live load prescribed for assembly areas in Table 4.1.6.A., and
(b) the live loads due to snow, ice and rain as prescribed in Subsection 4.1.7.

<table>
<thead>
<tr>
<th>Use of Area of Floor or Root</th>
<th>MinimumSpecified Load, kPa</th>
</tr>
</thead>
<tbody>
<tr>
<td>Assembly Areas</td>
<td></td>
</tr>
<tr>
<td>(a) Except for those areas listed under (b) and (c), assembly areas with or without fixed seats including Arenas</td>
<td></td>
</tr>
<tr>
<td>Auditoria</td>
<td></td>
</tr>
<tr>
<td>Churches</td>
<td></td>
</tr>
<tr>
<td>Dance floors</td>
<td></td>
</tr>
<tr>
<td>Dining areas [4]</td>
<td></td>
</tr>
<tr>
<td>Foyers and entrance halls</td>
<td></td>
</tr>
<tr>
<td>Grandstands, reviewing stands and bleachers</td>
<td></td>
</tr>
<tr>
<td>Gymnasia</td>
<td></td>
</tr>
<tr>
<td>Museums</td>
<td></td>
</tr>
<tr>
<td>Promenades</td>
<td></td>
</tr>
<tr>
<td>Rinks</td>
<td></td>
</tr>
<tr>
<td>Stadia</td>
<td></td>
</tr>
<tr>
<td>Column 1</td>
<td>2</td>
</tr>
</tbody>
</table>
### Table 4.1.6.A. (Cont’d)

<table>
<thead>
<tr>
<th>Use of Area of Floor or Roof</th>
<th>Minimum Specified Load, kPa</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stages</td>
<td></td>
</tr>
<tr>
<td>Theatres</td>
<td></td>
</tr>
<tr>
<td>and other areas with similar uses</td>
<td></td>
</tr>
<tr>
<td>(b) Assembly areas with fixed seats that have backs over at least 80 per cent of the assembly area for the following uses: Churches Courtrooms Lecture halls Theatres</td>
<td>4.8</td>
</tr>
<tr>
<td>(c) Classrooms with or without fixed seats</td>
<td>2.4</td>
</tr>
<tr>
<td>Attics</td>
<td></td>
</tr>
<tr>
<td>Accessible by a stairway in residential occupancies only</td>
<td>1.4</td>
</tr>
<tr>
<td>Having limited accessibility so that there is no storage of equipment or material</td>
<td>0.5</td>
</tr>
<tr>
<td>Balconies, exterior</td>
<td></td>
</tr>
<tr>
<td>Balconies, interior and mezzanines that could be used for the assembly of people as a viewing area (See Appendix A.)</td>
<td>4.8</td>
</tr>
<tr>
<td>Balconies, interior other than above</td>
<td>(1)</td>
</tr>
<tr>
<td>Mezzanines other than above</td>
<td>(1)</td>
</tr>
<tr>
<td>Corridors, lobbies and aisles other than those listed below</td>
<td>4.8</td>
</tr>
<tr>
<td>Corridors, lobbies and aisles not more than 1200 mm in width and all upper floor corridors of residential areas only of apartments, hotels and motels (that cannot be used for the assembly of people as viewing area) (See Appendix A.)</td>
<td>(1)</td>
</tr>
<tr>
<td>Equipment areas and service rooms including Generator rooms Mechanical equipment exclusive of elevators Machine rooms Pump rooms Transformer vaults Ventilating or air-conditioning equipment</td>
<td>3.6 (2)</td>
</tr>
<tr>
<td>Exits and fire escapes</td>
<td>4.8</td>
</tr>
<tr>
<td>Factories</td>
<td>6.0 (2)</td>
</tr>
<tr>
<td>Footbridges</td>
<td>4.8</td>
</tr>
<tr>
<td>Garages for</td>
<td></td>
</tr>
<tr>
<td>Passenger cars</td>
<td>2.4</td>
</tr>
<tr>
<td>Unloaded buses and light trucks</td>
<td>6.0</td>
</tr>
<tr>
<td>Loaded buses and trucks and all other trucking spaces</td>
<td>12.0</td>
</tr>
<tr>
<td>Column 1</td>
<td>2</td>
</tr>
</tbody>
</table>
Table 4.1.6.A. (Cont’d)

<table>
<thead>
<tr>
<th>Use of Area of Floor or Roof</th>
<th>Minimum Specified Load, kPa</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kitchens (other than residential)</td>
<td>4.8</td>
</tr>
<tr>
<td>Libraries</td>
<td></td>
</tr>
<tr>
<td>Stack rooms</td>
<td>7.2</td>
</tr>
<tr>
<td>Reading and study rooms</td>
<td>2.9</td>
</tr>
<tr>
<td>Office areas in office buildings and other buildings (not including record storage and computer rooms) located in Basement and first storey</td>
<td>4.8</td>
</tr>
<tr>
<td>Floors above first storey</td>
<td>2.4</td>
</tr>
<tr>
<td>Operating rooms and laboratories</td>
<td>3.6</td>
</tr>
<tr>
<td>Patients' bedrooms</td>
<td>1.9</td>
</tr>
<tr>
<td>Recreation areas that cannot be used for assembly purposes including Billiard rooms</td>
<td>3.6</td>
</tr>
<tr>
<td>Bowling alleys</td>
<td></td>
</tr>
<tr>
<td>Pool rooms</td>
<td></td>
</tr>
<tr>
<td>Residential areas (within the scope of Subsection 2.1.2.)</td>
<td>1.9</td>
</tr>
<tr>
<td>Sleeping and living quarters in apartments, hotels, motels, boarding schools and colleges</td>
<td></td>
</tr>
<tr>
<td>Residential areas (within the scope of Subsection 2.1.3.)</td>
<td></td>
</tr>
<tr>
<td>Bedrooms</td>
<td>1.4</td>
</tr>
<tr>
<td>Other areas</td>
<td>1.9</td>
</tr>
<tr>
<td>Stairs within dwelling units</td>
<td>1.9</td>
</tr>
<tr>
<td>Retail and wholesale areas</td>
<td>4.8</td>
</tr>
<tr>
<td>Roofs</td>
<td>1.0 (3)</td>
</tr>
<tr>
<td>Sidewalks and driveways over areaeways and basements</td>
<td>12.0</td>
</tr>
<tr>
<td>Storage areas</td>
<td>4.8 (2)</td>
</tr>
<tr>
<td>Toilet areas</td>
<td>2.4</td>
</tr>
<tr>
<td>Underground slabs with earth cover</td>
<td></td>
</tr>
<tr>
<td>Warehouses</td>
<td>4.8 (2)</td>
</tr>
</tbody>
</table>

Notes to Table 4.1.6.A.:
1. See Article 4.1.6.4.
2. See Article 4.1.6.7.
3. See Article 4.1.7.1.
4. See Article 4.1.6.6.
4.1.6.6. **Loads for Dining Areas.** The minimum specified load in Table 4.1.6.A. for dining areas may be reduced to 2.4 kPa for dining areas in buildings that have been converted for such purposes provided that the floor area does not exceed 100 m² and use of the dining area for other assembly purposes including dancing is precluded.

4.1.6.7. **Floor Loads Due to Intended Use.** Equipment areas and service rooms, factories, storage areas and warehouses shall be designed for the loads due to their intended use but not less than the specified loads listed in Table 4.1.6.A.

4.1.6.8. **More Than One Occupancy.** Where an area of floor or roof is intended for 2 or more occupancies at different times, the value to be used from Table 4.1.6.A. shall be the greatest value for any of the occupancies concerned.

4.1.6.9. **Variation with Tributary Area**

(1) Where a structural member supports a tributary area of floor, roof or combination thereof greater than 80 m² used for assembly occupancies designed for a live load of 4.8 kPa or more, or for storage, manufacturing, retail stores, garages or as a footbridge, the specified live load due to use and occupancy, excluding snow, is the load provided for in Article 4.1.6.3. multiplied by

\[ 0.5 + \frac{20}{A} \]

where A is the tributary area in square metres for this type of use and occupancy, excluding the area supporting snow.

(2) Where a structural member supports a tributary area of floor, roof or combination of these greater than 20 m² for any use or occupancy other than assembly occupancies and those indicated in Sentence (1), the specified live load due to use and occupancy, excluding snow, is the load provided for in Article 4.1.6.3. multiplied by

\[ 0.3 + \frac{19.8}{B} \]

where B is the tributary area in square metres for this type of use and occupancy excluding the area supporting snow.

(See Appendix A.)

4.1.6.10. **Concentrated Loads.** The specified 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 4.1.6.B. applied over an area of 750 mm by 750 mm located so as to cause maximum effects, except that for occupancies not listed in Table 4.1.6.B. the concentrations of load shall be determined in accordance with Article 4.1.6.2.

<table>
<thead>
<tr>
<th>Area of Floor or Roof</th>
<th>Minimum Specified Concentrated Load, kN</th>
</tr>
</thead>
<tbody>
<tr>
<td>Roof surfaces</td>
<td>1.3</td>
</tr>
<tr>
<td>Floors of classrooms</td>
<td>4.5</td>
</tr>
<tr>
<td>Floors of offices, manufacturing buildings, hospital wards and stages</td>
<td>9.0</td>
</tr>
<tr>
<td>Floors and areas used by passenger cars</td>
<td>11</td>
</tr>
<tr>
<td>Floors and areas used by vehicles not exceeding 3 600 kg gross weight</td>
<td>18</td>
</tr>
<tr>
<td>Floors and areas used by vehicles exceeding 3 600 kg but not exceeding 9 000 kg gross weight</td>
<td>36</td>
</tr>
<tr>
<td>Floors and areas used by vehicles exceeding 9 000 kg gross weight</td>
<td>54</td>
</tr>
<tr>
<td>Driveways and sidewalks over areaways and basements (See Appendix A.)</td>
<td>54</td>
</tr>
</tbody>
</table>

4.1.6.11. **Bleacher Seats.** Bleacher seats shall be designed for a uniformly distributed load of 1.75 kN for each linear metre or for a concentrated load of 2.2 kN distributed over a length of 0.75 m, whichever produces the greatest effect on the supporting members.

4.1.6.12. **Helicopter Landing Areas.** Helicopter landing areas on roofs shall be constructed in conformance with the regulations for Heliports established by Transport Canada.
4.1.6.1. Roof Parking Decks. Roof parking decks shall be designed for the uniformly distributed loads in Table 4.1.6.A., the concentrated loads in Table 4.1.6.B. or the roof snow load, whichever produces the greatest effect in the members concerned.

4.1.7. Live Loads Due to Snow, Ice and Rain

4.1.7.1. Specified Snow Loading

(1) The specified loading, $S$, due to snow accumulation on a roof or any other building surface subject to snow accumulation shall be calculated from the formula

$$S = S_s (C_b C_w C_s C_a) + S_r$$

where

- $S_s$ is the ground snow load in kPa, determined in accordance with Subsection 2.2.1.:
- $S_r$ is the associated rain load in kPa, determined in accordance with Subsection 2.2.1., but not greater than $S_s (C_b C_w C_s C_a)$,
- $C_b$ is the basic roof snow load factor of 0.8,
- $C_w$ is the wind exposure factor in Sentences (2) and (3),
- $C_s$ is the slope factor in Sentences (4), (5) and (6),
- $C_a$ is the accumulation factor in Sentence (7).

(2) Except as provided for in Sentence (3), the wind exposure factor, $C_w$, shall be 1.0.

(3) The wind exposure factor in Sentence (2) may be reduced to 0.75, or in exposed areas north of the treeline to 0.5, where

- the building is in an exposed location, so that the roof is exposed to the winds on all sides, with no obstructions higher than the roof located closer to the building than a distance equal to 10 times the height of the obstruction above the roof,
- 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 $C_s C_w S_s/\gamma$ metres, where $\gamma$ is the unit weight of snow on roofs, and
- the loading does not involve accumulation of snow due to drifting from adjacent surfaces.

(4) Except as provided for in Sentences (5) and (6), the slope factor, $C_s$, shall be

- (a) 1.0 when the roof slope, $\alpha$, is equal to or less than $30^\circ$,
- (b) $\left(\frac{70^\circ - \alpha}{40^\circ}\right)$ when $\alpha$ is greater than $30^\circ$, but not greater than $70^\circ$, and
- (c) 0 when $\alpha$ exceeds $70^\circ$.

(5) 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, $\alpha$, is equal to or less than $15^\circ$,
- (b) $\left(\frac{60^\circ - \alpha}{45^\circ}\right)$ when $\alpha$ is greater than $15^\circ$, but not greater than $60^\circ$, and
- (c) 0 when $\alpha$ exceeds $60^\circ$.

(6) The slope factor, $C_s$, shall be 1.0 when used in conjunction with accumulation factors for increased snow load as given in Clauses (7)(b)(ii) and (v).

(7) The accumulation factor, $C_a$, shall be 1.0, and

- (a) where appropriate for the shape of the roof, assigned other values which account for
  - (i) non-uniform snow loads on gable, arched or curved roofs and domes,
  - (ii) increased snow loads in valleys,
  - (iii) increased non-uniform snow loads due to snow drifting onto a roof which 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.
  - (iv) increased non-uniform snow loads on areas adjacent to roof projections, such as penthouses, large chimneys and equipment, and
increased snow or ice loads due to snow sliding or drainage of meltwater from adjacent roofs.

(See Appendix A.)

4.1.7.2. 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 4.1.7.1.(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 with rise to span ratios equal to or less than 1/10 shall be designed for the specified uniform snow load in Sentence 4.1.7.1.(1), computed using $C_e = 1.0$, 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 greatest effects on the member concerned. (See Appendix A.)

4.1.7.3. Specified Rain Load

(1) The specified load due to the accumulation of rain water on a surface, whose position and shape and deflection under load is such as to make such an accumulation possible, is that resulting from the 24 h rainfall determined in conformance with Subsection 2.2.1. 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 drainage, such as rain water leaders.

(3) Except as provided for in Sentence 4.1.7.1.(1), loads due to rain need not be considered to act simultaneously with loads due to snow.

4.1.8. Live Loads Due to Wind

4.1.8.1. Specified Wind Loading

(1) The specified external pressure or suction due to wind on part or all of a surface of a building shall be calculated from

$$p = q C_e C_g C_p$$

where $p$ = the specified external pressure acting statically and in a direction normal to the surface either as a pressure directed towards the surface or as a suction directed away from the surface,

$q$ = the reference velocity pressure as provided for in Sentence (4),

$C_e = $ the exposure factor as provided for in Sentence (5),

$C_g = $ the gust effect factor as provided for in Sentence (6), and

$C_p = $ the external pressure coefficient averaged over the area of the surface considered. (See Appendix A.)

(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 products of the external pressures or suction and the areas of the surfaces over which they are averaged as provided in Sentence (1). (See Appendix A.)

(3) The net specified pressure due to wind on part or all of a surface of a building shall be the algebraic difference of the external pressure or suction as provided for in Sentence (1) and the specified internal pressure or suction due to wind calculated from

$$p_i = q C_e C_g C_{pi}$$

where $p_i$ = the specified internal pressure acting statically and in a direction normal to the surface either as a pressure (directed outwards) or as a suction (directed inwards),

$q, C_e, C_g$ = as provided for in Sentences (4), (5) and (6), respectively, except that $C_e$ shall be evaluated at the building mid-height instead of the height of the element considered, and

$C_{pi} = $ the internal pressure coefficient.

(4) The reference velocity pressure, $q$, is the appropriate value determined in conformance with Subsection 2.2.1. for the following conditions:

(a) the reference velocity pressure, $q$, for the design of cladding shall be based on a probability of being exceeded in any one year of 1 in 10,

(b) the reference velocity pressure, $q$, for the design of structural members for deflection and vibration shall be based on a
(c) for all buildings, except those listed in Clause (d), the reference velocity pressure, \( q \), for the design of structural members for strength shall be based on a probability of being exceeded in any one year of 1 in 30, and

(d) the reference velocity pressure, \( q \), for the design of structural members for strength for post-disaster buildings shall be based on a probability of being exceeded in any one year of 1 in 100.

(5) The exposure factor \( C_e \) shall be

(a) the value shown in Table 4.1.8.A. for the appropriate reference height for the surface or part of the surface,

(b) the value of the function \((h/10)^{1/5}\) but not less than 0.9 where \( h \) is the reference height above grade in metres for the surface or part of the surface, or

(c) if a dynamic approach to the action of wind gusts is used, an appropriate value depending on both height and shielding. (See Appendix A.)

Table 4.1.8.A.
Forming Part of Sentence 4.1.8.1(5)

<table>
<thead>
<tr>
<th>Height, m</th>
<th>Exposure Factor</th>
</tr>
</thead>
<tbody>
<tr>
<td>Over 0 to 6</td>
<td>0.9</td>
</tr>
<tr>
<td>&quot; 6 to 12</td>
<td>1.0</td>
</tr>
<tr>
<td>&quot; 12 to 20</td>
<td>1.1</td>
</tr>
<tr>
<td>&quot; 20 to 30</td>
<td>1.2</td>
</tr>
<tr>
<td>&quot; 30 to 44</td>
<td>1.3</td>
</tr>
<tr>
<td>&quot; 44 to 64</td>
<td>1.4</td>
</tr>
<tr>
<td>&quot; 64 to 85</td>
<td>1.5</td>
</tr>
<tr>
<td>&quot; 85 to 140</td>
<td>1.6</td>
</tr>
<tr>
<td>&quot; 140 to 240</td>
<td>1.8</td>
</tr>
<tr>
<td>&quot; 240 to 400</td>
<td>2.0</td>
</tr>
</tbody>
</table>

(6) The gust effect factor \( C_g \) is one of the following values:

(a) 1.0 or 2.0 for internal pressures as appropriate (see Appendix A),

(b) 2.0 for the building as a whole and main structural members,

(c) 2.5 for small elements including cladding, or

(d) if a dynamic approach to the action of wind gusts is used, an appropriate value depending on the turbulence of the wind and the size and natural frequency of the structure. (See Appendix A.)

4.1.8.2. Dynamic Effects of Wind

(1) Buildings whose height is greater than 4 times their minimum effective width or greater than 120 m and other buildings whose light weight, low frequency and low damping properties make them susceptible to vibration shall be

(a) designed by experimental methods for the danger of dynamic overloading and vibration and the effects of fatigue, or

(b) designed using a dynamic approach to the action of wind gusts. (See Appendix A.)

4.1.8.3. Full and Partial Loading

(1) 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 (a) but with 25 per cent of the load removed from any portion of the area,

(c) the wind loads as in (a) but considered simultaneously at 75 per cent of their full value, and

(d) the wind loads as described in (c) but with 25 per cent of these loads removed from any portion of the area.

(See Appendix A.)

4.1.8.4. 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 which 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.
4.1.9. Live Loads Due to Earthquakes

4.1.9.1. Analysis

(1) The specified loading due to earthquake motion shall be determined by the analysis given in this Subsection.

(2) In this Subsection

\( A_r \) = response amplification factor to account for type of attachment of mechanical/electrical equipment, as defined in Sentence 4.1.9.1.(17).

\( A_x \) = amplification factor at level \( x \) to account for variation of response of mechanical/electrical equipment with elevation within the building, as defined in Sentence 4.1.9.1.(17).

\( C_p \) = seismic coefficient for mechanical/electrical equipment, as defined in Sentence 4.1.9.1.(17).

\( D \) = dimension of the building in a direction parallel to the applied forces.

\( D_n \) = plan dimension of the building in the direction of the computed eccentricity.

\( D_x \) = dimension of wall or braced frame which constitutes the main lateral load-resisting system in a direction parallel to the applied forces.

\( e \) = distance between the location of the resultant of all forces at and above the level being considered and the centre of rigidity at the level being considered.

\( e_x \) = design eccentricity at level \( x \).

\( F \) = foundation factor as given in Sentence 4.1.9.1.(11).

\( F_{t} \) = portion of \( V \) to be concentrated at the top of the structure, as defined in Sentence 4.1.9.1.(13).

\( F_{l} \) = lateral force applied to level \( x \).

\( h_i, h_n, h_x \) = the height above the base \((i=0)\) to level \( "i," "n," "x," \) respectively.

\( h_x \) = interstorey height \((h_i - h_{i-1})\).

\( I \) = seismic importance factor of the structure, as described in Sentence 4.1.9.1.(10).

\( J \) = numerical reduction coefficient for base overturning moment as defined in Sentence 4.1.9.1.(20).

\( J_x \) = numerical reduction coefficient for moment at level \( "x" \) as defined in Sentence 4.1.9.1.(21).

Level \( i \) = any level in the building, \( i = 1 \) for first level above the base.

Level \( n \) = that level which is uppermost in the main portion of the structure.

Level \( x \) = that level which is under design consideration.

\( M_x \) = torsional moment at level \( x \).

\( N \) = total number of storeys above exterior grade to level \( "n." \) (\( N \) is usually numerically equal to \( n \)).

\( R \) = force modification factor that reflects the capability of a structure to dissipate energy through inelastic behaviour, as given in Sentence 4.1.9.1.(8).

\( S \) = seismic response factor, for unit value of zonal velocity ratio, as defined in Sentence 4.1.9.1.(6).

\( S_p \) = horizontal force factor for architectural part or portion of a building and its anchorage, as given in Table 4.1.9.D. and Sentence 4.1.9.1.(16).

\( T \) = fundamental period of vibration of the building or structure in seconds in the direction under consideration.

\( U \) = factor representing level of protection based on experience, as specified in Sentence 4.1.9.1.(4).

\( v \) = zonal velocity ratio = the specified zonal horizontal ground velocity expressed as a ratio to \( 1 \) m/s.

\( V \) = minimum lateral seismic force at the base of the structure, to be used with a load factor \( a_q = 1.0 \).
\( V_e = \) equivalent lateral force at the base of the structure representing elastic response, as specified in Sentence 4.1.9.1.(5).

\( V_p = \) lateral force on a part of the structure.

\( W = \) dead load plus the following:
- 25 per cent of the design snow load specified in Subsection 4.1.7.,
- 60 per cent of the storage load for areas used for storage and the full contents of any tanks.

\( W_i, W_x = \) that portion of \( W \) which is located at or is assigned to level "i" or "x," respectively.

\( W_p = \) the weight of a part or portion of a structure, e.g. cladding, partitions and appendages.

\( Z_a = \) acceleration-related seismic zone.

\( Z_v = \) velocity-related seismic zone.

(3) Earthquake forces shall be assumed to act in any horizontal direction, except that independent design about each of the principal axes shall be considered to provide adequate resistance in the structure for earthquake forces applied in any direction. (See Appendix A.)

(4) The minimum lateral seismic force, \( V \), shall be calculated in accordance with the following formula:

\[
V = (V_e / R) U
\]

where \( U = 0.6 \).

(5) The equivalent lateral seismic force representing elastic response, \( V_e \), shall be calculated in accordance with the following formula:

\[
V_e = v \cdot S \cdot I \cdot F \cdot W
\]

where \( v \) is the zonal velocity ratio determined in conformance with Subsection 2.2.1., except when \( Z_v = 0 \) and \( Z_a > 0 \) the value of \( Z_v \) shall be taken as 1 and \( v \) as 0.05.

(6) The seismic response factor, \( S \), shall conform to Table 4.1.9.A.:
(9) For the purpose of applying Table 4.1.9.B, (c) for combinations of different types of lateral-load-resisting systems acting in the same direction, R shall be taken as the lowest value of R corresponding to these systems except as given in Clause (d).

(a) a space frame shall mean a 3 dimensional structural system composed of interconnected members laterally supported so as to function as a completed self-contained unit with or without horizontal diaphragms;

(b) a ductile moment-resisting space frame shall mean a space frame that is designed to resist the specified seismic forces and that, in addition, has adequate ductility or energy-absorptive capacity;

(d) if one of the lateral-load-resisting systems of the structure is designed to take 100 percent of the lateral force, R can be selected as appropriate for the system; the components of the structure not considered to be part of the lateral-load-resisting system must be capable of resisting their gravity.

Table 4.1.9.B.
Forming Part of Sentence 4.1.9.1.(8)

<table>
<thead>
<tr>
<th>Case</th>
<th>Type of Lateral Load Resisting System</th>
<th>R</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Steel Structures Designed and Detailed According to CAN/CSA-S16.1-M</td>
<td>4.0</td>
</tr>
<tr>
<td></td>
<td>ductile moment-resisting space frame</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>ductile eccentrically braced frame</td>
<td>3.5</td>
</tr>
<tr>
<td>3</td>
<td>ductile braced frame</td>
<td>3.0</td>
</tr>
<tr>
<td>4</td>
<td>moment-resisting space frame with nominal ductility</td>
<td>3.0</td>
</tr>
<tr>
<td>5</td>
<td>braced frame with nominal ductility</td>
<td>2.0</td>
</tr>
<tr>
<td>6</td>
<td>other lateral-force-resisting systems not defined in Cases 1 to 5</td>
<td>1.5</td>
</tr>
<tr>
<td>7</td>
<td>Reinforced Concrete Structures Designed and Detailed According to CAN3-A23.3-M</td>
<td>4.0</td>
</tr>
<tr>
<td></td>
<td>ductile moment-resisting space frame</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>ductile flexural wall</td>
<td>3.5</td>
</tr>
<tr>
<td>9</td>
<td>moment-resisting space frame with nominal ductility</td>
<td>2.0</td>
</tr>
<tr>
<td>10</td>
<td>wall with nominal ductility</td>
<td>2.0</td>
</tr>
<tr>
<td>11</td>
<td>other lateral-force-resisting systems not defined in Cases 7 to 10</td>
<td>1.5</td>
</tr>
<tr>
<td>12</td>
<td>Timber Structures Designed and Detailed According to CAN/CSA-O86.1-M</td>
<td>3.0</td>
</tr>
<tr>
<td></td>
<td>nailed shear panel with plywood, waterboard or strandboard</td>
<td></td>
</tr>
<tr>
<td>13</td>
<td>concentrically braced heavy timber space frame with ductile connections</td>
<td>2.0</td>
</tr>
<tr>
<td>14</td>
<td>moment-resisting wood space frame with ductile connections</td>
<td>2.0</td>
</tr>
<tr>
<td>15</td>
<td>other systems not included in 12 to 14</td>
<td>1.5</td>
</tr>
<tr>
<td></td>
<td>Masonry Structures Designed and Detailed According to CAN3-S304-M</td>
<td></td>
</tr>
<tr>
<td>16</td>
<td>reinforced masonry</td>
<td>1.5</td>
</tr>
<tr>
<td>17</td>
<td>unreinforced masonry</td>
<td>1.0</td>
</tr>
<tr>
<td>18</td>
<td>Other Lateral Load-resisting Systems not Defined in Cases 1 to 17</td>
<td>1.0</td>
</tr>
</tbody>
</table>

(See Appendix A.)

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4.1.9.1.

The seismic importance factor, $I$, shall equal 1.5 for post-disaster buildings, 1.3 for schools and 1.0 for all other buildings.

(10) The seismic importance factor, $I$, shall equal 1.5 for post-disaster buildings, 1.3 for schools and 1.0 for all other buildings.

(11) The foundation factor, $F$, shall conform to Table 4.1.9.C., except that the product $F \cdot S$ need not exceed 3.0 where $Z_a$ does not exceed $Z_v$ and need not exceed 4.2 where $Z_a$ is greater than $Z_v$. (See Appendix A.)

(12) The weight, $W$, of the structure shall be calculated in accordance with the following formula:

$$ W = \sum_{i=1}^{n} W_i $$

(13) The total lateral seismic force, $V$, shall be distributed as follows:

- (a) a portion, $F_Y$, shall be assumed to be concentrated at the top of the structure and equal to 0.07 TV, except that $F_Y$ need not exceed 0.25 V and may be considered as zero where $T$ does not exceed 0.7 s; the remainder, $V - F_Y$, shall be distributed along the height of the building, including the top level, in accordance with the formula

$$ F_Y = (V - F_Y) \frac{W_h}{\sum_{i=1}^{n} W_i} $$

(b) by dynamic analysis. (See Appendix A.)

(14) The total shear in any horizontal plane shall be distributed to the various elements of the lateral force-resistant system in proportion to their rigidities according to rational analysis, with due regard to the capacities and stiffnesses of the non-structural elements and to the effects of torsion as required by Sentence 4.1.9.1.22.

(15) Parts of buildings as described in Table 4.1.9.D. and 4.1.9.E. and their anchorage shall be designed for a lateral force, $V_p$, equal to $v \cdot S_p \cdot W_p$, distributed according to the distribution of mass of the element under consideration, where $v$ is determined in conformance with Subsection 2.2.1., except when $Z_v$ equals zero and $Z_a$ is greater than zero, $v$ shall be taken as 0.05.

(16) Except as provided for in Sentence (18), the values of $S_p$ in Sentence (15) for architectural components shall conform to Table 4.1.9.D.

### Table 4.1.9.C.

<table>
<thead>
<tr>
<th>Foundations Factors</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Categories</strong></td>
</tr>
<tr>
<td>1</td>
</tr>
<tr>
<td>2</td>
</tr>
<tr>
<td>3</td>
</tr>
<tr>
<td>4</td>
</tr>
<tr>
<td>Col. 1</td>
</tr>
</tbody>
</table>

(See Appendix A.)
### Table 4.1.9.D.
Forming Part of Sentence 4.1.9.1.(16)

<table>
<thead>
<tr>
<th>Category</th>
<th>Architectural Part or Portion of Building</th>
<th>Direction of Force</th>
<th>Value of $S_p$</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>All exterior and interior walls except those of Categories 2 and 3</td>
<td>Normal to flat surface</td>
<td>1.5</td>
</tr>
<tr>
<td>2</td>
<td>Cantilever parapet and other cantilever walls except retaining walls; horizontally cantilevered floors, balconies, beams, etc.</td>
<td>Normal to flat surface</td>
<td>6.5</td>
</tr>
<tr>
<td>3</td>
<td>Exterior and interior ornamentations and appendages</td>
<td>Any direction</td>
<td>6.5</td>
</tr>
<tr>
<td>4</td>
<td>Connections/attachments for Categories 1, 2 and 3</td>
<td>Any direction</td>
<td>15</td>
</tr>
<tr>
<td>5</td>
<td>Floors and roofs acting as diaphragms</td>
<td>Any direction</td>
<td>0.7 (1)</td>
</tr>
<tr>
<td>6</td>
<td>Towers, chimneys, smokestacks and penthouses when connected to or forming part of a building having $h_v/D &lt; 5$</td>
<td>Any direction</td>
<td>2.0</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>3.0</td>
</tr>
</tbody>
</table>

(See Appendix A.)

### Note to Table 4.1.9.D.: (1) See Sentence 4.1.9.1.(18).

![Image](image.png)

### Table 4.1.9.E.
Forming Part of Sentence 4.1.9.1.(17)

<table>
<thead>
<tr>
<th>Category</th>
<th>Mechanical/Electrical Part or Portion of Building</th>
<th>Direction of Force</th>
<th>Value of $C_p$</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Machinery, fixtures, equipment and pipes that are both rigid and rigidly connected to or forming part of a building. Tanks or bins containing non-liquids, rigidly connected.</td>
<td>Any direction</td>
<td>1.0</td>
</tr>
<tr>
<td>2</td>
<td>Tanks plus contents when resting on the ground within a building.</td>
<td>Any direction</td>
<td>0.7</td>
</tr>
<tr>
<td>3</td>
<td>Tanks plus contents when resting on the ground within a building and containing toxic or explosive materials or fire fighting fluids.</td>
<td>Any direction</td>
<td>1.0</td>
</tr>
<tr>
<td>4</td>
<td>Machinery, fixtures, equipment, pipes and tanks including contents other than those listed above. (See Appendix A.)</td>
<td>Any direction</td>
<td>1.0</td>
</tr>
<tr>
<td>5</td>
<td>Pipes and containers plus contents for toxic or explosive materials, for materials having a flash point below 38°C or for fire fighting fluids.</td>
<td>Any direction</td>
<td>1.5</td>
</tr>
</tbody>
</table>

Column 1 2 3 4
The values of $S_p$ in Sentence (15) for mechanical/electrical components shall be equal to:

$$S_p = C_p A_x A_r$$

where:

- $h_n = 1.0 + h_x$,
- $A_r = 1.0$ for components that are both rigid and rigidly connected,
- $A_r = 2.0$ for flexible components, or flexibly mounted components located on ground,
- $A_r = 4.5$ for all other cases,
- $C_p =$ seismic coefficient for components of mechanical and electrical equipment as given in Table 4.1.9.E.

Floors and roofs acting as diaphragms shall be designed for a minimum force corresponding to a value of $S_p$ equal to 0.7 applied to loads tributary from that storey, unless a greater force $F_x$ is assigned to the level under consideration as in Sentences (13) and (14).

When the mass of a tank plus contents is greater than 10 per cent of the mass of the supporting floor, the lateral forces shall be determined by rational analysis.

The overturning moment, $M$, at the base of the structure shall be multiplied by a reduction coefficient, $J$, where

(a) $J = 1$ where $T < 0.5$,  
(b) $J = (1.1 - 0.2T)$ where $T < 0.5$ but not more than 1.5, and  
(c) $J = 0.8$ where $T > 1.5$.

The overturning moment $M_x$ at any level $x$ shall be multiplied by $J_x$ where

$$J_x = J + (1-J)(h_x/h_n)^3$$

The incremental changes in the design overturning moments, in the storey under consideration, shall be distributed to the various resisting elements in the same proportion as the distribution of shears in the resisting system. Where other vertical members are provided which are capable of partially resisting the overturning moments, a redistribution may be made to these members if framing members of sufficient strength and stiffness to transmit the required loads are provided. Where a vertical-resisting element is discontinuous, the overturning moment carried by the lowest storey of that element shall be carried down as loads to the foundation.

Torsional moments in the horizontal plane of the building shall be computed in each storey using the following formula:

$$M_x = \left( F_x + \sum_{i=x}^{n} F_i \right) e_x$$

(See Appendix A.)

The design eccentricity, $e_x$, in Sentence (22) shall be computed by one of the following equations, whichever provides the greater stresses:

(a) $e_x = 1.5e + 0.10D$ or  
(b) $e_x = 0.5e - 0.10D$.

Where the centroids of mass and the centres of stiffness of the different floors do not lie approximately on vertical lines, a dynamic analysis shall be carried out to determine the torsional effects.

The building design shall take full account of the possible effects of setbacks. (See Appendix A.)

4.1.9.2. Deflections

1. Lateral deflections of a structure shall be calculated in accordance with accepted practice and based on the loads and requirements defined in this Section.

2. Lateral deflections obtained from an elastic analysis using the loads given in Sentences 4.1.9.1.(13) and (14) shall be multiplied by $R$ to give realistic values of anticipated deflections.

3. The interstorey deflections based on the lateral deflections as calculated in Sentence (2) shall be limited to 0.01 $h_s$ for post-disaster buildings and 0.02 $h_s$ for all other buildings.

4. All portions of the structure shall be designed to act as integral units in resisting horizontal forces, unless separated by adequate clearances which permit horizontal deflections of the structure consistent with values of deflections calculated in accordance with Sentence (2).

5. The nonstructural components shall be designed so as not to transfer to the structural system any forces unaccounted for in the design, and any interaction of rigid elements such as walls and the
4.1.9.2.

A structural system shall be designed so that the capacity of the structural system is not impaired by the action or failure of the rigid elements.

(6) Adjacent structures shall either be separated by the sum of their individual deflections as calculated in Sentence (2), or shall be connected to each other.

(7) The method of connection in Sentence (6) shall take into account the mass, stiffness, strength, ductility and anticipated motion of the connected buildings and the character of the connection.

(8) The deflections as calculated in Sentence (2) shall be used to account for sway effects due to seismic loading as required by Sentence 4.1.15.(2).

(9) The connected buildings in Sentence (6) shall be assumed to have the lowest R value of the buildings connected, unless the use of a higher value can be justified by rational analysis.

4.1.9.3. Special Provisions

(1) Buildings more than 3 storeys in building height in velocity- or acceleration-related seismic zones of 2 and higher shall have a structural system as described in Cases 1-5, 7-10, 12-14 or 16 in Table 4.1.9.B.

(2) For buildings more than 60 m in height with a structural system having R = 2.0 or R = 1.5 as determined from Table 4.1.9.B, or as determined from Clause 4.1.9.1.9(c), the value of V shall be increased by 50 per cent in velocity-related seismic zones of 4 and higher.

(3) Elevated tanks plus full contents not supported by a building shall be designed using R = 1 in the formula in Sentence 4.1.9.1.(4), with the conditions

(a) the minimum and maximum value of the product S · I shall be taken as 1.5 and 3.0, respectively,
(b) the overturning moment reduction coefficient, J, as set forth in Sentence 4.1.9.1.(2) shall be 1.0, and
(c) the torsional requirements of Sentence 4.1.9.1.(22) shall apply.

(4) The design for any structural system which has an assigned value of R of 3 or higher shall ensure that when any member yields, the remaining members of the structure shall be capable of resisting 25 per cent of the design seismic force including the effects of torsion.

(5) For buildings in velocity- or acceleration-related seismic zones of 2 and higher in which discontinuities in columns or shear walls occur, special design provisions shall be made to ensure that failure at the point of discontinuity will not occur before the capacity of the remaining portion of the structure has been realized.

(6) In velocity- or acceleration-related seismic zones of 2 and higher, reinforcement conforming to Clause 4.1.6. of CAN3-S304-M, “Masonry Design for Buildings” shall be provided for masonry construction in

(a) loadbearing and lateral load-resisting masonry,
(b) masonry enclosing elevator shafts and stairways, or used as exterior cladding, and
(c) masonry partitions, except for partitions which
   (i) do not exceed 200 kg/m² in weight, and
   (ii) do not exceed 3 m in height and are laterally supported at the top.

4.1.9.4. Foundation Provisions

(1) Foundations shall be designed so that yielding will occur first in the superstructure and not the foundations, unless the design specifically provides otherwise.

(2) Except in velocity-related seismic Zone 0, individual pile footings, drilled piers and caissons shall be interconnected by ties in not less than 2 directions.

(3) Ties in Sentence (2) shall be designed to carry by tension or compression a horizontal force equal to the greatest factored pile cap loading multiplied by a factor 0.5 v, but not exceeding 10 per cent of the greatest factored pile cap load, unless it can be demonstrated that equivalent restraints can be provided by other means. (See Appendix A.)

(4) Except in velocity-related seismic Zone 0, piles shall be connected to the pile cap or structure by reinforcement having sufficient anchorage to develop the yield strength of the reinforcement, and the top of the piles (below the pile cap) shall be reinforced to allow ductile behaviour if the design depends upon such action.
4.1.10. Other Effects

4.1.10.1. Loads on Guards

(1) The minimum specified load applied horizontally and normal to the span at the top of every required guard shall be:
   - (a) 0.6 kN/m for exterior balconies of individual residential units and a concentrated load of 0.9 kN applied concurrently,
   - (b) 1.5 kN/m for exits and stairs,
   - (c) 3.6 kN/m for grandstands and stadia including ramps,
   - (d) 4.4 kN/m for vehicle guardrails for parking garages applied 500 mm above the roadway but not less than 11 kN uniformly distributed over each vehicle space applied 500 mm above the roadway,
   - (e) a concentrated load of 0.55 kN applied at any point for access walkways to equipment platforms, contiguous stairs and similar areas where the gathering of many people is improbable, and
   - (f) 2.2 kN/m for locations other than described in Clauses (a) to (e).

(2) Individual elements within the guard, including solid panels and pickets, shall be designed for 1 kPa or 0.45 kN of concentrated load at any point in the element, whichever results in the more critical loading condition.

(3) The loads 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).

4.1.10.2. Loads on Walls. Where the floor elevation on one side of a wall, including a wall around a shaft, is not less than 600 mm greater than the elevation of the floor or ground on the other side, the wall shall be designed to resist the appropriate lateral design loads prescribed elsewhere in this Section or 0.5 kPa, whichever produces the greatest effect.

4.1.10.3. Firewalls

(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, when the fire-resistance rating of the structure is less than that of the firewall, lateral support shall be assumed to be provided by the structure on one side only. (See Appendix A.)

4.1.10.4. Vibrations and Impact of Machinery and Equipment

(1) Where vibration effects, such as resonance and fatigue resulting from machinery or equipment, are likely to be significant, a dynamic analysis shall be carried out.

(2) 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 4.1.10.A.

Table 4.1.10.A. Forming Part of Sentence 4.1.10.4(2)

<table>
<thead>
<tr>
<th>Impact Due to</th>
<th>Factor</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operation of motor driven cranes</td>
<td>1.25</td>
</tr>
<tr>
<td>Operation of hand driven cranes</td>
<td>1.10</td>
</tr>
<tr>
<td>Operation of elevators</td>
<td>See CAN/CSA-B44-M, Clauses 2.6.2. and 2.10.3.</td>
</tr>
<tr>
<td>Supports for light machinery, shaft or motor driven</td>
<td>1.20</td>
</tr>
<tr>
<td>Supports for reciprocating machinery (e.g. compressors) or power driven units (e.g. piston engines)</td>
<td>1.50</td>
</tr>
<tr>
<td>Column 1</td>
<td>2</td>
</tr>
</tbody>
</table>
(3) Crane runway rails shall be designed to resist a lateral force applied normal to the top of the rails equal to not less than 20 per cent of the sum of the weights of the lifted load and the crane trolley (excluding other parts of the crane) in the case of power operated trolleys, and equal to not less than 10 per cent of the sum of the weights in the case of hand operated trolleys.

(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 rails shall be designed to resist a lateral force applied parallel to the top of the rail equal to not less than 10 percent of the maximum wheel loads of the crane.

4.1.10.5. Resonance and Sway Forces

(1) 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.)

(2) The floor assembly and other structural elements that support fixed seats in any building used for assembly occupancies to accommodate 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 than 0.15 kN for each metre length of seats acting at right angles to each row of seats, assuming such forces to be acting independently of each other.

4.1.10.6. Bleachers

(1) Bleachers shall be checked by the erector after erection to ensure that all structural members including bracing specified in the design have been installed.

(2) Telescopic bleachers shall be provided with locking devices to ensure stability while in use.

Section 4.2 Foundations

4.2.1. General

4.2.1.1. This Section applies to excavations and foundation systems for buildings.

4.2.2. Subsurface Investigations, Drawings and Reviews

4.2.2.1. Subsurface Investigation. A subsurface investigation shall be carried out, which shall include groundwater conditions. (See Appendix A.)

4.2.2.2. Drawings. Drawings associated with foundations and excavations shall conform to the appropriate requirements of Part 2. (See Article 2.3.4.6.)

4.2.2.3. Review

(1) A review shall be carried out by the designer or by another suitably qualified person to ensure that the subsurface conditions are consistent with the design and that construction is carried out in accordance with the design and good engineering practice. (See Appendix A.)

(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 unit, and
   (ii) during the installation and removal of retaining structures and related backfilling operations, and
(b) as required, unless otherwise directed by the authority having jurisdiction,
   (i) in the construction of all shallow foundation units, and
   (ii) in excavating, dewatering and other related works.
4.2.2.4. Altered Subsurface Condition

(1) Where 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) Where 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. Wood used in foundations or in support of soil or rock shall conform with 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, "Wood Preservation" and the requirements of the appropriate commodity standard as follows:
   (a) CAN/CSA O80.2-M, "Preservative Treatment of Lumber, Timber, Bridge Ties and Mine Ties by Pressure Processes,"
   (b) CAN/CSA O80.3-M, "Preservative Treatment of Piles by Pressure Processes," or
   (c) CAN/CSA O80.15-M, "Preservative Treatment of Wood for Building Foundation Systems, Basements and Crawl Spaces by Pressure Processes."

(2) Where timber has been treated as set forth in Sentence (1), it shall be cared for as provided in CSA O80-M4, "Care of Preservative Treated Wood Products."

4.2.3.3. Plain and Reinforced Masonry. Plain or reinforced masonry used in foundations or in support of soil or rock shall conform with the requirements of Subsection 4.3.2.

4.2.3.4. Prevention of Deterioration of Masonry. 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. Plain, reinforced or prestressed concrete used in foundations or in support of soil or rock shall conform with the requirements of Subsection 4.3.3.

4.2.3.6. Chemical Attack of Concrete. Where concrete in foundations may be subject to chemical attack, it shall be treated in conformance with the requirements in CAN3-A23.1, "Concrete Materials and Methods of Concrete Construction."

4.2.3.7. Steel. Steel used in foundations 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 Section 4.2.

4.2.3.8. Steel Piles

(1) Where steel piles are used in deep foundations and act as permanent load-carrying members, the steel shall conform with one of the following standards:
   (a) CAN/CSA-G40.21-M, "Structural Quality Steels,"
   (b) ASTM A252, "Welded and Seamless Steel Pipe Piles,"
   (c) ASTM A283/A283M, "Low and Intermediate Tensile Strength Carbon Steel Plates"
   (d) ASTM A570/570M, "Steel, Sheet and Strip, Carbon, Hot Rolled, Structural Quality," or
   (e) ASTM A611, "Steel, Cold-Rolled Sheet, Carbon, Structural."

4.2.3.9. High Strength Steel Tendons. 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 CAN3-A23.1, "Concrete Materials and Methods of Concrete Construction."

4.2.3.10. Corrosion of Steel. Where conditions are corrosive to steel, adequate protection of exposed steel shall be provided. (See Subsection 2.5.1. for other materials.)


4.2.4.1. Design Requirements

4.2.4.1. Design Basis

(1) The design of foundations, 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 one 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 Part 4,
   (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 piles, anchors or footings carried out by a person competent in this field of work.

(See Appendix A.)

4.2.4.2. Subsurface Investigation. 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.

4.2.4.3. Identification. 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. Loads on Foundations. The foundation of a building shall be capable of resisting all loads as stipulated in Section 4.1.

4.2.4.5. Differential Movements. The foundation of a building shall be proportioned so that the estimated total and differential movements of the foundation are not greater than the movements that the building is designed to accommodate.

4.2.4.6. 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.

4.2.4.7. Sloping Ground. Where a foundation is to rest on, in or near sloping ground, this particular condition shall be provided for in the design.

4.2.4.8. Eccentric and Inclined Loads. Where there is eccentricity or inclination of loading in foundation units, this effect shall be fully investigated and provided for in the design.

4.2.4.9. Dynamic Loading. Where dynamic loading conditions apply, allowable loads or allowable bearing pressures shall be assessed by a special investigation of these conditions.

4.2.4.10. Hydrostatic Uplift. Where a foundation or any part of a building is subject to hydrostatic uplift, the effects shall be provided for in the design.

4.2.4.11. Groundwater Level Change. Where proposed construction will result in a temporary or permanent change in the groundwater level, the effects of this change on adjacent property shall be fully investigated and provided for in the design.

4.2.4.12. Permafrost. Where conditions of permafrost or perennially frozen soil or rock 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.

4.2.4.13. Swelling and Shrinking Soils. 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.
4.2.4.14. Expanding and Deteriorating Rock. Where rock which expands or deteriorates when subjected to unfavourable environmental conditions or to stress release is known to exist, such condition shall be fully investigated and provided for in the design.

4.2.4.15. 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 supporting the design loads;
(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.

4.2.4.16. Structural Design. 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 Section 4.2.

4.2.5. Excavations

4.2.5.1. Design of Excavations. The design of excavations and of supports for the sides of excavations shall conform with the requirements of Subsection 4.2.4. and to this Subsection. (See Appendix A.)

4.2.5.2. Excavation Construction

(1) Every excavation shall be undertaken in such a manner as to
(a) prevent movement which would cause damage to adjacent property, existing structures, utilities, roads and sidewalks at all stages of construction, and
(b) comply with the appropriate requirements of Part 8.

(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. 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. 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. Surface water, all groundwater, perched groundwater and in particular artesian groundwater shall be kept under control at all stages of excavation and construction.

4.2.5.6. Loss of Ground. At all stages 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. 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. The design of shallow foundations shall be in conformance with Subsection 4.2.4. and the requirements of this Subsection. (See Appendix A.)

4.2.6.2. Support of Shallow Foundations. 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 which may lead to changes of the properties of soil or rock.
4.2.6.3. Incorrect Placement of Shallow Foundations. Where a shallow foundation unit has not been placed or located as indicated on the drawings, the error shall be corrected or the design bearing pressure of the foundation unit recalculated for the altered conditions by the person responsible for the design and action taken as required in Article 2.3.4.7.

4.2.6.4. Damaged Shallow Foundations. Where a shallow foundation unit is damaged, it shall be repaired or the design bearing pressure of the foundation unit recalculated for the damaged condition by the person responsible for the design and action taken as required in Article 2.3.4.7.

4.2.7. Deep Foundations

4.2.7.1. General. 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 of 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) Where deep foundation units are not load tested as outlined in Clause 4.2.4.1.(1)(c), and where well established local practice as outlined in Clause 4.2.4.1.(1)(b) is not applicable, the design procedures and the appropriate factors of safety shall be determined by a person especially qualified in this type of work.

4.2.7.3. Allowable Load on a Deep Foundation

(1) The allowable load on a deep foundation 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, and
(d) other requirements of this Subsection.

(2) The allowable load on a deep foundation as determined in Sentence (1) shall not be more than the unfactored load determined on the basis of structural considerations in accordance with the appropriate requirements of Subsections 4.3.1., 4.3.3. and 4.3.4.

(3) The portion of a deep foundation unit permanently in contact with soil or rock shall be structurally designed as a laterally supported compression member.

(4) The portion of a deep foundation unit which is not permanently in contact with soil or rock shall be structurally designed as a laterally unsupported compression member.

(5) The structural design of prefabricated deep foundation units shall allow for all stresses resulting from driving, handling and testing.

4.2.7.4. Tolerance in Alignment and Location. 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.

4.2.7.5. Incorrect Alignment and Location. Where a deep foundation unit has not been placed within the permissible deviations referred to in Article 4.2.7.4., the condition of the foundation shall be assessed by the person responsible for the design, any necessary changes made and action taken as required in Article 2.3.4.7.

4.2.7.6. 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 structures and services.
4.2.7. Damaged Deep Foundation Units

Where inspection shows that a deep foundation unit is damaged or not consistent with design or good engineering practice, the allowable load of such a unit shall be reassessed by the person responsible for the design, and necessary changes made and action taken as required in Article 2.3.4.

4.2.8. Special Foundations

4.2.8.1. General

Where special foundation systems are used, such systems shall conform to Subsection 4.2.4. and Section 2.5.

4.2.8.2. Use of Existing Foundations

Existing foundations may be used to support new or altered buildings provided they comply with all pertinent requirements of Section 4.2.

Section 4.3 Design Requirements for Structural Materials

4.3.1. Wood

4.3.1.1. Design Basis for Wood

Buildings and their structural members made of wood shall be designed in conformance with CAN3-086, "Engineering Design in Wood" or CAN/CSA-O6, "Engineering Design in Wood - Limit States Design.

4.3.1.2. Glued-Laminated Members


4.3.1.3. Termites

In areas known to be infested by termites, the requirements in Articles 9.3.2.9., 9.12.11., 9.15.1. and 9.18.4.1. shall apply.

4.3.2. Masonry

4.3.2.1. Design Basis for Masonry

Buildings and their structural members made of plain and reinforced masonry shall conform to CAN3-S304-M, "Masonry Design for Buildings."

4.3.3. Concrete

4.3.3.1. Design Basis for Concrete

Buildings and their structural members made of plain, reinforced and prestressed concrete shall conform to CAN3-A23.3-M, "Design of Concrete Structures for Buildings.

(See Appendix A.)

4.3.4. Steel

4.3.4.1. Design Basis for Structural Steel

Buildings and their structural members made of structural steel shall conform to CAN/CSA-S16.1-M, "Limit States Design of Steel Structures.” (See Appendix A.)

4.3.4.2. Design Basis for Cold Formed Steel

Buildings and their structural members made of cold formed steel shall conform to CAN/CSA-S136-M, "Cold Formed Steel Structural Members.” (See Appendix A.)

4.3.5. Aluminum

4.3.5.1. Design Basis for Aluminum

Buildings and their structural members made of aluminum shall conform to CAN3-S157-M, "Strength Design in Aluminum." (See Appendix A.)

4.3.6. Glass

4.3.6.1. Design Basis for Glass

Glass shall be designed in conformance with CAN/CGSB-12.20-M, "Structural Design of Glass for Buildings.” (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

The structural design of air-supported structures shall conform to CAN3-S367-M, "Air-Supported Structures.”

4.4.2. Use of Existing Foundations

Existing foundations may be used to support new or altered buildings provided they comply with all pertinent requirements of Section 4.2.

4.4.3.1. Design Basis for Air-Supported Structures

The structural design of air-supported structures shall conform to CAN3-S367-M, "Air-Supported Structures.”
4.4.2. Parking Structures

4.4.2.1. Design Basis for Parking Structures. Parking structures shall be designed in conformance with CAN/CSA-S413, “Parking Structures.”
Part 5
Wind, Water and Vapour Protection

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Part 5
Wind, Water and Vapour Protection

Section 5.1 General

5.1.1. Scope
5.1.1.1. The scope of this Part shall be as described in Section 2.1.

5.1.2. Application
5.1.2.1. This Part applies to the design of a building assembly such as a wall, floor, roof, floor-ceiling combination or roof-ceiling combination with respect to the control of groundwater, condensation and the penetration of wind and rain.

5.1.3. Definitions
5.1.3.1. Words that appear in italics are defined in Part 1.

5.1.4. Other Design and Structural Requirements
5.1.4.1. The design and structural requirements of other Parts of this Code shall apply.

Section 5.2 Control of Vapour Diffusion

5.2.1. Vapour Barriers
5.2.1.1. Where a building assembly that would be adversely affected by condensation will be subjected to a temperature differential and a differential in water vapour pressure, the assembly shall have a continuous vapour barrier at a location that will prevent condensation within the assembly.

5.2.2. Assemblies with Low Permeance Exterior Components

5.2.2.1. Protection
(1) Where a material or combination of materials that have a resistance to water vapour flow equivalent to that of a vapour barrier are used on the low vapour pressure side of the material that has the major thermal resistance in a building assembly
(a) a continuous vapour barrier, for use in above-grade building construction, shall be installed on the high vapour pressure side, and
(b) an air space ventilated to the outside or other method of equal effectiveness shall be provided for removing the water vapour that may pass from the high vapour pressure side through the material with the major thermal resistance (see Section 2.5.).

Section 5.3 Control of Air Leakage

5.3.1. Air Barriers

5.3.1.1. Locations
(1) Where a building assembly will be subjected to a temperature differential, a differential in water vapour pressure and a differential in air pressure due to stack effect, mechanical systems or wind, the assembly shall be designed to provide an effective barrier to air exfiltration and infiltration, at a
5.3.1.1. location that will prevent condensation within the assembly, through
(a) the materials of the assembly,
(b) joints in the assembly,
(c) joints in components of the assembly, and
(d) junctions with other building elements.

Section 5.4 Control of Rain Penetration

5.4.1. Joints
5.4.1.1. Joints in exterior cladding and the junctions of different exterior claddings shall be constructed to minimize the entrance of rainwater into the building assembly.

5.4.2. Openings
5.4.2.1. An opening in an exterior wall or roof shall be so constructed as to prevent the entrance of rain or snow into the building.

5.4.3. Roofing
5.4.3.1. Installation
(1) Roofing shall be installed so as to
(a) shed or drain water effectively,
(b) reduce the likelihood, when the roofing is comprised of overlapping units, of water backing up under the units due to ice damming or other cause, and
(c) be resistant to damage due to wind.

5.4.4. Parapets
5.4.4.1. Protection
(1) Where the top of a wall is exposed to the weather
(a) it shall be capped, and
(b) a through-wall flashing shall be installed immediately under a segmented or pervious cap, and at such other points in the wall as are necessary to divert rainwater to the outside.

5.4.5. Exterior Wall Cladding
5.4.5.1. Exterior wall cladding shall be so installed that it sheds water to prevent its entry into other components of the building assembly. Where there is a likelihood of some penetration, drainage shall be provided to take water to the outside.

Section 5.5 Control of Groundwater

5.5.1. Through-Wall Flashing
5.5.1.1. Where moisture from the ground can move upward into a wall and cause deterioration of the materials in the wall assembly, a through-wall flashing shall be installed in the wall below the materials likely to be so affected.

5.5.2. Dampproofing and Waterproofing
5.5.2.1. The portion of an exterior basement wall below ground level or any floor slab in contact with the ground shall be dampproofed or waterproofed as appropriate. (See Appendix A.)

5.5.3. Crawl Spaces
5.5.3.1. Ground Cover. Crawl spaces shall be comprised of overlapping units, or water provided with a ground cover. (See Appendix A.)
5.5.3.2. Slope. Unless groundwater levels and site conditions are such that water will not accumulate in the crawl space, the crawl space shall be sloped to drain to a sewer, ditch or dry well.

Section 5.6 Materials

5.6.1. Specifications
5.6.1.1. Materials used for exterior claddings, vapour barriers, air barriers, flashings, thermal insulation or fastening devices shall comply with the appropriate standards listed in Part 2. (See Appendix A.)
5.6.2. Deterioration

5.6.2.1. A material exposed to corrosive conditions shall be corrosion-resistant or shall be resistant to deterioration under those conditions.

5.6.3. Fastening Devices

5.6.3.1. Fastening devices shall be made of a material which is compatible with the materials to be so joined and shall be resistant to the type of corrosion likely to be present.

Section 5.7 Practices

5.7.1. Installation

5.7.1.1. General. Exterior claddings, vapour barriers, air barriers, thermal insulation, sheathing papers, flashings and fastening devices shall be installed in such a manner as to effectively perform their intended functions. (See Appendix A.)

5.7.1.2. Glass. Glass shall be designed and installed to resist the loads specified in Section 4.1. (See Appendix A.)

5.7.1.3. Exterior Cladding

(1) Exterior cladding shall be securely fastened to backing that is
   (a) an integral structural element of a building, or
   (b) an element added to the structure for the purpose of supporting such exterior cladding.

(2) Backing for exterior cladding as provided for in Sentence (1) shall be suitably located, secured and of a kind suitable for the type of fasteners to be used for attachment.

(3) Exterior cladding shall be designed, constructed and attached so as to accommodate stresses and deformations within the structure, the cladding system and all points of attachment caused by wind, earthquake and temperature effects. (See Appendix A.)
Part 6
Heating, Ventilating and Air-Conditioning

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Section 6.1 General

6.1.1. Scope

6.1.1.1. The scope of this Part shall be as described in Section 2.1.

6.1.2. Application

6.1.2.1. This Part applies to systems and equipment for heating, ventilating and air-conditioning services.

6.1.3. Definitions

6.1.3.1. Words that appear in italics are defined in Part 1.

6.1.4. Plans and Specifications

6.1.4.1. Plans, specifications and other information for heating, ventilating and air-conditioning systems shall conform to Subsection 2.3.5.

Section 6.2 Design and Installation

6.2.1. General

6.2.1.1. Good Engineering Practice. Heating, ventilating and air-conditioning systems, including mechanical refrigeration equipment, shall be designed, constructed and installed to conform to good engineering practice such as described in the ASHRAE Handbooks and Standards, the HRA Digest, the Hydronics Institute Manuals, the SMACNA Manuals and the Industrial Ventilation Manual published by the American Conference of Governmental Industrial Hygienists.

6.2.1.2. Capacity of Heating Appliances in Dwelling Units. The required capacity of heating appliances located in a dwelling unit and serving only that dwelling unit, shall be determined in accordance with CAN/CSA-F280, “Determining the Required Capacity of Residential Space Heating and Cooling Appliances,” except that the outside winter design temperatures shall conform to Subsection 2.2.1.

6.2.1.3. Structural Movement. Mechanical systems and equipment shall be designed and installed to accommodate the maximum amount of relative structural movement provided for in the construction of the building.

6.2.1.4. Installation Standards

(1) Except as provided in 6.2.1.5., 6.2.1.6. and 6.2.1.7., the installation of heating and air-conditioning equipment, including mechanical refrigeration equipment, and including provisions for mounting, clearances and air supply, shall conform to appropriate provincial requirements or, in the absence of such requirements, to the requirements of

(a) CSA B139, “Installation Code for Oil Burning Equipment,”
(b) CAN/CGA-B149.1, “Natural Gas Installation Code,”
(c) CAN/CGA-B149.2, “Propane Installation Code,”
(d) CSA C22.1, “Canadian Electrical Code, Part 1,”
(e) CSA B51, “Boiler, Pressure Vessel and Pressure Piping Code,”
(f) CSA B52, “Mechanical Refrigeration Code,” and
6.2.1.4.

(g) CAN/CSA B365, “Installation Code for Solid-Fuel Burning Appliances and Equipment.”

6.2.1.5. Solid-Fuel Burning Stoves, Ranges and Space Heaters. The design and installation of solid-fuel burning stoves, ranges and space heaters shall conform to the requirements of Section 9.33.

6.2.1.6. Fireplaces. Fireplaces shall conform to the requirements of Section 9.22.

6.2.1.7. Heat Recovery Ventilators. 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 CAN/CSA-C444, “Installation Requirements for Heat Recovery Ventilators.”

6.2.1.8. Outside Design Conditions. The outside conditions to be used in designing heating, ventilating and air-conditioning systems shall be determined in conformance with Subsection 2.2.1.

6.2.1.9. Installation – General

(1) Equipment forming part of a heating, ventilating or air-conditioning system, with the exception of embedded pipes or ducts, shall be installed with provision for access for inspection, maintenance, repair and cleaning.

(2) Mechanical equipment shall be guarded to prevent injury to the public or maintenance staff.

(3) Equipment forming part of a heating or air-conditioning system that may be adversely affected by freezing temperatures and that is located in an unheated area shall be protected from freezing.

6.2.1.10. Expansion, Contraction and System Pressure. 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.

6.2.1.11. Asbestos. Asbestos shall not be used in air distribution systems or equipment in a form or in a location where asbestos fibres could enter the air supply or return systems.

6.2.1.12. Access Openings. 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.

6.2.2. Ventilation

6.2.2.1. Required Ventilation

(1) Except as provided in Sentences (2) and 6.2.2.2.(2), all rooms and spaces in buildings shall be ventilated in accordance with this Part.

(2) Self-contained mechanical ventilation systems, such as kitchen and bathroom exhaust fans, serving only one dwelling unit shall conform to the requirements of Section 9.32.

6.2.2.2. Natural Ventilation

(1) The ventilation of rooms and spaces in occupancies other than residential occupancies by natural methods shall be permitted in lieu of mechanical ventilation where such ventilation will provide sufficient air change to provide healthful conditions in that occupancy.

(2) The ventilation of rooms or spaces by natural methods in residential occupancies shall conform to Section 9.32.

6.2.2.3. Ventilation of Storage 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 parts of air when measured between 900 mm and 1200 mm from the floor, or

(b) provide, during operating hours, a continuous supply of fresh air at a rate equal to not less than 3.9 L/s for each square metre of floor area. (See also Article 3.3.1.19. and Sentence 3.3.5.5.(4).)

(2) Mechanical ventilation systems provided in accordance with Clause (1)(a) shall be controlled by carbon monoxide monitoring devices.

(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 Sentences (1) and (2), 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 uncontaminated air.

(6) The requirements of Sentences (1) to (5) shall not apply to open-air storeys in a storage garage.

6.2.2.4. Air Contaminants

(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 unsafe concentrations.

(2) Systems serving spaces that contain sources of contamination shall be designed in such a manner as to prevent spreading of such contamination to other occupied parts of the building and surrounding areas.

6.2.2.5. Hazardous Gases, Dusts or Liquids. Systems serving spaces that contain hazardous gases, dusts or liquids such as grain elevators, metal powder plants and ammonium nitrate storage shall be designed, constructed and installed to conform to the requirements of the appropriate provincial legislation or, in the absence of such legislation, to good engineering practice such as is described in the publications of the National Fire Protection Association and in the National Fire Code of Canada 1990. (See Appendix A.)

6.2.2.6. Commercial Cooking Equipment. Systems for the ventilation of restaurant and other commercial cooking equipment shall be designed, constructed and installed to conform to NFPA 96, “Installation of Equipment for the Removal of Smoke and Grease-Laden Vapors from Commercial Cooking Equipment,” except as required by Sentence 3.5.3.1.(1) and Article 3.5.4.2.

6.2.2.7. Crawl Spaces and Attic or Roof Spaces. Every crawl space and every attic or roof space shall be ventilated by natural or mechanical means.

6.2.3. Air Duct Systems

6.2.3.1. Application. Where ducts serve a heating system with a rated heat input not more than 120 kW, the requirements of Subsection 6.2.4. shall apply in addition to those in this Subsection.

6.2.3.2. Materials in Air Duct Systems

(1) Except as provided in Sentences (2) to (4) and in Article 3.5.4.3., all ducts, duct connectors, associated fittings and plenums used in air duct systems shall be constructed of steel, aluminum alloy, copper, clay, asbestos-cement or similar noncombustible material.

(2) Ducts, associated fittings and plenums may contain limited amounts of combustible material provided they

(a) conform to the appropriate requirements for Class 1 duct materials in CAN/ULC-S110-M, “Standard Methods of Test for Air Ducts,”

(b) conform to Article 3.1.5.14. and Subsection 3.1.9.,

(c) are not used in vertical runs serving more than 2 storeys, and

(d) 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-M, “Standard Methods of 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) when used 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.
6.2.3.3. Connections and Openings in Air Duct Systems

(1) Air duct systems shall have tight-fitting connections throughout, and shall have no openings other than those required for proper operation and maintenance of the system.

(2) Except for systems that serve one dwelling unit only, access openings shall be provided in duct systems where lint, grease, debris, paper or other combustible material may accumulate in plenums and ducts.

6.2.3.4. 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, “Standard for 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.

6.2.3.5. Tape. 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, “Standard for Flame Tests of Flame-Resistant Fabrics and Films.”

6.2.3.6. Coverings, Linings, Adhesives and Insulation

(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.

(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 Sentence 3.1.5.11.

(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 or of fire dampers, fire stop flaps and other closures.

6.2.3.7. Underground Ducts. Underground ducts shall be constructed to provide interior drainage from and access to all low points and shall not be connected directly to a sewer.

6.2.3.8. Clearances. 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.

6.2.3.9. Fire Dampers. Fire dampers shall conform to the requirements of Article 3.1.8.9.

6.2.3.10. 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.
Exhaust ducts of nonmechanical ventilating systems serving similar occupancies may be combined immediately below the point of final delivery to the outside, such as the base of a roof ventilator.

Exhaust ducts of ventilating systems shall have provision for the removal of condensation where this may be a problem.

Exhaust outlets shall be designed to prevent back draft under wind conditions.

Exhaust ducts directly connected to laundry drying equipment shall be independent of other exhaust ducts.

Except as provided in Sentence (8) 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.

Exhaust ducts directly connected to laundry drying equipment shall be independent of other exhaust ducts.

Two or more exhaust systems described in Sentences (6) and (7) may be interconnected or connected with exhaust ducts serving other areas of the building provided 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.

Where exhaust ducts containing air from heated spaces pass through or are adjacent to unheated spaces, the ducts shall be insulated to prevent moisture condensation in the ducts.

Interconnection of Systems

Air duct systems serving garages shall not be directly interconnected with other parts of the building.

In a residential occupancy, air from one suite shall not be circulated to any other suite nor to a public corridor.

Make-up Air. 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. (See Appendix A.)

Supply, Return, Intake and Exhaust Air Openings

Supply, return and exhaust air openings in rooms or spaces in buildings when located less than 2 m above the floor shall be protected by grilles having openings of a size that will not allow the passage of a 15 mm diam sphere.

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.

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 that the normal exterior air of the locality in which the building is situated.

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 not larger than 15 mm, except where climatic conditions may require larger openings.

Screens required in Sentence (4) shall be accessible for maintenance.

Filters and Odour Removal Equipment

Air filters for air duct systems shall conform to the requirements for Class 2 air filter units as described in CAN4-S111, "Standard Method of Fire Tests For Air Filter Units."

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, in dwelling units, when the furnace circulating fan is not operating.

When odour removal equipment of the adsorption type is used it shall be 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.

6.2.3.15. Air Washers and Evaporative Cooling Sections or Towers

(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 cooling sections or towers of combustible material located on or outside buildings shall have a clearance of not less than 12 m from sources of ignition such as chimneys or incinerators when the tower exterior construction is noncombustible, and a clearance of not less than 30 m when the tower exterior construction is combustible.

(4) Evaporative cooling sections or towers the main structure of which exceeds a volume of 55 m³ shall comply with the requirements of NFPA 214, “Water-Cooling Towers.”

6.2.3.16. 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 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.

6.2.4. Air Ducts for Low Capacity Heating Systems

6.2.4.1. Application. The design, construction and installation of air duct distribution systems serving heating systems in which the rated heat input does not exceed 120 kW shall conform to this Subsection and Subsection 6.2.3.

6.2.4.2. Galvanized Steel or Aluminum Supply Ducts

(1) Galvanized steel or aluminum supply ducts shall conform to Table 6.2.4.A.

(2) The design of fittings for ducts shall conform to CSA B228.1, “Pipes, Ducts, and Fittings for Residential Type Air Conditioning Systems,” except that metal thickness requirements shall conform to those in Table 6.2.4.A.

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 or equivalent mechanical connections.

(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.
Table 6.2.4.A.  
Forming part of Sentence 6.2.4.2.(1)

<table>
<thead>
<tr>
<th>Type of Duct</th>
<th>Maximum Diameter, mm</th>
<th>Maximum Width or Depth, mm</th>
<th>Duct Material</th>
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<td></td>
<td></td>
<td>Galvanized Steel</td>
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<tr>
<td></td>
<td>Over 350</td>
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<td>0.41</td>
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<tr>
<td>Rectangular, enclosed</td>
<td>—</td>
<td>350</td>
<td>0.33</td>
</tr>
<tr>
<td></td>
<td>—</td>
<td>Over 350</td>
<td>0.41</td>
</tr>
<tr>
<td>Rectangular, not enclosed, for single dwelling units with required clearance up to 12 mm</td>
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<td>350</td>
<td>0.33</td>
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<tr>
<td></td>
<td>—</td>
<td>Over 350</td>
<td>0.41</td>
</tr>
<tr>
<td>Rectangular, not enclosed, with required clearance of more than 12 mm</td>
<td>—</td>
<td>350</td>
<td>0.41</td>
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<td></td>
<td>—</td>
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<td>4</td>
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</table>

(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 and corrosion-, decay-, and mildew-resistant.

6.2.4.4. Clearances of Ducts and Plenums

(1) The clearance of furnace plenums from combustible material shall conform to the requirements of the appropriate standards of Sentence 6.2.1.4.(1).

(2) Where the plenum clearance required in Sentence (1) 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.

(3) Where the plenum clearance required in Sentence (1) 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 1.8 m of the plenum, and
(b) be not less than 12 mm at a horizontal distance of 1.8 m 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.

(4) Where the plenum clearance required in Sentence (1) 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 m of the plenum,
(b) be not less than 150 mm within a horizontal distance between 1 and 1.8 m from the plenum, and
(c) be not less than 25 mm at a horizontal distance of 1.8 m 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.

(5) 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 (2), (3) and (4).

6.2.4.5. Warm-Air Supply Outlets

(1) In a dwelling unit, a warm-air supply outlet shall be provided in each finished room which is located adjacent to unheated space.

(2) When a room described in Sentence (1) is located adjacent to exterior walls, such outlet shall be located so as to bathe not less than one exterior wall or window with warm air, except in bathrooms, utility rooms or kitchens, where this may not be practical. (See Appendix A.)

(3) Not less than one warm-air supply outlet shall be provided for each 40 m² of floor surface area in unfinished basements serving dwelling units, and it shall be located so as to provide adequate distribution of warm air throughout the basement.

(4) 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.

(5) 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.

(6) 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.

(7) The temperature of supply air at warm-air supply outlets shall not exceed 70°C.

6.2.4.6. Concrete Slabs-on-Grade. Warm-air supply systems for residential buildings built on concrete slabs-on-grade shall be installed in the slab and shall be of the perimeter loop type or radial perimeter type.

6.2.4.7. Adjustable Dampers and Balance Stops. All branch supply ducts which are not fitted with diffusers with adjustable balance stops shall be supplied with adjustable dampers and fitted with devices to indicate the positions of the dampers.

6.2.4.8. 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 furnace 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.

(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 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 one floor.

(8) A public corridor or public stairway shall not be used as a return-air plenum.

(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.
(10) Return-air inlets shall not be installed in an enclosed room or crawl space that provides combustion air to a furnace.

(11) Return air from a dwelling unit shall not be recirculated to any other dwelling unit.

(12) Except for unfinished areas and floor levels which are less than 900 mm above or below an adjacent floor level which is provided with a return-air inlet, not less than one return-air inlet shall be provided in each floor level in a dwelling unit.

(13) Provision shall be made for the return of air from all rooms by leaving gaps beneath doors, using louvered doors or installing return duct inlets.

(14) Except for a return-air plenum located within a dwelling unit, where a ceiling assembly is used as a plenum, the requirements of Subsection 6.2.3. shall apply.

6.2.5. Heating Appliances, General

6.2.5.1. Location of Appliances. 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 3.5. (See also Subsection 9.10.10.)

6.2.5.2. Appliances Installed outside the Building

(1) Fuel-fired appliances installed on the roof of a building or otherwise outside the building shall be designed for outdoor use,

(a) installed not less than 1.2 m from the property line, measured horizontally, and

(b) 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


6.2.6.2. Venting. Every incinerator shall be served by a chimney flue conforming to Section 6.3.

6.2.7. Unit Heaters

6.2.7.1. Every unit heater using either steam or hot water as the heating medium shall be installed with a clearance of not less than 25 mm between the appliance and adjacent combustible material.

6.2.8. Radiators and Convectors

6.2.8.1. 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.

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. (See Article 3.1.5.15., 3.1.9.1. and Article 9.10.9.10. for fire safety requirements.)

(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 mold.

(a) shall be made of noncombustible material, or
6.2.9.2. (b) shall not flame, glow, smoulder or smoke when tested in accordance with the method of test 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.

6.2.9.3. Clearances. Clearances between combustible material and bare pipes carrying steam or hot water shall conform to Table 6.2.9.A.

6.2.9.4. Surface Temperature. The exposed surface temperature of a steam or hot water radiator shall not exceed 70°C unless precautions are taken to prevent human contact.

| Clearance between Steam or Hot Water Pipes and Combustible Material |
|---------------------------------|------------------|
| Steam or Water Temperature, °C | Minimum Clearance, mm |
| up to 120                      | 15               |
| above 120                      | 25               |

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. Where piping for heating or air-conditioning systems is enclosed in a shaft, the requirements of Article 3.5.3.1. 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) Solid fuels shall not be stored where the air temperature in the bin or the surface temperature of any part of the floor or walls is 50°C or above.

6.2.11.2. Ash Storage Bins

(1) Every ash storage bin shall be constructed of noncombustible material and, where the bin is not covered, the ceiling of the room in which it is located shall be 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.

Section 6.3 Chimneys and Venting Equipment

6.3.1. General

6.3.1.1. Requirement for Venting. Except as provided in Articles 6.3.1.2. and 6.3.1.3., the products of combustion from oil-, gas- and solid-fuel burning appliances shall be vented in conformance with the requirements in the applicable appliance installation standard listed in Sentence 6.2.1.4.(1).

6.3.1.2. Masonry or Concrete Chimneys

(1) Rectangular masonry or concrete chimneys not more than 12 m in height that serve appliances with a combined total rated heat output of 120 kW or less, or that serve fireplaces, shall conform to Part 9.

(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, “Standard for Chimneys, Fireplaces, Vents and Solid Fuel Burning Appliances.”


6.3.1.4. Lightning Protection Systems. A lightning protection system, when provided, shall conform to the requirements of the appropriate provincial legislation or, in the absence of such legislation, to CAN3-B72-M, “Installation Code for Lightning Protection Systems.”

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 2.5 m from ground level.
## Part 7
### Plumbing Services

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Part 7
Plumbing Services

Section 7.1 General

7.1.1. Scope
7.1.1.1. The scope of this Part shall be as described in Section 2.1.
7.1.1.2. This Part applies to the design, construction, extension, alteration, renewal or repair of plumbing systems.

7.1.2. Application
7.1.2.1. Every plumbing system shall be designed and installed in conformance with appropriate municipal or provincial regulations or, in the absence of such regulations, in conformance with the ACNBC Canadian Plumbing Code 1990.

7.1.3. Required Facilities
7.1.3.1. Buildings shall be equipped with plumbing facilities as required in Subsections 3.6.4. and 3.7.3.
7.1.3.2. Dwelling units shall be equipped with plumbing facilities as required in Section 9.31.

7.1.4. Definitions
7.1.4.1. Words that appear in italics are defined in Part 1.
Part 8
Safety Measures at Construction and Demolition Sites

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Part 8
Safety Measures at Construction and Demolition Sites

Section 8.1 General

8.1.1. Scope

8.1.1.1. Scope

(1) The scope of this Part shall be as described in Section 2.1.

(2) This Part applies to fire safety and the protection of the public during the construction, alteration or demolition of every building, including any incompletely or abandoned building.

8.1.1.2. Definitions. Words that appear in italics are defined in Part 1.


8.1.2. Application

8.1.2.1. Application. Where a building is undergoing construction, alteration or demolition, measures shall be taken at the building site in conformance with this Code. (See Appendix A.)

8.1.2.2. Protection from Risk. Precautions shall be taken to ensure that no person is exposed to undue risk.

Section 8.2 Protection of the Public and Fire Safety

8.2.1. Fencing and Barricades

8.2.1.1. Covered Way Exceptions

(1) Where the construction may constitute a hazard to the public, work shall not commence on the construction, alteration or repair of a building until a covered way has been provided as described in Article 8.2.1.2. to protect the public, except where

(a) the work is done within a solid enclosure,

(b) the building is at a distance of 2 m or more from a public way used by pedestrians, or

(c) site conditions warrant a distance greater than provided in Clause (b).

8.2.1.2. Covered Way Construction

(1) A covered way shall

(a) have a clear height of not less than 2.5 m,

(b) have a clear width of not less than 1.5 m or the width of the public way whichever is the lesser,

(c) be designed and constructed to support safely all loads that may be reasonably expected to be applied to it, but in no case less than 2.4 kPa on the roof,

(d) have a weathertight roof sloped towards the site or if flat be equipped with a splash
board not less than 300 mm high on the street side,
(e) be totally enclosed on the site side with a structure having a reasonably smooth surface facing the public way,
(f) have a railing 1 070 mm high on the street side where the covered way is supported by posts on the street side, and
(g) be adequately lighted when the public way is lighted.

8.2.1.3. Fencing, Boarding or Barricades
(1) When a construction or demolition activity may constitute a hazard to the public and is located 2 m or more from a public way, a strongly constructed fence, boarding or barricade not less than 1.8 m high shall be erected between the site and the public way or open sides of a construction site.
(2) Barricades shall have a reasonably smooth surface facing the public way and shall be without openings, except those required for access.
(3) Access openings through barricades shall be equipped with gates which shall be kept closed and locked when the site is unattended and shall be maintained in place until completion of the construction or demolition activity.

8.2.1.4. Special Hazards. Where any special hazard exists from which it is not possible to protect the public by other means, persons shall be employed to prevent the public from entering the danger zone at any time of the day or night.

8.2.1.5. Work Shutdown
(1) When work on a construction site is suspended or ceases so that it will not be occupied during normal working hours, the hazardous part of the construction site shall be protected by
(a) covering all windows, doors and other openings located within 3 m of the ground which may give access to the building with a securely fastened barricade, or
(b) a fence or barricade constructed according to the requirements of Article 8.2.1.3.

8.2.2. Fire Safety at Demolition Sites
8.2.2.1. Application to Demolition Sites
(1) This Subsection applies to buildings or parts of buildings undergoing demolition. (See Appendix A.)
(2) The degree of application of this Subsection to each demolition activity shall be determined prior to the commencement of demolition as part of the fire safety plan. (See Appendix A.)

8.2.2.2. Fire Safety Plan. Prior to the commencement of demolition, a fire safety plan conforming to Section 2.14 of the National Fire Code of Canada 1990 shall be prepared for the demolition site.

8.2.2.3. Access for Fire Fighting
(1) Unobstructed access shall be maintained to fire hydrants and to fire department connections for standpipe and sprinkler systems.
(2) Where practicable, access routes to the demolition site shall be provided for fire department vehicles. (See Appendix A.)
(3) Where a demolition site is fenced so as to prevent general entry, provision shall be made for access by fire department equipment and personnel.

8.2.2.4. Portable Extinguishers
(1) Portable extinguishers shall be installed and maintained in conformance with Part 6 of the National Fire Code of Canada 1990.
(2) In addition to the requirements of Sentence (1), portable extinguishers shall be provided
(a) adjacent to cutting or welding operations,
(b) in areas where combustibles are stored,
(c) near or on any internal-combustion engines,
(d) adjacent to areas where flammable liquids or gases are stored or handled, and
(e) adjacent to temporary oil or gas fired equipment.
(3) The minimum rating for extinguishers in Sentences (1) and (2) shall be
(a) 2-A:10-BC on moveable equipment, and
(b) 4-A:40-BC in all other locations.
8.2.2.5. **Standpipe Systems.** Where a building being demolished floor by floor is equipped with a standpipe system, such system, together with fire department connections and valves, shall be maintained in operable condition on all storeys below that being demolished except the storey immediately below it. (See Appendix A.)

8.2.2.6. **Cutting and Welding Operations**

1. Cutting and welding operations shall conform to Section 5.17 of the National Fire Code of Canada 1990.

2. Areas on a demolition site where cutting and welding operations have taken place shall be kept under supervision for not less than 1 h after the operations have been completed.

8.2.2.7. **Egress Provision.** Not less than one stairway shall be maintained in usable condition at all times.

8.2.2.8. **Fire Warning.** A system to alert site personnel of fire in a building being demolished shall be provided, and the system shall be capable of being heard in all areas of the building.

8.2.2.9. **Building Service Shut-Off**

1. Except as provided in Sentence (2), and except for water supplies for fire fighting, building services shall be shut off and gas and fuel lines shall be capped in a building being demolished.

2. Temporary electrical installations shall be installed in conformance with the requirements of the appropriate provincial, territorial or municipal legislation or, in the absence of such legislation, to the requirements of CSA C22.1, “Canadian Electrical Code, Part I.”

8.2.2.10. **Clearance to Combustible Materials**

1. Internal combustion engines shall be located so that the exhaust discharges not less than 500 mm from combustible materials.

2. Where exhaust from internal combustion engines is piped outdoors, a clearance of not less than 150 mm shall be maintained between the exhaust pipe and combustible material.

8.2.2.11. **Fuel Supply Installation**

1. Fuel supplies for heating equipment and internal-combustion engines shall conform to

   a. CAN/CGA-B149.2-M, “Propane Installation Code,”

   b. CSA-B139, “Installation Code for Oil Burning Equipment,” or

   c. CAN/CGA-B149.1-M, “Natural Gas Installation Code.”

8.2.2.12. **Tank, Piping and Machinery Reservoir Safety**

1. Tanks, piping and machinery reservoirs containing combustible liquids or flammable liquids or which are likely to contain flammable vapours shall be drained and, except as required in Sentence (2), removed prior to demolition of the building.

2. Where it is impracticable to remove tanks, piping or machinery reservoirs from the building prior to demolition, such equipment shall be conspicuously identified and removed as soon as conditions permit.

3. Tanks, piping and machinery reservoirs in Sentences (1) and (2) which contained combustible liquids, flammable liquids or flammable gases shall be purged with inert materials prior to demolition to prevent an explosion. (See Appendix A.)

8.2.2.13. **Fire Separations in Partly Occupied Building.** Where part of a building continues to be occupied during demolition, the occupied part shall be separated from that being demolished by a fire separation having a fire-resistance rating of not less than 1 h.

8.2.2.14. **Watch**

1. A watch, with tours at intervals of not more than 1 h apart, shall be provided throughout demolition sites when there are occupants in the portion of the building not being demolished.

2. Facilities shall be provided to enable the watcher to communicate with the fire department.

8.2.2.15. **Smoking Restrictions.** Smoking shall be permitted only in conformance with Subsection 2.4.3. of the National Fire Code of Canada 1990.
8.2.3. Fire Safety at Construction Sites

8.2.3.1. Application to Construction Sites. This Subsection applies to all buildings and portions of buildings under construction and includes alterations. (See Appendix A.)

8.2.3.2. Fire Safety Plan. Prior to construction, a fire safety plan conforming to Section 2.15 of the National Fire Code of Canada 1990 shall be prepared for the construction site.

8.2.3.3. Access for Fire Fighting
(1) Unobstructed access to fire protection equipment, such as hydrants, fire department connections and portable extinguishers, shall be maintained at all times.
(2) Where practicable, access routes to the construction site shall be provided for fire department vehicles. (See A-8.2.2.3.(2) in Appendix A.)
(3) Where a construction site is fenced so as to prevent general entry, provision shall be made for access by fire department equipment and personnel.

8.2.3.4. Portable Extinguishers
(1) Portable extinguishers shall be installed and maintained in conformance with Part 6 of the National Fire Code of Canada 1990.
(2) In addition to the requirements of Sentence (1), portable extinguishers shall be provided
(a) adjacent to cutting or welding operations,
(b) in areas where combustibles are stored,
(c) near or on any internal-combustion engines,
(d) adjacent to areas where flammable liquids or gases are stored or handled,
(e) adjacent to temporary oil or gas fired equipment, and
(f) adjacent to bitumen heating equipment.
(3) The minimum rating for extinguishers in Sentences (1) and (2) shall be
(a) 2-A:10-BC on moveable equipment, and
(b) 4-A:40-BC in all other locations.

8.2.3.5. Standpipe Systems. Where a standpipe and hose system is to be installed in a building, such system shall be installed progressively in conformance with Subsection 3.2.5.

8.2.3.6. Cutting and Welding Operations. Cutting and welding operations shall conform to Section 5.17 of the National Fire Code of Canada 1990.

8.2.3.7. Egress Provisions. In areas of the building in which construction operations are taking place, at least one exit shall be accessible and usable at all times.

8.2.3.8. Fire Warning. A suitable means of alerting site personnel to a fire shall be provided, and this system shall be capable of being heard in all areas of the building.

8.2.3.9. Clearance to Combustible Materials
(1) Clearances between combustible material and internal combustion engines shall conform to Article 8.2.2.10.
(2) The clearance between combustible materials and temporary heating equipment, including flues, shall be in conformance with Part 6 or in conformance with the minimum clearances shown on certified heating equipment.

8.2.3.10. Combustible Liquid and Flammable Liquid Storage
(1) Combustible liquids and flammable liquids shall be stored and used in conformance with Part 4 of the National Fire Code of Canada 1990.
(2) Bitumen heating equipment shall be provided with metal covers.
(3) Bitumen heating equipment shall be under constant supervision when in operation.
(4) Mops used for spreading bitumen shall be kept outside the building in a safe location.

8.2.3.11. Watch
(1) Except where the building is provided with a fire alarm system or similar equipment acceptable to the authority having jurisdiction, a watch, with tours at intervals of not more than 1 h apart shall be provided when a portion of a building is occupied while construction operations are taking place.
(2) In buildings which are occupied prior to completion of construction, provision shall be made for the watcher to sound the alarm and notify the fire department.
8.2.3.12. Smoking Restrictions. Smoking shall be permitted only in conformance with Subsection 2.4.3. of the National Fire Code of Canada 1990.

8.2.3.13. Disposal of Combustible Refuse. Combustible refuse in sufficient quantities to constitute a fire hazard shall be moved to a safe location. (See also Subsection 8.2.7.)

8.2.3.14. Temporary Enclosures. Fabrics and films used temporarily to enclose buildings shall be securely fastened to prevent them from being blown against heaters or other ignition sources.

8.2.4. Excavation

8.2.4.1. Building Services Shut-Off
(1) Except as provided in Article 8.2.4.2., before excavation begins, all existing gas, electrical, water, steam and other services shall be shut off, capped and labelled so as to permit easy identification outside the limits of the excavation.
(2) The service company whose service connections will be affected shall be notified in advance of any action and, if it is necessary to maintain any such service, it shall be relocated as necessary and protected from damage in such a way as to afford safety to the public.

8.2.4.2. Maintaining Existing Services
(1) Existing gas, electrical, water, steam and other services may be left within the area of the excavation provided:
   (a) before work begins the approval of the service company involved is obtained to the proposed method of operation,
   (b) their location is determined before excavation commences,
   (c) a suitable method of excavation is adopted which will ensure that they are not damaged, and
   (d) suitable temporary supports are provided.

8.2.4.3. Water Removal. Excavations shall be kept reasonably clear of water so as not to endanger the safety of the public or to create conditions hazardous to health.

8.2.4.4. Protection of Adjoining Property. If the stability of adjoining structures, walls or services may be endangered by the work of excavating, adequate underpinning, shoring and bracing shall be provided to prevent damage to, or movement of, any part of the adjoining property, or the creation of a hazard to the public.

8.2.5. Use of Streets or Public Property

8.2.5.1. Safe Passage Past Site
(1) Except as provided in Article 8.2.5.2., provisions shall be made at all times for the safe passage of pedestrian and vehicular traffic past the site.
(2) Material or equipment shall not be placed on any street or other public property except as authorized.
(3) Except as provided in Sentence (4), where a sidewalk exists adjacent to the site it shall be kept clear of obstructions at all times.
(4) Where the construction operations necessitate the obstruction of the sidewalk, a temporary sidewalk shall be provided where necessary and it shall be kept clear of obstruction at all times.

8.2.5.2. Overhead Activities. Operations such as the hoisting of major components onto a tall building or other overhead activities that constitute a hazard to pedestrians below from which the public cannot be protected by barricades, covered ways or similar means shall not be carried out until the street or other public way is closed.

8.2.5.3. Barricades. Excavations in streets or public property shall be adequately barricaded and warning signs or lights shall be installed on each section of such barricades.

8.2.5.4. Restoration and Repair. All sidewalks, streets or other public property that have been damaged shall be restored to a safe condition, and all obstructions shall be removed when the need for such obstruction is ended.

8.2.5.5. Warning Lights. Warning lights shall be placed and shall be in operation during the hours of darkness at all obstructions on streets or other public ways.
8.2.6. Direction of Vehicular Traffic

8.2.6.1. Hazards to Vehicular Traffic

Where a hazard to vehicular traffic on a public way is created by work on the construction site, one or more of the following shall be provided to direct the traffic:
(a) one or more workers,
(b) warning signs,
(c) barriers,
(d) lane control devices, or
(e) flashing lights or flares located at a suitable distance from the hazard.

8.2.6.2. Flags Used for Directing Traffic

A flag used to direct traffic shall be
(a) red,
(b) not less than 450 mm by 500 mm,
(c) mounted on a staff not less than 1 m long with the long side attached securely to the staff along its entire length, and
(d) maintained in a clean and un torn condition when being used.

8.2.6.3. Signs Used for Directing Traffic

A sign used to direct traffic shall be
(a) diamond-shaped and of material not less rigid than 6 mm thick plywood,
(b) not less than 450 mm by 450 mm in size and mounted at one corner on a substantial pole not less than 1.2 m long,
(c) red on one side with black corner areas so that the red area is a regular 8-sided figure, and with the word “STOP” or “ARRET” in clearly distinguishable white letters not less than 150 mm high located centrally on the sign,
(d) yellow on the other side with the word “SLOW” or “LENTEMENT,” in clearly distinguishable black letters not less than 150 mm high located centrally on the sign, or symbols recognized by the International Traffic Code, and
(e) maintained in a clean condition when being used.

8.2.6.4. Worker Directing Traffic

A worker who is directing traffic shall
(a) be equipped as required by Article 8.2.6.5.,
(b) be instructed in the signals to be used in controlling traffic,
(c) be provided with a copy of written instructions on the correct methods for traffic direction, and
(d) direct traffic by using either a flag or sign.

8.2.6.5. Clothing While Directing Traffic

A worker while directing traffic shall wear the following clothing which shall be fluorescent and coloured either blaze orange or red:
(a) a vest, or
(b) sleeves that extend from above the elbow to the wrist.

8.2.7. Waste Material

8.2.7.1. Control of Waste Material. Except as provided in Article 8.2.7.2., waste material or other material shall not be permitted to fall freely from one storey to another.

8.2.7.2. Removal of Waste Material

The clearing away of waste material shall be carried out as quickly as possible, and shall
(a) be carried out by means of appropriate containers,
(b) be guided into an enclosed shaft or chute conforming to Sentence 8.2.7.4.(1), or
(c) be carried out by means of a hoisting apparatus if large pieces or objects are involved.

8.2.7.3. Enclosures for Waste Material

Waste material cleared as provided in Sentence 8.2.7.2.(1) shall be deposited in an enclosure
(a) so arranged as to prevent waste material from being projected beyond the confines of the enclosure, and
(b) not accessible to the public.

8.2.7.4. Chutes for Waste Material

The chute described in Clause 8.2.7.2.(1) shall
(a) be closed if it is inclined more than 45° with the horizontal,
(b) be kept closed or covered at its entrance when not in use, and
(c) have a device to prevent wheelbarrows from entering the top of the chute.
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Housing and Small Buildings

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Housing and Small Buildings

Section 9.1 General

9.1.1. Scope
9.1.1.1. The scope of this Part shall be as described in Section 2.1.

Section 9.2 Definitions

9.2.1. General
9.2.1.1. Words in italics are defined in Part 1.

Section 9.3 Materials, Systems and Equipment

9.3.1. Concrete
9.3.1.1. Concrete. Concrete shall be designed, mixed, placed, cured and tested in accordance with CAN3-A438, "Concrete Construction for Housing and Small Buildings."

9.3.1.2. Cement. Cement shall meet the requirements of CAN3-A5, "Portland Cements."

9.3.1.3. Concrete in Contact with Sulphate Soil
   (1) Concrete in contact with sulphate soil deleterious to normal cement shall conform to the requirements in Section 16 of CAN3-A23.1, "Concrete Materials and Methods of Concrete Construction."
   (2) Sulphate-resisting cement shall be used for concrete referred to in Sentence (1).

9.3.1.4. Aggregates. Aggregates shall consist of sand, gravel, crushed rock, crushed air-cooled blast furnace slag, expanded shale or expanded clay conforming to CAN3-A23.1, "Concrete Materials and Methods of Concrete Construction" and shall be clean, well-graded and free of injurious amounts of organic and other deleterious material.

9.3.1.5. Water. 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. Unless specifically required elsewhere in this Part, the compressive strength of unreinforced concrete shall be not less than 15 MPa after 28 days. (See also Articles 9.3.1.7., 9.12.4.1., 9.15.4.1. and 9.18.6.1.)

9.3.1.7. Concrete for Garage and Carport Floors and Exterior Steps. When concrete is used for garage and carport floors and exterior steps, it shall have a minimum compressive strength of 20 MPa after 28 days and shall have air entrainment of 5 to 8 per cent.

9.3.1.8. Concrete Mixes
   (1) The concrete mixes described in Table 9.3.1.A. shall be considered acceptable if the slump does not exceed 100 mm when measured according to the slump test described in CAN3-A23.2, "Methods of Test for Concrete."
   (2) Aggregate for mixes referred to in Sentence (1) shall not exceed 50 mm in size.

9.3.1.9. Admixtures. Admixtures shall conform to CAN3-A266.1, "Air Entraining Admixtures for Concrete" or CAN3-A266.2, "Chemical Admixtures for Concrete," as applicable.
9.3.1.10. **Reinforced Concrete.** Reinforced concrete shall be designed to conform to the requirements of Part 4.

### Table 9.3.1.A.
Forming Part of Sentence 9.3.1.8(1)

<table>
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<th>Concrete Strength, MPa</th>
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</tbody>
</table>

9.3.1.11. **Cold Weather Requirements**

**(1)** When the air temperature is below 5°C, concrete shall be kept at a temperature of not less than 10°C or more than 25°C while being mixed and placed, and 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.** Lumber for joists, rafters, trusses and beams and for the uses listed in Table 9.3.2.A. 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.)

### Table 9.3.2.A.
Forming Part of Article 9.3.2.1.

<table>
<thead>
<tr>
<th>Use</th>
<th>Boards (1)</th>
<th>Framing</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>All Species</td>
<td>Eastern White Pine &amp; Red Pine</td>
</tr>
<tr>
<td></td>
<td>Para 113</td>
<td>Para 114</td>
</tr>
<tr>
<td>Stud wall framing (load bearing members)</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>Stud wall framing (non-load bearing members)</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>Plank frame construction (load bearing members)</td>
<td>No. 3 Common</td>
<td>No. 3 Common</td>
</tr>
<tr>
<td>Plank frame construction (non-load bearing members)</td>
<td>No. 5 Common</td>
<td>—</td>
</tr>
<tr>
<td>Posts and beams less than 114 mm in thickness</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>Posts and beams not less than 114 mm in thickness</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>Roof sheathing</td>
<td>No. 3 Common</td>
<td>Standard</td>
</tr>
<tr>
<td>Subflooring</td>
<td>No. 3 Common</td>
<td>Standard</td>
</tr>
<tr>
<td>Wall sheathing when required as a nailing base</td>
<td>No. 4 Common</td>
<td>Utility</td>
</tr>
<tr>
<td>Wall sheathing not required as a nailing base</td>
<td>No. 5 Common</td>
<td>Economy</td>
</tr>
</tbody>
</table>

Column 1 | 2 | 3 | 4 | 5

**Note to Table 9.3.2.A.:**

(1) See Appendix A.
9.3.2.2. **Lumber Grades.** Except for joists, rafters, trusses and beams, visually graded lumber shall conform to the grades in Table 9.3.2.A. (See Article 9.23.3.1. for joists, rafters and beams and Article 9.23.13.1. for trusses).

9.3.2.3. **Machine Stress Rated Lumber.** Machine stress rated lumber shall conform to the requirements of Subsection 4.3.1.

9.3.2.4. **Waferboard, Strandboard and Plywood Marking.** Waferboard, strandboard and plywood used for roof sheathing, wall sheathing and subflooring shall be legibly identified on the face of the material indicating the manufacturer of the material, the standard to which it is produced and that the material is of an exterior type.

9.3.2.5. **Moisture Content.** Moisture content of lumber shall be not more than 19 per cent at the time of installation.

9.3.2.6. **Lumber Dimensions.** Lumber dimensions referred to in this Part are actual dimensions determined in conformance with CSA O141, “Softwood Lumber.”

9.3.2.7. **Panel Thickness Tolerances.** The thicknesses specified in this Part for plywood, hardboard, particleboard, waferboard and strandboard shall be subject to the tolerances permitted in the standards referenced for these products unless specifically indicated herein.

9.3.2.8. **Undersized Lumber.** Joist, rafter, lintel and beam members up to 5 per cent less than the actual Canadian standard sizes may be used provided the allowable spans for the grade and species of lumber under consideration are reduced 5 per cent from those shown in the span tables for full size members. (See Appendix A.)

9.3.2.9. **Termite Resistance**

(1) Where wood is pressure treated to resist termites, such treatment shall be in accordance with the requirements of

(a) CAN/CSA O80.1, “Preservative Treatment of All Timber Products by Pressure Processes,”

(b) CAN/CSA O80.2, “Preservative Treatment of Lumber, Timber, Bridge Ties and Mine Ties by Pressure Processes,”

(c) CAN/CSA O80.9, “Preservative Treatment of Plywood by Pressure Processes,” or

(d) CAN/CSA O80.15, “Preservative Treatment of Wood for Building Foundation Systems, Basements and Crawl Spaces by Pressure Processes.”

9.3.3. **Metal**

9.3.3.1. **Sheet Metal Thickness.** Minimum thicknesses for sheet metal material given in this Part refer to the actual minimum thicknesses measured at any point of the material, and in the case of galvanized steel, includes the thickness of the coating unless otherwise indicated.

9.3.3.2. **Galvanized Sheet Metal.** Where galvanized sheet metal 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 coating designation in ASTM A525, “Steel Sheet, Zinc-Coated (Galvanized) by the Hot-Dip Process.”

Section 9.4 **Structural Requirements**

9.4.1. **General**

9.4.1.1. **Structural Design**

(1) Except as provided in Sentence (2), Sentence 9.23.4.1.(2) and Subsections 9.4.2. to 9.4.4., structural members and their connections shall be designed in conformance with Part 4.

(2) Where structural members and their connections conform to the requirements listed elsewhere in this Part, it shall be deemed that the structural design requirements have been met.

9.4.1.2. **Post, Beam and Plank Construction.** Except for columns described in Section 9.17 and beams described in Subsection 9.23.4., wood-frame post, beam and plank construction with the loadbearing framing members spaced more than 600 mm apart shall be designed in conformance with Subsection 4.3.1.
9.4.2. Snow Loads

9.4.2.1. Application. This Subsection applies to wood frame assemblies with clear spans not exceeding 12.20 m and members spaced not more than 600 mm apart.

9.4.2.2. Design Snow Loads

(1) Except as provided in Sentences (2) and (3), design snow loads shall be not less than calculated using the following formula:

\[ S = C_b \cdot S_s + S_r \]

Where

- \( S \) = the design snow load,
- \( C_b \) = the basic snow load roof factor, which is 0.5 where the entire width of a roof does not exceed 4.3 m and 0.6 for all other roofs,
- \( S_s \) = the ground snow load listed in Chapter 1 of the Supplement to the NBC 1990,
- \( S_r \) = the associated rain load listed in Chapter 1 of the Supplement to the NBC 1990.

(2) In no case shall the design snow load be less than 1 kPa.

(3) Bow string, arch or semi-circular roof trusses having an unsupported span greater than 6 m shall be designed in conformance with the snow load requirements in Section 4.1.

9.4.2.2. Balconies. Residential balconies not used as passageways shall be designed to carry the design roof snow load or 1.9 kPa, whichever is greater.

9.4.3. Deflections

9.4.3.1. Deflections

(1) The maximum deflection of structural members shall conform to Table 9.4.3.A.

(2) Dead loads need not be considered in computing deflections referred to in Sentence (1).

<table>
<thead>
<tr>
<th>Structural Members</th>
<th>Type of Ceiling Supported</th>
<th>Maximum Allowable Deflection Expressed as a Ratio of the Clear Span</th>
</tr>
</thead>
<tbody>
<tr>
<td>Roof rafters, roof joists, roof beams and roof decking of plank and beam construction</td>
<td>No ceiling</td>
<td>1/180</td>
</tr>
<tr>
<td>Floor beams, floor joists and floor decking of plank and beam construction for floor areas other than bedrooms in dwelling units</td>
<td>Other than plaster or gypsum board</td>
<td>1/240</td>
</tr>
<tr>
<td>Ceiling joists</td>
<td>Plaster or gypsum board</td>
<td>1/360</td>
</tr>
<tr>
<td>Floor beams, floor joists and floor decking of plank and beam construction for floor areas of bedrooms in dwelling units</td>
<td>No ceiling</td>
<td>1/360</td>
</tr>
<tr>
<td></td>
<td>Other than plaster or gypsum board</td>
<td>1/360</td>
</tr>
<tr>
<td></td>
<td>Plaster or gypsum board</td>
<td>1/360</td>
</tr>
<tr>
<td>Floor beams, floor joists and floor decking of plank and beam construction for floor areas of bedrooms in dwelling units</td>
<td>No ceiling</td>
<td>1/240</td>
</tr>
<tr>
<td></td>
<td>Other than plaster or gypsum board</td>
<td>1/240</td>
</tr>
<tr>
<td></td>
<td>Plaster or gypsum board</td>
<td>1/360</td>
</tr>
</tbody>
</table>

| Column 1 | 2 | 3 |
9.4.4. Foundation Conditions

9.4.4.1. Allowable Bearing Pressures.
Where footing sizes for shallow foundations are not determined in conformance with Section 9.15, footings may be designed using maximum allowable bearing pressures in Table 9.4.4.A.

Table 9.4.4.A.
Forming Part of Article 9.4.4.1.

<table>
<thead>
<tr>
<th>Type and Condition of Soil or Rock</th>
<th>Maximum Allowable Bearing Pressure, kPa</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dense or compact sand or gravel (1)</td>
<td>150</td>
</tr>
<tr>
<td>Loose sand or gravel (1)</td>
<td>50</td>
</tr>
<tr>
<td>Dense or compact silt (1)</td>
<td>100</td>
</tr>
<tr>
<td>Stiff clay (1)</td>
<td>150</td>
</tr>
<tr>
<td>Firm clay (1)</td>
<td>75</td>
</tr>
<tr>
<td>Soft clay (1)</td>
<td>40</td>
</tr>
<tr>
<td>Till</td>
<td>200</td>
</tr>
<tr>
<td>Clay shale</td>
<td>300</td>
</tr>
<tr>
<td>Sound rock</td>
<td>500</td>
</tr>
</tbody>
</table>

Column 1 2

Note to Table 9.4.4.A.: (1) See Appendix A

9.4.4.2. Foundation Capacity in Weaker Soil and Rock
(1) Where a soil or rock within a distance equal to twice the footing width below the bearing surface has a lower allowable bearing pressure than that at the bearing surface as shown in Article 9.4.4.1., the design capacity of the foundation shall not be greater than would cause the weakest soil or rock to be stressed beyond its allowable bearing pressure.

(2) In calculating subsurface pressures referred to in Sentence (1), the loads from the footings shall be assumed to be distributed uniformly over a horizontal plane within a frustum extending downward from the footing at an angle of 60° to the horizontal.

9.4.4.3. High Water Table. Where a foundation bears on gravel, sand or silt, and the water table is within a distance below the bearing surface equal to the width of the foundation, the allowable bearing pressure shall be 50 per cent of that determined in Article 9.4.4.1.

9.4.4.4. Soil Movement. Where a foundation is located in an area in which soil movement caused by changes in soil moisture content is known to occur to the extent that it will cause significant damage to a building, measures shall be taken to minimize the effect of such movement on the building.

9.4.4.5. Retaining Walls. Walls shall be designed to resist the lateral pressure of the retained material.

9.4.4.6. Walls Supporting Drained Earth
(1) Walls supporting drained earth may be designed for pressure equivalent to that exerted by a fluid with a density of not less than 480 kg/m³ and having a depth equal to that of the retained earth.

(2) Any surcharge shall be in addition to the equivalent fluid pressure specified in Sentence (1).

Section 9.5 Room and Space Dimensions

9.5.1. General

9.5.1.1. Application. Unless otherwise specifically indicated, 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. Unless otherwise indicated herein, 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. 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. Two or more areas are considered as a combination room if the dividing wall occupies less than 60 per cent of the separating plane.
9.5.1.5. Lesser Areas and Dimensions.
Areas and dimensions of rooms and spaces may 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. Ceiling Heights

9.5.2.1. Heights of Rooms or Spaces. Heights of rooms or spaces in residential occupancies shall conform to Table 9.5.2.A.

9.5.2.2. Mezzanines. The clear height above and below a mezzanine floor assembly in all occupancies shall be not less than 2.1 m.

9.5.2.3. Storage Garages. The clear height in a storage garage shall be not less than 2 m.

9.5.3. Living Rooms or Spaces within Dwelling Units

9.5.3.1. Areas and Dimensions of Living Rooms and Spaces

(1) Living areas within dwelling units, either as separate rooms or in combination with other spaces, shall have an area not less than 13.5 m² and no dimension less than 3 m within the required area.

(2) Where the area of a living space is combined with a kitchen and dining area, the living area alone in a dwelling unit that contains sleeping accommodation for not more than 2 persons shall be not less than 11 m².

9.5.4. Dining Rooms or Spaces within Dwelling Units

9.5.4.1. Area of Dining Rooms or Spaces

(1) A dining space in combination with other space shall have an area not less than 3.25 m².

(2) Dining rooms not combined with other space shall have an area not less than 7 m².

9.5.4.2. Dimensions of Dining Rooms or Spaces

(1) Except as permitted in Sentence (2), a dining room or space combined with other space shall have no dimension less than 2.3 m within the required area measured between wall faces or a wall face and a built-in cabinet or appliance.

(2) When a required dining area is provided in a kitchen or serves a dwelling unit that contains sleeping accommodation for not more than 2 persons, the minimum dimension of such space may be reduced to 1.7 m.

Table 9.5.2.A.
Forming Part of Article 9.5.2.1.

<table>
<thead>
<tr>
<th>Room or Space</th>
<th>Room Heights</th>
</tr>
</thead>
<tbody>
<tr>
<td>Living room or space, dining kitchen or required floor area with a clear height</td>
<td>2.3 m over not less than 75 per cent of the room or space, kitchen space of 2.1 m at any point over the required area</td>
</tr>
<tr>
<td>Bedroom or bedroom space</td>
<td>2.3 m over not less than 50 per cent of the required floor area or 2.1 m over all of the required floor area. Any part of the floor having a clear height of less than 1.4 m shall not be considered in computing the required floor area.</td>
</tr>
<tr>
<td>Unfinished basement including laundry area therein</td>
<td>1.95 m under beams in laundry areas and in any location that would normally be used for passage to laundry and storage areas</td>
</tr>
<tr>
<td>Bathroom, water-closet room or laundry area above grade</td>
<td>2.1 m in any area where a person would normally be in a standing position</td>
</tr>
<tr>
<td>Passage, hall or main entrance vestibule and finished rooms not specifically mentioned above</td>
<td>2.1 m</td>
</tr>
</tbody>
</table>

Column 1 2
9.5.5. Kitchens within Dwelling Units

9.5.5.1. Kitchen areas within dwelling units either separate from or in combination with other spaces, shall have an area not less than 4.2 m² including the area occupied by the base cabinets, except that in dwelling units containing sleeping accommodation for not more than 2 persons, the minimum area shall be 3.7 m².

9.5.6. Bedrooms or Spaces in Dwelling Units and Dormitories

9.5.6.1. Area and Dimension of Bedrooms
(1) Except as provided in Articles 9.5.6.2. and 9.5.6.3., bedrooms in dwelling units shall have an area not less than 7 m² where built-in cabinets are not provided and not less than 6 m² where built-in cabinets are provided.
(2) The minimum dimension within the required area specified in Sentence (1) shall be 2 m.

9.5.6.2. Areas and Dimensions of Master Bedrooms
(1) Except as provided in Article 9.5.6.3., not less than one bedroom in every dwelling unit shall have an area not less than 9.8 m² where built-in cabinets are not provided and not less than 8.8 m² where built-in cabinets are provided.
(2) The minimum dimension within the required area specified in Sentence (1) shall be 2.7 m.

9.5.6.3. Areas and Dimensions of Combination Bedrooms. Bedroom spaces in combination with other spaces in dwelling units shall have an area not less than 4.2 m² and have no dimension less than 2 m within the required area.

9.5.6.4. Areas and Dimensions of Other Sleeping Rooms
(1) Sleeping rooms other than in dwelling units shall have an area not less than 7 m² per person for single occupancy and not less than 4.6 m² per person for multiple occupancy.
(2) The minimum dimension within the required area specified in Sentence (1) shall be 2 m.

9.5.7. Bathrooms and Water-Closet Rooms

9.5.7.1. In every dwelling unit an enclosed space of sufficient size shall be provided to accommodate a bathtub, water closet and lavatory.

9.5.8. Hallways

9.5.8.1. The width of a hallway within a dwelling unit shall be at least 860 mm, except that in buildings not more than 4.3 m wide the hallway width may be 710 mm where a second exit is provided near the end of the hallway farthest from the living area.

Section 9.6 Doors

9.6.1. General

9.6.1.1. This Section applies to doors, to glazed areas in doors and to sidelights for doors. (See also Sections 3.7, 9.9 and 9.10.)

9.6.2. Required Doors

9.6.2.1. A door shall be provided at each entrance to a dwelling unit and to each room containing a water closet within a dwelling unit.

9.6.3. Doorway Sizes

9.6.3.1. Doorway Opening Sizes. Except as provided in Articles 9.6.3.3. and 9.9.6.4., doorway openings within dwelling units shall be designed to accommodate not less than the door sizes in Table 9.6.3.A. for swing-type doors or folding doors.

9.6.3.2. Doors to Public Water-Closet Rooms. Doors to public water-closet rooms shall be not less than 810 mm wide and 2030 mm high.

9.6.3.3. Doors to Bathrooms. A doorway to not less than one bathroom as described in Article 9.5.7.1. shall accommodate a door not less than 760 mm wide.

9.6.4. Exterior Doors

9.6.4.1. Exterior Wood Doors
(1) Exterior wood doors shall conform to CSA O132.2, "Wood Doors."
### Table 9.6.3.A.
Forming Part of Article 9.6.3.1.

**Minimum Size of Doors**

<table>
<thead>
<tr>
<th>At Entrance to:</th>
<th>Width, mm</th>
<th>Height, mm</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dwelling unit (required entrance)</td>
<td>810</td>
<td>1980</td>
</tr>
<tr>
<td>Vestibule or entrance hall</td>
<td>810</td>
<td>1980</td>
</tr>
<tr>
<td>Stairs to a floor level that contains a finished space</td>
<td>810</td>
<td>1980</td>
</tr>
<tr>
<td>All doors in not less than one line of passage from the exterior to the basement</td>
<td>810</td>
<td>1980</td>
</tr>
<tr>
<td>Utility rooms</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Walk-in closet</td>
<td>610</td>
<td>1980</td>
</tr>
<tr>
<td>Bathroom, water-closet room, shower room (1)</td>
<td>610</td>
<td>1980</td>
</tr>
<tr>
<td>Rooms located off hallways that are permitted to be 710 mm wide</td>
<td>610</td>
<td>1980</td>
</tr>
<tr>
<td>Rooms not mentioned above, exterior balconies</td>
<td>760</td>
<td>1980</td>
</tr>
<tr>
<td>Column 1</td>
<td>2</td>
<td>3</td>
</tr>
</tbody>
</table>

**Note to Table 9.6.3.A.:**

(1) See Article 9.6.3.3.

### Table 9.6.5.A.
Forming Part of Article 9.6.5.1.

**Maximum Glass Area for Doors, m² (1)**

<table>
<thead>
<tr>
<th>Glass Thickness, mm</th>
<th>Annealed</th>
<th>Annealed Multiple-Glazed Factory-Sealed Units</th>
<th>Laminated</th>
<th>Wired</th>
<th>Heat Strengthened</th>
<th>Fully Tempered</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>0.50</td>
<td>0.70</td>
<td>(2)</td>
<td>(2)</td>
<td>1.00</td>
<td>1.00</td>
</tr>
<tr>
<td>4</td>
<td>1.00</td>
<td>1.50</td>
<td>(2)</td>
<td>(2)</td>
<td>1.50</td>
<td>4.00</td>
</tr>
<tr>
<td>5</td>
<td>1.50</td>
<td>1.50</td>
<td>(2)</td>
<td>(2)</td>
<td>1.50</td>
<td>No limit</td>
</tr>
<tr>
<td>6</td>
<td>1.50</td>
<td>1.50</td>
<td>1.20</td>
<td>1.00</td>
<td>1.50</td>
<td>No limit</td>
</tr>
<tr>
<td>Column 1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td>7</td>
</tr>
</tbody>
</table>

**Note to Table 9.6.5.A.:**

(1) See Appendix A.
(2) Not generally available.
(2) Each door described in Sentence (1) shall indicate legibly the name of the manufacturer, the standard to which it is produced and that it is of an exterior type.


9.6.4.3. Insulated Steel Doors. Insulated steel doors shall conform to CAN/CGSB 82.5-M “Insulated Steel Doors.”

9.6.5. Glass

9.6.5.1. Maximum Area of Glass. The maximum area of individual panes of glass for doors shall conform to Table 9.6.5.A.

9.6.5.2. Glass in Doors and Sidelights

(1) Glass in doors and in sidelights for doors shall conform to Sentence 9.7.3.1.(1).

(2) 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 dwelling unit and in public areas shall be safety glass of the laminated or tempered type conforming to CAN2-12.1, “Glass, Safety, Tempered or Laminated,” or shall be of wired glass conforming to CAN2-12.11, “Glass, Wired, Safety.”

(3) Except as provided in Article 9.7.5.3., glass in entrance doors to dwelling units and in public areas, other than the entrance doors described in Sentence (2), shall be safety glass or wired glass of the type described in Sentence (2) where the glass area exceeds 0.5 m² and extends to less than 900 mm from the bottom of the door.

9.6.5.3. Mirrored Glass Doors. Mirrored glass doors may be used only at the entrance to clothes closets and shall conform to the requirements of CAN/CGSB-82.6, “Doors, Mirrored Glass, Sliding or Folding Wardrobe.” (See Appendix A.)

9.6.5.4. Visibility of Glass or Transparent Doors. Except as provided in Article 9.7.5.3., every glass or transparent door accessible to and used by the public shall be equipped with hardware, bars or other permanent fixtures designed so that the existence and position of such door will be readily apparent.

9.6.5.5. Glass for Shower or Bathtub Enclosures. Glass other than safety glass shall not be used for a shower or bathtub enclosure.

9.6.5.6. Double Glazing

(1) Except where a separate storm door is provided, in buildings intended for use on a continuing basis during the winter months, exterior glass doors and glass in doors and adjacent sidelights separating heated space from unheated space or from the exterior shall be equipped with double glazing. (See A-9.7.1.5. in Appendix A.)

(2) Metal frames for doors or glazing described in Sentence (1) shall incorporate a thermal break.

9.6.6. Resistance to Forced Entry

9.6.6.1. Application

(1) Except as permitted in Sentence (2), this Subsection 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 which provide access directly or indirectly from a storage garage to a dwelling unit.

(2) Sentence (1) does not apply to exterior doors to garages and to other ancillary spaces. (See Appendix A.)

9.6.6.2. Wood Doors

(1) Except as permitted in Article 9.6.6.10., wood doors as described in Sentence 9.6.6.1.(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.

9.6.6.3. Deadbolt Lock. Except as permitted in Article 9.6.6.10., doors described in Sentence 9.6.6.1.(1) shall be provided with a deadbolt lock with a cylinder having not less than 5 pins and a bolt throw not less than 25 mm, protected with a solid or hardened free-turning ring or bevelled cylinder housing.
9.6.6.4. **Double Doors.** Except as permitted in Article 9.6.6.10., an inactive leaf in double doors used in locations specified in Sentence 9.6.6.1.(1) shall be provided with heavy duty bolts top and bottom having an engagement of not less than 15 mm.

9.6.6.5. **Fastening of Hinges**

(1) Except as permitted in Article 9.6.6.10., hinges for doors described in Sentence 9.6.6.1.(1) shall be fastened to wood doors with wood screws not less than 25 mm long and to wood frames with wood screws so that at least 2 screws per hinge penetrate not less than 30 mm into solid wood. (See Appendix A.)

(2) Except as permitted in Article 9.6.6.10., hinges for doors described in Sentence 9.6.6.1.(1) shall be fastened to metal doors and metal frames with machine screws not smaller than No. 10 and not less than 10 mm long.

9.6.6.6. **Fastening of Strikeplates**

(1) Except as permitted in Article 9.6.6.10., strikeplates for doors described in Sentence 9.6.6.1.(1) shall be fastened to wood frames with wood screws that penetrate not less than 30 mm into solid wood. (See A-9.6.6.5. in Appendix A.)

(2) Except as permitted in Article 9.6.6.10., strikeplates for doors described in Sentence 9.6.6.1.(1) shall be fastened to metal frames with machine screws not smaller than No. 10 and not less than 10 mm long.

9.6.6.7. **Outward Swinging Doors.** Except for storm or screen doors, doors described in Sentence 9.6.6.1.(1) which 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.)

9.6.6.8. **Door Viewer.** Main entrance doors to dwelling units shall be provided with a door viewer with a viewing angle of not less than 160°, unless transparent glazing is provided in the door or in a sidelight.

9.6.6.9. **Solid Blocking.** Solid blocking shall be provided on both sides at the lock height between the jambs for doors described in Sentence 9.6.6.1.(1) and the structural framing so that the jambs will resist spreading by force.

9.6.6.10. **Alternate Test Procedure.**

Doors, frames and hardware which conform to a security level of at least Grade 10 as described in the Annex to ASTM F476, “Standard Test Methods for Security of Swinging Door Assemblies,” are not required to conform to Articles 9.6.6.2. to 9.6.6.6. (See Appendix A.)

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Section 9.7 Windows and Skylights

9.7.1. **General**

9.7.1.1. **Application.** Windows shall conform to the requirements of this Section. (See also Sections 9.10 and 9.32 for fire protection and ventilation.)

9.7.1.2. **Minimum Window Areas**

(1) Except as required in Article 9.7.1.3., the minimum window glass area for rooms in buildings of residential occupancy or which are used for sleeping shall conform to Table 9.7.I.A.

(2) The unobstructed glass area of a door or skylight is considered equivalent to that of a window.

9.7.1.3. **Bedroom Windows**

(1) Except where a bedroom door provides access directly to the exterior, each bedroom shall have not less than one outside window openable from the inside without the use of tools or special knowledge.

(2) Windows referred to in Sentence (1) shall provide an unobstructed opening of not less than 380 mm in height and width and 0.35 m² in area. (See Article 9.7.1.4.)

9.7.1.4. **Window Opening into a Window-Well**

(1) Where a window required in Article 9.7.1.3. opens into a window-well, a clearance of not less than 550 mm shall be provided in front of the window.

(2) Where the sash of a window referred to in Sentence (1) 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.
9.7.1.5. **Double Glazing or Storm Sash.** In buildings intended for use on a continuing basis during the winter months, windows which separate heated space from unheated space or from the exterior shall be provided with storm sash or double glazing. (See Appendix A.)

9.7.2. **Window Standards**

9.7.2.1. **Window Standard.** Windows shall conform at least to the requirements for window ratings A1, B1 and C1 in CAN3-A440, "Windows." (See Appendix A.)

9.7.3. **Glass**

9.7.3.1. **Glass Standards**

(a) CAN2-12.1, “Glass, Safety, Tempered or Laminated,”

(b) CAN2-12.2, “Glass, Sheet, Flat, Clear,”

(c) CAN2-12.3, “Glass, Polished Plate or Float, Flat, Clear,”

(d) CAN2-12.4, “Glass, Heat-Absorbing,”

(e) CAN2-12.8, “Insulating Glass Units,”

(f) CAN2-12.10, “Glass, Light and Heat Reflecting,” or

(g) CAN2-12.11, “Glass, Wired, Safety.”

9.7.3.2. **Structural Design of Glass.** Glass in windows shall be designed in conformance with CAN/CGSB-12.20-M, "Structural Design of Glass for Buildings." (See Appendix A.)

9.7.4. **Caulking and Glazing**

9.7.4.1. **Sealing Compound.** Sealing compound used in the glazing of factory-sealed double-glazed units shall be compatible with the material used to edge seal the units.

9.7.4.2. **Caulking Compound.** Caulking shall be provided between window frames or trim and the exterior siding or masonry in conformance with Subsection 9.27.4.

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### Table 9.7.1.A.
Forming Part of Article 9.7.1.2.

<table>
<thead>
<tr>
<th>Location</th>
<th>Unobstructed Glass Area</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>With No Electric Lighting</td>
</tr>
<tr>
<td>Laundry, basement</td>
<td>4 per cent of area served</td>
</tr>
<tr>
<td>recreation room, unfinished basement</td>
<td>0.37 m²</td>
</tr>
<tr>
<td>Water-closet room</td>
<td>10 per cent of area served</td>
</tr>
<tr>
<td>Kitchen, kitchen space, kitchen alcove</td>
<td>10 per cent of area served</td>
</tr>
<tr>
<td>Living rooms and dining rooms</td>
<td>5 per cent of area served</td>
</tr>
</tbody>
</table>

**Note to Table 9.7.1.A.:**

(1) See Article 9.7.1.3.
9.7.5. Windows in Public Areas

9.7.5.1. Transparent Panels. Except as provided in Article 9.7.5.3., transparent panels that could be mistaken as a means of egress shall be protected by barriers or railings.

9.7.5.2. Windows in Exit Stairways. Windows in exit stairways that extend to less than 1070 mm above the landing shall be protected by barriers or railings located approximately 1070 mm above such landings.

9.7.5.3. Sliding Glass Partitions. Sliding glass partitions which separate a public corridor from an adjacent occupancy and which are open during normal working hours need not conform to Article 9.7.5.1. and Sentence 9.6.5.2.(3), except that such partitions shall be suitably marked to indicate their existence and position.

9.7.5.4. Windows in Public Areas. Windows in public areas that extend to less than 1 m from the floor and are located above the second storey in buildings of residential occupancy shall be protected by barriers or railings 1 m above the floor or the windows shall be non-openable and designed to withstand the lateral design loads for balcony guards in Part 4.

9.7.6. Resistance to Forced Entry

9.7.6.1. 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 10.13 of CAN/A440, “Windows.” (See Appendix A.)

9.7.7. Skylights


9.7.7.2. Glass Skylights. Factory-built glass skylights shall meet the performance requirements of CAN/CGSB 63.14-M.

Section 9.8 Stairs, Ramps, Handrails and Guards

9.8.1. Scope

9.8.1.1. Application. This Section applies to the design and construction of interior and exterior stairs, ramps, railings and guards.

9.8.1.2. Exit Stairs. Where the stair forms part of an exit, the appropriate requirements in Sections 9.9 and 9.10 shall also apply.

9.8.1.3. Escalators and Moving Walkways. Escalators and moving walkways shall conform to the appropriate requirements in Part 3.

9.8.2. General

9.8.2.1. Uniform Treads and Risers. Treads and risers shall have uniform rise and run in any one flight.

9.8.2.2. Minimum Number of Risers. Except for interior stairs within a dwelling unit, not less than 3 risers shall be provided for interior stairs.

9.8.3. Stair Dimensions

9.8.3.1. Rise and Run of Stairs

(1) Except for stairs to areas used only as service rooms, interior stairs within dwelling units and exterior stairs serving dwelling units shall have a maximum rise of 200 mm, a minimum run of 210 mm and a minimum tread width of 235 mm.

(2) Except for stairs serving not more than one dwelling unit, interior stairs not contained within dwelling units and exterior stairs for buildings shall have a rise of not more than 200 mm and not less than 125 mm.

(3) Stairs referred to in Sentence (2) shall have a run of not less than 230 mm, or more than 355 mm and a tread width of not less than 250 mm.
9.8.3.2. Nosing or Backslope. Where the run of any stair is less than 250 mm, a nosing of not less than 25 mm shall be provided beyond the face of the riser, or an equivalent back slope on the risers shall be provided.

9.8.3.3. Stair Width

(1) Exit stairs and stairs used by the public shall have a width, measured between wall faces or guards, of not less than 900 mm.

(2) At least one stairway between each floor level in a dwelling unit shall have a width between wall faces of not less than 860 mm.

9.8.3.4. Head Room. The head room measured vertically from a line drawn through the outer edges of the nosings shall be not less than 1.95 m for stairs located in dwelling units and 2.05 m for all other stairs.

9.8.4. Landings

9.8.4.1. Dimensions of Landings. Landings shall be at least as wide and as long as the width of stairs in which they occur, except that the length of landing for exterior stairs serving not more than one dwelling unit need not exceed 1.95 m for stairs located in dwelling units and 2.05 m for all other stairs.

9.8.4.2. Required Landings

(1) Where a door swings towards a stair, the full arc of its swing shall be over a landing.

(2) Except as provided in Sentence (3), a landing shall be provided at the top and bottom of each flight of interior stairs and where a doorway occurs in a stairway.

(3) 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 stairs.

(4) A landing shall be provided at the top of all exterior stairs, except that a landing may be omitted at a secondary entrance to a building containing a single dwelling unit provided the stair does not contain more than 3 risers.

9.8.4.3. Height between Landings. The vertical height between any landings shall not exceed 3.7 m.

9.8.4.4. Height over Landings. The clear height over landings shall be not less than 1.95 m in dwelling units and 2.05 m for other landings.

9.8.5. Curved Stairs and Winders

9.8.5.1. Curved Stairs in Exits. Curved stairs used in exits shall conform to the requirements of Article 3.4.6.8.

9.8.5.2. Curved Stairs not in Exits. Except as permitted in Article 9.8.5.3., a curved stair not required as an exit shall have an average run of not less than 200 mm and a minimum run of 150 mm and shall have risers conforming to Article 9.8.3.1.

9.8.5.3. Winders

(1) Stairs within dwelling units may contain winders that converge to a centre point provided the winders turn through an angle of not more than 90° and individual treads turn through an angle of 30°.

(2) Only one set of winders described in Sentence (1) shall be permitted between floor levels.

9.8.6. Pedestrian Ramps

9.8.6.1. Ramps in a Barrier-Free Path of Travel. Ramps in a barrier-free path of travel shall conform to the requirements in Section 3.7.

9.8.6.2. Maximum Gradient

(1) Except as provided in Article 9.8.6.1., the gradient for pedestrian ramps shall be not more than 1 in 10 for residential occupancies, 1 in 6 for mercantile or industrial occupancies and 1 in 8 for all other occupancies.

(2) The gradient for every exterior ramp shall be not more than 1 in 10.

9.8.6.3. Level Areas on Ramps

(1) Except as provided in Article 9.8.6.1., where a doorway or stairway opens onto the side of a ramp, there shall be a level area extending across the full width of the ramp and for a distance of not less than 300 mm on either side of the wall opening.
9.8.6.3.

(2) Except as provided in Article 9.8.6.1, where a doorway or stairway opens onto the end of a ramp, there shall be a level area extending across the full width of the ramp and along it for not less than 900 mm.

9.8.7. Handrails

9.8.7.1. Required Handrails

(1) Except as permitted in Sentences (2) and (3), a handrail shall be provided on

(a) at least one side of stairs less than 1100 mm in width,
(b) two sides of stairs 1100 mm in width or greater, and
(c) two sides of a curved stair used as an exit.

(2) Handrails are not required for stairs within dwelling units having not more than 2 risers, or for exterior stairs having not more than 3 risers and serving not more than one dwelling unit.

(3) Only one handrail is required on exterior stairs having more than 3 risers provided such stairs serve not more than one dwelling unit.

9.8.7.2. Continuous Handrail. Except for stairs serving only one dwelling unit, not less than one handrail shall be continuous throughout the length of the stairway, including landings, except where interrupted by doorways or newels at changes in direction. (See A-3.4.6.4.(5) in Appendix A.)

9.8.7.3. Termination of Handrails. Except for stairs serving only one dwelling unit, handrails shall be terminated in a manner that will not obstruct pedestrian travel or create a hazard. (See A-3.4.6.4.(5) in Appendix A.)

9.8.7.4. Handrail Extension. Except for stairways serving only one dwelling unit, at least one handrail at the sides of a stairway or ramp shall extend horizontally not less than 300 mm beyond the top and bottom of the stairway or ramp. (See A-3.4.6.4.(5) in Appendix A.)

9.8.7.5. Height of Handrails. Handrails on stairs and ramps shall be not less than 800 mm and not more than 920 mm in height, measured vertically from a line drawn through the outside edges of the stair nosing or from the surface of the ramp, except that handrails not meeting these requirements are permitted provided they are installed in addition to the required handrails.

9.8.7.6. Handrail Clearance. A clearance of not less than 40 mm shall be provided between each handrail and the wall to which it is fastened.

9.8.7.7. Obstructions. Handrails shall be constructed with no obstruction on or above them to break a handhold except where the handrail is interrupted by newels at changes in direction.

9.8.7.8. Handrail Projection. Handrails and stair stringers shall not project more than 100 mm into the required width of stairway.

9.8.7.9. Handrails for Ramps. Where ramps are used in lieu of stairs, the handrail requirements for stairs in Articles 9.8.7.1. to 9.8.7.8. shall apply where the gradient exceeds 1 in 10.

9.8.7.10. Attachment of Handrails

(1) Handrails shall be attached to wood studs, wood blocking, steel studs or masonry at points spaced not more than 1.2 m apart.

(2) Attachment to wood studs and blocking required in Sentence (1) shall consist of not less than 2 wood screws at each point, penetrating not less than 32 mm into solid wood.

9.8.8. Guards

9.8.8.1. Required Guards

(1) Every exterior landing, porch and every balcony, mezzanine, gallery, raised walkway and roof to which access is provided for other than maintenance purposes, shall be protected by guards on all open sides where the difference in elevation between adjacent levels exceeds 600 mm.

(2) Every exterior stair with more than 6 risers shall be protected with guards on all open sides where the difference in elevation between the adjacent ground level and the stair exceeds 600 mm.

(3) When an interior stair has more than 2 risers, the sides of the stair and the landing or floor level around the stair well shall be enclosed by walls or be protected by guards, except that a stair to an unfinished basement in a dwelling unit may have one unprotected side. (See Appendix A.)
9.8.8.2. Height of Guards

(1) Except as provided in Sentences (2) to (5), all guards, including those for balconies, shall be not less than 1070 mm high.

(2) Guards for porches, decks, landings and balconies serving not more than one dwelling unit and which are not more than 1.8 m above the finished ground level are permitted to be a minimum of 900 mm high.

(3) Except as provided in Sentence (4), guards for stairs shall be not less than 900 mm high measured vertically from a line drawn through the outside edges of the stair nosings, and 1070 mm in height at landings.

(4) Guards for stairs within dwelling units and stairs serving not more than one dwelling unit shall be not less than 800 mm measured vertically above a line drawn through the outside edges of stair nosings, and not less than 900 mm above landings.

(5) All required guards within dwelling units other than those described in Sentence (4), shall be not less than 900 mm high.

9.8.8.3. Guards for Floors and Ramps in Garages. Except for floors of garages referred to in Section 9.35, a continuous curb not less than 150 mm in height and a guard not less than 1070 mm above the floor level shall be provided at every opening through a garage floor and around the perimeter of such floor and ramps where the exterior walls are omitted and where the top of the floor is 600 mm or more above an adjacent ground or floor level.

9.8.8.4. Openings in Guards. Openings through a guard on a balcony or an exit stair, except an exit stair serving not more than one dwelling unit, shall be of a size as to prevent the passage of a spherical object having a diameter of 100 mm in residential occupancies and 200 mm in other occupancies, unless it can be shown that the location and size of openings which exceed these limits do not represent a hazard.

9.8.8.5. Design to Prevent Climbing. Guards around exterior balconies of buildings of residential occupancy shall be designed so that no member, attachment or opening between 100 mm and 900 mm above the balcony floor will facilitate climbing.


9.8.9. Construction

9.8.9.1. Exterior Concrete Stairs

(1) Exterior concrete stairs with more than 2 risers and 2 treads shall be

(a) supported on unit masonry or concrete walls or piers not less than 150 mm by 150 mm or shall be cantilevered from the main foundation wall;

(b) when cantilevered from the foundation wall, constructed and installed in conformance with Subsection 9.8.10.

(2) The depth below ground level for foundations for exterior steps shall conform to the requirements in Section 9.12.

9.8.9.2. Exterior Wood Steps. Exterior wood steps shall not be in direct contact with the ground unless suitably treated with a wood preservative.

9.8.9.3. Wooden Stair Stringers

(1) Wooden stair stringers shall

(a) have a minimum effective depth of 90 mm and an over-all 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

(d) except as permitted in Sentence (2), be spaced not more than 900 mm O.C. for stairs serving not more than one dwelling unit and 600 mm O.C. in other stairs.

(2) For stairs serving not more than one dwelling unit where risers support the front portion of the tread, the space between stringers shall be not more than 1200 mm.

9.8.9.4. Thickness of Treads. Lumber or plywood treads for stairs 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.
9.8.9.5. Finish for Treads and Landings

(1) The finish for treads and landings of interior stairs in dwelling units, other than stairs to unfinished basements, shall consist of hardwood, vertical grain softwood, resilient flooring or other material providing equivalent performance.

(2) 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 which extend not more than 1 mm above the surface.

9.8.10. Cantilevered Precast Concrete Steps

9.8.10.1. Design. 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. Cantilevered concrete steps in Article 9.8.10.1. shall be anchored to concrete foundation walls not less than 200 mm thick.

9.8.10.3. Prevention of Damage Due to Frost. 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. Scope

9.9.1.1. Application. 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.


9.9.2. General

9.9.2.1. Egress from Roof Area, Podiums, Terraces, Platforms and Contained Open Spaces

(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, not less than 2 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 9.9.7.3.

9.9.2.2. Types of Exits. Exits may consist of doorways, passageways, ramps, stairways and horizontal exits.

9.9.2.3. Fire Escapes

(1) Fire escapes may be used as exits on existing buildings provided they are designed and installed in conformance with Part 3.

(2) Fire escapes shall not be installed on any new building.

9.9.2.4. Elevators, Slide Escapes and Windows. Elevators, slide escapes or windows shall not be considered as part of a required means of egress.

9.9.2.5. Purpose of Exits. An exit shall be designed for no purpose other than for exiting except that an exit may also serve as an access to a floor area.

9.9.2.6. Ancillary Rooms. Ancillary rooms such as storage rooms, washrooms, toilet rooms, laundry rooms and service rooms shall not open directly into an exit.

9.9.2.7. Barrier-Free Path of Travel

(1) Except as provided in Sentences (3) and (4), every building shall be designed to provide for a
3.3.1.7. shall apply.

Sentence above the entrance level and every exit between the entrance level and every dwelling house, or roomers, semi-detached houses, duplex houses, triplex houses, town houses or row houses.

Where the difference in floor elevation is not equipped with an elevator.

9.9.2.8. Horizontal Exits. Where a horizontal exit is used, it shall conform to Part 3.

9.9.3. Dimensions of Means of Egress

9.9.3.1. Application. This Subsection applies to every means of egress except exits that serve more than one dwelling unit and access to exits within dwelling units.

9.9.3.2. Exit Width. Except for doors and corridors, the width of every exit facility shall be not less than 900 mm. (See Article 9.9.6.4. for doors. and Subsection 9.8.3. for stairs.)

9.9.3.3. Width of Corridors. The width of every public corridor, corridor used by the public, and exit corridor shall be not less than 1 100 mm. (See also Subsection 9.9.5. for obstructions in corridors.)

9.9.3.4. Headroom Clearance

(1) Except for stairways, doorways and storage garages, the minimum headroom clearance in exits and access to exits shall be 2.1 m. (See Articles 9.8.3.4. and 9.8.4.4. for stairways and Subsection 9.9.6. for doorways.)

(2) The clear height of every storey in a storage garage shall be not less than 2 m.

9.9.4. Fire Protection of Exits

9.9.4.1. Application. Except as provided in 9.9.4.4., this Subsection applies to the fire protection of all exits except exits serving not more than one dwelling unit.

9.9.4.2. Fire Separations for Exits

(1) Except as provided in Sentence (5) and Article 9.9.8.5., every exit other than an exit doorway shall be separated from each adjacent floor area or from another exit by a fire separation having a fire-resistance rating not less than that required for the floor assembly above the floor area. (See Article 9.10.9.10.)

(2) Where there is no floor assembly above, the fire-resistance rating required in Sentence (1) shall not be less than that required by Subsection 9.10.8. for the floor assembly below, but in no case shall the fire-resistance rating be less than 45 min.

(3) A fire separation common to 2 exits shall be smoke-tight and not be pierced by doorways, duct work, piping or any other opening that may affect the continuity of the separation.

(4) A fire separation that separates an exit from the remainder of the building shall have no openings except those for electrical wiring, noncombustible conduit and noncombustible piping that serve only the exit, and for standpipes, sprinkler piping, exit doorways and wired glass and glass block permitted in Article 9.9.4.3.

(5) The requirements in Sentence (1) do not apply to an exterior exit passageway provided the passageway has not less than 50 per cent of its exterior sides open to the outdoors and is served by an exit stair at each end of the passageway.

9.9.4.3. Wired Glass or Glass Block. The area of wired glass in a door of wired glass or glass block in a sidelight between an exit enclosure and the remainder of the building shall not exceed 0.8 m², except that greater glass areas are permitted when the door or sidelight is located in an enclosed vestibule or corridor constructed as a fire separation having at least a 45 min fire-resistance rating. (See A-3.1.8.17. in Appendix A.)

9.9.4.4. Openings Near Unenclosed Exit Stairs and Ramps. Where an unenclosed exterior exit stair or ramp provides the only means of
9.9.4.4. egress from a suite, and is exposed to fire from openings in the exterior walls of another fire compartment, the openings in the exterior walls of the building shall be protected with wired glass in fixed steel frames or glass block conforming to Articles 9.10.13.5. and 9.10.13.7. when the openings in the exterior walls of the building are within 3 m horizontally and less than 10 m below or less than 5 m above the exit stair or ramp.

9.9.4.5. Openings in Exterior Walls of Exits. Openings in the exterior wall of an exit shall be protected with wired glass or glass block installed in accordance with Articles 9.10.13.5. and 9.10.13.7., where openings may be exposed to the hazard of a fire in another fire compartment of the same building.

9.9.4.6. Openings Near Exit Doors. Where an exterior exit door in one fire compartment is within 3 m horizontally of an unprotected opening in another fire compartment and the exterior walls of these fire compartments intersect at an exterior angle of less than 135°, the opening shall be protected with wired glass in fixed steel frames or glass block conforming to Articles 9.10.13.5. and 9.10.13.7.

9.9.4.7. Stairways in 2 Storey, Group D or E Buildings

(1) Where a suite of Group D or E occupancy is located partly on the first storey and partly on the second storey, stairways serving the second storey need not be constructed as exit stairs provided,
(a) the building is not greater than 2 storeys in building height,
(b) the suite is separated from other occupancies by at least a 45 min fire separation,
(c) the area occupied by the suite is not greater than 75 m² per storey,
(d) the maximum travel distance from any point in the suite to an exterior exit is not greater than 23 m,
(e) the floor assemblies have at least a 45 min fire-resistance rating or are of noncombustible construction, and
(f) the basement and first storey are separated by at least a 45 min fire separation.

9.9.5. Obstructions and Hazards in Means of Egress

9.9.5.1. Application. This Subsection applies to obstructions and hazards in every means of egress except those within a dwelling unit or serving not more than one dwelling unit.

9.9.5.2. Occupancies in Public Corridors. Where a public corridor or a corridor used by the public contains an occupancy, such occupancy shall not reduce the unobstructed width of the corridor to less than the required width of the corridor.

9.9.5.3. Obstructions in Public Corridors

(1) Except as permitted in Sentence (2), obstructions located within 1 980 mm of the floor shall not project horizontally more than 100 mm into exit passageways, corridors used by the public or public corridors in a manner that would create a hazard for visually impaired persons travelling adjacent to walls.

(2) The horizontal projection of an obstruction referred to in Sentence (1) is permitted to exceed 100 mm where the obstruction extends to less than 680 mm above the floor. (See A-3.3.1.9.(4) in Appendix A.)

9.9.5.4. Obstructions in Exits. Except as permitted in Subsection 9.9.6. and Article 9.8.7.8., no fixture, turnstile or construction shall project within the required width of an exit.

9.9.5.5. Mercantile Occupancies. In any mercantile occupancy, no obstructions such as posts or turnstiles shall be placed so as to restrict the width of a normal means of egress from a floor area or part of a floor area to less than 750 mm unless an alternate means of egress is provided adjacent to and is plainly visible from the restricted egress.

9.9.5.6. Mirrors or Draperies. No mirror shall be placed in or adjacent to any exit so as to confuse the direction of exit, and no mirror or draperies shall be placed on or over exit doors.

9.9.5.7. Fuel-Fired Appliances. Fuel-fired appliances shall not be installed in an exit or corridor serving as an access to exit.


9.9.5.8. Service Rooms. Service rooms containing equipment subject to possible explosion, such as boilers designed to operate at a pressure in excess of 100 kPa, and certain types of refrigerating and transformer equipment, shall not be located under required exits.

9.9.6. Doors in a Means of Egress

9.9.6.1. Application. This Subsection applies to all doors in a means of egress except doors within dwelling units and exterior doors serving not more than one dwelling unit unless otherwise stated herein.

9.9.6.2. Obstructions by Doors

(1) Exit doors shall not decrease the required exit width by more than 100 mm in exit corridors, and not more than 50 mm for other exit facilities.

(2) Doors in their swing shall not reduce the width of the path of travel to less than

(a) the required exit width in exit corridors and passageways, and

(b) 750 mm on exit stairs or landings.

9.9.6.3. Headroom Obstructions. No door closer or other device shall be installed in an exit in such a manner as to reduce the headroom clearance to less than 1980 mm.

9.9.6.4. Door Sizes

(1) Every exit door or door that opens into or is located within a public corridor or other facility that provides access to exit from a suite shall

(a) be not less than 2030 mm high,

(b) be not less than 810 mm wide where there is only one door leaf, and

(c) have no single leaf less than 610 mm wide in any multiple leaf door.

9.9.6.5. Direction of Door Swing

(1) Except as provided in Sentence 3.3.1.11.(1), every door that opens 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, and every door that is located within a corridor that is required to be separated from the remainder of the floor area by a fire separation shall swing on a vertical axis in the direction of exit travel and shall not open onto a step.

(2) Except as permitted in Sentences (3) and (4) and in Sentence 3.4.6.13.(1), every required exit door shall open in the direction of exit travel and shall swing on its vertical axis.

(3) An exit door serving not more than one dwelling unit is permitted to swing inward.

(4) Exit doors serving a storage garage serving not more than one dwelling unit, or doors serving other accessory buildings where there is no danger to life safety, need not conform to Sentence (2).

9.9.6.6. Nearness of Doors to Stairs

(1) Except as provided in Sentence (2), the distance between a stair riser and the leading edge of a door during its swing shall be not less than 300 mm.

(2) Where there is a danger of blockage from ice or snow, an exit door may open onto not more than one step provided the riser of such step does not exceed 150 mm.

9.9.6.7. Revolving Doors. Revolving doors used as exits shall conform to Article 3.4.6.14.

9.9.6.8. Door Opening Mechanism. Exit doors and doors to suites, including exterior doors to dwelling units, shall be openable from the inside without requiring keys, special devices or specialized knowledge of the door opening mechanism.

9.9.6.9. Automatic Locking Prohibited. Except for hotels and motels, a door opening onto a public corridor which provides access to exit from suites shall be designed not to lock automatically when such doors are equipped with automatic self-closing devices. (See A-3.3.4.5. in Appendix A.)

9.9.6.10. Effort Required to Open. Every exit door 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 at the knob or other latch releasing device. (See Sentence 3.7.3.3.(7) for door opening forces in a barrier-free path of travel.)

9.9.7. Access to Exits

9.9.7.1. Means of Egress from Suites. Except as permitted in Articles 9.9.7.2. and 9.9.9.3., each suite in a floor area occupied by more than one
9.9.7.1. suite shall have an exterior exit doorway or a door-
way to a public corridor or to an exterior passageway, and
from the point where such doorway enters the public corridor or exterior passageway, it shall be possible to go in opposite directions to each of 2 separate exits.

9.9.7.2. Dead End Corridors. Except for a dead-end corridor that is entirely within a suite and except as permitted in Article 9.9.9.3., a dead-end corridor is permitted provided it is not more than 6 m long.

9.9.7.3. Number and Spacing of Egress Doors

(1) Except for dwelling units, at least 2 egress doors shall be provided when the area of a room or suite, or the distance measured from any point within the room or suite to the nearest egress door, exceeds the values in Table 9.9.7.A.

<table>
<thead>
<tr>
<th>Occupancy of Room, Suite or Floor Area</th>
<th>Maximum Area of Room, Suite or Floor Area, m²</th>
<th>Maximum Distance to Egress Door, m</th>
</tr>
</thead>
<tbody>
<tr>
<td>Group C (except dwelling units)</td>
<td>100</td>
<td>15</td>
</tr>
<tr>
<td>Group D</td>
<td>200</td>
<td>25</td>
</tr>
<tr>
<td>Group E</td>
<td>150</td>
<td>15</td>
</tr>
<tr>
<td>Group F, Division 2</td>
<td>150</td>
<td>10</td>
</tr>
<tr>
<td>Group F, Division 3</td>
<td>200</td>
<td>15</td>
</tr>
<tr>
<td>Column 1</td>
<td>2</td>
<td>3</td>
</tr>
</tbody>
</table>

(2) Doors required in Sentence (1) shall be spaced so that in the event that one door is made inaccessible by a fire within such room or suite, the other door will provide safe egress.

9.9.7.4. Independent Access to Exit.
Required access to exit from suites shall not be through any other dwelling unit, service room or other occupancy.

9.9.7.5. Travel Distance within Rooms and Suites. Except for dwelling units, the travel distance from any point within the room or suite to the nearest egress door shall not exceed the maximum travel distance in Article 9.9.8.2.

9.9.8. Exits from Floor Areas

9.9.8.1. Measurement of Travel Distance

(1) Except as provided in Sentences (2) and (3), 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 exit travel.

(2) Where a room or suite is separated from the remainder of the floor area by a fire separation having a fire-resistance rating of at least 45 min or, in a sprinklered building, by a fire separation which is not required to have a fire-resistance rating, the travel distance may be measured from an egress door of the room or suite to the nearest exit.

(3) Where a public corridor is not less than 9 m wide and conforms to Clause 3.4.2.5.(1)(d), the travel distance may be determined in accordance with that Clause.

9.9.8.2. Number of Required Exits

(1) Except as provided in Sentence (2) and Subsection 9.9.9., not less than 2 exits shall be provided from every floor area, spaced so that the travel distance to the nearest exit is not more than

(a) 40 m in the case of business and personal services occupancies,

(b) 45 m for all occupancies where the floor area is sprinklered, and

(c) 30 m for all other occupancies.

(2) Except as provided in Subsection 9.9.9., a single exit is permitted from each storey in buildings of 1 and 2 storeys in building height provided the floor area and travel distance requirements conform to those required in Article 9.9.7.3. and the total occupant load served by an exit facility does not exceed 60 persons.

9.9.8.3. Contribution of Each Exit. Where more than one exit is required from a floor area, each exit shall be considered as contributing not more than half the required exit width.
9.9.8.4. Location of Exits. Where more than one exit is required from a floor area, not less than 2 exits shall be independent of each other and be placed remote from each other along the path of travel between them.

9.9.8.5. Exiting through a Lobby

(1) Not more than one exit from a floor area above the floor and not more than 7 m above

(2) The lobby referred to in Sentence (1) shall be not more than 4.5 m above grade, and the path of travel through the lobby to the outdoors shall not exceed 15 m.

(3) The lobby referred to in Sentence (1) shall conform in all respects with the requirements for exits, except that rooms other than service rooms, storage rooms and rooms of residential or industrial occupancy may open directly onto such lobby.

(4) Where the lobby referred to in Sentence (1) and adjacent occupancies that are permitted to open into the lobby are sprinklered, the fire separation between such occupancies and the lobby need not have a fire-resistance rating.

(See A-3.4.4.2.(2)(e) in Appendix A.)

9.9.8.6. Exits for Mezzanines. A mezzanine shall be provided with exits on the same basis as required for a floor area where a mezzanine is considered to be a storey in Subsection 9.10.4. or is of a size required to have more than one exit.

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 a sufficient number of exits or egress doors 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 1.5 m above adjacent ground level.

(2) Where there is no dwelling unit above or below another dwelling unit, the travel limit from a floor level in a dwelling unit to an exit or egress door may exceed 1 storey where that floor level is served by an openable window providing an unobstructed opening of not less than 1 m in height and 0.55 m in width, located so that the sill is not more than 1 m above the floor and not more than 7 m above adjacent ground level.

(3) The travel limit from a floor level in a dwelling unit to an exit or egress door may exceed 1 storey where that floor level has direct access to a balcony.

9.9.9.2. Two Separate Exits. Except as provided in Article 9.9.7.2., 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 2 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 serving more than one suite and served by a single exit stairway,

(c) an exterior passageway serving more than one suite and served by a single exit stairway, or

(d) a balcony serving more than one suite and served by a single exit stairway.

9.9.10. Exit Signs

9.9.10.1. Application. This Subsection applies to all exits except those serving not more than one dwelling unit.

9.9.10.2. Visibility of Exits. Exits shall be located so as to be clearly visible or their locations shall be clearly indicated.

9.9.10.3. Required Exit Signs. Except for the main entrance door to a building, every exit door in a building 3 storeys in building height or in a building having an occupant load greater than 150 shall have an exit sign over or adjacent to it.
9.9.10.4. Exit Direction Signs. Exit direction signs shall be placed in corridors and passages where necessary to indicate the direction of exit travel.

9.9.10.5. Visibility of Exit Signs. Exit signs shall be installed so as to be visible from the exit approach and shall be illuminated continuously while the building is occupied.

9.9.10.6. Lettering

(1) Exit signs shall have the word EXIT or SORTIE in red letters on a contrasting background or a red background with contrasting letters when the sign is internally lighted, and white letters on a red background or red letters on a white background when the sign is externally lighted.

(2) Lettering referred to in Sentence (1) shall be made with not less than 19 mm wide strokes and be not less than 150 mm high when the sign is externally lighted, and not less than 114 mm high when the sign is internally lighted.

9.9.10.7. Illumination. Where illumination of exit signs required in Article 9.9.10.3. is provided by an electrical circuit, that circuit shall serve no equipment other than emergency equipment.

9.9.10.8. Exits Continuing to a Basement.

In buildings 3 storeys in building height any part of an exit ramp or stair that continues down to a basement past an exterior exit door shall be clearly marked to indicate that it does not lead to an exit where the portion below ground level may be mistaken as the direction of exit travel.

9.9.11. Lighting

9.9.11.1. Application. This Subsection applies to the lighting of all exits except those serving not more than one dwelling unit.

9.9.11.2. Required Lighting in Egress Facilities. 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.

9.9.11.3. 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 when the electric lighting in the affected area is interrupted.

(4) Illumination from lighting required in Sentence (1) shall be not less than 10 lx for a period of at least 30 min.

(5) Where incandescent lighting is provided, lighting equal to 1 W/m² of floor area shall be considered to meet the requirement in Sentence (4).

(6) Where self-contained emergency lighting units are used, they shall conform to CSA C22.2 No. 141, “Unit Equipment for Emergency Lighting.”

Section 9.10 Fire Protection

9.10.1. General

9.10.1.1. Support of Noncombustible Construction. An assembly required to be of noncombustible construction shall be supported by noncombustible construction.

9.10.1.2. Sloped Roofs. For the purposes of this Section, roofs with slopes of 60° or more to the horizontal and which are adjacent to a room or space intended for occupancy shall be considered as a wall.

9.10.1.3. Dispensing of Fuel. Except as provided in Article 3.3.5.9., facilities for the dispensing of fuel shall not be installed in any building.

9.10.1.4. Commercial Cooking Equipment. In kitchens containing commercial cooking equipment used in processes producing grease-laden
vapours, the equipment shall be designed and installed in conformance with Part 6. (See Appendix A.)

9.10.1.5. Other Items Under Part 3 Jurisdiction. Tents, air-supported structures, transformer vaults, walkways, elevators and escalators shall conform to Part 3.

9.10.1.6. Openings through Floors. Openings through floors that are not protected by shafts or closures shall be protected in conformance with Subsection 3.2.8. (See also Sentence 9.9.4.10.(1).)

9.10.1.7. Assembly Occupancy. Where rooms or spaces are intended for an assembly occupancy, such rooms or spaces shall conform to Part 3.

9.10.1.8. Hazardous or Explosive Material. 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. (See A-3.3.1.2.(1) in Appendix A.)

9.10.1.9. Appliances Installed on a Roof. Where fuel-fired appliances are installed on a roof, such appliances shall be installed in conformance with Part 6.

9.10.1.10. Sprinkler, Standpipe and Hose Systems. Where sprinkler, standpipe and hose systems are installed, they shall be installed in conformance with Part 3.

9.10.1.11. Chutes and Shafts. Chutes and shafts shall conform to Subsection 3.5.3. except where they are entirely contained within a dwelling unit.

9.10.1.12. Large or Multi-Storey Basements. Basements containing more than 1 storey or exceeding 600 m² in area shall conform to the requirements contained in Part 3.

9.10.2. Occupancy Classification

9.10.2.1. Occupancy Classification. Except as provided in Article 9.10.2.2., every building or part thereof shall be classified according to its major occupancy as belonging to one of the groups or divisions described in Table 9.10.2.A.

9.10.2.2. Custodial and Convalescent Homes. Children’s custodial homes and convalescent homes for ambulatory occupants living as a single housekeeping unit in a dwelling unit with sleeping accommodation for not more than 10 persons may be classified as residential occupancies (Group C).

9.10.2.3. Major Occupancies above Other Major Occupancies. Except as permitted in Article 9.10.2.4., in any building containing more than one major occupancy in which one major occupancy is located entirely above another, the requirements of Article 9.10.8.1. for each portion of the building containing a major occupancy shall be applied to that portion as if the entire building was of that major occupancy.

9.10.2.4. Buildings Containing More Than One Major Occupancy. In a building containing more than one major occupancy, where the aggregate area of all major occupancies in a particular group or division does not exceed 10 per cent of the floor area on the storey on which they are located, they need not be considered as major occupancies for the purposes of Articles 9.10.8.1. and 9.10.2.3. provided they are not classified as Group F, Division 2 occupancies.

9.10.3. Ratings

9.10.3.1. Fire-Resistance and Fire-Protection Ratings. Where a fire-resistance rating or a fire-protection rating is required in this Section for an
9.10.3.1. Flame-Spread Ratings

(1) Where a flame-spread rating is required in this Section for an element of a building, such rating shall be determined in accordance with the test methods described in Part 3, or in accordance with Chapter 2 of the Supplement to the NBC 1990.

(2) Unless the flame-spread rating is referred to herein as a "surface flame-spread rating," it shall apply to any surface of the element being considered that would be exposed by cutting through it as well as to the exposed surface of the element.

9.10.3.2. Fire Exposure

(1) Floor, roof and ceiling assemblies shall be rated for exposure to fire on the underside.

(2) Exterior walls shall be rated for exposure to fire from inside the building, except that such walls need not comply with the temperature rise limitations required by the standard tests referred to in Article 9.10.3.1. if such walls have a limiting distance of not less than 1.2 m, and due allowance is made for the effects of heat radiation in accordance with the requirements in Part 3.

(3) Firewalls and interior vertical fire separations required to have fire-resistance ratings shall be rated for exposure to fire on each side.

9.10.3.3. Suspended Membrane Ceilings

Where a ceiling construction has a suspended membrane ceiling with lay-in panels or tiles which contribute to the required fire-resistance rating, hold down clips or other means shall be provided to prevent the lifting of such panels or tiles in the event of a fire.

9.10.4. Building Size Determination

9.10.4.1. Mezzanines not Considered as Stories

(1) Mezzanines shall not be considered as stories for the purpose of determining building height where the aggregate area of mezzanine floors does not exceed 10 per cent of the floor area of the story in which they are located.

(2) Mezzanines shall not be considered as stories for the purpose of determining building height where they occupy an aggregate area of less than 40 per cent of the floor area of the story in which they are located provided the space above the mezzanine floors and the floor below them have no visual obstructions more than 1070 mm above such floors.

See A-3.2.1.1.(3) in Appendix A.

9.10.4.2. More Than One Level of Mezzanine.

Where more than one level of mezzanine is provided in a story, each level additional to the first shall be considered as a story.

9.10.4.3. Basement Storage Garages.

Where a basement is used primarily as a storage garage, the basement may 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.

9.10.4.4. Roof-Top Enclosures.

Roof-top enclosures provided for elevator machinery, stairways and service rooms, used for no purpose other than for service to the building, shall not be considered as a story in calculating the building height.

9.10.5. Permitted Openings in Wall and Ceiling Membranes

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 may 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.

(4) A membrane ceiling forming part of an assembly assigned a fire-resistance rating on the basis of Chapter 2, “Fire Performance Ratings” of the supplement to the NBC 1990 or of Table A-9.10.3.B., 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 the requirements of Chapter 2.

9.10.6. Construction Types

9.10.6.1. Combustible Elements in Non-combustible Construction. Where a wall, floor or roof assembly 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. Heavy timber construction shall be considered to have 45 min fire-resistance rating when it is constructed in accordance with the requirements for heavy timber construction in Article 3.1.4.6.

9.10.7. Protection of Steel Members

9.10.7.1. Except as permitted 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.

9.10.8. Fire Resistance in Relation to Occupancy and Height

9.10.8.1. Fire Resistance Ratings for Floors and Roofs. Except as otherwise provided in this Subsection, the fire-resistance ratings of floors and roofs shall conform to Table 9.10.8.A. (See Subsection 9.10.20. for construction camps.) (See Subsection 9.10.2. for mixed occupancies.)

9.10.8.2. Fire Resistance Ratings in Sprinklered Buildings. The requirements in Table 9.10.8.A. for roof assemblies to have a fire-resistance rating may be waived in sprinklered buildings where the sprinkler system conforms to Sentence 3.2.2.12.(1).

9.10.8.3. Fire Resistance Ratings for Walls, Columns and Arches. 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.

9.10.8.4. Service Rooms. Construction supporting a service room need not conform to Article 9.10.8.3.

9.10.8.5. Mezzanines. Mezzanines required to be counted as storeys in Articles 9.10.4.1. and 9.10.4.2. shall be constructed in conformance with the requirements of Column 3 of Table 9.10.8.A.

<table>
<thead>
<tr>
<th>Major Occupancy</th>
<th>Maximum Building Height, storeys</th>
<th>Building Element</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>Floors Except Floors over Crawl Spaces</td>
<td>Mezzanine Floors</td>
</tr>
<tr>
<td>Residential (Group C)</td>
<td>3</td>
<td>45 min</td>
</tr>
<tr>
<td>All other occupancies</td>
<td>2</td>
<td>45 min</td>
</tr>
<tr>
<td></td>
<td>3</td>
<td>45 min</td>
</tr>
<tr>
<td>Column 1</td>
<td>2</td>
<td>3</td>
</tr>
</tbody>
</table>
9.10.8.6. Roofs Supporting an Occupancy. Where a portion of a roof supports an occupancy, that portion shall be constructed as a fire separation having a fire-resistance rating conforming to the rating shown for floors in Column 3 of Table 9.10.8.A.

9.10.8.7. Floors of Exterior Passageways. The floor assembly of every exterior passageway used as part of a means of egress shall have a fire-resistance rating of not less than 45 min or be of noncombustible construction, except that no fire-resistance rating is required in buildings of Group D, E or F major occupancy that are not more than 2 storeys in building height.

9.10.8.8. Crawl Spaces. Where a crawl space exceeds 1.8 m in height or is used for any occupancy or as a plenum in combustible construction or for the passage of flue pipes, it shall be considered as a basement in applying the requirements in Article 9.10.8.1.

9.10.8.9. Application to Houses. Table 9.10.8.A. does not apply to a dwelling unit which has no other dwelling unit above or below it, or to a dwelling unit which is not above or below another major occupancy.

9.10.8.10. Part 3 as an Alternative. The fire-resistance ratings of floors, roofs, loadbearing walls, columns and arches need not conform to this Subsection if such assemblies conform in all respects to the appropriate requirements in Section 3.2.

9.10.9. Fire Separations between Rooms and Spaces within Buildings

9.10.9.1. Application. This Subsection applies to fire separations required between rooms and spaces in buildings except between rooms and spaces within a dwelling unit.

9.10.9.2. Continuous Barrier. Except as permitted in Article 9.10.9.3., a wall or floor assembly required to be a fire separation shall be constructed as a continuous barrier against the spread of fire. (See A-3.1.8.1.(1)(a) in Appendix A.)

9.10.9.3. Openings to be Protected with Closures. Except as permitted in Articles 9.10.9.5., 9.10.9.6. and 9.10.9.7., openings in required fire separations shall be protected with closures conforming to Subsection 9.10.13.

9.10.9.4. Floor Assemblies

(1) Except as permitted in Sentences (2) to (4), all floor assemblies shall be constructed as fire separations.

(2) Floor assemblies contained within dwelling units need not be constructed as fire separations.

(3) Floor assemblies for which no fire-resistance rating is required by Subsection 9.10.8. and floors of mezzanines not required to be counted as storeys in Articles 9.10.4.1. and 9.10.4.2. need not be constructed as fire separations.

(4) Where a crawl space is not required by Article 9.10.8.8. to be constructed as a basement, the floor above it need not be constructed as a fire separation.

9.10.9.5. Interconnected Floor Spaces. Interconnected floor spaces shall conform to the requirements of Subsection 3.2.8.

9.10.9.6. Service Equipment Penetrating a Fire Separation

(1) Piping, tubing, ducts, chimneys, wiring, conduit, electrical outlet boxes and other similar service equipment that penetrate a required fire separation shall be tightly fitted or fire stopped to maintain the integrity of the separation. (See Appendix A.)

(2) Except as provided in Sentences (3) to (8), pipes, ducts, electrical outlet boxes, totally enclosed raceways or other similar service equipment that partly or wholly penetrate an assembly required to have a fire-resistance rating shall be noncombustible unless the assembly has been tested incorporating such equipment.

(3) Electrical wires or similar wiring enclosed in noncombustible totally enclosed raceways may 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 (2).
9.10.9.10.

(4) Electrical wires or cables, single or grouped, with combustible insulation or jacketing that is not totally enclosed in raceways of noncombustible material, may 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 (2) provided the overall diameter of the wiring is not more than 25 mm.

(5) Combustible totally enclosed raceways which 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 (2) where the concrete provides not less than 50 mm of cover between the raceway and the bottom of the slab.

(6) 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 (2) provided the opening through the membrane into the box does not exceed 160 cm².

(7) Combustible water distribution piping that has an outside diameter not more than 30 mm is permitted to partly or wholly penetrate a vertical 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 (2) provided the piping is sealed in conformance with Article 3.1.9.1.

(8) Combustible sprinkler piping is permitted to penetrate a fire separation provided the fire compartments on each side of the fire separation are sprinklered.

9.10.9.7. Combustible Drain, Waste and Vent Piping

(1) Except as permitted in Sentences (2) to (6), combustible piping shall not be used in any part of a drain, waste and vent piping system where any part of that system partly or wholly penetrates a fire separation required to have a fire-resistance rating or penetrates a membrane that forms part of an assembly required to have a fire-resistance rating.

(2) Combustible drain, waste and vent 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 firestop 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 CAN4-S115, “Standard Method of Fire Tests for 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 provided it leads directly from a noncombustible water closet through a concrete floor slab.

(5) Combustible drain, waste and vent piping is permitted on one side of a vertical fire separation provided it is not located in a vertical shaft.

(6) In buildings containing two dwelling units only, combustible drain, waste and vent piping is permitted on one side of a horizontal fire separation.

9.10.9.8. Collapse of Combustible Construction. 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. Beams and joists framed into a masonry or concrete fire separation shall not reduce the thickness of the fire separation to less than 100 mm of masonry or concrete.

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 may be reduced to
30 min.

9.10.9.11. Separation of Residential Occupancies
(1) Except as provided in Sentence (2), 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) A major occupancy classified as a residential
occupancy shall be separated from other major occup-
ancies classified as mercantile or medium hazard
industrial occupancies by a fire separation having a fire-
resistance rating of not less than 2 h, except that where
not more than 2 dwelling units are located in a building
containing a mercantile occupancy, such mercantile
occupancy shall be separated from the dwelling units
by a fire separation having not less than 1 h fire-
resistance rating.

9.10.9.12. Residential Suites in Industrial Buildings. Not more than one suite of residential
occupancy shall be contained within a building classified
as a Group F, Division 2 major occupancy.

9.10.9.13. Separation of Suites
(1) Except as required in Article 9.10.9.14, and
as permitted by Sentence (2), 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 of not less than 45 min.
(2) In sprinklered buildings, suites of business
and personal services occupancy and mercantile occu-
pancy that are served by public corridors conforming
with Clause 3.3.1.1.(1)(c) are not required to be sepa-
rated from each other by fire separations.

(1) Except as provided in Sentences (2) and
(3) and Article 9.10.20.2., suites in residential occup-
ancies shall be separated from adjacent rooms and suites
by a fire separation having a fire-resistance rating of not
less than 45 min.
(2) Sleeping rooms in boarding and lodging
houses where sleeping accommodation is provided
for not more than 8 boarders or lodgers need not be
separated from the remainder of the floor area as
required in Sentence (1) where the sleeping rooms
form part of the proprietor’s residence and do not
contain cooking facilities.
(3) Dwelling units that contain 2 or more
storeys including basements shall be separated from
the remainder of the building by a fire separation
having a fire-resistance rating of not less than 1 h. (See
A-3.3.4.4.(1) in Appendix A.)

9.10.9.15. Separation of Public Corridors
(1) Except as provided in Sentences (2) and
(3), public corridors shall be separated from the
remainder of the building by a fire separation having
not less than a 45 min fire-resistance rating.
(2) In other than residential occupancies, no fire
separation is required between a public corridor and the remainder of the building if
the floor area is sprinklered in conformance with Sen-
tence 3.3.1.4.(2).
(3) In other than residential occupancies, no fire
separation is required between a public corridor and the
remainder of the building if the floor area is sprinklered
in conformance with Sentence 3.3.1.4.(2) and the
corridor exceeds 5 m in width.

9.10.9.16. Separation of Storage Garages
(1) Except as provided in Sentences (2) and
(3), a storage garage shall be separated from other
occupancies by a fire separation having not less than a
1.5 h fire-resistance rating.
(2) Except as permitted in Sentence (3), storage
garages containing 5 cars or fewer shall be separated
from other occupancies by a fire separation of not less
than 1 h.
(3) Where a storage garage serves only the
dwelling unit to which it is attached or built in, it shall
be considered as part of that dwelling unit and the fire
separation required in Sentence (2) need not be
provided between the garage and the dwelling unit
where
(a) the construction between the garage and
the dwelling unit provides an effective
barrier to gas and exhaust fumes, and
(b) every door between the garage and the
dwelling unit conforms to Article
9.10.13.15.
(See Appendix A.)
9.10.9.17. Separation of Repair Garages

(1) Except as provided in Sentence (2), a repair garage shall be separated from other occupancies by a fire separation having a fire-resistance rating of not less than 2 h.

(2) Ancillary spaces directly serving a repair garage, including waiting rooms, reception rooms, tool and parts storage areas and supervisory office space, need not be separated from the repair garage but shall be separated from other occupancies as required in Sentence (1).

9.10.9.18. Exhaust Ducts Serving More Than One Fire Compartment. Where 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, and such individual fire compartments shall not have fans that exhaust directly into the duct in the vertical service space.

9.10.10. Service Rooms

9.10.10.1. Application. This Subsection applies to service rooms in all buildings except rooms located within a dwelling unit.

9.10.10.2. Service Room Floors. 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 Sentence (2) and Article 9.10.10.5., fuel-fired appliances other than fireplaces 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.

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.

(2) The design, construction, installation and alteration of each indoor incinerator shall conform to NFPA 82, "Incinerators, 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. 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.

9.10.11. Firewalls

9.10.11.1. Required Firewalls. Except as provided in Article 9.10.11.2., a party wall on a property line shall be constructed as a firewall.

9.10.11.2. Firewalls Not Required

(1) In a building of residential occupancy in which there is no dwelling unit above another dwelling unit, a party wall on a property line between dwelling
9.10.11.2. **Construction of Firewalls.** Where firewalls are used, the requirements in Subsection 3.1.10. shall apply.

9.10.12. **Prevention of Fire Spread at Exterior Walls and between Storeys**

9.10.12.1. **Separation of Exterior Openings.** In buildings of mercantile or medium hazard industrial occupancy, the exterior openings in one story shall be separated from openings in an adjacent story by not less than 1 m of wall, or a canopy or balcony not less than 1 m in width having a fire-resistance rating not less than that required for the floor assembly, except that the rating need not exceed 1 h.

9.10.12.2. **Termination of Floors or Mezzanines.**

(1) Except as provided in Sentence (2) and in Articles 9.10.1.6. 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.

9.10.12.3. **Location of Skylights.** 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.

9.10.12.4. **Exterior Walls Meeting at an Angle**

(1) Except as provided in Articles 9.10.14.14. and 9.9.4.5., where exterior walls of a building meet at an external angle of 135° or less, the horizontal distance from an opening in one wall to an opening in the other wall shall be not less than 1.2 m, where the openings are in different fire compartments.

(2) The exterior wall of each fire compartment referred to in Sentence (1) within the 1.2 m distance, shall have a fire-resistance rating not less than that required for the interior vertical fire separation between the compartment and the remainder of the building.

9.10.12.5. **Protection of Soffits**

(1) Except as provided in Sentence (2), where a common attic or roof space spans more than 2 suites of residential occupancy and projects beyond the exterior wall of the building, the portion of any soffit or other surface enclosing the projection which is less than 2.5 m vertically above a window or door and less than 1.2 m from either side of the window or door, shall have no unprotected openings and shall be protected by

(a) noncombustible material having a minimum thickness of 0.38 mm and a melting point not below 650°C,

(b) not less than 11-mm thick plywood,

(c) not less than 12.5-mm thick waferboard or strandboard, or

(d) not less than 11-mm thick lumber.

(2) Where such soffit or other surface is completely separated from the remainder of the attic or roof space by fire stopping, the requirements in Sentence (1) do not apply.

(See Appendix A.)

9.10.13. **Doors, Dampers and Other Closures in Fire Separations**

9.10.13.1. **Closures.** Except as provided in Article 9.10.13.2., openings in required fire separations shall be protected with a closure conforming to Table 9.10.13.1. and shall be installed in conformance with Chapters 2 to 14 of NFPA 80, “Fire Doors and Windows” unless otherwise specified herein. (See also Article 9.10.3.1.)
Table 9.10.13.A.
Forming Part of Article 9.10.13.1.

<table>
<thead>
<tr>
<th>Fire-Protection Ratings for Closures</th>
</tr>
</thead>
<tbody>
<tr>
<td>Required Fire-Resistance Rating of Fire Separation</td>
</tr>
<tr>
<td>30 or 45 min</td>
</tr>
<tr>
<td>1 h</td>
</tr>
<tr>
<td>1.5 h</td>
</tr>
<tr>
<td>2 h</td>
</tr>
<tr>
<td>3 h</td>
</tr>
<tr>
<td>4 h</td>
</tr>
<tr>
<td>Column 1</td>
</tr>
</tbody>
</table>

Note to Table 9.10.13.A.:
(1) See Article 9.10.13.2.

9.10.13.5. Wired Glass as a Closure
(1) Wired glass conforming to Article 9.7.3.1. which has not been tested in accordance with Article 9.10.3.1. is permitted as a closure in a vertical fire separation required to have a fire-resistance rating of not more than 1 h provided such glass is not less than 6 mm thick and is mounted in conformance with Sentence (2).

(2) Wired glass described in Sentence (1) shall be mounted in fixed steel frames having a metal thickness of not less than 1.35 mm and providing a glazing stop of not less than 20 mm on each side of the glass.

(3) Individual panes of glass described in Sentence (1) shall not exceed 0.84 m² in area or 1.4 m in height or width, and the area of glass not structurally supported by mullions shall not exceed 7.5 m².

9.10.13.6. Steel Door Frames. Steel door frames forming part of a closure in a fire separation, including anchorage requirements, shall conform to CAN4-S105, “Standard Specification for Fire Door Frames Meeting the Performance Required by CAN4-S104.”

9.10.13.7. Glass Block as a Closure.
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. (See Article 9.20.9.6.)

9.10.13.8. Maximum Size of Closure
(1) The size of an opening in an interior fire separation required to be protected with a closure shall not exceed 11 m², with no dimension greater than 3.7 m, when the fire compartments on both sides of the fire separation are not sprinklered.

(2) The size of an opening in an interior fire separation required to be 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. Every swing type door in a fire separation shall be equipped with a latch.

9.10.13.2. Solid Core Wood Door as a Closure
(1) A 45 mm thick solid core wood door may be used where a minimum fire-protection rating of 20 min is permitted or between a public corridor and a suite provided that the door conforms to CAN4-S113, “Standard Specification for Wood Core Doors Meeting the Performance Required by CAN4-S104 for Twenty Minute Fire-Rated Closure Assemblies.” (See Appendix A.)

(2) Doors described in Sentence (1) shall have not more than a 6 mm clearance beneath and not more than 3 mm at the sides and top.

(3) Where a 45 mm thick solid core wood door is permitted in a required fire separation, the requirement for a noncombustible sill in NFPA 80, “Fire Doors and Windows” shall not apply.

Doors required to provide a 20 min fire-protection rating or permitted to be 45 mm solid core wood shall be mounted in a wood frame of not less than 38 mm thickness where the frame has not been tested and rated.

9.10.13.4. Doors as a Means of Egress.
Doors forming part of an exit or a public means of egress shall conform to Subsection 9.9.6. in addition to this Subsection.

9.10.13.6. Wired Glass as a Closure
(1) Wired glass conforming to Article 9.7.3.1. which has not been tested in accordance with Article 9.10.3.1. is permitted as a closure in a vertical fire separation required to have a fire-resistance rating of not more than 1 h provided such glass is not less than 6 mm thick and is mounted in conformance with Sentence (2).

(2) Wired glass described in Sentence (1) shall be mounted in fixed steel frames having a metal thickness of not less than 1.35 mm and providing a glazing stop of not less than 20 mm on each side of the glass.

(3) Individual panes of glass described in Sentence (1) shall not exceed 0.84 m² in area or 1.4 m in height or width, and the area of glass not structurally supported by mullions shall not exceed 7.5 m².

9.10.13.6. Steel Door Frames. Steel door frames forming part of a closure in a fire separation, including anchorage requirements, shall conform to CAN4-S105, “Standard Specification for Fire Door Frames Meeting the Performance Required by CAN4-S104.”

9.10.13.7. Glass Block as a Closure.
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. (See Article 9.20.9.6.)

9.10.13.8. Maximum Size of Closure
(1) The size of an opening in an interior fire separation required to be protected with a closure shall not exceed 11 m², with no dimension greater than 3.7 m, when the fire compartments on both sides of the fire separation are not sprinklered.

(2) The size of an opening in an interior fire separation required to be 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. 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 doors are not required between public corridors and suites in business and personal services occupancies, except in dead-end corridors.

9.10.13.11. Hold-Open Devices. 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. 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 Article 9.10.5.1.(4), ducts that connect 2 fire compartments or penetrate an assembly required to be a fire separation with a fire-resistance rating shall be equipped with a fire damper in conformance with Article 3.1.8.9.

(2) A fire damper is not required where a noncombustible branch duct pierces a required fire separation provided the melting point of the duct is not below 760°C, a cross-sectional area less than 130 cm² and 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 the melting point of the branch duct is not below 760°C, the branch duct is carried up inside the riser not less than 500 mm and 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 the ducts have a melting point above 760°C and 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. (See also Article 6.2.2.6.)


9.10.13.15. Doors between Garages and Dwelling Units

(1) A door between an attached or built-in garage and a dwelling unit shall be tight fitting and weather-stripped to provide an effective barrier against the passage of gas and exhaust fumes and shall be fitted with a self-closing device.

(2) A doorway between an attached or built-in garage and a dwelling unit shall not be located in a room intended for sleeping.

9.10.13.16. Door Stops. 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.


9.10.14.1. Maximum Percentage of Unprotected Openings. Except as provided in Articles 9.10.14.3. to 9.10.14.11., the maximum percentage of unprotected openings in an exposing building face shall conform to Table 9.10.14.A. or to Subsection 3.2.3., whichever is the least restrictive for the occupancy being considered.

9.10.14.2. Area of Exposing Building Face. 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, except that where a building is divided by fire separations into fire compartments, the area of exposing building face may be calculated for each fire compartment provided such separations have not less than a 45 min fire-resistance rating.

9.10.14.3. Inadequate Fire Fighting Facilities. Where there is no fire department or where a fire department is not organized, trained and
Table 9.10.14.A.
Forming Part of Article 9.10.14.

Maximum Percentage of Unprotected Openings in Exterior Walls

<table>
<thead>
<tr>
<th>Occupancy Classification of Building</th>
<th>Maximum Area of Exposing Building Face, m²</th>
<th>Limiting distance, m</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Less than 1.2</td>
<td>1.2</td>
</tr>
<tr>
<td>Residential, business and personal services, and low hazard industrial</td>
<td>30</td>
<td>0</td>
</tr>
<tr>
<td>Mercantile and medium hazard industrial</td>
<td>40</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>50</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>100</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>Over 100</td>
<td>0</td>
</tr>
</tbody>
</table>

Equipped to meet the needs of the community, the limiting distance determined from Article 9.10.14.1, or required in Articles 9.10.14.12, 9.10.14.14, and 9.10.14.16, shall be doubled.

9.10.14.6. Allowance for Sprinklers and Wired Glass or Glass Block. The maximum area of unprotected openings may be doubled where the building is sprinklered, or where the unprotected openings are glazed with wired glass in steel frames or glass blocks as described in Articles 9.10.13.5 and 9.10.13.7. (See A-3.2.3.11 in Appendix A.)

9.10.14.7. Exterior Wall Construction for Irregular-Shaped Buildings. For the purpose of using Table 9.10.14.B to determine the required type of construction, cladding and fire-resistance rating for an exterior wall, the exposing building face shall be taken as the projection of the exterior wall onto a vertical plane located so that no portion of the exposing building face of the building is between the vertical plane and the line to which the limiting distance is measured and for these purposes, the permitted area of unprotected openings shall be determined from Table 9.10.14.A or Article 9.10.14.4, using the limiting distance measured from this exposing building face. (See A-3.2.3.1.4 in Appendix A.)
For the purpose of using Table 9.10.14.A. to determine the actual percentage of unprotected openings permitted in an exterior wall, the location of the exposing building face is permitted to be taken at a vertical plane located so that there are no unprotected openings between the vertical plane and the line to which the limiting distance is measured. (See A-3.2.3.1.(4) in Appendix A.)

9.10.14.9. Storeys at Street Level. The exposing building face of a storey that faces a street and is at the same level as the street is permitted to have unlimited unprotected openings if the limiting distance is not less than 9 m.

9.10.14.10. Open-Air Storage Garages. When a storage garage has all storeys constructed as open-air storeys, the exposing building face of such garage is permitted to have unlimited unprotected openings provided the storage garage has a limiting distance of not less than 3 m.


(1) Except as required in Article 9.10.14.3., in buildings containing only dwelling units in which there is no dwelling unit above another dwelling unit, the requirements of Article 9.10.14.11. do not apply provided that the exposing building face has a fire-resistance rating of not less than 45 min where the limiting distance is less than 1.2 m, and when the limiting distance is less than 0.6 m, the exposing building face is clad with noncombustible material.

(2) Window openings in the exposing building face referred to in Sentence (1) shall not be permitted

Table 9.10.14.B.
Forming Part of Article 9.10.14.11.

<table>
<thead>
<tr>
<th>Occupancy Classification of Building</th>
<th>Maximum Percentage of Unprotected Openings Permitted, per cent</th>
<th>Minimum Required Fire-Resistance Rating</th>
<th>Type of Construction Required</th>
<th>Type of Cladding Required</th>
</tr>
</thead>
<tbody>
<tr>
<td>Residential, business and personal services, and low hazard industrial</td>
<td>0 – 10</td>
<td>1 h</td>
<td>Noncombustible</td>
<td>Noncombustible</td>
</tr>
<tr>
<td></td>
<td>11 – 25</td>
<td>1 h</td>
<td>Combustible or noncombustible</td>
<td>Noncombustible</td>
</tr>
<tr>
<td></td>
<td>26 – 100</td>
<td>45 min</td>
<td>Combustible or noncombustible</td>
<td>Combustible or noncombustible</td>
</tr>
<tr>
<td>Mercantile, and medium hazard industrial</td>
<td>0 – 10</td>
<td>2 h</td>
<td>Noncombustible</td>
<td>Noncombustible</td>
</tr>
<tr>
<td></td>
<td>11 – 25</td>
<td>2 h</td>
<td>Combustible or noncombustible</td>
<td>Noncombustible</td>
</tr>
<tr>
<td></td>
<td>26 – 100</td>
<td>1 h</td>
<td>Combustible or noncombustible</td>
<td>Combustible or noncombustible</td>
</tr>
<tr>
<td>Column 1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
</tbody>
</table>
if the limiting distance is less than 1.2 m and shall be limited in conformance with the requirements for unprotected openings in Article 9.10.14.1. where the limiting distance is 1.2 m or greater.

9.10.14.13. Combustible Projections. Except for buildings containing 1 or 2 dwelling units only, combustible projections on the exterior of a wall that are more than 1 m above ground level, such as balconies, platforms, canopies, eave projections and stairs, and that could expose an adjacent building to fire spread, shall not be permitted within 1.2 m of a property line or the centreline of a public way, or within 2.4 m of a combustible projection on another building on the same property.

(1) Except as required in Article 9.10.14.3., the exposing building face of a detached garage that serves one dwelling unit only shall have a fire-resistance rating of not less than 45 min, except that no fire-resistance rating is required where the limiting distance is 0.6 m or greater.
(2) The exterior cladding of detached garages described in Sentence (1) is not required to be noncombustible regardless of the limiting distance.
(3) The percentage of window openings permitted in the exposing building face of detached garages described in Sentence (1) shall conform to the requirements for unprotected openings in Article 9.10.14.1.
(4) Where a detached garage serves only one dwelling unit and is located on the same property as that dwelling unit, then the requirements for limiting distance shall not apply between the garage and the dwelling unit.

9.10.14.15. Heavy Timber and Steel Columns. Heavy timber and steel columns need not conform to the requirements of Article 9.10.14.11. provided the limiting distance is not less than 3 m.

9.10.14.16. Low Fire Load Occupancies. Except as required in Article 9.10.14.3., in buildings of 1 storey in building height of noncombustible construction classified as low hazard industrial occupancy which are used only for low fire load occupancies such as power generating plants or plants for the manufacture or storage of noncombustible materials, non-loadbearing wall components need not have a minimum fire-resistance rating provided the limiting distance is 3 m or more.

9.10.15. Fire Stops
9.10.15.1. Required Fire Stops in Concealed Spaces
(1) Concealed spaces in interior walls, ceilings and crawl spaces shall be separated by fire stops from concealed spaces in exterior walls and attic or roof spaces.
(2) Fire stops 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.
(3) Fire stops shall be provided at the top and bottom of each run of stairs where they pass through a floor containing concealed space in which the exposed construction materials within the space have a surface flame-spread rating greater than 25.
(4) In unsprinklered buildings of combustible construction, every concealed space created by a ceiling, roof space or unoccupied attic space shall be separated by fire stops into compartments of not more than 300 m² in area where such space contains exposed construction materials having a surface flame-spread rating greater than 25.
(5) No dimension of the concealed space described in Sentence (4) 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 stops at intervals of not more than 20 m and at points where such concealed spaces extend across the ends of required vertical fire separations.

9.10.15.2. Required Fire Stops in Wall Assemblies
(1) Except as permitted in Sentences (2) and (3), fire stops shall be provided to block off concealed spaces within wall assemblies, including spaces created by furring, at each floor level, and at each
ceiling level where the ceiling contributes to part of the required fire-resistance rating, and at other locations within the wall, so that the distance between fire stops does not exceed 20 m horizontally and 3 m vertically.

(2) Fire stops required in Sentence (1) are not required provided the exposed construction materials within the wall space, including insulation, but not including wiring, piping or similar services, have a flame-spread rating of not more than 25.

(3) Fire stops required in Sentence (1) are not required provided the wall space is filled with insulation.

9.10.15.3. Fire Stop Materials. Fire stops shall be constructed of not less than 0.38 mm sheet steel, 6 mm asbestos board, 12.7 mm gypsum wallboard, 12.5 mm plywood, waferboard or strandboard, with joints having continuous support, 2 layers of 19 mm lumber with joints staggered, 38 mm lumber or materials conforming to Sentence 3.1.11.7.(1).

9.10.15.4. Penetration of Fire Stops. Where fire stops are pierced by pipes, ducts or other elements, the effectiveness of the fire stops shall be maintained around such elements.

9.10.16. Flame Spread Limits

9.10.16.1. 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 Article 9.10.16.1. provided they have a surface flame-spread rating of not more than 200.

(3) Doors within dwelling units need not conform to Sentences (1) and (2).

9.10.16.2. Ceilings in Exits or Public Corridors. At least 90 per cent 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. (See Article 9.10.16.6.)

9.10.16.3. Walls in Exits

(1) Except as provided in Sentence (2), at least 90 per cent of the exposed surfaces of every wall in an exit shall have a surface flame-spread rating of not more than 25. (See Article 9.10.16.6.)

(2) At least 75 per cent 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. (See Article 9.10.16.6.)

9.10.16.4. Exterior Exit Passageways.

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 per cent of the total wall area and 10 per cent of the total ceiling area is permitted to have a surface flame-spread rating of not more than 150.

9.10.16.5. Walls in Public Corridors.

At least 90 per cent 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 per cent of the upper half of such walls shall have a surface flame-spread rating of not more than 25. (See Article 9.10.16.6.)

9.10.16.6. Calculation of Wall and Ceiling Areas.

Combustible doors, skylights, glazing and combustible light diffusers and lenses shall not be considered in the calculation of wall and ceiling areas in this Subsection.

9.10.16.7. Corridors Containing an Occupancy.

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.


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).

9.10.16.9. Combustible Skylights. Individual combustible skylights in corridors required to be separated from the remainder of the building by fire separations shall not exceed 1 m² in area and shall be spaced not less than 1.2 m apart.

9.10.16.10. Protection of Foamed Plastics
(1) Foamed plastics which form part of a wall or ceiling assembly in combustible construction shall be protected from adjacent space in the building, other than adjacent concealed spaces within attic and roof spaces, crawl spaces, and wall assemblies, by
(a) one of the interior finishes described in Subsections 9.29.4. to 9.29.9.,
(b) sheet metal mechanically fastened to the supporting assembly independent of the insulation and having a thickness of not less than 0.38 mm and a melting point not below 650°C provided the building does not contain a Group C major occupancy, or
(c) any thermal barrier that meets the requirements of Clause 3.1.5.11.(2)(e).

9.10.16.11. Walls and Ceilings in Bathrooms. 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.

9.10.16.12. Coverings or Linings of Ducts. 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.

9.10.17. Alarm and Detection Systems
9.10.17.1. Access Provided through a Firewall. 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.

9.10.17.2. Fire Alarm System Required
(1) Except as provided in Sentence (2), a fire alarm system shall be installed in every building that contains more than 3 storeys, including storeys below the first storey, or where the total occupant load exceeds 300, or when the occupant load for any major occupancy in Table 9.10.17.A. is exceeded.

Table 9.10.17.A. Forming Part of Sentence 9.10.17.2.(1)

<table>
<thead>
<tr>
<th>Major Occupancy Classification</th>
<th>Occupant Load Above which Fire Alarm System is Required</th>
</tr>
</thead>
<tbody>
<tr>
<td>Residential</td>
<td>10 (sleeping accommodation)</td>
</tr>
<tr>
<td>Business and personal services, Mercantile</td>
<td>150 above or below the first storey</td>
</tr>
<tr>
<td>Low or medium hazard industrial</td>
<td>75 above or below the first storey</td>
</tr>
<tr>
<td>Column 1</td>
<td>2</td>
</tr>
</tbody>
</table>

(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.

9.10.17.3. 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), buildings required to have a fire alarm system shall be equipped with heat detectors or smoke detectors in storage rooms, service rooms, elevator shafts, chutes, janitors’ closets and any other rooms where hazardous substances are intended to be used or stored.

(3) 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.
9.10.17.4. Smoke Detectors in Recirculating Air Handling Systems. 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.

9.10.17.5. 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 not less than 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 may 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.

9.10.17.6. Design and Installation Requirements. Fire alarm, fire detection and smoke detection devices and systems, and their installation, shall conform to Subsection 3.2.4.

9.10.17.7. Central Vacuum Systems. Central vacuum cleaning systems in buildings required to be equipped with a fire alarm system shall be designed to shut down upon activation of the fire alarm system.

9.10.17.8. Open-Air Storage Garages. A fire alarm system is not required in a storage garage conforming to Article 3.2.2.60, provided there are no other occupancies in the building.

9.10.18. Smoke Alarms

9.10.18.1. Required Smoke Alarms. Smoke alarms conforming to CAN/ULC-S531, “Standard for Smoke Alarms” shall be installed in each dwelling unit and in each sleeping room not within a dwelling unit.

9.10.18.2. Location of Smoke Alarms

(1) Smoke alarms within dwelling units shall be installed between each sleeping area and the remainder of the dwelling unit; and where the sleeping areas are served by hallways, the smoke alarms shall be installed in the hallway.

(2) Smoke alarms required in Article 9.10.18.1 and Sentence (1) shall be installed on or near the ceiling.

9.10.18.3. Power Supply

(1) Smoke alarms shall be installed by permanent connections to an electrical circuit and shall have no disconnect switch between the overcurrent device and the smoke alarm.

(2) Where the building is not supplied with electrical power, smoke alarms are permitted to be battery operated.

9.10.18.4. Interconnection of Smoke Alarms. 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.

9.10.18.5. Instructions for Maintenance and Care. 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.

9.10.19. Fire Fighting

9.10.19.1. Windows or Access Panels Required

(1) Except as provided in Sentence (3), a window or access panel providing an opening not less than 1100 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 not less than 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.
9.10.19.2. Access to Basements

(1) Except in basements serving not more than one dwelling unit, each unsprinklered basement exceeding 25 m in length or width shall be provided with direct access to the outdoors to not less than one street.

(2) Access required in Sentence (1) may 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) may also be provided by an interior stair accessible from the outdoors.

9.10.19.3. 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 A-3.2.5.7.(1) in Appendix A.)

(2) Where access to a building as required in Sentence (1) is provided by means of a roadway or yard shall take into account connection with public thoroughfares, weight of fire fighting equipment, width of roadway, radius of curves, overhead clearance, location of fire hydrants, location of fire department connections and vehicular parking.

9.10.19.4. Portable Extinguishers. Portable extinguishers shall be installed in all buildings, except within dwelling units, in conformance with the appropriate provincial or municipal regulations or, in the absence of such regulations, the National Fire Code of Canada 1990.

9.10.20. Fire Protection for Construction Camps

9.10.20.1. Requirements for Construction Camps. Except as provided in Articles 9.10.20.2. to 9.10.20.11., construction camps shall conform to Sections 9.10.1. to 9.10.19.

9.10.20.2. Separation of Sleeping Rooms. Except for sleeping rooms within dwelling units, sleeping rooms in construction camps 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.

9.10.20.3. Floor Assemblies between the First and Second Storey. Except in a dwelling unit, a floor assembly in a construction camp building 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.

9.10.20.4. Walkways Connecting Buildings. 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.

9.10.20.5. Spatial Separations. Construction camp buildings shall be separated from each other by a distance of not less than 10 m except as otherwise permitted in Subsection 9.10.14.

9.10.20.6. 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 per cent 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 having a fire-resistance rating of not less than 45 min shall have a flame-spread rating conforming to the appropriate requirements in Subsection 9.10.16.

9.10.20.7. Smoke Detectors. Except in dwelling units, corridors providing access to exit from sleeping rooms in construction camp buildings with sleeping accommodation for more than 10 persons shall be provided with a smoke detector connected to the building alarm system.

9.10.20.8. Portable Fire Extinguishers. Each construction camp building shall be provided
9.10.20.8. with portable fire extinguishers in conformance with the appropriate provincial or municipal regulations or, in the absence of such regulations, in conformance with the National Fire Code of Canada 1990.

9.10.20.9. Hose Stations

(1) Every construction camp building providing sleeping accommodation for more than 30 persons shall be provided with a hose station that is protected from freezing and is 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 not less than 4 500 L with a pumping system capable of supplying a flow of not less than 5 L/s at a gauge pressure of 300 kPa.

Section 9.11 Sound Control

9.11.1. Sound Transmission Class Rating (Airborne Sound)


9.11.2. Required Sound Control Locations (Airborne Sound)

9.11.2.1. Minimum Sound Transmission Class Ratings

(1) Except as provided in Sentence (2), every dwelling unit shall be separated from every other space in a building in which noise may be generated by a construction providing a sound transmission class rating of at least 50, measured in accordance with Subsection 9.11.1. or listed in A-9.10.3.1. in Appendix A.

(2) Where a dwelling unit is adjacent to an elevator shaft or a refuse chute, the separating construction shall have a sound transmission class rating of at least 55, measured in accordance with Subsection 9.11.1. or listed in A-9.10.3.1. in Appendix A.

Section 9.12 Excavation

9.12.1. General


(1) The topsoil and vegetable matter in all unexcavated areas under a building shall be removed.

(2) In localities where termites are known to occur, 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. Excavations shall be kept free of standing water.

9.12.1.3. Protection from Freezing. The bottom of excavations shall be kept from freezing throughout the entire construction period.

9.12.2. Depth


9.12.2.2. Minimum Depth of Foundations

(1) Except as provided in Sentences (4) and (5), the minimum depth of foundations below finished ground level shall conform to Table 9.12.2.A.

(2) The minimum depth of foundations for exterior concrete steps with more than 2 risers shall conform to Sentences (1) to (5).
Table 9.12.2.A.  
Forming Part of Sentence 9.12.2.2(1)

<table>
<thead>
<tr>
<th>Type of Soil</th>
<th>Foundation Containing Heated Basement or Crawl Space</th>
<th>Foundation Containing no Heated Space</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Good Soil Drainage to not less than the Depth of Frost Penetration</td>
<td>Poor Soil Drainage</td>
</tr>
<tr>
<td>Rock</td>
<td>No limit</td>
<td>No limit</td>
</tr>
<tr>
<td>Coarse grained soils</td>
<td>No limit</td>
<td>No limit</td>
</tr>
<tr>
<td>Silt</td>
<td>No limit</td>
<td>No limit</td>
</tr>
<tr>
<td>Clay or soils not clearly defined (1)</td>
<td>1.2 m</td>
<td>1.2 m</td>
</tr>
<tr>
<td>Column 1</td>
<td>2</td>
<td>3</td>
</tr>
</tbody>
</table>

Note to Table 9.12.2.A.:  
(1) See Appendix A.

(3) Concrete steps with 1 and 2 risers are permitted to be laid on ground level.

(4) 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.

(5) The foundation depths required in Sentence (1) do not apply to foundations for buildings of other than masonry or masonry veneer construction  
   (a) whose superstructure will not be damaged by differential soil movement caused by frost action, or
   (b) used as accessory buildings of not more than 1 storey in building height and not more than 50 m² in building area.

9.12.3. Backfill

9.12.3.1. Placement of Backfill. Backfill shall be placed to avoid damaging the foundation wall, the drainage tile, externally applied thermal insulation and waterproofing of the wall.

9.12.3.2. Grading of Backfill. Backfill shall be graded to prevent drainage towards the foundation after settling.

9.12.3.3. Deleterious Debris and Boulders. Backfill within 600 mm of the foundation shall be free of deleterious debris and boulders larger than 250 mm diam.

9.12.4. Trenches beneath Footings

9.12.4.1. 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
Waterproofing and Dampproofing
(See Appendix A.)

9.13.1. General

9.13.1.1. Required Waterproofing
(1) Where hydrostatic pressure occurs, floors on ground and exterior surfaces of walls below ground level shall be waterproofed.

(2) Roofs of underground structures shall be waterproofed to prevent the entry of water into the structure.

9.13.1.2. Required Dampproofing
(1) Where hydrostatic pressure does not occur and 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 in garages and unenclosed portions of buildings, concrete slabs-on-ground shall be dampproofed. (See A-9.13 in Appendix A.)

9.13.1.3. Standards for Application
(1) The method of application of all bituminous waterproofing and dampproofing materials shall conform to
(a) CGSB 37-GP-3M, “Application of Emulsified Asphalts for Dampproofing or Waterproofing,”
(b) CGSB 37-GP-6Ma, “Asphalt, Cutback, Unfilled, for Dampproofing,”
(c) CGSB 37-GP-16M, “Asphalt, Cutback, Filled, for Dampproofing and Waterproofing,”
(d) CGSB 37-GP-18Ma, “Tar, Cutback, Unfilled, for Dampproofing,”
(e) CSA A123.4, “Bitumen for Use in Construction of Built-Up Roof Coverings and Dampproofing and Waterproofing Systems,” or
(f) CAN2-51.34-M, “Vapour Barrier, Polyethylene Sheet, for Use in Building Construction.”

9.13.2. Material

9.13.2.1. Material Standards
(1) Materials used for dampproofing or waterproofing shall conform to
(a) CAN/CGB-37.2-M, “Asphalt, Emulsified, Mineral Colloid Type, Unfilled, for Dampproofing and Waterproofing and for Roof Coatings,”
(b) CGSB 37-GP-6Ma, “Asphalt, Cutback, Unfilled, for Dampproofing,”
(c) CGSB 37-GP-16M, “Asphalt, Cutback, Filled, for Dampproofing and Waterproofing,”
(d) CGSB 37-GP-18Ma, “Tar, Cutback, Unfilled, for Dampproofing,”
(e) CSA A123.4, “Bitumen for Use in Construction of Built-Up Roof Coverings and Dampproofing and Waterproofing Systems,” or
(f) CAN2-51.34-M, “Vapour Barrier, Polyethylene Sheet, for Use in Building Construction.”

9.13.3. Waterproofing of Walls

9.13.3.1. Preparation of Surface
(1) Unit masonry walls 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.

(2) Concrete walls to be waterproofed shall have all holes and recesses resulting from removal of form ties sealed with mortar or waterproofing material.

9.13.3.2. Application of Waterproofing
Membranes. Concrete or unit masonry walls to be waterproofed shall be covered with not less than 2 layers of bitumen-saturated membrane, with each layer being cemented in place with bitumen and coated over-all with a heavy coating of bitumen.

9.13.4. Waterproofing of Floors

9.13.4.1. Basement floors 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 mopped to the wall membrane to form a complete seal.

9.13.5. Dampproofing of Walls

9.13.5.1. Preparation of Surface
(1) 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, and shall be coved over the footing when the first course of block is laid.

(2) Concrete walls to be dampproofed shall have holes and recesses resulting from the removal of form ties sealed with cement mortar or dampproofing material.

9.13.5.2. Application of Dampproofing Material. Bituminous or other dampproofing material shall be applied over the parging or concrete below ground level.

9.13.5.3. Interior Dampproofing of Walls

(1) Where a separate interior cladding is applied to a concrete or unit masonry wall which is in contact with the soil, or where wood members are applied to such walls for the installation of insulation or finish, the interior surface of the foundation wall below ground level shall be dampproofed.

(2) The dampproofing required in Sentence (1) shall extend from the basement floor and shall terminate at ground level and no membrane shall be applied above ground level between the insulation and the foundation wall.

9.13.5.4. Barrier to Soil Gas and Water Vapour. Masonry walls which are to be dampproofed and which are not dampproofed on their interior surface as required in Sentence 9.13.5.3.(1) shall include a course of masonry units without voids or be sealed with flashing material extending across the full width of the masonry at or below the level of the adjoining floor slab or, in the absence of a floor slab, the level of the ground cover required in Article 9.18.6.1. (See A-9.13 in Appendix A.)

9.13.6. Dampproofing and Sealing of Slabs

9.13.6.1. Location of Dampproofing. When slabs are dampproofed, the dampproofing shall be installed below the slab, except that where a separate floor is provided over the slab, the dampproofing may be applied to the top of the slab.

9.13.6.2. Dampproofing below the Slab

(1) When installed below the slab, dampproofing shall consist of polyethylene not less than 0.15 mm thick.

(2) Joints in dampproofing described in Sentence (1) shall be lapped not less than 300 mm.

9.13.6.3. Dampproofing above the Slab. When installed above the slab, dampproofing shall consist of not less than 2 mopped-on coats of bitumen, 0.05 mm polyethylene or other material providing equivalent performance.

9.13.6.4. Perimeter Seal. The slab shall be sealed around its perimeter to the inner surfaces of adjacent walls using flexible sealant. (See A-9.13 in Appendix A.)

9.13.6.5. Seal of Penetrations. All penetrations of the slab by pipes or other objects shall be sealed against water vapour and soil gas leakage. (See A-9.13 in Appendix A.)

9.13.6.6. Seal of Drain Penetrations. All penetrations of the surface of the concrete slab which are required to drain water from the slab surface shall be sealed in a manner which prevents the upward flow of water vapour and soil gas without preventing the downward flow of liquid water. (See A-9.13 in Appendix A.)

Section 9.14 Drainage


9.14.1.1. Application. This Section applies to subsurface drainage and to surface drainage.


9.14.1.3. Floor Slabs. Drainage requirements beneath floor slabs shall conform to Section 9.16.

9.14.2. General

9.14.2.1. Foundation Wall Drainage

(1) Unless it can be shown to be unnecessary, the bottom of every exterior foundation wall shall be drained by drainage tile or pipe laid around the

(2) Where mineral fibre insulation or crushed rock backfill is provided adjacent to the exterior surface of a foundation wall, it shall extend to the footing level to facilitate drainage of ground water to the foundation drainage system. (See Appendix A.)

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,”
(b) ASTM C412-M, “Concrete Drain Tile,”
(c) ASTM C444-M, “Perforated Concrete Pipe Metric,”
(d) ASTM C700, “Vitrified Clay Pipe, Extra Strength, Standard Strength and Perforated,”
(e) CAN/CGSB-34.22-M, “Pipe, Asbestos Cement, Drain,”
(f) CGSB 41-GP-29M, “Tubing, Plastic, Corrugated, Drainage,”
(g) CSA B182.1, “Plastic Drain and Sewer Pipe and Pipe Fittings,” or
(h) CAN3-G401, “Corrugated Steel Pipe Products.”

9.14.3.2. Minimum Size. 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 undis turbed or well-compacted soil so that the top of the tile or pipe is below the bottom of the floor slab or 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 per cent of material that will pass a 4 mm sieve.


9.14.4.1. Type of Granular Material. 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 not more than 10 per cent of material that will pass a 4 mm sieve.

9.14.4.2. Installation. Granular material described in Article 9.14.4.1. shall be laid on undis turbed or compacted soil to a minimum depth of not less than 125 mm beneath the building and extend not less than 300 mm beyond the outside edge of the footings.

9.14.4.3. Grading. 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. 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 are kept free of soil.

9.14.5. Drainage Disposal

9.14.5.1. Drainage Disposal. Foundation drains shall drain to a sewer, drainage ditch or dry well.

9.14.5.2. Sump Pits

(1) Where a sump pit is provided, it shall be not less than 750 mm deep, 0.25 m² in area and be provided with a cover.

(2) Where gravity drainage is not practical, an automatic sump pump shall be provided to discharge the water from the sump pit described in Sentence (1) into a sewer, drainage ditch or dry well.

9.14.5.3. Dry Wells

(1) Dry wells may be used only when located in areas where the natural groundwater level is below the bottom of the dry well.
9.14.6. **Surface Drainage**

9.14.6.1. **Surface Drainage.** The building shall be located on the building site so that water will not accumulate at or near the building.

9.14.6.2. **Drainage away from Wells or Septic Disposal Beds.** Surface drainage shall be directed away from the location of a water supply well or septic tank disposal bed.

9.14.6.3. **Catch Basin.** Where runoff water from a driveway is likely to accumulate or enter a garage, a catch basin shall be installed to provide adequate drainage.

9.14.6.4. **Downspouts.** Where downspouts are provided and are not connected to a sewer, provisions shall be made to prevent soil erosion.

**Section 9.15 Footings and Foundations**

9.15.1. **Scope**

9.15.1.1. **Application**

(1) Except as provided in Articles 9.15.1.2. and 9.15.1.3., this Section applies to concrete or unit masonry foundation walls and concrete footings on soils with an allowable bearing pressure of 75 kPa or greater for buildings of wood frame or masonry construction. (See Appendix A.)

(2) *Foundations* for applications other than as described in Sentence (1) shall be designed in accordance with Section 9.4.

9.15.1.2. **Permafrost.** 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. **Wood Frame Foundations**

(1) *Foundations* of wood frame construction are permitted to be used provided they conform to Sentence (2) or (3).

(2) Except as provided in Sentence (3), wood frame *foundations* shall be designed in conformance with Part 4.

(3) Wood frame *foundations* need not conform to Sentence (2) provided such *foundations*, including their lateral supports, conform to CAN3-S406, "Construction of Preserved Wood Foundations."

(4) The *foundation* referred to in Sentence (3) shall be supported on soil having an *allowable bearing pressure* of not less than 75 kPa and shall not be subjected to loads that exceed those determined from the design assumptions listed in Clause 1.1.2. of the Standard. (See Appendix A.)

9.15.2. **General**

9.15.2.1. **Concrete.** Concrete shall conform to Section 9.3.

9.15.2.2. **Concrete Block.** Concrete block shall be loadbearing type conforming to CAN3-A165.1, "Concrete Masonry Units" and shall have a compressive strength over the gross area of the block of not less than 7.5 MPa for hollow units and 12.5 MPa for solid units.

9.15.2.3. **Unit Masonry Construction.** Mortar, mortar joints, corbelling and protection for unit masonry shall conform to Section 9.20.

9.15.2.4. **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 when 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.
9.15.3. Footings

9.15.3.1. Footings Required. Footings shall be provided under walls, pilasters, columns, piers, fireplaces and chimneys that bear on soil or rock, except that footings may 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. Footings shall rest on undisturbed soil, rock or compacted granular fill.

9.15.3.3. Footing Sizes

(1) Except as provided in Sentences (2) to (6), the minimum footing size shall be as shown in Table 9.15.3.A. provided the length of supported joists does not exceed 4.9 m and the design live load on any floor supported by the footing does not exceed 2.4 kPa (Table 4.1.6.A.).

(2) Where the design live load exceeds 2.4 kPa or the length of the supported joists exceeds 4.9 m, footings shall be designed in accordance with Section 4.2.

(3) The strip footing sizes for exterior walls shown in Column 2 of Table 9.15.3.A. shall be increased by 65 mm for each storey of masonry veneer over wood frame construction supported by the foundation wall.

(4) The strip footing sizes for exterior walls shown in Column 2 of Table 9.15.3.A. shall be increased by 130 mm for each storey of masonry construction supported by the foundation wall.

(5) The minimum strip footing sizes for interior walls shown in Column 3 of Table 9.15.3.A. shall be increased by 100 mm for each storey of masonry construction supported by the footing.

(6) The footing area for column spacings other than shown in Table 9.15.3.A. shall be adjusted in proportion to the distance between columns.

9.15.3.4. High Water Table. 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, the footing width shall be not less than twice the width required by Article 9.15.3.3.

9.15.3.5. Non-Loadbearing Walls. Footings for interior non-loadbearing masonry walls shall be not less than 200 mm wide for walls up to 5.5 m high and shall be increased by 100 mm for each additional 2.7 m of height.

9.15.3.6. Thickness. Footings shall be not less than 100 mm thick except when greater thicknesses are required because of the projection of the footing beyond the supported element.

9.15.3.7. Footing Projection. The projection of an unreinforced footing beyond the supported element shall be not greater than the thickness of the footing.

9.15.3.8. Step Footings. When step footings are used, the vertical rise between horizontal portions shall not exceed 600 mm. The horizontal distance between risers shall not be less than 600 mm.

9.15.4. Foundation Walls

9.15.4.1. Foundation Wall Thickness. Where average stable soils are encountered, the thickness of foundation walls subject to lateral earth
### Table 9.15.4.A.
Forming Part of Article 9.15.4.1.

<table>
<thead>
<tr>
<th>Type of Foundation Wall</th>
<th>Minimum Wall Thickness, mm</th>
<th>Maximum Height of Finish Grade Above Basement Floor or Inside Grade</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Foundation Wall Laterally Unsupported at the Top, (m)</td>
</tr>
<tr>
<td>Solid concrete (15 MPa min. strength)</td>
<td>150</td>
<td>0.80</td>
</tr>
<tr>
<td></td>
<td>200</td>
<td>1.20</td>
</tr>
<tr>
<td></td>
<td>250</td>
<td>1.40</td>
</tr>
<tr>
<td></td>
<td>300</td>
<td>1.50</td>
</tr>
<tr>
<td>Solid concrete (20 MPa min. strength)</td>
<td>150</td>
<td>0.80</td>
</tr>
<tr>
<td></td>
<td>200</td>
<td>1.20</td>
</tr>
<tr>
<td></td>
<td>250</td>
<td>1.40</td>
</tr>
<tr>
<td></td>
<td>300</td>
<td>1.50</td>
</tr>
<tr>
<td>Unit masonry</td>
<td>140</td>
<td>0.60</td>
</tr>
<tr>
<td></td>
<td>190</td>
<td>0.90</td>
</tr>
<tr>
<td></td>
<td>240</td>
<td>1.20</td>
</tr>
<tr>
<td></td>
<td>290</td>
<td>1.40</td>
</tr>
<tr>
<td>Column 1</td>
<td>2</td>
<td>3</td>
</tr>
</tbody>
</table>

Note to Table 9.15.4.A.: (1) See Article 9.15.4.2.

latterly unsupported, unless the wall around the opening is reinforced to withstand the earth pressure.

(4) When the length of solid wall between windows is less than the average length of the windows, the combined length of such windows shall be considered as a single opening for the purposes of Sentence (3).

#### 9.15.4.5. Corbelling

Corbelling of foundation walls supporting cavity walls shall conform to Article 9.20.12.2.

#### 9.15.4.6. 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.

#### 9.15.4.7. Interior Masonry Walls

Interior masonry foundation walls not subject to lateral earth pressure shall conform to Section 9.20.

#### 9.15.5. Joist and Beam Support

##### 9.15.5.1. Support of Floor Joists

(1) Except as permitted in Sentence (2), foundation walls of hollow unit masonry supporting...
Section 9.16 Slabs-On-Ground

9.16.1. Scope

9.16.1.1. Application. This Section applies to concrete slabs supported on ground or on granular slabs that support loads from the superstructure.

9.16.1.2. Structural Floor Slabs. Floor slabs that support loads from the superstructure shall be designed in conformance with Part 4.


9.16.2. Granular Material beneath Slabs

9.16.2.1. Except for slabs in garages, not less than 100 mm of coarse clean granular material containing not more than 10 per cent of material that will pass a 4 mm sieve shall be placed beneath slabs in dwelling units. (See Appendix A.)

9.16.3. Drainage

9.16.3.1. Prevention of Water Accumulation. Except as provided in Article 9.16.3.2. or where it can be shown to be unnecessary, the accumulation of water underneath a slab-on-ground shall be prevented by grading or drainage.

9.16.3.2. Hydrostatic Pressure. Where ground water levels may cause hydrostatic pressure beneath the slab, the slab shall be designed to resist such pressures.

9.16.3.3. Floor Drains. When floor drains are installed (see Section 9.31), 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.
Dry cement shall not be added to the floor surfaces to absorb surplus water.

9.16.4.2. Topping Course

(1) When 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. Concrete slabs shall not be less than 75 mm thick exclusive of concrete topping.

9.16.4.4. Bond Break. A bond-breaking material shall be placed between the slab and footings or rock.

Section 9.17 Columns

9.17.1. Scope

9.17.1.1. Application

(1) This Section applies to columns used to support carport roofs (see Section 9.35), and beams carrying loads from not more than 2 wood-frame floors where the length of joists carried by such beams does not exceed 5 m and the live load on any floor does not exceed 2.4 kPa. (See Table 4.1.6.A.)

(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. Columns shall be centrally located on a footing conforming to Section 9.15.

9.17.2.2. Fastening. Columns shall be securely fastened to the supported member to prevent lateral movement.

9.17.3. Steel Columns

9.17.3.1. Size and Thickness

(1) Except as permitted in 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) may 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) may be omitted 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. Steel columns shall be treated on the outside surface with not less than one coat of rust-inhibitive paint.

9.17.3.4. Adjustable Steel Columns. Adjustable steel columns shall conform to CAN/CGSB 7.2-M, “Adjustable Metal Columns.”

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, glued-laminated or built-up.

(2) Built-up columns shall consist of not less than 38 mm thick full-length members bolted together with not less than 9.52 mm diam bolts spaced not more than 450 mm o.c., or 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. Wood columns shall be separated from concrete in contact with the ground by 0.05 mm polyethylene film or Type S roll roofing.

9.17.5. Unit Masonry Columns
9.17.5.1. Materials. Unit masonry columns shall be built of loadbearing masonry units.
9.17.5.2. Sizes. 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. Concrete shall conform to Section 9.3.
9.17.6.2. Sizes. 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. This Section applies to crawl spaces whose exterior walls have less than 25 per cent of their total area above exterior ground level open to the outdoors.
9.18.1.3. Insulation. Insulation shall conform to Section 9.25.

9.18.2. Access
9.18.2.1. Access Openings
(1) An access opening of not less than 500 mm by 700 mm shall be provided to each crawl space where the crawl space serves a single dwelling unit, and not less than 550 mm by 900 mm for other crawl spaces.
(2) Access openings shall be fitted with a door or hatch, except when the access opening into the crawl space is from the adjacent basement and provides ventilation to the crawl space.

9.18.3. Ventilation
9.18.3.1. General. Crawl spaces shall be ventilated by natural or mechanical means.
9.18.3.2. Natural Ventilation. Except as otherwise permitted in Article 9.18.3.5., natural ventilation for crawl spaces shall be provided to the outside air by not less than 0.1 m² of unobstructed vent area for every 50 m² of floor area.
9.18.3.3. Design of Vents. Vents for crawl spaces shall be designed to prevent the entry of snow, rain and insects, and shall be provided with tight-fitting covers to prevent air leakage in winter if the crawl space is heated.
9.18.3.4. Distribution of Vents. Vents for crawl spaces shall be uniformly distributed on opposite sides of the building.
9.18.3.5. Ventilation to the Outside Not Required. Ventilation to the outside air is not required when the crawl space is used as a warm-air plenum, or if the crawl space is vented to an adjacent basement with an opening conforming to Article 9.18.3.2.

9.18.4. Clearance
9.18.4.1. Ground Clearance. The ground level in a crawl space shall be not less than 300 mm below the level of all joists and beams, except that in localities where termites are known to occur, the clearance shall be not less than 450 mm, unless the joists are pressure treated with a chemical that is toxic to termites.
9.18.4.2. Access Way to Services. Where equipment requiring service such as plumbing cleanouts, traps and burners is located in crawl spaces, an access way with a height and width of not less than 600 mm shall be provided from the access door to the equipment and for a distance of 900 mm on the side or sides of the equipment to be serviced.
9.18.5. Drainage

9.18.5.1. Drainage

(1) Unless groundwater levels and site conditions are such that water will not accumulate in the crawl space, the crawl space floor and access trenches shall be sloped to drain to a sewer, ditch or dry well.

(2) Drains shall conform to Section 9.14.

9.18.6. Ground Cover

9.18.6.1. Materials and Installation

(1) Except as required in Sentence (3), a ground cover consisting of not less than 50 mm of asphalt, 10 MPa Portland cement concrete, Type S roll roofing or 0.10 mm polyethylene shall be provided in every crawl space.

(2) Joints in sheet-type ground cover required in Sentence (1) shall be lapped not less than 100 mm and weighted down.

(3) Where a crawl space serves a dwelling unit and is not vented to the outside air, a ground cover consisting of not less than 0.15 mm polyethylene sheet conforming to CAN2-51.34-M, “Vapour Barrier, Polyethylene Sheet, for Use in Building Construction” shall be provided in every crawl space.

(4) Joints in the ground cover required in Sentence (3) shall be lapped not less than 300 mm and weighted down.

(See A-9.13 in Appendix A.)

9.18.7. Fire Protection

9.18.7.1. Crawl Spaces as Warm Air Plenums

(1) Crawl spaces used as warm-air plenums in buildings of residential occupancy shall be restricted to 1-storey portions of dwelling units.

(2) Enclosing material in crawl spaces described in Sentence (1) including insulation shall have a surface flame-spread rating not greater than 150.

(3) Combustible ground cover in crawl spaces described in Sentence (1) shall be covered with noncombustible material or have noncombustible receptacles beneath the register openings.

Section 9.19 Roof Spaces

9.19.1. Ventilation

9.19.1.1. Required Ventilation

(1) Except as provided in Article 9.19.1.2., every roof space or attic above an insulated ceiling shall be ventilated with openings to the exterior to provide unobstructed vent area of not less than 1/300 of the insulated ceiling area.

(2) Vents required in Sentence (1) may be roof type, eave type, gable-end type or any combination thereof, and shall be uniformly distributed on opposite sides of the building.

(3) Vents required in Sentence (1) shall be designed to prevent the entry of rain, snow and insects.

(4) The unobstructed vent area required in Sentence (1) shall be determined in conformance with CAN3-A93, “Natural Airflow Ventilators for Buildings.”

9.19.1.2. Low Slope Roofs

(1) Where insulation is placed below the roof sheathing in roofs having a slope of less than 1 in 6 or in roofs that are constructed with roof joists, the unobstructed vent area shall be not less than 1/150 of the insulated ceiling area.

(2) Vents described in Sentence (1) shall be uniformly distributed to ventilate each roof space.

9.19.1.3. Cross Purlins

(1) Except as provided in Sentence (2), cross purlins not less than 38 mm by 38 mm shall be applied to the top of the roof joists where the roof does not incorporate an attic space, and the top of the insulation shall be not less than 25 mm below the top of the roof joists.

(2) Cross purlins required by Sentence (1) may be omitted where the roof slope is 1 in 6 or greater provided the roof framing members run in the same direction as the roof slope and a clearance of not less than 75 mm is maintained between the underside of the roof sheathing and the top of the insulation throughout the length of the roof joist.
(3) Vents in roofs described in Sentence (2) shall be distributed so that approximately 50 per cent of the required vent area is located near the lower part of the roof and approximately 50 per cent of the required vent area is near the ridge.

9.19.1.4. Obstruction by Insulation. Ceiling insulation shall be installed in a manner which will not restrict a free flow of air through roof vents or through any portion of the roof space or attic.

9.19.1.5. Mansard or Gambrel Roof

(1) The lower portion of a mansard or gambrel style roof need not be ventilated.

(2) The upper portion of roofs described in Sentence (1) shall be ventilated in conformance with the requirements in Articles 9.19.1.1. to 9.19.1.4., except that not less than 50 per cent of the required vent opening shall be provided near the junction of the upper and lower portions.

9.19.2. Access

9.19.2.1. Access

(1) Every attic space more than 600 mm in height at the highest point shall be provided with an access stair or shall have a hatchway of not less than 550 mm by 900 mm, except that where such hatchway serves not more than one dwelling unit, the hatchway may be reduced to 500 mm by 700 mm.

(2) Hatchways to attic spaces shall be fitted with doors or covers.

Section 9.20 Above-Grade Masonry

9.20.1. Scope

9.20.1.1. Application

(1) This Section applies to unreinforced masonry and masonry veneer in which the wall height above the foundation wall does not exceed 11 m, and in which the roof or floor system above the first storey is not of concrete construction.

(2) For buildings other than described in Sentence (1), or where the masonry is designed on the basis of design loads and allowable stresses, Subsection 4.3.2. shall apply.

9.20.1.3. Earthquake Reinforcement

(1) In velocity- or acceleration-related seismic zones of 4 or greater, loadbearing elements of masonry buildings more than 1 storey in building height shall be reinforced with not less than the minimum amount of reinforcement required in Subsection 9.20.15.

(2) In velocity- or acceleration-related seismic zones of 2 and 3, loadbearing elements of masonry buildings 3 storeys in building height shall be reinforced with not less than the minimum amount of reinforcement required in Subsection 9.20.15. (See Appendix A.)

9.20.2. Masonry Units

9.20.2.1. Masonry Unit Standards

(1) Masonry units shall comply with

(a) CAN/CSA-A82.1, “Burned Clay Brick (Solid Masonry Units Made from Clay or Shale),”

(b) CSA A82.3, “Calcium Silicate (Sand-Lime) Building Brick,”

(c) CSA A82.4, “Structural Clay Load-Bearing Wall Tile,”

(d) CSA A82.5, “Structural Clay Non-Load-Bearing Tile,”

(e) CAN3-A165.1, “Concrete Masonry Units,”

(f) CAN3-A165.2, “Concrete Brick Masonry Units,”

(g) CAN3-A165.3, “Prefaced Concrete Masonry Units,”

(h) CAN3-A165.4, “Autoclaved Cellular Units,”

(i) ASTM C126, “Ceramic Glazed Structural Clay Facing Tile, Facing Brick, and Solid Masonry Units,” or

(j) ASTM C212, “Structural Clay Facing Tile.”

9.20.2.2. Used Brick. 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. Glass blocks shall not be used as loadbearing units or in the construction of fireplaces or chimneys.
9.20.2.4. Foamed Concrete. Masonry made with foamed concrete shall not be used in contact with the soil or exposed to the weather.

9.20.2.5. Stone. Stone shall be sound and durable.

9.20.2.6. Concrete Units Exposed to the Weather

(1) Loadbearing concrete units or non-loadbearing concrete units exposed to the weather shall have weight and water absorption characteristics conforming to the Classes A, B or C, described in CAN3-A165.1, “Concrete Masonry Units.”

(2) Where cellular concrete blocks are used in situations described in Sentence (1), allowance shall be made in the design for the shrinkage characteristics of the units to be used.

9.20.2.7. Compressive Strength. The compressive strength of masonry units shall conform to Table 9.20.2.A.

Table 9.20.2.A.
Forming Part of Article 9.20.2.7.

<table>
<thead>
<tr>
<th>Type of Unit</th>
<th>Minimum Compressive Strength over Net Area, MPa</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Exposed to Weather</td>
</tr>
<tr>
<td>Solid or hollow concrete block</td>
<td>15</td>
</tr>
<tr>
<td>Solid loadbearing cellular units</td>
<td>Not permitted</td>
</tr>
<tr>
<td>Solid non-loadbearing cellular units</td>
<td>Not permitted</td>
</tr>
<tr>
<td>Column 1</td>
<td>2</td>
</tr>
</tbody>
</table>

9.20.3. Mortar

9.20.3.1. Mortar Materials

(1) Cementitious materials and aggregates for mortar shall comply with

(a) CAN3-A5, “Portland Cements,”
(b) CAN3-A8, “Masonry Cement,”

(c) CSA A82.22, “Gypsum Plasters,”
(d) CSA A82.56, “Aggregate for Masonry Mortar,”
(e) ASTM C5, “Quicklime for Structural Purposes,” or
(f) ASTM C207, “Hydrated Lime for Masonry Purposes.”

(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 Mixes

(1) Except as provided in Sentences (3) and (4), mortar mixes shall conform to Table 9.20.3.A.

(2) Mortar containing portland cement shall not be used later than 2.5 h after mixing.

(3) Mortar for sand-lime brick and concrete brick may consist of 1 part of masonry cement to not less than 3 or not more than 3.5 parts of aggregate by volume in addition to those mixes permitted in Table 9.20.3.A.

(4) Mortar for glass block shall consist of 1 part portland cement, 1 part hydrated lime to not more than 4 parts aggregate by volume.

9.20.4. Mortar Joints

9.20.4.1. Thickness

(1) Maximum average joint thickness shall be 12 mm.

(2) Maximum thickness of an individual joint shall be 20 mm.

9.20.4.2. Solid Masonry Units. Solid masonry units shall be laid full head and bed joints.

9.20.4.3. Hollow Masonry Units. Hollow masonry units shall be laid with mortar applied to head and bed joints of both inner and outer face shells.
Table 9.20.3.A.
Forming Part of Article 9.20.3.2.

Mortar Mix Proportions (by volume)

<table>
<thead>
<tr>
<th>Permissible Use of Mortar</th>
<th>Portland Cement</th>
<th>Masonry Cement</th>
<th>Lime</th>
<th>Aggregate</th>
</tr>
</thead>
<tbody>
<tr>
<td>All locations but not for use with sand-lime or concrete brick</td>
<td>1/2 to 1</td>
<td>1</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>All locations except foundation walls and piers, but not for use with sand-lime or</td>
<td>1</td>
<td>—</td>
<td>1/4 to 1/2</td>
<td></td>
</tr>
<tr>
<td>concrete brick</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>All locations except loadbearing walls of hollow units, parapet walls and chimneys</td>
<td>1</td>
<td>1</td>
<td>1/4 to 2 1/2</td>
<td></td>
</tr>
<tr>
<td>All non-loadbearing interior walls and all loadbearing walls of solid units, except</td>
<td>1</td>
<td>—</td>
<td>2 1/4 to 4</td>
<td></td>
</tr>
<tr>
<td>foundation walls, parapet walls and chimneys</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Column 1 2 3 4 5

Table 9.20.5.A.
Forming Part of Sentence 9.20.5.2.(2)

Maximum Allowable Spans for Steel Lintels Supporting Masonry Veneer, m

<table>
<thead>
<tr>
<th>Minimum Angle Size, mm</th>
<th>Vertical Leg</th>
<th>Horizontal Leg</th>
<th>Thickness</th>
<th>75 mm Brick</th>
<th>90 mm Brick</th>
<th>100 mm Stone</th>
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<tr>
<td></td>
<td>90</td>
<td>75</td>
<td>6</td>
<td>2.55</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>90</td>
<td>90</td>
<td>6</td>
<td>2.59</td>
<td>2.47</td>
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</tbody>
</table>

Column 1 2 3 4 5 6

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 may be supported on foundations of wood frame constructed in conformance with Sentence 9.15.1.3.(3).

(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 or masonry lintels or arches designed to support the imposed load.

(2) Steel angle lintels supporting masonry veneer above openings shall conform to Table 9.20.5.A.
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-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 walls 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 nor 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 Article 9.20.10.1.

(2) Interior non-loadbearing walls shall be not less than 65 mm thick. (See Article 9.20.10.1.)

**9.20.6.4. Masonry Veneer Walls**

(1) Masonry veneer resting on a bearing support shall be of solid units not less than 75 mm thick for wall heights up to 11 m.

(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 individually supported by the back-up material shall conform to the appropriate requirements contained in Subsection 4.3.2.

**9.20.6.5. Parapet Walls**

(1) The height of parapet walls above the adjacent roof surface shall be not more than 3 times the parapet wall thickness.

(2) Parapet walls shall be solid from the top of the parapet to not less than 300 mm below the adjacent roof level.

**9.20.6.6. Facings.** Limestone slab facings and precast concrete panel facings shall conform to the appropriate requirements of Subsection 4.3.2.

**9.20.7. Chases and Recesses**

**9.20.7.1. Maximum Dimensions.** Except as permitted 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 horizontal projection of the chase or recess shall not exceed 500 mm.

**9.20.7.2. Minimum Wall Thickness**

(1) Except as permitted 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 and 750 mm in height, and the horizontal projection of the recess does not exceed 500 mm.

**9.20.7.3. Separation of Chases or Recesses.** Chases and recesses shall not be less than 4 times the wall thickness apart and not less than 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.** 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.

**9.20.7.5. Chases or Recesses Cut into Walls.** Chases and 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), load-bearing 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

(1) Floor joists supported on cavity walls shall be supported on solid 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 not less than 57 mm of solid masonry, bridging the full thickness of the wall, or 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.

9.20.8.5. Distance to Edge of Supporting Members. The distance from the face of a wall to the edge of a supporting member attached to the structure, such as a shelf angle or the flange of a beam, shall not exceed 30 mm, except as otherwise permitted in Subsection 4.3.2.

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 not less than 2 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 Ties. Masonry walls that consist of 2 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 Article 9.20.9.4.

9.20.9.3. Bonding with Masonry Units

(1) Where wythes are bonded together with masonry units, the bonding units shall comprise not less than 4 per cent 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. Bonding with Metal Ties

(1) Where 2 or more wythes are bonded together with metal ties of the individual rod type, the ties shall conform to the requirements in Sentences (2) to (7).

(2) Other metal bonding 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.
9.20.10.1. Lateral Support

9.20.10.1.1. Lateral Support Required

(1) Masonry walls shall be supported at right angles to the wall by floor or roof construction or by intersecting masonry walls or buttresses.

(2) The maximum spacing of supports required in Sentence (1) shall be

(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 two-thirds of the sum of the thicknesses of the wythes.

(4) Floor and roof constructions 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.

### Table 9.20.9.A.

<table>
<thead>
<tr>
<th>Veneer Tie Spacing</th>
<th>Maximum Vertical Spacing, mm</th>
<th>Maximum Horizontal Spacing, mm</th>
</tr>
</thead>
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<td>400</td>
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<td>600</td>
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<tr>
<td>Column 1</td>
<td>2</td>
<td></td>
</tr>
</tbody>
</table>
9.20.11. Anchorage of Roofs, Floors and Intersecting Walls

9.20.11.1. Anchorage of Floor or Roof Assemblies

(1) Where required to provide lateral support (see Subsection 9.20.10.), 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 tie.

(4) When joists are parallel to the wall, anchors required in Sentence (1) shall extend across not less than 3 joists.

9.20.11.2. Anchorage of Intersecting Walls

(1) Where required to provide lateral support, intersecting walls shall be bonded or tied together.

(2) Fifty per cent of the adjacent masonry units in the intersecting wall referred to in Sentence (1) shall be embedded in the laterally supported wall, or corrosion-resistant metal ties equivalent to not less than 4.76 mm by 40 mm steel strapping shall be provided.

(3) Ties required in Sentence (1) shall be spaced not more than 800 mm o.c. vertically and 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 walls by not less than 12.7 mm diam anchor bolts, spaced not more than 2.4 m apart, embedded not less than 90 mm into the masonry and 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. Cornices, sills or other trim of masonry material which project beyond the wall face shall have not less than 65 per cent 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. Anchor Bolts. Where anchor bolts are to be placed in the top of a pier, the pier shall be capped with concrete or reinforced masonry not less than 300 mm thick.

9.20.12. Corbelling

9.20.12.1. Corbelling

(1) All corbelling shall consist of solid 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) The unit masonry foundation wall referred to in Sentence (1) is permitted to be corbelled to meet flush with the inner face of a cavity wall provided the individual corbel does not exceed half the height or one third the width of the corbelled unit and the total corbel does not exceed one-third of the foundation wall thickness.
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 not less than 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 Exposed Flashing

(1) Exposed flashing shall consist of not less than 1.73 mm sheet lead, 0.33 mm galvanized steel, 0.36 mm copper, 0.46 mm zinc or 0.48 mm thick aluminum.

(2) Aluminum flashing in contact with masonry or concrete shall be effectively coated or separated from the masonry or concrete by an impervious membrane.

9.20.13.2. Materials for Concealed Flashing. Concealed flashing shall consist of not less than 1.73 mm sheet lead, 0.33 mm galvanized steel, 0.36 mm copper, 0.46 mm zinc, Type S roll roofing, 0.15 mm polyethylene or 0.05 mm copper or aluminum laminated to felt or kraft paper.

9.20.13.3. Fastening of Flashing. Fastening devices for flashing shall be corrosion-resistant and compatible with the flashing with respect to galvanic action.

9.20.13.4. 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 or door openings in exterior walls when the vertical distance between the top of a window or door trim and the bottom edge of the eave exceeds one-quarter of the horizontal eave overhang.

9.20.13.5. Extension of Flashing. When installed beneath jointed masonry window sills or over the heads of openings, flashing shall extend from the front edge of the masonry up behind the sill or lintel.

9.20.13.6. Flashing for Weep Holes in Cavity Walls

(1) Flashing beneath weep holes in cavity 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 supporting wall, and
   (c) slope toward the outside wythe.

9.20.13.7. Flashing for Weep Holes in Veneer

(1) 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 supporting wall to a point 150 mm up behind the sheathing paper.

(2) Flashing described in Sentence (1) is permitted to conform to the requirements for concealed flashing in Article 9.20.13.2.


9.20.13.9. Required Weep Holes. Weep holes spaced not more than 800 mm apart shall be provided at the bottom of the cavity in cavity wall and masonry veneer wall construction including the cavities above lintels over window and door openings required to be flashed in conformance with Article 9.20.13.4.

9.20.13.10. 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 which 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 covered on the interior surface with sheathing paper conforming to CAN2-
51.32, "Sheathing, Membrane, Breather Type," 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 insulation that effectively limits the passage of water is applied by a waterproof adhesive or mortar directly to parged masonry, the requirements for sheathing paper in Sentence (1) do not apply. (See Appendix A.)

9.20.13.11. Mortar Drippings. 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.

9.20.13.12. Caulking at Door and Window Frames. The junction of door and window frames with masonry shall be caulked in conformance with Subsection 9.27.4.

9.20.13.13. Drips beneath Window Sills. Where no flashing is installed beneath window sills, such sills shall be provided with a drip not less than 25 mm from the wall surface.

9.20.14. Protection

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 mortar mix.

9.20.14.2. Protection from Weather. 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. 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 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. Where reinforcement for masonry is required in this Section, it shall be installed in conformance with the requirements for reinforced masonry as contained in CAN3-A371, "Masonry Construction for Buildings."

9.20.16. Corrosion Resistance

9.20.16.1. Carbon steel connectors required to be corrosion-resistant shall be galvanized to at least the minimum standards in Table 9.20.16.A.

Table 9.20.16.A. Forming Part of Article 9.20.16.1.

<table>
<thead>
<tr>
<th>Connector Material</th>
<th>ASTM Standard</th>
<th>Coating Class</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wire ties and continuous reinforcing (hot-dipped galvanizing)</td>
<td>A153</td>
<td>Class B2 458 g/m²</td>
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<tr>
<td>Hardware and bolts</td>
<td>A153</td>
<td>See A153</td>
</tr>
<tr>
<td>Strip, plate, bars and rolled sections (not less than 3.18 mm thick)</td>
<td>A123</td>
<td>610 g/m²</td>
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<tr>
<td>Sheet (less than 3.18 mm thick)</td>
<td>A123</td>
<td>305 g/m² on material 0.76 mm thick</td>
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</table>

Note to Table 9.20.16.A.: (1) ASTM A123 does not apply to metal less than 3.18 mm thick. Galvanizing coatings may be interpolated for thicknesses between 3.18 mm and 0.76 mm.
Section 9.21 Chimneys and Flues

9.21.1. General

9.21.1.1. Application. Except when otherwise specifically stated herein, this Section applies to rectangular chimneys of brick masonry or concrete not more than 12 m in height serving fireplaces or serving appliances having a combined total rated heat output of 120 kW or less, and to flue pipes serving appliances regulated by Article 9.33.1.2.


9.21.1.3. Chimneys, Gas Vents or Flue Pipes

(1) Except as provided in Sentence (2), chimneys (other than those described in Articles 9.21.1.1. and 9.21.1.2.), gas vents and flue pipes serving gas- oil- or solid-fuel burning appliances and associated equipment shall conform to Section 6.3.

(2) Flue pipes serving solid-fuel burning stoves, ranges and space heaters shall conform to the requirements of CAN3-B365, “Installation Code for Solid-Fuel Burning Appliances and Equipment.”

9.21.1.4. Chimney or Flue Pipe Walls. The walls of any chimney or flue pipe shall be constructed to be smoke- and flame-tight.

9.21.2. Chimney Flues

9.21.2.1. Chimney Flue Limitation. A chimney flue serving a fireplace or incinerator shall not serve any other appliance.

9.21.2.2. Connections of More Than One Appliance

(1) Except as required in Article 9.21.2.1., 2 or more fuel-burning appliances may be connected to the same chimney flue provided adequate draft is maintained for the connected appliances and the connections are made as described in Sentences (2) and (3).

(2) Where 2 or more fuel-burning appliances are connected to the same chimney flue, the appliances must be located on the same story.

(3) The connection referred to in Sentence (2) for a solid-fuel burning appliance shall be below connections for appliances burning other fuels.

9.21.2.3. Inclined Chimney Flues. Chimney flues shall not be inclined more than 45° to the vertical.

9.21.2.4. Size of Chimney Flues

(1) Except for chimneys serving fireplaces, the size of a chimney flue shall conform to the requirements of the appliance installation standards referenced in Sentence 6.2.1.4.(1) and Article 9.33.1.2.

(2) Where a chimney flue serves only one appliance, the flue area shall be at least equal to that of the flue pipe connected to it.

9.21.2.5. Fireplace Chimneys. The minimum size of a chimney flue serving a masonry fireplace shall conform to Table 9.21.2.A. or Table 9.21.2.B.

Table 9.21.2.A.
Forming Part of Article 9.21.2.5.

<table>
<thead>
<tr>
<th>Diameter of Round Flues for Fireplace Chimneys, mm</th>
<th>Maximum Fireplace Opening, m²</th>
<th>Chimney Height, m</th>
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</table>

Column 1 | 2 | 3 | 4 | 5
9.21.2.6. Oval Chimney Flues. 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. 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 ASTM C315, “Clay Flue Linings.”

(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. Firebrick liners shall conform to ASTM C27, “Classification of Fireclay and High Alumina Refractory Brick” and shall be laid with high temperature cement mortar conforming to CGSB 10-GP-3Ma, “Refractory Mortar, Air Setting.”

9.21.3.5. Concrete Liners. Concrete flue liners shall conform to Clause 4.2.6.4. of CAN/CSA-A405, “Design and Construction of Masonry Chimneys and Fireplaces.”

9.21.3.6. Metal Liners

(1) Metal liners shall be constructed of not less than 0.3 mm thick stainless steel.

(2) Metal liners referred to in Sentence (1) shall only be used in chimneys serving gas-, or oil-burning appliances.

(See Appendix A.)

Table 9.21.2.B.
Forming Part of Article 9.21.2.5.

<table>
<thead>
<tr>
<th>Maximum Fireplace Opening, m²</th>
<th>Nominal Rectangular Flue Sizes for Fireplace Chimneys, mm</th>
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<td>1.6</td>
<td>—</td>
</tr>
<tr>
<td>1.8</td>
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</tr>
<tr>
<td>2.0</td>
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</tr>
<tr>
<td>2.2</td>
<td>—</td>
</tr>
</tbody>
</table>

| Column 1 | 2 | 3 | 4 | 5 |

264
9.21.3.7. **Installation of Chimney Liners.** Chimney liners shall be installed when the surrounding masonry or concrete is placed.

9.21.3.8. **Spaces between Liners and Surrounding Masonry**

(1) Spaces between the liner and surrounding masonry shall not be filled with mortar where the chimney walls are less than 190 mm thick.

(2) A space not less than 10 mm wide shall be left between a liner and the surrounding masonry.

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 high temperature cement mortar conforming to CGSB 10-GP-3Ma, “Refractory Mortar, Air Setting,” or mortar consisting of 1 part Portland cement to 3 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 1 part Portland cement to 3 parts sand by volume.

9.21.4. **Masonry and Concrete Chimney Construction**

9.21.4.1. **Unit Masonry.** Unit masonry shall conform to Section 9.20.

9.21.4.2. **Concrete.** Concrete shall conform to Section 9.3.

9.21.4.3. **Footings.** Footings for masonry chimneys and concrete chimneys shall conform to the requirements in Section 9.15.

9.21.4.4. **Height of Chimney Flues.** A chimney flue shall extend not less than 900 mm above the highest point at which the chimney comes in contact with the roof, and not less than 600 mm above the highest roof surface or structure within 3 m of the chimney. (See Appendix A.)

9.21.4.5. **Lateral Stability.** Chimneys shall be braced when necessary to provide lateral stability. (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.** A cleanout opening with a metal frame and a tight-fitting metal door shall be installed near the base of the chimney flue.

9.21.4.8. **Wall Thickness.** The walls of a masonry chimney shall be built of solid units not less than 75 mm thick.

9.21.4.9. **Separation of Flue Liners**

(1) Flue liners in the same chimney shall be separated by not less than 75 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.** 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 shall be not less than 50 mm for interior chimneys and 12 mm for exterior chimneys.

(2) A clearance of not less than 150 mm shall be provided between a cleanout opening and combustible material.
9.21.5.1. (3) Flooring shall have not less than a 12 mm clearance from masonry or concrete chimneys.

9.21.5.2. Sealing of Spaces. All spaces between masonry or concrete chimneys and combustible framing shall be sealed top or bottom with noncombustible material.

9.21.5.3. Support of Joists or Beams. Joists or beams may be supported on masonry walls which enclose chimney flues provided the combustible members are separated from the flue by not less than 290 mm of solid masonry.

Section 9.22 Fireplaces

9.22.1. General

9.22.1.1. Application. Except when otherwise specifically stated herein, this Section applies to masonry fireplaces constructed on-site.

9.22.1.2. Masonry and Concrete. Except as otherwise stated in this Section, unit masonry shall conform to Section 9.20 and concrete to Section 9.3.

9.22.1.3. Footings. Footings for masonry and concrete fireplaces shall conform to Section 9.15.

9.22.1.4. Combustion Air. Fireplaces, including factory-built fireplaces, shall have a supply of combustion air. (See Appendix A.)

9.22.2. Fireplace Liners

9.22.2.1. Fireplace Liners. Except where a fireplace is equipped with a steel liner, every fireplace shall have a firebrick liner not less than 50 mm thick for the sides and back and not less than 25 mm thick for the floor.

9.22.2.2. Firebrick Liners

(1) Firebrick liners shall be laid with high temperature cement mortar conforming to CGSB 10-GP-3Ma, “Refractory Mortar, Air Setting.”

(2) Joints between a firebrick liner and the adjacent back-up masonry shall be offset.

9.22.2.3. Steel Liners. Steel liners for fireplaces shall conform to CAN/ULC-S639M, “Standard for Steel Liner Assemblies for Solid-Fuel Burning Masonry Fireplaces,” and shall be installed in accordance with the installation instructions required by that Standard.

9.22.3. Wall Thickness

9.22.3.1. Thickness of Walls

(1) Except as provided in Sentences (2) and (3), the back and sides of a fireplace shall be not less than 190 mm thick where a metal liner or a 50 mm thick firebrick liner is used, including the thickness of the masonry liner.

(2) Portions of the back exposed to the outside may be 140 mm thick.

(3) When a steel fireplace liner is used with an air circulating chamber surrounding the firebox, the back and sides of the fireplace shall consist of not less than 90 mm thickness of solid masonry units or 190 mm thickness of hollow masonry units.

9.22.4. Openings

9.22.4.1. Masonry above openings shall be supported by steel lintels conforming to Sentence 9.20.5.2.(2), reinforced concrete or a masonry arch.

9.22.5. Hearth

9.22.5.1. Hearth Extension

(1) Except as required in Sentence (2), fireplaces shall have a noncombustible hearth extending not less than 400 mm in front of the fireplace opening and not less than 200 mm beyond each side of the fireplace opening.

(2) Where the hearth floor is elevated more than 150 mm above the hearth extension, the width of the hearth extension shall be increased by

(a) 50 mm for an elevation above 150 mm and not more than 300 mm, and

(b) an additional 25 mm for every 50 mm in elevation above 300 mm.
9.22.5.2. Support of Hearth

(1) Except as permitted in Sentence (2), the hearth shall be supported on not less than a 140 mm thick trimmer arch of solid masonry units or not less than a 100 mm thick reinforced concrete trimmer.

(2) A hearth extension for a fireplace with an opening raised not less than 200 mm from a combustible floor is permitted to be placed on that floor provided the requirements of Clauses 5.3.6.5. to 5.3.6.7. of CAN/CSA-A405, “Design and Construction of Masonry Chimneys and Fireplaces” are followed.

9.22.6. Damper

9.22.6.1. The throat of every fireplace shall be equipped with a metal damper sufficiently large to cover the full area of the throat opening.

9.22.7. Smoke Chamber

9.22.7.1. Slope of Smoke Chamber. The sides of the smoke chamber connecting a fireplace throat with a flue shall not be sloped at an angle greater than 45° to the vertical.

9.22.7.2. Wall Thickness. The thickness of masonry walls surrounding the smoke chamber shall be not less than 190 mm at the sides, front and back, except that the portions of the back exposed to the outside may be 140 mm thick.

9.22.8. Factory-Built Fireplaces


9.22.9. Clearance of Combustible Material

9.22.9.1. Clearance to the Fireplace Opening. Combustible material shall not be placed on or near the face of a fireplace within 150 mm of the fireplace opening, except that where the combustible material projects more than 38 mm out from the face of the fireplace above the opening, such material shall be not less than 300 mm above the top of the opening.

9.22.9.2. Metal Exposed to the Interior. Metal exposed to the interior of a fireplace such as the damper control mechanism shall have not less than a 50 mm clearance from any combustible material on the face of the fireplace where such metal penetrates through the face of the fireplace.

9.22.9.3. Clearance to Combustible Framing

(1) Not less than a 100 mm clearance shall be provided between the back and sides of a fireplace and combustible framing, except that a 50 mm clearance is permitted where the fireplace is located in an exterior wall.

(2) Not less than a 50 mm clearance shall be provided between the back and sides of the smoke chamber of a fireplace and combustible framing, except that a 25 mm clearance is permitted where the fireplace is located in an exterior wall.

9.22.9.4. Heat Circulating Duct Openings

(1) The clearance of combustible material above heat-circulating duct openings from those openings shall be not less than

(a) 300 mm where the combustible material projects not less than 38 mm from the face, and

(b) 150 mm where the projection is less than 38 mm.

9.22.10. Fireplace Inserts


Section 9.23 Wood-Frame Construction

9.23.1. Scope

9.23.1.1. Application

(1) This Section applies to conventional wood-frame construction in which the framing members are spaced not more than 600 mm o.c.

(2) The requirements in this Section with regard to floor framing, subflooring and their fasten-
ings apply to floors for which the design live load does not exceed 2.4 kPa.

(3) The requirements in this Section with regard to wall framing and its fastenings apply to walls which support floors for which the design live load does not exceed 2.4 kPa on any floor.

(4) Where the conditions in Sentences (2) or (3) are exceeded, the design of the framing and fastening shall conform to Subsection 4.3.1.

9.23.1.2. Post, Beam and Plank Construction. Post, beam and plank construction and plank frame wall construction shall conform to Article 9.4.1.2.

9.23.2. General

9.23.2.1. Strength and Rigidity. All members shall be so framed, anchored, fastened, tied and braced to provide the necessary strength and rigidity.

9.23.2.2. Protection from Decay

(1) Ends of wood joists, beams and other members framing into masonry or concrete shall be treated to prevent decay where the bottom of the member is at or below ground level, or a 12 mm air space shall be provided at the end and sides of the member.

(2) Air spaces required in Sentence (1) shall not be blocked by insulation, vapour barriers or air barriers.

9.23.2.3. Protection from Dampness

(1) Except as permitted in Sentence (2), wood framing members that are not pressure treated with a wood preservative and which are supported on concrete in contact with the ground or fill shall be separated from the concrete by not less than 0.05 mm polyethylene film or Type S roll roofing.

(2) Dampproofing material referred to in Sentence (1) is not required where the wood member is at least 150 mm above the ground.

9.23.2.4. Lumber. Lumber shall conform to the appropriate requirements in Subsection 9.3.2.

9.23.3. Nails and Staples

9.23.3.1. Standard for Nails. Nails specified in this Section shall be common steel wire nails or common spiral nails, conforming to CSA B111, “Wire Nails, Spikes and Staples” unless otherwise indicated.

9.23.3.2. Length of Nails. All nails shall be long enough so that not less than half their length penetrates into the second member.

9.23.3.3. Prevention of Splitting. Splitting of wood members shall be minimized by staggering the nails in the direction of the grain and by keeping nails well in from the edges.

9.23.3.4. Nailing of Framing

(1) Except as provided in Sentence (2), nailing of framing shall conform to Table 9.23.3.A.

(2) Where the bottom wall plate or sole plate of an exterior wall is not nailed to joists or blocking in accordance with Table 9.23.3.A., the exterior wall may be fastened to the floor framing by

(a) having plywood, waferboard or strandboard sheathing extend down over floor framing and fastened to the floor framing by nails or staples conforming to Article 9.23.3.5., or

(b) tying the wall framing to the floor framing by 50 mm wide galvanized-metal strips of not less than 0.41 mm in thickness, spaced not more than 1.2 m apart, and fastened at each end with not less than two 63 mm nails.

9.23.3.5. Fasteners for Sheathing or Subflooring

(1) Fastening of sheathing and subflooring shall conform to Table 9.23.3.B.

(2) Staples shall not be less than 1.6 mm in diameter or thickness, with not less than a 9.5 mm crown driven with the crown parallel to framing.

(3) Roofing nails for the attachment of fibreboard or gypsum sheathing shall not be less than 3.2 mm in diameter with a minimum head diameter of 11.1 mm.
### Table 9.23.3.A.
Forming Part of Article 9.23.3.4.

#### Nailing for Framing

<table>
<thead>
<tr>
<th>Construction Detail</th>
<th>Minimum Length of Nails, mm</th>
<th>Minimum Number or Maximum Spacing of Nails</th>
</tr>
</thead>
<tbody>
<tr>
<td>Floor joist to plate — toe nail</td>
<td>82</td>
<td>2</td>
</tr>
<tr>
<td>Wood or metal strapping to underside of floor joists</td>
<td>57</td>
<td>2</td>
</tr>
<tr>
<td>Cross bridging to joists</td>
<td>57</td>
<td>2 each end</td>
</tr>
<tr>
<td>Double header or trimmer joists</td>
<td>76</td>
<td>300 mm (o.c.)</td>
</tr>
<tr>
<td>Floor joist to stud (balloon construction)</td>
<td>76</td>
<td>2</td>
</tr>
<tr>
<td>Ledger strip to wood beam</td>
<td>82</td>
<td>2 per joist</td>
</tr>
<tr>
<td>Joist to joist splice (see also Table 9.23.13.A)</td>
<td>76</td>
<td>2 at each end</td>
</tr>
<tr>
<td>Tail joist to adjacent header joist</td>
<td>82</td>
<td>5</td>
</tr>
<tr>
<td>(end nailed) around openings</td>
<td>101</td>
<td>3</td>
</tr>
<tr>
<td>Each header joist to adjacent trimmer joist</td>
<td>82</td>
<td>5</td>
</tr>
<tr>
<td>(end nailed) around openings</td>
<td>101</td>
<td>3</td>
</tr>
<tr>
<td>Stud to wall plate (each end) toe nail</td>
<td>63</td>
<td>4</td>
</tr>
<tr>
<td>or end nail</td>
<td>82</td>
<td>2</td>
</tr>
<tr>
<td>Doubled studs at openings, or studs at walls or wall intersections and corners</td>
<td>76</td>
<td>750 mm (o.c.)</td>
</tr>
<tr>
<td>Doubled top wall plates</td>
<td>76</td>
<td>600 mm (o.c.)</td>
</tr>
<tr>
<td>Bottom wall plate or sole plate to joists or blocking (exterior walls) (1)</td>
<td>82</td>
<td>400 mm (o.c.)</td>
</tr>
<tr>
<td>Interior walls to framing or subflooring</td>
<td>82</td>
<td>600 mm (o.c.)</td>
</tr>
<tr>
<td>Horizontal member over openings in non-loadbearing walls — each end</td>
<td>82</td>
<td>2</td>
</tr>
<tr>
<td>Lintels to studs</td>
<td>82</td>
<td>2 at each end</td>
</tr>
<tr>
<td>Ceiling joist to plate — toe nail each end</td>
<td>82</td>
<td>2</td>
</tr>
<tr>
<td>Roof rafter, roof truss or roof joist to plate — toe nail</td>
<td>82</td>
<td>3</td>
</tr>
<tr>
<td>Rafter plate to each ceiling joist</td>
<td>101</td>
<td>2</td>
</tr>
<tr>
<td>Rafter to joist (with ridge supported)</td>
<td>76</td>
<td>3</td>
</tr>
<tr>
<td>Rafter to joist (with ridge unsupported)</td>
<td>76</td>
<td>see Table 9.23.13.A.</td>
</tr>
<tr>
<td>Gusset plate to each rafter at peak</td>
<td>57</td>
<td>4</td>
</tr>
<tr>
<td>Rafter to ridge board — toe nail</td>
<td>57</td>
<td>4</td>
</tr>
<tr>
<td>— end nail</td>
<td>82</td>
<td>3</td>
</tr>
<tr>
<td>Collar tie to rafter — each end</td>
<td>76</td>
<td>3</td>
</tr>
<tr>
<td>Collar tie lateral support to each collar tie</td>
<td>57</td>
<td>2</td>
</tr>
<tr>
<td>Jack rafter to hip or valley rafter</td>
<td>82</td>
<td>2</td>
</tr>
<tr>
<td>Roof strut to rafter</td>
<td>76</td>
<td>3</td>
</tr>
<tr>
<td>Roof strut to loadbearing wall — toe nail</td>
<td>82</td>
<td>2</td>
</tr>
<tr>
<td>38 mm x 140 mm or less plank decking to support</td>
<td>82</td>
<td>2</td>
</tr>
<tr>
<td>Plank decking wider than 38 mm x 140 mm to support</td>
<td>82</td>
<td>3</td>
</tr>
<tr>
<td>38 mm edge laid plank decking to support (toe nail)</td>
<td>76</td>
<td>1</td>
</tr>
<tr>
<td>38 mm edge laid plank to each other</td>
<td>76</td>
<td>450 mm (o.c.)</td>
</tr>
</tbody>
</table>

**Column 1**

2 | 3

**Note to Table 9.23.3.A.:**

(1) See Sentence 9.23.3.4.(2)
9.23.4. **Allowable Spans**

9.23.4.1. **Spans for Joists, Rafters and Beams**

(1) Except as required in Sentence (2), spans for wood joists, rafters and beams shall conform to the spans shown in Tables A-1 to A-9 for the uniform live loads shown in the tables. (See Appendix A.)

(2) Spans for floor joists which are not selected from Tables A-1 and A-2 and which 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.)

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**Table 9.23.3.B.**
Forming Part of Article 9.23.3.5.

<table>
<thead>
<tr>
<th>Element</th>
<th>Minimum Length of Fasteners for Sheathing and Subfloor Attachment, mm</th>
<th>Minimum Number or Maximum Spacing of Fastener</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Common or Spiral Nails</td>
<td>Ring Thread Nails</td>
</tr>
<tr>
<td>Plywood, waferboard or strandboard up to 10 mm thick</td>
<td>51</td>
<td>N/A</td>
</tr>
<tr>
<td>Plywood, waferboard or strandboard from 10 mm to 20 mm thick</td>
<td>51</td>
<td>N/A</td>
</tr>
<tr>
<td>Plywood, waferboard or strandboard over 20 mm thick</td>
<td>57</td>
<td>N/A</td>
</tr>
<tr>
<td>Fibreboard sheathing up to 13 mm thick</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>Gypsum sheathing up to 13 mm thick</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>Board lumber 184 mm or less wide</td>
<td>51</td>
<td>N/A</td>
</tr>
<tr>
<td>Board lumber more than 184 mm wide</td>
<td>51</td>
<td>N/A</td>
</tr>
</tbody>
</table>
9.23.4.2. Steel Beams

(1) The spans for steel beams with laterally supported top flanges that support floors in 1- and 2-storey houses shall conform to Table 9.23.4.A. (See Appendix A.)

(2) Beams described in Sentence (1) shall at least meet the requirements for Grade 300 W steel in CAN/CSA-G40.21, “Structural Quality Steels.”

9.23.4.3. Glued-Laminated Beams

(1) The spans for glued-laminated beams that support floors in 1- and 2-storey houses shall conform to Table 9.23.4.B.

(2) Beams described in Sentence (1) shall conform to 20 f-E stress grade in CSA O122, “Glued-Laminated Timber” and to Article 4.3.1.2.

<table>
<thead>
<tr>
<th>Table 9.23.4.A.(^{1})</th>
</tr>
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<tbody>
<tr>
<td><strong>Forming Part of Sentence 9.23.4.2.(1)</strong></td>
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<tr>
<td><strong>Maximum Spans for Steel Beams Supporting Floors in Dwelling Units, m</strong></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Section</th>
<th>One Storey Supported</th>
<th>Two Storeys Supported</th>
</tr>
</thead>
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<td>W150 × 22</td>
<td>5.5</td>
<td>5.2</td>
</tr>
<tr>
<td>W200 × 21</td>
<td>6.5</td>
<td>6.2</td>
</tr>
<tr>
<td>W200 × 27</td>
<td>7.3</td>
<td>6.9</td>
</tr>
<tr>
<td>W200 × 31</td>
<td>7.8</td>
<td>7.4</td>
</tr>
<tr>
<td>W250 × 24</td>
<td>8.1</td>
<td>7.5</td>
</tr>
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<td>W250 × 33</td>
<td>9.2</td>
<td>8.7</td>
</tr>
<tr>
<td>W250 × 39</td>
<td>10.0</td>
<td>9.4</td>
</tr>
<tr>
<td>W310 × 31</td>
<td>10.4</td>
<td>9.6</td>
</tr>
<tr>
<td>W310 × 39</td>
<td>11.3</td>
<td>10.7</td>
</tr>
</tbody>
</table>

**Note to Table 9.23.4.A.:**

(1) See Appendix A.
9.23.4.4. Concentrated Loads or Higher Live Loads. Where a floor is required to be designed to support a concentrated load as specified in Table 4.1.6.B., or to support a uniform live load in excess of those shown in the span tables, such spans shall be determined in conformance with Subsection 4.3.1.

9.23.4.5. Concrete Topping. Where a floor is required to support a concrete topping, the spans shown in Tables A-2 and A-3 or the spacing of the members shall be reduced to allow for the loads due to the topping. (See Appendix A.)

Table 9.23.4.B.
Forming Part of Sentence 9.23.4.3.(1)

Maximum Spans (m) for Glued-Laminated Floor Beams Supporting Floors in Dwellings (2, 3, 4)

<table>
<thead>
<tr>
<th>Number of Storeys Supported</th>
<th>Beam Width, mm</th>
<th>Supported Length, (m)</th>
<th>Beam Depth, mm</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>228</td>
<td>266</td>
<td>304</td>
</tr>
<tr>
<td>1</td>
<td>80</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>2.4</td>
<td>4.32</td>
<td>5.04</td>
</tr>
<tr>
<td></td>
<td>3.0</td>
<td>3.87</td>
<td>4.51</td>
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<td>3.6</td>
<td>3.53</td>
<td>4.12</td>
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<td></td>
<td>4.2</td>
<td>3.27</td>
<td>3.81</td>
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<tr>
<td></td>
<td>4.8</td>
<td>3.06</td>
<td>3.57</td>
</tr>
<tr>
<td>1</td>
<td>130</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>2.4</td>
<td>5.51</td>
<td>6.43</td>
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<td>3.90</td>
<td>4.54</td>
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<td>2</td>
<td>80</td>
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<td></td>
<td>2.4</td>
<td>3.28</td>
<td>3.83</td>
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<td>2.68</td>
<td>3.12</td>
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<td></td>
<td>4.2</td>
<td>2.48</td>
<td>2.89</td>
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<td></td>
<td>4.8</td>
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<td>2.71</td>
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<td>2.4</td>
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<td>4.2</td>
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<td>4.8</td>
<td>2.96</td>
<td>3.45</td>
</tr>
</tbody>
</table>

Col. 1 2 3 4 5 6 7 8 9 10

Note to Table 9.23.4.B.:

(1) Supported length means half the sum of the joist spans on both sides of the beam.

(2) Spans are valid for any species covered by CSA O122-M, "Structural Glued-Laminated Timber."

(3) Spans are clear spans between supports.

(4) Provide minimum 89 mm of bearing.
9.23.4.6. **Heavy Roofing Materials.** Where a roof is required to support an additional uniform dead load from roofing materials other than as specified in Section 9.27, such as concrete or clay roofing tiles, spans for framing members in Tables A-3 to A-7, A-10 and A-11 or the spacing of the members shall be reduced to allow for the loads due to the roofing. (See A-9.23.4.1.(1) and A-9.23.4.5. in Appendix A.)

9.23.5. **Notching and Drilling**

9.23.5.1. **Holes Drilled in Framing Members.** 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.** Floor, roof and ceiling framing members may 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.** 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.** 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.** 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.** Exterior columns and posts shall be anchored to resist uplift and lateral movement.

9.23.6.3. **Anchorage of Smaller Buildings**

(1) Buildings not more than 4.3 m wide and not more than 1 storey in building height may be anchored by means of corrosion-resistant steel rods or cables of not less than 12.7 mm diam, attached to the building frame near each corner of the building in a manner that will develop the full strength of the rod or cable.

(2) Each rod or cable described in Sentence (1) shall be anchored to the ground by means of ground anchors having a withdrawal resistance of not less than 500 N for each metre of length of the building. (See A-9.15.1.1.(1) in Appendix A.)

9.23.7. **Sill Plates**

9.23.7.1. **Size of Sill Plates.** 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.** Sill plates shall be levelled by setting them on a full bed of mortar, except that where the top of the foundation is level, they may be laid directly on the foundation provided the junction between the foundation and the sill plate is caulked or the sill plate is placed on a layer of mineral wool not less than 25 mm thick before being compressed. (See also 9.23.2.3.)

9.23.8. **Beams to Support Floors**

9.23.8.1. **Bearing for Beams.** Beams shall have even and level bearing and shall have not less than 89 mm length of bearing at end supports.
9.23.8.2. Priming of Steel Beams. Steel beams shall be shop primed.

9.23.8.3. Built-up Wood Beams

(1) Where a beam is made up of individual pieces of lumber that are nailed together, the individual members shall be 38 mm or greater in thickness and installed on edge.

(2) Except as permitted in Sentence (3), where individual members of a built-up beam are butted together to form a joint, the joint shall occur over a support.

(3) Where a beam is continuous over more than one span, individual members are permitted to be butted together to form a joint at or within 150 mm of the end quarter points of the clear spans, provided the quarter points are not those closest to the ends of the beam.

(4) Members joined at quarter points shall be continuous over adjacent supports.

(5) Joints in individual members of a beam that are located at or near the end quarter points shall not occur in adjacent members at the same quarter point and shall not reduce the effective beam width by more than half.

(6) Not more than one butt joint shall occur in any individual member of a built-up beam within any one span.

(7) Except as provided in Sentence (8), where 38 mm members are laid on edge to form a built-up beam, individual members shall be nailed together with a double row of nails not less than 89 mm in length, spaced not more than 450 mm apart in each row with the end nails located 100 mm to 150 mm from the end of each piece.

(8) Where 38 mm members in built-up wood beams are not nailed together as provided in Sentence (7), they shall be bolted together with not less than 12.7 mm diam bolts equipped with washers and spaced not more than 1.2 m o.c., with the end bolts located not more than 600 mm from the ends of the members.

(See Appendix A.)

9.23.9. Floor Joists

9.23.9.1. End Bearing for Joists

(1) Except when supported on ribbon boards, floor joists shall have not less than 38 mm length of end bearing.

(2) Ribbon boards referred to in Sentence (1) shall be not less than 19 mm by 89 mm lumber let into the studs.

9.23.9.2. Joists Supported by Beams

(1) Floor joists may be supported on the tops of beams or may be framed into the sides of beams.

(2) When framed into the side of a wood beam, joists referred to in Sentence (1) shall be supported on

(a) joist hangers or other acceptable mechanical connectors, or

(b) not less than 38 mm by 64 mm ledger strips nailed to the side of the beam, except that 38 mm by 38 mm ledger strips may be used provided each joist is nailed to the beam by not less than four 89 mm nails, in addition to the nailing for the ledger strip required in Table 9.23.3.A.

(3) When framed into the side of a steel beam, joists referred to in Sentence (1) shall be supported on the bottom flange of the beam or on not less than 38 mm by 38 mm lumber bolted to the web with not less than 6.3 mm diam bolts spaced not more than 600 mm apart.

(4) Joists referred to in Sentence (3) shall be spliced above the beam with not less than 38 mm by 38 mm lumber at least 600 mm long to support the flooring.

(5) Not less than a 12 mm space shall be provided between the splice required in Sentence (4) and the beam to allow for shrinkage of the wood joists.

9.23.9.3. Restraint of Joist Bottoms.

Except as provided in Sentence 9.23.9.4.(2), bottoms of floor joists shall be restrained from twisting at each end by toe-nailing to the supports, end-nailing to the header joists or by providing continuous strapping, blocking between the joists or cross-bridging near the supports.
9.23.9.4. Strapping and Bridging in Tables A1 and A2

(1) Except as permitted in Sentence (2), where strapping only is specified in Tables A-1 and A-2, it shall be
   (a) not less than 19 mm by 64 mm, nailed to the underside of floor joists,
   (b) located not more than 2,100 mm from each support or other rows of strapping, and
   (c) fastened at each end to a sill or header.

(2) Strapping is not required if furring strips or a panel-type ceiling finish is attached directly to the joists.

(3) Where bridging is specified in Tables A-1 and A-2, it shall consist of not less than 19 mm by 64 mm or 38 mm by 38 mm cross bridging located not more than 2,100 mm from each support or other rows of bridging.

(4) Where bridging plus strapping is specified in Tables A-1 and A-2, it shall consist of
   (a) bridging as described in Sentence (3), together with wood strapping as described in Sentence (1), or
   (b) 38-mm solid blocking located not more than 2,100 mm from each support or other rows of bridging and securely fastened between the joists, together with wood strapping as defined in Sentence (1).

(See A-9.23.4.1.2 in Appendix A.)

9.23.9.5. Header Joists

(1) Header joists around floor openings shall be doubled when they exceed 1.2 m in length.

(2) The size of header joists exceeding 3.2 m in length shall be determined by calculations.

9.23.9.6. Trimmer Joists

(1) Trimmer joists around floor openings shall be doubled when the length of the header joist exceeds 800 mm.

(2) When the header joist exceeds 2 m in length the size of the trimmer joists shall be determined by calculations.

9.23.9.7. Support of Tail and Header Joists. When tail joists and header joists are supported by the floor framing, they shall be supported by suitable joist hangers or nailing.

9.23.9.8. Support of Walls

(1) Non-loadbearing walls parallel to the floor joists shall be supported by joists beneath the wall or on blocking between the joists.

(2) Blocking referred to in Sentence (1) for the support of non-loadbearing walls shall be not less than 38 mm by 89 mm lumber, spaced not more than 1.2 m apart.

(3) Non-loadbearing interior walls at right angles to the floor joists are not restricted as to location.

(4) Loadbearing interior walls parallel to floor joists shall be supported by beams or walls of sufficient strength to transfer safely the design loads to the vertical supports.

(5) Loadbearing interior walls at right angles to floor joists shall be located not more than 900 mm from the joist support when the wall does not support a floor, and not more than 600 mm from the joist support when the wall supports one or more floors, unless the joist size is designed to support such loads.

9.23.9.9. Cantilevered Floor Joists

(1) Floor joists supporting roof loads shall not be cantilevered more than 400 mm beyond their supports where 38 mm by 184 mm joists are used and not more than 600 mm beyond their supports where 38 mm by 235 mm or larger joists are used.

(2) The cantilevered portions referred to in Sentence (1) shall not support floor loads from other storeys unless calculations are provided to show that the allowable design stresses of the cantilevered joists are not exceeded.

(3) Where cantilevered floor joists described in Sentences (1) and (2) are at right angles to the main floor joists, the tail joists in the cantilevered portion shall extend inward away from the cantilever support a distance equal to not less than 6 times the length of the cantilever, and end nailed to an interior doubled header joist in conformance with Table 9.23.3.A.

9.23.10. Wall Studs

9.23.10.1. Stud Size and Spacing. The size and spacing of studs shall conform to Table 9.23.10.A.
Table 9.23.10.A.
Forming Part of Article 9.23.10.1.

<table>
<thead>
<tr>
<th>Type of Wall</th>
<th>Supported Loads (including dead loads)</th>
<th>Minimum Stud Size, mm</th>
<th>Maximum Stud Spacing, mm</th>
<th>Maximum Unsupported Height, m</th>
</tr>
</thead>
<tbody>
<tr>
<td>No load</td>
<td></td>
<td>38 × 38</td>
<td>400</td>
<td>2.4</td>
</tr>
<tr>
<td></td>
<td></td>
<td>38 × 89</td>
<td>400</td>
<td>3.6</td>
</tr>
<tr>
<td></td>
<td></td>
<td>38 × 64</td>
<td>600</td>
<td>2.4</td>
</tr>
<tr>
<td></td>
<td></td>
<td>38 × 64</td>
<td>400</td>
<td>3.6</td>
</tr>
<tr>
<td>Attic not accessible by a stairway</td>
<td></td>
<td>38 × 89</td>
<td>600</td>
<td>2.4</td>
</tr>
<tr>
<td>Attic accessible by a stairway</td>
<td></td>
<td>38 × 89</td>
<td>400</td>
<td>3.6</td>
</tr>
<tr>
<td>Roof load</td>
<td></td>
<td>38 × 64</td>
<td>600</td>
<td>2.4</td>
</tr>
<tr>
<td>Attic not accessible by a stairway</td>
<td></td>
<td>38 × 64</td>
<td>400</td>
<td>2.4</td>
</tr>
<tr>
<td>plus one floor</td>
<td></td>
<td>38 × 89</td>
<td>600</td>
<td>3.6</td>
</tr>
<tr>
<td>Attic accessible by a stairway</td>
<td></td>
<td>38 × 140</td>
<td>400</td>
<td>4.2</td>
</tr>
<tr>
<td>plus two floors, or roof load plus 2 floors</td>
<td></td>
<td>38 × 140</td>
<td>400</td>
<td>4.2</td>
</tr>
<tr>
<td>Attic accessible by a stairway</td>
<td></td>
<td>38 × 140</td>
<td>300</td>
<td>4.2</td>
</tr>
<tr>
<td>plus three floors, or roof load plus 3 floors</td>
<td></td>
<td>38 × 140</td>
<td>300</td>
<td>4.2</td>
</tr>
<tr>
<td>Roof with or without attic storage</td>
<td></td>
<td>38 × 89</td>
<td>600</td>
<td>3.0</td>
</tr>
<tr>
<td>plus one floor</td>
<td></td>
<td>38 × 89</td>
<td>600</td>
<td>3.0</td>
</tr>
<tr>
<td>Roof with or without attic storage</td>
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<td>38 × 140</td>
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<tr>
<td>plus two floors</td>
<td></td>
<td>38 × 140</td>
<td>600</td>
<td>3.0</td>
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<tr>
<td>Roof with or without attic storage</td>
<td></td>
<td>38 × 140</td>
<td>300</td>
<td>3.0</td>
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<tr>
<td>plus three floors</td>
<td></td>
<td>38 × 140</td>
<td>300</td>
<td>3.0</td>
</tr>
</tbody>
</table>

Note to Table 9.23.10.A.:
(1) See Article 9.23.10.2.
9.23.10.2. **Lateral Support.** *Loadbearing* studs shall be laterally supported by cladding or blocking.

9.23.10.3. **Orientation of Studs**

(1) Except as permitted in Sentences (2) and (3), all studs shall be placed at right angles to the wall face.

(2) Studs on the flat are permitted to be used in gable ends of roofs that contain only unfinished space or in non-*loadbearing* interior walls within the limits described in Article 9.23.10.1.

(3) Wall studs that support only a load from an attic not accessible by a stairway are permitted to be placed on the flat within the limits permitted in Article 9.23.10.1. provided:
   (a) the studs are clad on not less than one side with plywood, waferboard or strandboard sheathing fastened to the face of the studs with a structural adhesive, and
   (b) the portion of the roof supported by the studs does not exceed 2.1 m in width.

9.23.10.4. **Continuity of Studs.** Wall studs shall be continuous for the full *storey* height except at openings and shall not be spliced except by finger-joining with a structural adhesive. (See Appendix A.)

9.23.10.5. **Support for Cladding Materials**

(1) Corners and intersections shall be designed to provide adequate support for the vertical edges of interior and exterior cladding materials, and in no instance shall exterior corners be framed with less than the equivalent of 2 studs.

(2) Where the vertical edges of interior cladding at wall intersections are supported at vertical intervals by blocking or other acceptable methods, the vertical distance between such supports shall not exceed the maximum distance between supports specified in Section 9.29.

9.23.11.1. **Size of Wall Plates.** Wall plates shall be not less than 38 mm thick and shall be the same width as the wall studs, except that in non-*loadbearing* walls and in *loadbearing* walls where the studs are located directly over framing members, the bottom wall plate may be 19 mm thick.

9.23.11.2. **Bottom Wall Plates**

(1) A bottom wall plate shall be provided in all cases.

(2) The bottom plate in exterior walls shall not project more than one-third the plate width over the support.

9.23.11.3. **Top Plates**

(1) Except as permitted in Sentences (2) to (4), no fewer than 2 top plates shall be provided in *loadbearing* walls.

(2) A single top plate may be used in a section of a *loadbearing* wall containing a lintel provided the top plate forms a tie across the lintel.

(3) A single top plate may be used in *loadbearing* walls where the concentrated loads from ceilings, floors and roofs are not more than 50 mm to one side of the supporting studs and in all non-*loadbearing* walls.

(4) The top plates may be omitted in a section of *loadbearing* wall containing a lintel provided the lintel is tied to the adjacent wall section with not less than 75 mm by 150 mm by 0.91 mm thick galvanized steel, or 19 mm by 89 mm by 300 mm wood splice nailed to each wall section with no fewer than three 63 mm nails.

9.23.11.4. **Joints in Top Plates**

(1) Joints in the top plates of *loadbearing* walls shall be staggered not less than one stud spacing.

(2) The top plates in *loadbearing* walls shall be lapped or otherwise suitably tied at corners and intersecting walls.

(3) Joints in single top plates used with *loadbearing* walls shall be suitably tied.
(4) Ties referred to in Sentences (2) and (3) shall be the equivalent of not less than 75 mm by 150 mm by 0.91 mm thick galvanized steel nailed to each wall with not less than three 63 mm nails.

9.23.12. Framing over Openings

9.23.12.1. Openings in Non-Loadbearing Walls

(1) Except as provided in Sentence (2), openings in non-loadbearing walls shall be framed with not less than 38 mm material the same width as the studs securely nailed to adjacent studs.

(2) Openings for doors in non-loadbearing walls required to be fire resistant shall be framed with the equivalent of not less than two 38 mm thick members the same width as the wall plates.

9.23.12.2. Openings in Loadbearing Walls

(1) Openings in loadbearing walls shall be framed with lintels designed to carry the superimposed loads to adjacent studs.

(2) Except as provided in Sentence 9.23.12.3.(3), where 2 or more members are used in lintels, they shall be fastened together with not less than 82 mm nails in a double row, with nails not more than 450 mm apart in each row.

(3) Lintel members may be separated by filler pieces.

9.23.12.3. Lintel Spans and Sizes

(1) In buildings of residential occupancy, where the wall studs exceed 38 mm by 64 mm in size, and where the spans of supported joists do not exceed 4.9 m and the spans of trusses do not exceed 9.8 m, the spans for wood lintels shown in Table 9.23.12.A. may be used.

(2) Lintels referred to in Sentence (1) shall consist of a single piece of lumber 89 mm thick or 2 pieces of 38-mm thick lumber on edge.

(3) In loadbearing exterior and interior walls of 38-mm by 64-mm framing members, lintels shall consist of solid 64-mm thick members on edge or 38 mm thick and 19-mm thick members fastened together with not less than 63-mm nails in a double row, with nails not more than 450 mm apart in each row.

(4) Lintels referred to in Sentence (3) shall be not less than 50 mm greater in depth than those shown in Table 9.23.12.A. for the allowable spans, and shall not exceed 2.24 m in length.

(5) In buildings of residential occupancy, the spans shown in Table 9.23.12.B. for wood lintels supporting roof and ceiling loads and consisting of 3 or 4 pieces of 38-mm thick lumber on edge or glued-laminated timber, are permitted to be used.

9.23.13. Roof and Ceiling Framing

9.23.13.1. Continuity of Rafters and Joists. Roof rafters and joists and ceiling joists shall be continuous or shall be spliced over vertical supports that extend to suitable bearing.

9.23.13.2. Framing around Openings. Roof and ceiling framing members shall be doubled on each side of openings greater than 2 rafter or joist spacings wide.

9.23.13.3. End Bearing Length. The length of end bearing of joists and rafters shall be not less than 38 mm.

9.23.13.4. Location and Attachment of Rafters

(1) Rafters shall be located directly opposite each other and tied together at the peak, or may be offset by their own thickness if nailed to a ridge board not less than 17.5 mm thick.

(2) Except as permitted in Sentence (3), framing members shall be connected by gusset plates or nailing at the peak in conformance with Table 9.23.3.A.

(3) Where the roof framing on opposite sides of the peak is assembled separately, such as in the case of factory-built houses, the roof framing on opposite sides may be fastened together with galvanized-steel strips not less than 200 mm by 75 mm by 0.41 mm thick spaced not more than 1.2 m apart and nailed at each end to the framing by not less than two 63 mm nails.

9.23.13.5. Shaping of Rafters. Rafters shall be shaped at supports to provide even bearing surfaces and supported directly above the exterior walls.
### Table 9.23.12.A.
Forming Part of Sentences 9.23.12.3.(1) and (4)

<table>
<thead>
<tr>
<th>Location of Lintels</th>
<th>Supported Loads including Dead Loads and Ceiling</th>
<th>Depth of Lintels, mm</th>
<th>Maximum Allowable Spans, m</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Interior walls</strong></td>
<td><strong>Limited attic storage</strong></td>
<td><strong>89</strong></td>
<td><strong>1.22</strong></td>
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<tr>
<td></td>
<td></td>
<td><strong>140</strong></td>
<td><strong>1.83</strong></td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>184</strong></td>
<td><strong>2.44</strong></td>
</tr>
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<td></td>
<td><strong>235</strong></td>
<td><strong>3.05</strong></td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>286</strong></td>
<td><strong>3.81</strong></td>
</tr>
<tr>
<td></td>
<td><strong>Full attic storage or roof load or limited attic storage plus one floor</strong></td>
<td><strong>89</strong></td>
<td><strong>0.61</strong></td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>140</strong></td>
<td><strong>0.91</strong></td>
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<tr>
<td></td>
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<td></td>
<td><strong>235</strong></td>
<td><strong>1.52</strong></td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>286</strong></td>
<td><strong>1.83</strong></td>
</tr>
<tr>
<td></td>
<td><strong>Full attic storage plus one floor or roof load plus one floor or limited attic storage plus 2 or 3 floors</strong></td>
<td><strong>89</strong></td>
<td><strong>—</strong></td>
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<tr>
<td></td>
<td></td>
<td><strong>140</strong></td>
<td><strong>0.76</strong></td>
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<td><strong>235</strong></td>
<td><strong>1.22</strong></td>
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<td></td>
<td><strong>286</strong></td>
<td><strong>1.52</strong></td>
</tr>
<tr>
<td></td>
<td><strong>Full attic storage plus 2 or 3 floors or roof load plus 2 or 3 floors</strong></td>
<td><strong>89</strong></td>
<td><strong>—</strong></td>
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<tr>
<td></td>
<td></td>
<td><strong>140</strong></td>
<td><strong>0.61</strong></td>
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<td><strong>184</strong></td>
<td><strong>0.91</strong></td>
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<td><strong>286</strong></td>
<td><strong>1.22</strong></td>
</tr>
<tr>
<td><strong>Exterior walls</strong></td>
<td><strong>Roof with or without attic storage</strong></td>
<td><strong>89</strong></td>
<td><strong>1.12</strong></td>
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<td><strong>140</strong></td>
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<td><strong>286</strong></td>
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<td></td>
<td><strong>Roof with or without attic storage plus one floor</strong></td>
<td><strong>89</strong></td>
<td><strong>0.56</strong></td>
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<td><strong>140</strong></td>
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<td><strong>184</strong></td>
<td><strong>0.96</strong></td>
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<td><strong>235</strong></td>
<td><strong>2.24</strong></td>
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<td></td>
<td><strong>286</strong></td>
<td><strong>2.51</strong></td>
</tr>
<tr>
<td></td>
<td><strong>Roof with or without attic storage plus 2 or 3 floors</strong></td>
<td><strong>89</strong></td>
<td><strong>0.56</strong></td>
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<td><strong>140</strong></td>
<td><strong>1.12</strong></td>
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<td></td>
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<td></td>
<td><strong>286</strong></td>
<td><strong>2.24</strong></td>
</tr>
</tbody>
</table>

| Column 1 | 2 | 3 | 4 |
### Table 9.23.12.8.
Forming Part of Sentence 9.23.12.3.(5)

<table>
<thead>
<tr>
<th>Supported Length, m</th>
<th>No. 1 and No. 2</th>
<th>Select Structural</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Header Span, m</td>
<td></td>
</tr>
<tr>
<td>Live Load - 1.0 kPa</td>
<td>2.4</td>
<td>3.0</td>
</tr>
<tr>
<td>2.4</td>
<td>A A</td>
<td>A B D</td>
</tr>
<tr>
<td>3.0</td>
<td>A A</td>
<td>A B D</td>
</tr>
<tr>
<td>3.6</td>
<td>A B</td>
<td>C D F</td>
</tr>
<tr>
<td>4.2</td>
<td>A B</td>
<td>D F G*</td>
</tr>
<tr>
<td>4.8</td>
<td>A C D</td>
<td>F G*</td>
</tr>
</tbody>
</table>

| Live Load - 1.5 kPa| 2.4            | 3.0              | 3.6              | 4.2  | 4.8  | 5.4  | 6.0  | 2.4   | 3.0 | 3.6  | 4.2  | 4.8  | 5.4  | 6.0  |
| 2.4                | A A            | A B D            | B D F            | G*   | I*   | K*   | I*   | A A   | A B | C    | E    | I*   | K*   | |
| 3.0                | A B            | D F G*           | I*   | K*   | M*   | I*   | A A   | A C | D    | F    | I*   | M*   | |
| 3.6                | A C D          | F G*            | I*   | K*   | M*   | I*   | A B   | B D | F    | I*   | K*   | M*   | |
| 4.2                | B D G*         | G*   | I*   | K*   | M*   | F    | A B   | D F  | I*   | K*   | M*   | P*   | |
| 4.8                | C F G*         | G*   | I*   | M*   | F*   | A D   | F G* | I*   | M*   | R*   | P*   |      |

| Live Load - 2.0 kPa| 2.4            | 3.0              | 3.6              | 4.2  | 4.8  | 5.4  | 6.0  | 2.4   | 3.0 | 3.6  | 4.2  | 4.8  | 5.4  | 6.0  |
| 2.4                | A A            | A C D            | D F G*           | I*   | M*   | I*   | K*   | A A   | A C | D    | F    | I*   | M*   | |
| 3.0                | A B            | D F G*           | I*   | K*   | M*   | I*   | A A   | A B | D    | F    | I*   | M*   | |
| 3.6                | B D F G*       | I*   | K*   | M*   | I*   | A B   | B D | F    | I*   | K*   | M*   | P*   | |
| 4.2                | D F G*         | G*   | I*   | M*   | P*   | A B   | D F  | I*   | K*   | M*   | R*   |      | |
| 4.8                | C F G*         | G*   | I*   | M*   | F*   | A D   | F G* | I*   | M*   | R*   | P*   |      | |

| Live Load - 2.5 kPa| 2.4            | 3.0              | 3.6              | 4.2  | 4.8  | 5.4  | 6.0  | 2.4   | 3.0 | 3.6  | 4.2  | 4.8  | 5.4  | 6.0  |
| 2.4                | A A            | A C E            | G*   | G*   | I*   | M*   | A A   | A C | D    | F    | I*   | M*   | |
| 3.0                | B E G*         | G*   | I*   | K*   | M*   | P*   | A B   | B D | F    | I*   | K*   | M*   | P*   | |
| 3.6                | B E G*         | G*   | I*   | M*   | P*   | A B   | B D | F    | I*   | K*   | M*   | R*   | |
| 4.2                | D F G*         | G*   | I*   | M*   | P*   | A B   | D F  | I*   | K*   | M*   | R*   |      | |
| 4.8                | D G*           | G*   | I*   | K*   | P*   | R*   | B D   | F G* | I*   | K*   | M*   | R*   | |

**Addendum to Table 9.23.12.B.:**

1. Supported length means half the span of trusses, roof joists or rafters supported by the header plus the length of the overhang beyond the lintel.
2. Table valid for all major species groups (D Fir-L, Hem-Fir, S-P-F).
3. Span are clear spans between supports. For total spans, add two bearing lengths.
4. Provide minimum 89 mm of bearing.
5. Any size in the Table may be substituted by any size of higher rank (A lowest, R highest).

**Legend – Header Sizes**

<table>
<thead>
<tr>
<th>Material</th>
<th>Size</th>
<th>Code</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>3 × 38 × 184</td>
<td>A</td>
</tr>
<tr>
<td>B</td>
<td>4 × 38 × 184</td>
<td>B</td>
</tr>
<tr>
<td>C</td>
<td>3 × 38 × 235</td>
<td>C</td>
</tr>
<tr>
<td>D</td>
<td>4 × 38 × 235</td>
<td>D</td>
</tr>
<tr>
<td>E</td>
<td>3 × 38 × 286</td>
<td>E</td>
</tr>
<tr>
<td>F</td>
<td>4 × 38 × 286</td>
<td>F</td>
</tr>
</tbody>
</table>

- A: 80 × 380
- B: 80 × 418
- C: 130 × 342
- D: 80 × 456
- E: 130 × 380
- F: 80 × 494

- G*: 80 × 380
- H*: 130 × 304
- I*: 80 × 380
- J*: 80 × 342
- K*: 80 × 456
- L*: 130 × 380

- N*: 80 × 532
- O*: 130 × 418
- P*: 80 × 570
- Q*: 130 × 456
- R*: 80 × 608

*Glued-laminated 20 f-E grade*
9.23.13.6. Hip and Valley Rafters. Hip and valley rafters shall be not less than 50 mm greater in depth than the common rafters and not less than 38 mm thick, actual dimension.

9.23.13.7. Intermediate Support for Rafters and Joists

1. Ceiling joists and collar ties of not less than 38 mm by 89 mm lumber may be assumed to provide intermediate support to reduce the span for rafters and joists where the roof slope is 1 in 3 or greater.

2. Collar ties referred to in Sentence (1) more than 2.4 m long shall be laterally supported near their centres by not less than 19 mm by 89 mm continuous members at right angles to the collar ties.

3. Dwarf walls and struts are permitted to be used to provide intermediate support to reduce the span for rafters and joists.

4. When struts are used to provide intermediate support they shall be not less than 38 mm by 89 mm material extending from each rafter to a load-bearing wall at an angle of not less than 45° to the horizontal.

5. When dwarf walls are used for rafter support, they shall be framed in the same manner as load-bearing walls and securely fastened top and bottom to the roof and ceiling framing to prevent overall movement.

6. Solid blocking shall be installed between floor joists beneath dwarf walls referred to in Sentence (5) that enclose finished rooms.

9.23.13.8. Ridge Support

1. Except as provided in Sentence (3), the ridge of the roof shall be supported by a load-bearing wall extending from the ridge to suitable bearing or by a ridge beam of not less than 38 mm by 140 mm material.

2. Ridge beams referred to in Sentence (1) shall be supported at intervals not exceeding 1.2 m by not less than 38 mm by 89 mm members extending vertically from the ridge to suitable bearing.

3. When the roof slope is 1 in 3 or more, ridge support may be omitted provided the lower ends of the rafters are adequately tied to prevent outward movement.

4. Ties required in Sentence (3) are permitted to consist of tie rods or ceiling joists forming a continuous tie for opposing rafters and nailed in accordance with Table 9.23.13.A.

5. Ceiling joists referred to in Sentence (4) shall be fastened together with at least one more nail per joist splice than required for the rafter to joist connection shown in Table 9.23.13.A.

6. Members referred to in Sentence (5) may be fastened together either directly or through a gusset plate.

9.23.13.9. Restraint of Joist Bottoms. Roof joists supporting a finished ceiling, other than plywood, waferboard or strandboard, shall be restrained from twisting along the bottom edges by means of furring, blocking, cross bridging or strapping conforming to Article 9.23.9.4.

9.23.13.10. Ceiling Joists Supporting Roof Load

1. Except as permitted in Sentence (2), ceiling joists supporting part of the roof load from the rafters shall be not less than 25 mm greater in depth than required for ceiling joists not supporting part of the roof load.

2. When the roof slope is 1 in 4 or less, the ceiling joist sizes referred to in Sentence (1) shall be determined from the span tables for roof joists.

9.23.13.11. Wood Roof Trusses

1. Except for roof trusses constructed of Poplar, Eastern White Pine, Western White Pine, Red Pine, Western Red Cedar and Eastern White Cedar, the member sizes for Howe or Fink type wood roof trusses spaced not more than 600 mm O.C. which are to be supported at or near their ends may be determined in conformance with Tables A-10 and A-11 provided such trusses conform to the requirements of Sentences (3) to (7). (See Appendix A.)

2. The joint connections used in trusses described in Sentence (1) shall be designed in conformance with the requirements in Subsection 4.3.1.

3. Where a roof truss described in Sentence (1) supports a ceiling, and the unsupported length of the bottom chord between the truss panel points exceeds 3.05 m, the bottom chord shall be not less than 38 mm by 114 mm in size.
Table 9.23.13.A.
Forming Part of Sentences 9.23.13.8.(4) and (5)

<table>
<thead>
<tr>
<th>Roof Slope</th>
<th>Spacing, mm</th>
<th>Rafter Tied to Every Joist</th>
<th>Rafter Tied to Joist every 1.2 m</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Building Width up to 8 m</td>
<td>Building Width up to 9.8 m</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1.0 or less</td>
<td>2.0 or more</td>
</tr>
<tr>
<td>1 in 3</td>
<td>400</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td></td>
<td>600</td>
<td>6</td>
<td>8</td>
</tr>
<tr>
<td>1 in 2.4</td>
<td>400</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>600</td>
<td>5</td>
<td>7</td>
</tr>
<tr>
<td>1 in 2</td>
<td>400</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>600</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>1 in 1.71</td>
<td>400</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>600</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>1 in 1.33</td>
<td>400</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>600</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>1 in 1</td>
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<td>4</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>600</td>
<td>4</td>
<td>4</td>
</tr>
</tbody>
</table>

Column 1 2 3 4 5 6 7 8 9 10 11 12 13 14

(4) Where the unsupported length of the bottom chord described in Sentence (3) exceeds 3.66 m between the panel points, the bottom chord shall be not less than 38 mm by 140 mm in size.

(5) 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.

(6) Bracing required in Sentence (5) 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.

(7) Web members referred to in Sentence (5) shall be not less than 38 mm by 89 mm lumber of at least No. 2 grade.

(8) Roof trusses that are not designed in conformance with Sentence (1) shall
   (a) be capable of supporting a total ceiling load (dead load plus live load) of 0.5 kPa plus two and two-thirds times the design roof load for 24 h, and
   (b) not exceed the deflections shown in Table 9.23.13.B when loaded with the ceiling load plus one and one-third times the design roof snow load for 1 h.

(9) Testing for lumber roof trusses referred to in Sentence (8) shall be in conformance with CSA S307, “Load Test Procedure for Wood Roof Trusses for Houses and Small Buildings,” except that the unsymmetrical loading requirement in Clause 7.7 of that standard shall not apply.

9.23.14.1. Subflooring Required. Subflooring shall be provided beneath finish flooring where the finish flooring does not have adequate strength to support the design loads (see Subsection 9.30.3).


(1) Wood-based panels for subfloors shall conform to
(a) CSA O121, “Douglas Fir Plywood,”
(b) CSA O151, “Canadian Softwood Plywood,”
(c) CSA O153, “Poplar Plywood,”
(d) CAN3-O437.0-M85, “Waferboard and Strandboard,” or
(e) CAN/CSA O325.0, “Construction Sheathing.”

(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 N-1 or N-2 in CAN3-O188.1, “Interior Mat-Formed Wood 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. Where the edges of panel-type subflooring are required to be supported (see Sentence 9.30.2.1.(2)), 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.

(2) Waferboard and strandboard subflooring conforming to O-1 and O-2 grades in CAN3-O437.0 shall be installed with the direction of face orientation at right angles to the joists and with joints parallel to floor joists 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 either Table 9.23.14.A. or Table 9.23.14.B.

(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 600 mm o.c., subflooring shall be permitted to consist of not less than
(a) 12.5-mm thick plywood,
(b) 12.5-mm thick waferboard or strandboard conforming to O-2 grade, or
(c) 15.5-mm thick plywood or waferboard, R-1 or O-1 grade, or
(d) 15.9-mm thick plywood, R-1 or O-1 grade, or
(e) 19-mm thick plywood, R-1 or O-1 grade, or
(f) 25.4-mm thick plywood, R-1 or O-1 grade.

Table 9.23.14.A.

Forming Part of Sentences 9.23.14.5.(1) and 9.23.15.6.(1)

<table>
<thead>
<tr>
<th>Thickness of Subflooring, mm</th>
<th>Plywood and O-2 Grade Waferboard and Strandboard, R-1 and O-1 Grades</th>
<th>Particleboard</th>
<th>Lumber</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maximum Spacing of Supports, mm</td>
<td>15.9</td>
<td>15.9</td>
<td>15.9</td>
</tr>
<tr>
<td>400</td>
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<td>18.5</td>
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</table>

Table 9.23.13.B.

Forming Part of Sentence 9.23.13.11.(8)

<table>
<thead>
<tr>
<th>Maximum Roof Truss Deflections</th>
<th>Plaster or gypsum board</th>
<th>Other than plaster or gypsum board</th>
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<tbody>
<tr>
<td>Truss Span</td>
<td>Maximum</td>
<td>Maximum</td>
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<tr>
<td>4.3 m or less</td>
<td>1/360 of the span</td>
<td>1/180 of the span</td>
</tr>
<tr>
<td>Over 4.3 m</td>
<td>1/240 of the span</td>
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</tr>
<tr>
<td>Column 1</td>
<td>2</td>
<td>3</td>
</tr>
</tbody>
</table>
Table 9.23.14.B
Forming Part of Sentences 9.23.14.5.(1) and 9.23.15.6.(1)

<table>
<thead>
<tr>
<th>Maximum Spacing of Supports, mm</th>
<th>Panel Mark</th>
<th>Subfloor</th>
<th>Used with Panel-Type Underlay</th>
</tr>
</thead>
<tbody>
<tr>
<td>400</td>
<td>1F16</td>
<td>1F16</td>
<td>2F16</td>
</tr>
<tr>
<td>500</td>
<td>1F20</td>
<td>2F20</td>
<td></td>
</tr>
<tr>
<td>600</td>
<td>1F24</td>
<td>2F24</td>
<td></td>
</tr>
</tbody>
</table>

(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 400 mm o.c., the subfloor may consist of not less than:
(a) 12.5-mm thick plywood,
(b) 12.5-mm thick waferboard or strandboard conforming to O-2 grade, or
(c) 12.7-mm thick waferboard or strandboard conforming to grades R-1 or O-1.
(See Article 9.30.6.2.)

9.23.14.6. Annular Grooved Nails. When resilient flooring is applied directly to a waferboard and strandboard, 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. Material Standards
(1) Wood-based panels used for roof sheathing shall conform to the requirements of
(a) CSA O121, “Douglas Fir Plywood,”
(b) CSA O151, “Canadian Softwood Plywood,”
(c) CSA O153, “Poplar Plywood,”
(d) CAN3-O437.0-M85, “Waferboard and Strandboard,” or
(e) CAN/CSA O325.0, “Construction Sheathing.”

9.23.15.2. Direction of Installation
(1) Plywood roof sheathing shall be installed with the surface grain at right angles to the roof framing.
(2) Waferboard and strandboard roof sheathing conforming to O-1 and O-2 grades in CAN3-O437.0 shall be installed with the direction of face orientation at right angles to the roof framing members. (See A-9.23.14.4.(2) in Appendix A.)

9.23.15.3. Gap between Sheets. Waferboard and strandboard and plywood roof sheathing shall be installed with not less than a 2 mm gap between sheets.

9.23.15.4. Lumber Roof Sheathing. 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.

9.23.15.5. Edge Support. Where panel-type roof sheathing requires edge support, the support shall consist of metal H clips or not less than 38 mm by 38 mm blocking securely nailed between framing members.

9.23.15.6. 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.A. or Table 9.23.14.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.A. or Table 9.23.15.B.
(3) Asphalt-coated or asphalt-impregnated fibreboard not less than 11.1 mm thick conforming to CAN3-A247-M, “Insulating Fibreboard” may be used as a roof sheathing over supports spaced not more than 400 mm o.c. provided the roofing consists of a continuous sheet of galvanized steel of not less than 0.33 mm in thickness or a continuous sheet of aluminum of not less than 0.61 mm in thickness.
Table 9.23.15.A.  
Forming Part of Sentence 9.23.15.6.(2)  
Minimum Thickness of Roof Sheathing, mm

<table>
<thead>
<tr>
<th>Maximum Spacing of Supports, mm</th>
<th>Plywood and O-2 Grade Waferboard and Strandboard</th>
<th>Waferboard and Strandboard, R-1 and O-1 Grades</th>
<th>Lumber</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Edges Supported</td>
<td>Edges Unsupported</td>
<td></td>
</tr>
<tr>
<td>300</td>
<td>7.5</td>
<td>7.5</td>
<td>9.5</td>
</tr>
<tr>
<td>400</td>
<td>7.5</td>
<td>9.5</td>
<td>11.1</td>
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<td>12.7</td>
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<tr>
<td>Column 1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
</tbody>
</table>

Table 9.23.15.B
Forming Part of Sentence 9.23.15.6.(2)

<table>
<thead>
<tr>
<th>Rating for Roof Sheathing When Applying CSA O325.0</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maximum Spacing of Supports, mm</td>
</tr>
<tr>
<td>Panel Mark</td>
</tr>
<tr>
<td>Edges Supported</td>
</tr>
<tr>
<td>Edges Unsupported</td>
</tr>
<tr>
<td>400</td>
</tr>
<tr>
<td>500</td>
</tr>
<tr>
<td>600</td>
</tr>
<tr>
<td>Column 1</td>
</tr>
</tbody>
</table>

9.23.16. Wall Sheathing

9.23.16.1. Required Sheathing. 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. Where wall sheathing is required, it shall conform to either Table 9.23.16.A. or Table 9.23.16.B.

9.23.16.3. Attachment of Siding to Sheathing. Gypsum sheathing, rigid insulation and fibreboard shall not be used for the attachment of siding materials.

9.23.16.4. Lumber Sheathing. Lumber wall sheathing shall be applied so that all ends are supported with end joints staggered.

9.23.16.5. Joints in Panel-Type Sheathing

(1) Panel-type sheathing board shall be applied so that vertical joints are staggered if the sheathing is applied horizontally.

(2) A gap of not less than 2 mm shall be left between sheets of plywood, waferboard, strandboard or fibreboard.

9.23.16.6. Mansard Style Roofs. 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 Subsection 9.23.17.

9.23.17. Wall Sheathing Paper

### Table 9.23.16.A.
Forming Part of Article 9.23.16.2.

**Wall Sheathing Thickness and Specifications**

<table>
<thead>
<tr>
<th>Type of Sheathing</th>
<th>Minimum Thickness, mm</th>
<th>Material Standards</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>With Supports 400 mm o.c.</td>
<td>With Supports 600 mm o.c.</td>
</tr>
<tr>
<td>Lumber</td>
<td>17.0</td>
<td>17.0</td>
</tr>
<tr>
<td>Fibreboard (insulating)</td>
<td>9.5</td>
<td>11.1</td>
</tr>
<tr>
<td>Gypsum sheathing</td>
<td>9.5</td>
<td>12.7</td>
</tr>
<tr>
<td>Plywood (exterior type)</td>
<td>6.0</td>
<td>7.5</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Waferboard and Strandboard Grade O-2</td>
<td>6.0</td>
<td>7.5</td>
</tr>
<tr>
<td>Waferboard and Strandboard Grades R-1 and O-1</td>
<td>6.35</td>
<td>7.9</td>
</tr>
<tr>
<td>Expanded polystyrene Types 1 and 2</td>
<td>38</td>
<td>38</td>
</tr>
<tr>
<td>Expanded polystyrene Types 3 and 4</td>
<td>25</td>
<td>25</td>
</tr>
<tr>
<td>Urethane and Isocyanurate Types 1, 2 and 4</td>
<td>38</td>
<td>38</td>
</tr>
<tr>
<td>Urethane and Isocyanurate Type 3</td>
<td>25</td>
<td>25</td>
</tr>
<tr>
<td>Urethane and Isocyanurate Types 1 and 2, faced</td>
<td>25</td>
<td>25</td>
</tr>
<tr>
<td>Phenolic, faced</td>
<td>25</td>
<td>25</td>
</tr>
<tr>
<td>Rigid Board</td>
<td>25</td>
<td>25</td>
</tr>
<tr>
<td>Mineral Fibre, Type 2</td>
<td>25</td>
<td></td>
</tr>
</tbody>
</table>

**Column 1**

| 2 | 3 | 4 |

**Note to Table 9.23.16.A.:**

See also Sentences 9.27.5.1.(2) to (4).
Table 9.23.16.B. Forming Part of Article 9.23.16.2

<table>
<thead>
<tr>
<th>Maximum Spacing of Supports, mm</th>
<th>Panel Mark</th>
</tr>
</thead>
<tbody>
<tr>
<td>400</td>
<td>W16</td>
</tr>
<tr>
<td>500</td>
<td>W20</td>
</tr>
<tr>
<td>600</td>
<td>W24</td>
</tr>
<tr>
<td>Column 1</td>
<td>2</td>
</tr>
</tbody>
</table>

9.23.17.2. Sheathing Paper beneath Stucco. Tar-saturated felts or papers shall not be used as a sheathing paper beneath stucco.

9.23.17.3. Sheathing Paper

(1) Except as provided in Sentences (3) and (6), not less than one layer of sheathing paper shall be applied beneath siding, stucco or masonry veneer.

(2) Sheathing paper required in Sentence (1) shall be applied so that joints are lapped not less than 100 mm, and if applied horizontally, the upper sheets shall overlap the lower sheets.

(3) Except as provided in Sentence (6), where no sheathing is used with masonry veneer or other siding, not less than 2 layers of sheathing paper shall be applied beneath the veneer or siding.

(4) All joints in the sheathing paper required in Sentence (3) shall occur over framing, and the paper 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.

(5) Where bracing is required, it shall consist of not less than 19 mm by 89 mm wood members applied to the studs at an angle of approximately 45° to the horizontal, extending the full height of the wall on each storey.

(6) Sheathing paper may be omitted beneath siding when the joints in the siding are formed to effectively prevent the passage of wind and rain in conformance with Sentences (7) or (9), as applicable.

(7) Siding consisting of sheets of plywood, hardboard, waferboard and strandboard or asbestos cement is considered to meet the requirements in Sentence (6) provided the siding is applied so that all edges are directly supported by framing and the vertical joints between adjacent sheets covered with battens or shiplapped or otherwise matched to provide weather tight joints.

(8) Vertical joints between sheets described in Sentence (7) shall be caulked.

(9) Metal siding consisting of sheets of metal is considered to meet the requirements of Sentence (6) where the joints between sheets are of the locked seam type. (See Appendix A.)

9.23.18. Bracing (See Appendix A.)

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.
9.24.1.2. **Material Standards.** Steel studs and runners shall conform to CAN/CGSB-7.1-M, “Cold Formed Steel Framing Components.”

9.24.1.3. **Metal Thickness.** Metal thickness specified in this Section shall be the minimum base steel thickness exclusive of coatings.

9.24.1.4. **Screws.** Screws for the application of cladding materials to steel studs, runners and furring channels shall conform to ASTM C1002, “Steel Drill Screws for the Application of Gypsum Board.”

9.24.1.5. **Cladding Required.** Steel stud framing shall have cladding on both sides, fastened with screws spaced at the appropriate spacing described in Section 9.29, penetrating not less than 10 mm through the metal.

9.24.2. **Size of Framing**

9.24.2.1. **Size and Spacing of Studs in Interior Walls.** Except as required in Articles 9.24.2.3. and 9.24.2.4., the size and spacing of steel studs for non-loadbearing interior walls shall conform to Table 9.24.2.A.

<table>
<thead>
<tr>
<th>Minimum Stud Size, mm</th>
<th>Maximum Stud Spacing, mm</th>
<th>Maximum Wall Height, m</th>
</tr>
</thead>
<tbody>
<tr>
<td>30 × 40</td>
<td>400</td>
<td>3.0</td>
</tr>
<tr>
<td></td>
<td>600</td>
<td>2.7</td>
</tr>
<tr>
<td>30 × 63</td>
<td>400</td>
<td>4.0</td>
</tr>
<tr>
<td></td>
<td>600</td>
<td>3.6</td>
</tr>
<tr>
<td>30 × 91</td>
<td>400</td>
<td>5.2</td>
</tr>
<tr>
<td></td>
<td>600</td>
<td>4.9</td>
</tr>
<tr>
<td>Column 1</td>
<td>2</td>
<td>3</td>
</tr>
</tbody>
</table>

9.24.2.2. **Thickness of Studs.** Except as required in Article 9.24.2.4., steel studs in non-loadbearing interior walls shall have a metal thickness of not less than 0.46 mm.

9.24.2.3. **Runners.** Runners for interior and exterior non-loadbearing walls shall have a thickness of not less than the thickness of the corresponding studs and shall have not less than 30 mm flanges.

9.24.2.4. **Openings in Fire Separations**

1. Where openings for doors in non-loadbearing fire separations required to have a fire-resistance rating do not exceed 1 200 mm in width, the width of steel studs shall be not less than 63 mm, and have a metal thickness of not less than 0.50 mm.

2. Where openings described in Sentence (1) exceed 1 200 mm in width, the stud width shall be not less than 91 mm, and shall have a metal thickness of not less than 0.85 mm.

3. The distance to the first stud beyond the jamb of any door opening referred to in a fire separation required to have a fire-resistance rating shall not exceed 400 mm.

4. Where the distance between the framing over the opening in Sentence (3) and the top runner exceeds 400 mm in such walls, intermediate support shall be installed at intervals of not more than 400 mm above the opening.

9.24.2.5. **Size and Spacing of Studs in Exterior Walls.** The size and spacing of non-loadbearing steel studs for exterior walls shall conform to Table 9.24.2.B.

9.24.3. **Installation**

9.24.3.1. **Installation of Runners**

1. Runners shall be provided at the tops and bottoms of walls.

2. Runners required in Sentence (1) shall be securely attached to the building at approximately 50 mm from the ends, and at intervals of not more than 600 mm o.c. for interior walls and 300 mm o.c. for exterior walls.

3. Fasteners used for attachment described in Sentence (2) shall consist of the equivalent of 63 mm nails or 25 mm screws.

4. Studs at openings and which are not full wall height shall be supported by a runner at the ends of the studs, securely fastened to the full length studs at the sides of the opening.
9.24.3.2. Fire-Rated Walls

(1) Steel studs used in walls required to have a fire-resistance rating shall be installed so that there is 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 fire.

(2) Except as provided in Article 9.24.3.6., studs in walls referred to in Sentence (1) shall not be attached to the runners in a manner that will prevent such expansion.

(3) Framing above doors with steel door frames in non-loadbearing fire separations required to have a fire-resistance rating shall consist of 2 runners on the flat fastened back to back.

(4) The upper runner required in Sentence (3) shall be bent at each end to extend upwards not less than 150 mm and fastened to the adjacent studs.

(5) A gypsum board filler piece, the width and length of the runner, shall be provided between the door frame referred to in Sentence (3) and the adjacent runner.

(See Appendix A.)

9.24.3.3. Orientation of Studs. Steel studs shall be installed with webs at right angles to the wall face and, except at openings, shall be continuous for the full wall height.

9.24.3.4. Support for Cladding Materials. Corners and intersections of walls shall be constructed to provide support for the cladding materials.

9.24.3.5. Framing around Openings

(1) Studs shall be doubled on each side of every opening where such openings involve more than one stud space, and shall be tripled where the openings in exterior walls exceed 2.4 mm in width.

(2) Studs described in Sentence (1) shall be suitably fastened together to act as a single structural unit in resisting transverse loads.

9.24.3.6. Attachment of Studs to Runners

(1) Studs shall be attached to runners by screws, crimping, welding or other suitable methods around wall openings and elsewhere where necessary to keep the studs in alignment during construction.

(2) Where clearance for expansion is required in Article 9.24.3.2., such attachment required in Sentence (1) shall be applied between studs and bottom runners only.

9.24.3.7. Openings for Fire Dampers

(1) Openings for fire dampers in non-loadbearing fire separations required to have a fire-resistance rating shall be framed with double studs on each side of the opening.

(2) The sill and header for openings described in Sentence (1) shall consist of a runner track with right angle bends made on each end so as to extend 300 mm above the header or below the sill and fastened to the studs.

(3) The openings described in Sentence (1) shall be lined with a layer of gypsum board not less
Section 9.25 Thermal Insulation and Control of Condensation

(See Appendix A.)

9.25.1. Scope

9.25.1.1. Application

(1) This Section applies to thermal insulation and measures to control condensation for buildings of residential occupancy intended for use on a continuing basis during the winter months.

(2) Insulation of heating and ventilating ducts shall conform to Sections 9.32 and 9.33.

9.25.2. General

9.25.2.1. Required Insulation. All walls, ceilings and floors separating heated space from unheated space, the exterior air or the exterior soil shall be provided with sufficient thermal insulation to prevent moisture condensation on their room side during the winter and to ensure comfortable conditions for the occupants.

9.25.2.2. Barrier to Air Leakage. Thermally insulated wall, ceiling and floor assemblies shall be constructed so as to provide a continuous barrier to leakage of air from the interior of the building into wall spaces, floor spaces or attic or roof spaces.

9.25.2.3. Barrier to Vapour Diffusion. Except as provided in Article 9.25.6.3., thermally insulated wall, ceiling and floor assemblies shall be constructed so as to provide a barrier to diffusion of water vapour from the interior into wall spaces, floor spaces or attic or roof spaces.

9.25.3. Materials

9.25.3.1. Insulation Material Standards

(1) Except as required in Sentence (2), thermal insulation shall conform to the requirements of

(a) CSA A101, "Thermal Insulation, Mineral Fibre, for Buildings,

(b) CAN/CSA-A247-M, "Insulating Fibreboard,"

(c) CAN/CGSB 51.20-M, "Thermal Insulation, Polystyrene, Boards and Pipe Covering,"

(d) CGSB 51-GP-21M, "Thermal Insulation, Urethane and Isocyanurate, Unfaced,"

(e) CAN/CGSB-51.25-M, "Thermal Insulation, Phenolic, Faced,"

(f) CAN/CGSB-51.26-M, "Thermal Insulation, Urethane and Isocyanurate, Board, Faced,"

(g) CGSB 51-GP-27M, "Thermal Insulation, Polystyrene, Loose Fill, or

(h) CGSB 51-GP-60M, "Thermal Insulation, Cellulose Fibre, Loose Fill."

(2) The flame-spread ratings requirements contained in the standards listed in Sentence (1) shall not apply. (See Appendix A.)

9.25.3.2. Insulation in Contact with the Ground. Insulation in contact with the ground shall be inert to the action of soil and water and shall be such that its insulative properties are not significantly reduced by moisture.

9.25.3.3. Type 1 Polystyrene Insulation. Type 1 expanded polystyrene insulation as described in CAN/CGSB 51.20M "Thermal Insulation, Expanded Polystyrene" shall not be used in contact with the ground or as roof insulation applied above the roofing membrane.

9.25.3.4. Air Barrier Materials

(1) Air barrier protection shall possess the characteristics necessary to provide an effective barrier to air exfiltration under differential air pressure due to stack effect, mechanical systems or wind.

(2) Polyethylene sheet used to provide the air barrier protection required in 9.25.2.2., shall conform to CAN/CGSB-51.34-M, "Vapour Barrier, Polyethylene Sheet for Use in Building Construction."

9.25.3.5. Vapour Barrier Materials

(1) Membrane-type vapour barriers shall conform to the requirements of

(a) CAN/CGSB-51.34-M, "Vapour Barrier,
Polyethylene Sheet for Use in Building Construction," or
(b) CAN2-51.33-M, “Vapor Barrier, Sheet, for Use in Building Construction.”

(2) Vapour barriers conforming to Clause (1)(b) shall be Type 1 when used where a high resistance to vapour movement is required, such as in wall constructions that incorporate exterior cladding or sheathing having a low water vapour permeance.

9.25.4. Installation of Thermal Insulation

9.25.4.1. General
(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.

9.25.4.2. Batt-Type Insulation. Batt-type insulation manufactured with no membrane on either face shall be installed so that at least one face is in full and continuous contact with cladding, sheathing or other air-impermeable membrane.

9.25.4.3. Loose-Fill Insulation
(1) Except as provided in Sentences (2) and (3), loose-fill insulation shall be used on horizontal surfaces only.
(2) Water repellent loose-fill insulation may be used between the outer and inner wythes of masonry cavity walls. (See Appendix A.)
(3) Loose-fill insulation may be used in wood frame walls of existing buildings. (See Appendix A.)
(4) Where soffit venting is used, measures shall be taken to prevent loose-fill insulation from causing blockage of soffit vents.

9.25.4.4. Insulation in Crawl Spaces. Insulation on the interior of foundation walls enclosing a crawl space shall be applied so that there is not less than 50 mm clearance above the crawl space floor, if the insulation is of a type that may be damaged by water.

9.25.4.5. Insulation around Slabs-on-Grade. Insulation around concrete slabs-on-grade 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.

9.25.4.6. Insulation Exposed to Weather. Where insulation is exposed to the weather and subject to mechanical damage, it shall be protected with not less than 6 mm asbestos-cement board, 6 mm preservative-treated plywood or 12 mm cement parging on wire lath applied to the exposed face and edge.

9.25.4.7. Mechanical Damage. Insulation located in areas where it may be subject to mechanical damage shall be protected by a covering such as gypsum board, plywood, particleboard, waferboard, strandboard or hardboard.

9.25.4.8. Factory-Built Buildings. Insulation in factory-built buildings shall be installed so that it will not become dislodged during transportation.

9.25.5. Installation of Air Barrier Systems

9.25.5.1. Joints in Air Barrier Protection
(1) Where the air barrier protection consists of an air-impermeable panel-type material, all joints shall be sealed to prevent air leakage.
(2) Where the air barrier protection is formed of flexible sheet material, all joints shall be
   (a) sealed, or
   (b) lapped not less than 100 mm and clamped, such as between framing members, furring or blocking and rigid panels.

9.25.5.2. Air Barrier Protection with Low Permeability. Where the air barrier protection consists of a material with a water vapour permeance less than the maximum permitted for Type 2 vapour barriers in Clause 9.25.3.5.(1)(b), it shall be installed in a location where the temperature will not be below the dew point of the interior air when the exterior temperature is 10°C above the 2.5 per cent January design temperature. (See Appendix A.)
9.25.5.3. **Interior/Exterior Intersections.** Where an interior wall meets an exterior wall, ceiling, floor or roof required to be provided with air barrier protection, the protection shall extend across the intersection.

9.25.5.4. **Penetrations of Air Barrier Protection.** Penetrations of the air barrier protection, such as those created by the installation of doors, windows, electrical wiring, electrical boxes, piping or ductwork, shall be sealed to maintain the integrity of the air barrier protection over the entire surface.

9.25.5.5. **Access Hatches.** Access hatches through surfaces requiring air barrier protection shall be weatherstripped around their perimeters to prevent air leakage.

9.25.5.6. **Joints in Ductwork.** Ductwork passing through unheated spaces shall have all joints taped or be otherwise sealed to ensure that the ducts are airtight throughout their length.

9.25.5.7. **Clearances around Chimneys and Vents.** Clearances between chimneys or gas vents and the surrounding construction which would permit air leakage from within the building into a wall or attic or roof space shall be sealed by noncombustible material to prevent such leakage.

9.25.5.8. **Hollow Masonry Walls**

   (1) Masonry walls of hollow units which penetrate the ceiling shall be sealed at or near the ceiling adjacent to the roof space to prevent air within the voids from entering the attic or roof space by
   - capping with masonry units without voids, or
   - installation of flashing material extending across the full width of the masonry.

9.25.6. **Installation of Vapour Barriers**

9.25.6.1. **General.** Vapour barrier protection shall be installed to protect the entire surfaces of thermally insulated wall, ceiling and floor assemblies.

9.25.6.2. **Location of Vapour Barriers.** Vapour barrier protection shall be installed on the warm side of insulation. (See Appendix A.)

9.25.6.3. **Low Permeance Insulation**

   (1) Additional vapour barrier protection is not required with insulation when
   - the insulation is of a type which, when installed, has a vapour permeance less than that required for vapour barriers in Article 9.25.3.5., or
   - the insulation is foamed plastic insulation with a permeance rating of not more than 230 ng/Pa ⋅ s ⋅ m² and is installed in continuous contact with masonry or concrete walls.

(See Appendix A.)

**Section 9.26 Roofing**

9.26.1. **General**

9.26.1.1. **Purpose of Roofing.** Roofs shall be protected with roofing, including flashing, installed to shed rain effectively and prevent water due to ice damming from entering the roof.

9.26.1.2. **Alternate Installation Methods.** Methods described in CAN3-A123.51, “Asphalt Shingle Application on Roof Slopes 1:3 and Steeper,” or CAN3-A123.52, “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.


9.26.2.1. **Material Standards**

   (1) Roofing materials shall conform to
   - CAN/CGSB 37.4-M, “Cement, Lap, Cutback Asphalt, Fibrated, for Asphalt Roofing,”
   - CAN/CGSB 37.5-M, “Cement, Plastic, Cutback Asphalt,”
   - CAN/CGSB 37.6-M, “Asphalt, Cutback, Filled, for Roof Coating,”
   - CGSB 37-GP-9M, “Primer, Asphalt for Asphalt Roofing, Dampproofing and Waterprooﬁng,”
   - CGSB 37-GP-21M, “Tar, Cutback, Fibrated, for Roof Coating,”
   - CGSB 37-GP-50M, “Asphalt, Rubberized,
9.26.2.3. 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 if the number of staples specified in Article 9.26.7.4. is increased by one-third.

(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. (See Appendix A.)

9.26.3. Roof Slope

9.26.3.1. Slope

(1) Except as provided in Sentences (2) and (3), the roof slopes on which roof coverings may be applied shall conform to Table 9.26.3.A.

(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) Sheet metal roof cladding systems specifically designed for low-slope applications are permitted to be installed with lower slopes than required in Sentence (1).

9.26.4. Flashing at Intersections

9.26.4.1. Materials. Sheet metal flashing shall consist of not less than 1.73 mm thick sheet lead, 0.33 mm thick galvanized steel, 0.46 mm thick copper, 0.46 mm thick zinc or 0.48 mm thick aluminum.

9.26.4.2. Valley Flashing

(1) Where sloping surfaces of shingled roofs intersect to form a valley, the valley shall be flashed.

(2) Closed valleys shall not be used with rigid shingles on slopes of less than 1 in 1.2.

(3) Open valleys shall be flashed with not less than one layer of sheet metal not less than 600 mm wide, or 2 layers of roll roofing.
### Table 9.26.3.A.
Forming Part of Sentence 9.26.3.1.(1)

<table>
<thead>
<tr>
<th>Roofing Types and Slope Limits of Roofs</th>
<th>Minimum Slope</th>
<th>Maximum Slope</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Built-up Roofing</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Asphalt base (gravelled)</td>
<td>1 in 50 (1)</td>
<td>1 in 4</td>
</tr>
<tr>
<td>Asphalt base (without gravel)</td>
<td>1 in 25</td>
<td>1 in 2</td>
</tr>
<tr>
<td>Coal-tar base (gravelled)</td>
<td>1 in 50 (1)</td>
<td>1 in 25</td>
</tr>
<tr>
<td>Cold process</td>
<td>1 in 25</td>
<td>1 in 1.33</td>
</tr>
<tr>
<td><strong>Asphalt Shingles</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Normal application</td>
<td>1 in 3</td>
<td>no limit</td>
</tr>
<tr>
<td>Low slope application</td>
<td>1 in 6</td>
<td>no limit</td>
</tr>
<tr>
<td><strong>Roll Roofing</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Smooth and mineral surfaced</td>
<td>1 in 4</td>
<td>no limit</td>
</tr>
<tr>
<td>480 mm wide selvage asphalt roofing</td>
<td>1 in 6</td>
<td>no limit</td>
</tr>
<tr>
<td>Cold application felt</td>
<td>1 in 50</td>
<td>1 in 1.33</td>
</tr>
<tr>
<td><strong>Wood Shingles</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Handsplit Shakes</td>
<td>1 in 4</td>
<td>no limit</td>
</tr>
<tr>
<td><strong>Asbestos-Cement Corrugated Sheets</strong></td>
<td>1 in 4</td>
<td>no limit</td>
</tr>
<tr>
<td><strong>Corrugated Metal Roofing</strong></td>
<td>1 in 4</td>
<td>no limit</td>
</tr>
<tr>
<td><strong>Sheet Metal Shingles</strong></td>
<td>1 in 4</td>
<td>no limit</td>
</tr>
<tr>
<td><strong>Slate Shingles</strong></td>
<td>1 in 2</td>
<td>no limit</td>
</tr>
<tr>
<td><strong>Clay Tile</strong></td>
<td>1 in 2</td>
<td>no limit</td>
</tr>
<tr>
<td><strong>Glass Fibre Reinforced Polyester</strong></td>
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<td>no limit</td>
</tr>
<tr>
<td>Roofing Panels</td>
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</tr>
<tr>
<td>Column 1</td>
<td>2</td>
<td>3</td>
</tr>
</tbody>
</table>

**Note to Table 9.26.3.A.:**

(1) See Sentences 9.26.3.1.(2) and (3).

(4) The bottom layer of roofing required in Sentence (3) 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.

(5) The top layer of roofing required in Sentence (3) 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.

### 9.26.4.3. 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.

9.26.4.4. 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.

9.26.4.5. 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.

9.26.4.6. 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.

9.26.4.7. 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 suitably flashed where they intersect the roof.

(4) The intersection of the saddle and the chimney shall be flashed and counterflashed as in Article 9.26.4.3.

(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 not less than 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 chimney, 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 9.26.4.3.

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.

(2) Eave protection is not required
(a) over unheated garages, carports and porches,
(b) where the roof overhang exceeds 900 mm measured along the roof slope from the edge of the roof to the inner face of the exterior wall,
(c) on roofs of asphalt shingles installed in accordance with Subsection 9.26.8.,
(d) on roofs with slopes of 1 in 1.5 or greater, or
(e) in regions with 3500 or fewer degree-days.
9.26.5.2. Materials

(1) Eave protection shall be laid beneath the starter strip and shall consist of
   (a) No. 15 asphalt-saturated felt laid in two plies lapped 480 mm and cemented together with lap cement,
   (b) Type M or S roll roofing laid with not less than 100 mm head and end laps cemented together with lap cement,
   (c) glass fibre or polyester fibre coated base sheets, or
   (d) self-sealing composite membranes consisting of modified bituminous coated material.

9.26.6. Underlay beneath Shingles

9.26.6.1. Materials. When underlay is used beneath shingles, it shall be asphalt-saturated sheathing paper weighing not less than 0.195 kg/m² or No. 15 plain or perforated asphalt-saturated felt or 0.05 mm polyethylene, except that underlayment used beneath wood shingles shall be breather type.

9.26.6.2. Installation

(1) When used with shingles, underlay shall be installed parallel to the eaves with head and end lap of not less than 50 mm.

(2) The top edge of each strip of underlay referred to in Sentence (1) shall be fastened with sufficient roofing nails to hold it in place until the shingles are applied.

(3) The underlay referred to in Sentence (1) shall overlap the eave protection by not less than 100 mm. (See Article 9.26.10.2. for underlay beneath wood shakes.)

9.26.7. Asphalt Shingles on Slopes of 1 in 3 or Greater

9.26.7.1. Coverage. Coverage shall be not less than 2 thicknesses of shingle over the entire roof, disregarding cutouts.

9.26.7.2. Starter Strip

(1) A starter strip shall be installed along the lower edge of the roof so that it extends approximately 12 mm beyond the eaves and rake of the roof and fastened along the bottom edge with nails spaced not more than 300 mm o.c.

(2) Starter strips shall be not less than Type M mineral-surfaced roll roofing not less than 300 mm wide, or shingles of the same weight and quality as those used as a roof covering with tabs facing up the roof slope.

(3) Starter strips may be omitted where eave protection of not less than Type M mineral-surfaced roll roofing is provided.

9.26.7.3. Head Lap. Shingles shall have a head lap of not less than 50 mm.

9.26.7.4. Fasteners

(1) Shingles shall be fastened with no fewer than 4 nails or staples for 1 m wide shingles so that no nails or staples are exposed.

(2) Fasteners may be reduced for narrower shingles in proportion to the width of the shingle or when shingles incorporating interlocking devices are used.

(3) Fasteners referred to in Sentence (1) shall be located 25 mm to 40 mm from each end of each strip shingle with other fasteners equally spaced between them.

(4) Fasteners referred to in Sentence (1) shall be located not less than 12 mm above the tops of the cutouts.

9.26.7.5. Securing of Tabs. Shingle tabs shall be secured by a spot of plastic cement not exceeding 25 mm diam under the centre of each tab or by interlocking devices or self-sealing strips.

9.26.7.6. Hips and Ridges

(1) Shingles on hips and ridges shall be applied so they extend not less than 100 mm on either side of the hip or ridge, and shall be lapped not less than 150 mm.

(2) Shingles referred to in Sentence (1) shall be fastened with nails or staples on each side located not more than 25 mm from the edge and 25 mm above the butt of the overlying shingle.


9.26.8. Asphalt Shingles on Slopes of less than 1 in 3

9.26.8.1. Coverage. Except for the first 2 courses, coverage shall be not less than 3 thicknesses of shingle over the entire roof, disregarding cutouts.

9.26.8.2. Starter Strip
(1) A starter strip shall be installed as in Article 9.26.7.2.
(2) Starter strips required in Sentence (1) shall be laid in a continuous band of cement not less than 200 mm wide.

9.26.8.3. Securing of Tabs. Shingle tabs shall be secured with cold application cement applied at the rate of not less than 0.5 L/m² of cemented area, or hot application asphalt applied at the rate of 1 kg/m² of cemented area.

9.26.8.4. Securing of Shingle Courses
(1) The first course of shingles shall be secured by a continuous band of cement along the eaves applied so that the width of the band equals the shingle exposure plus 100 mm and the band is located not less than 50 mm above the lower edge of the starter strip.
(2) The succeeding courses of shingles shall be secured by a continuous band of cement applied so that the width of the band equals the shingle exposure plus 50 mm.
(3) The band required in Sentence (2) shall be located not less than 25 mm nor more than 50 mm above the butt of the overlying course of shingles.

9.26.8.5. Hips and Ridges
(1) Shingles on hips and ridges shall be not less than 300 mm wide applied to provide triple coverage.
(2) Shingles referred to in Sentence (1) shall be cemented to the roof shingles and to each other with a coat of cement 25 mm from the edges of the shingles and fastened with nails or staples located 40 mm above the butt of the overlying shingle and 50 mm from each edge.


9.26.9. Wood Roof Shingles

9.26.9.1. Decking. Decking for wood shingled roofs may be continuous or spaced.

9.26.9.2. Grade. Shingles shall be not less than No. 2 grade.

9.26.9.3. Size. Wood shingles shall be not less than 400 mm long and not less than 75 mm nor more than 350 mm wide.

9.26.9.4. Spacing and Joints. Shingles shall be spaced approximately 6 mm apart and offset at the joints in adjacent courses not less than 40 mm so that joints in alternate courses are staggered.

9.26.9.5. Fastening. Shingles shall be fastened with 2 nails or staples located approximately 20 mm from the sides of the shingle and 40 mm above the exposure line.


9.26.10.1. Size and Thickness. Shakes shall be not less than 450 mm long and not less than 100 mm nor more than 350 mm wide with a butt thickness of not more than 32 mm and not less than 9 mm.

9.26.10.2. Underlay
(1) Where eave protection is not provided, an underlay conforming to the requirements in Article 9.26.6.1. for wood shingles shall be laid as a strip not less than 900 mm wide along the eaves.
(2) A strip of material similar to that described in Sentence (1) not less than 450 mm wide shall be interlaid between each course of shakes with the bottom edge of the strip positioned above the butt line at a distance equal to double the exposure of the shakes.
(3) Interlaid strips referred to in Sentence (2) shall be lapped not less than 150 mm at hips and ridges in a manner that will prevent water from reaching the roof sheathing.

9.26.10.3. Spacing and Joints. Shakes shall be spaced 6 mm to 9 mm apart and offset at the joints in adjacent courses not less than 40 mm so that joints in alternate courses are staggered.

9.26.10.4. Fastening. Shakes shall be fastened with nails located approximately 20 mm from the sides of the shakes and 40 mm above the exposure line.

9.26.10.5. Exposure. The exposure of wood shakes shall not exceed 190 mm for shakes not less than 450 mm long and 250 mm for shakes not less than 600 mm long.


9.26.11.1. Quantity of Materials. The quantities of bituminous materials used on built-up roofs shall conform to Table 9.26.11.A.

9.26.11.2. Coal-Tar and Asphalt Products. Coal-tar products and asphalt products shall not be used together in built-up roof construction.

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### Table 9.26.11.A.

<table>
<thead>
<tr>
<th>Type of Roof</th>
<th>Amount of Bitumen per Square Metre of Roof Surface</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mopping Coats between Layers</td>
</tr>
<tr>
<td>Asphalt and aggregate</td>
<td>1 kg</td>
</tr>
<tr>
<td>Coal-tar and aggregate</td>
<td>1.2 kg</td>
</tr>
<tr>
<td>Cold process roofing</td>
<td>0.75 L cold process cement</td>
</tr>
</tbody>
</table>

9.26.11.3. Roof Felts. Bitumen roofing felts shall be not less than No. 15 felt.

9.26.11.4. Aggregate Surfacing

(1) Aggregate used for surfacing built-up roofs shall be clean, dry and durable and shall consist of particles of gravel, crushed stone or air-cooled blast furnace slag having a size of from 6 mm to 15 mm.

(2) The minimum amount of aggregate surfacing per square metre of roof surface shall be 15 kg gravel or crushed stone or 10 kg crushed slag.

9.26.11.6. **Number of Layers.** Built-up roofing shall consist of not less than 3 mopped-down layers of roofing felt flood coated with bitumen.

9.26.11.7. **Installation of Layers**

1. In hot process applications each layer of bitumen-saturated felt shall be laid while the bitumen is hot, with each layer overlapping the previous one.

2. The full width under each lap referred to in Sentence (1) shall be coated with bitumen so that in no place does felt touch felt.

3. Felt shall be laid free of wrinkles and shall be rolled directly into the hot bitumen and broomed forward and outward from the centre to ensure complete adhesion.

9.26.11.8. **Roofing over Wood-Based Sheathing**

1. Except as permitted in Sentence (2), built-up roofing applied over wood, plywood, waferboard or strandboard roof sheathing shall be laid over an additional base layer of felt laid dry over the entire roof deck with not less than a 50 mm headlap and a 50 mm sidelap between each sheet.

2. Where plywood, waferboard or strandboard roof sheathing is used, the dry layer of felt required in Sentence (1) may be omitted when the joints are taped and the sheathing is primed with asphalt.

9.26.11.9. **Attachment to Decking.** Roofing shall be securely attached to the decking or where insulation is applied above the deck, the insulation shall be securely attached to the deck before the first layer of felt is fastened to the insula-

9.26.11.10. **Cant Strips**

1. Except as permitted in Sentence (4), a cant strip shall be provided at the edges of roofs.

2. No fewer than 2 plies of the roofing membrane shall be carried over the top of the cant strip.

3. Flashing shall extend over the top of the cant strip and be shaped to form a drip.

4. The cant strip required in Sentence (1) may be omitted where a gravel stop is provided at the edge of roofs.

5. The roofing membranes shall be carried over the edge of the roof before the gravel stop is fastened and 2 plies of roofing membrane mopped to the top surface of the gravel stop referred to in Sentence (4) before the flood coat is applied.

6. The gravel stop referred to in Sentence (4) shall extend over the edge of the roof to form a drip or shall be flashed so that the flashing extends over the edge to form a drip.

9.26.12. **Selvage Roofing**

9.26.12.1. Wide selvage asphalt roofing shall provide double coverage over the entire roof surface.

9.26.12.2. Plies of selvage roofing shall be cemented together to ensure a water tight joint.

9.26.13. **Sheet Metal Roofing**

9.26.13.1. Sheet metal roofing shall be not less than 0.33 mm thick galvanized steel, 0.46 mm thick copper, 0.46 mm thick zinc or 0.48 mm thick aluminum.


9.26.14.1. Where glass reinforced polyester roofing panels are not supported by roof decking but span between spaced supports, the panels shall be designed to support the design roof load.

9.26.15. **Hot Applied Rubberized Asphalt Roofing**

9.26.16. Polyvinyl Chloride Sheet Roofing


9.26.17.1. Where downspouts are provided and are not connected to a sewer, extensions shall be provided to carry rainwater away from the building in a manner which will prevent soil erosion.

9.26.17.2. When roof drains are provided they shall conform to Part 7.

Section 9.27 Siding

9.27.1. Scope

9.27.1.1. Application. This Section applies to exterior wall coverings of lumber, wood shingles, shakes, asbestos-cement shingles and sheets, plywood, waferboard, hardboard, asphalt shingles, vinyl, aluminum and steel including trim, soffits and flashing.

9.27.1.2. Stucco and Masonry Veneer. Requirements for stucco shall conform to Section 9.28 and requirements for masonry veneer shall conform to Section 9.20.

9.27.1.3. Asphalt Shingles. Where asphalt shingles are used as siding, they shall conform to the requirements in Section 9.26 for asphalt roof shingles.

9.27.2. General

9.27.2.1. Required Siding. Exterior walls shall be protected with siding, including flashing, trim and other special purpose accessory pieces required for the siding system being used, to restrict the entry of rain and snow into the wall assembly.

9.27.2.2. Clearance from Ground. Not less than a 200 mm clearance shall be provided between the finished ground level and siding that is adversely affected by moisture such as wood, plywood, waferboard, strandboard and hardboard.

9.27.2.3. Clearance from Roof Surface. Not less than a 50 mm clearance shall be provided between a roof surface and siding that is adversely affected by moisture such as wood, plywood, waferboard and strandboard and hardboard.

9.27.2.4. Insulating Asphalt Siding. Insulating asphalt siding shall be ventilated by not less than a 10 mm air space behind the siding. (See Sentence 9.25.3.5.(2))

9.27.3. Flashing

9.27.3.1. Materials. Flashing shall consist of not less than 1.73 mm thick sheet lead, 0.33 mm thick galvanized steel, 0.46 mm thick copper, 0.46 mm thick zinc, 0.48 mm thick aluminum or 1.02 mm thick vinyl.

9.27.3.2. Installation

(1) Flashing shall be installed at every horizontal junction between 2 different exterior finishes, except where the upper finish overlaps the lower finish.

(2) Except as provided in Sentence (4), flashing shall be applied 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.

(3) Flashing shall be installed so that it extends upwards not less than 50 mm behind the sheathing paper and forms a drip on the outside edge.

(4) Where a window or exterior door is designed to be installed without head flashing, the exterior flange of the window or door frame shall be bedded into a non-hardening type caulking material and the exterior flange screwed down over the caulking material to the wall framing to form a waterproof joint.

9.27.4. Caulking

9.27.4.1. Required Caulking

(1) Caulking shall be provided where required to prevent the entry of water into the structure.
(2) Caulking 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) Caulking shall be provided at vertical joints between different cladding materials unless the joint is suitably lapped or flashed to prevent the entry of rain. (See Articles 9.7.4.2., 9.20.13.12. and 9.28.1.5.)

9.27.4.2. Materials

(1) Caulking shall be of a non-hardening type suitable for exterior use, selected for its ability to resist the effects of weathering and shall be compatible with and adhere to the substrate to which it is applied.

(2) Caulking shall conform to

(a) CGSB 19-GP-5M, "Sealing Compound, One Component, Acrylic Base, Solvent Curing,"

(b) CAN/CGSB-19.13, "Sealing Compound, One Component, Elastomeric, Chemical Curing,"

(c) CGSB 19-GP-14M, "Sealing Compound, One Component, Butyl-Polyisobutylene Polymer Base, Solvent Curing," or

(d) CAN2-19.24, "Sealing Compound, Multi-Component, Chemical Curing,"

9.27.5. Attachment of Siding

9.27.5.1. Attachment

(1) Except as permitted in Sentences (2) to (7), siding shall be nailed to the framing members, furring members or to blocking between the framing members.

(2) Vertical lumber and stucco lath or reinforcing may be attached to sheathing only where the sheathing consists of not less than 14.3 mm lumber, 12.5 mm plywood or 12.5 mm waferboard and strandboard.

(3) Vertically applied metal siding and wood shingles and shakes may be attached to the sheathing only where the sheathing consists of not less than 14.3 mm lumber, 7.5 mm plywood or 7.5 mm waferboard and strandboard.

(4) Asbestos-cement shingles may be attached to the sheathing only when the sheathing consists of not less than 14.3 mm lumber, 9.5 mm plywood or 9.5 mm waferboard and strandboard.

(5) Where wood shingles or shakes are applied to sheathing which 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.

(6) Where asbestos-cement shingles are applied to sheathing that is not suitable for attaching the shingles, the shingles may be fastened to a wood lath not less than 89 mm by 9.5 mm thick securely nailed to the framing.

(7) Lath referred to in Sentence (6) shall be applied so that it overlaps the preceding shingle course by not less than 20 mm.

9.27.5.2. Blocking. Blocking for the attachment of siding shall be not less than 38 mm by 38 mm lumber securely nailed to the framing and spaced not more than 600 mm o.c.

9.27.5.3. Furring

(1) Except as permitted in Sentences 9.27.5.1.(5) and (6), furring for the attachment of siding 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 19 mm by 64 mm lumber on supports spaced not more than 400 mm o.c., and 19 mm by 89 mm on supports spaced not more than 600 mm o.c.

(3) Furring referred to in Sentence (1) shall be securely fastened to the framing and shall be spaced not more than 600 mm o.c.

9.27.5.4. Size and Spacing of Fasteners. Nail or staple size and spacing for the attachment of siding and trim shall conform to Table 9.27.5.A.

9.27.5.5. Fastener Materials. Nails or staples for the attachment of sidings and wood trim shall be corrosion-resistant and shall be compatible with the siding material.
### 9.27.5.6.

**Table 9.27.5.A.**

Forming Part of Article 9.27.5.4.

<table>
<thead>
<tr>
<th>Type of Siding</th>
<th>Minimum Nail or Staple Length, mm</th>
<th>Minimum Number of Nails or Staples</th>
<th>Maximum Nail or Staple Spacing</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wood trim</td>
<td>51</td>
<td>—</td>
<td>600 mm (o.c.)</td>
</tr>
<tr>
<td>Lumber siding or horizontal siding made from sheet material</td>
<td>51</td>
<td>—</td>
<td>600 mm (o.c.)</td>
</tr>
<tr>
<td>Metal siding</td>
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<td></td>
<td>600 mm (o.c.) (nailed to framing)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>400 mm (o.c.) (nailed to sheathing only)</td>
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<tr>
<td>Handsplit wood shakes up to 200 mm in width</td>
<td>51</td>
<td>2</td>
<td>—</td>
</tr>
<tr>
<td>Handsplit wood shakes over 200 mm in width</td>
<td>51</td>
<td>3</td>
<td>—</td>
</tr>
<tr>
<td>Wood shingles and machine grooved shakes up to 200 mm in width</td>
<td>32</td>
<td>2</td>
<td>—</td>
</tr>
<tr>
<td>Wood shingles and machine grooved shakes over 200 mm in width</td>
<td>32</td>
<td>3</td>
<td>—</td>
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<tr>
<td>Asbestos-cement shingles</td>
<td>32</td>
<td>2</td>
<td>—</td>
</tr>
<tr>
<td>Panel or sheet type siding up to 7 mm thick</td>
<td>38</td>
<td>—</td>
<td>150 mm (o.c.) along edges</td>
</tr>
<tr>
<td>Panel or sheet type siding more than 7 mm thick</td>
<td>51</td>
<td>—</td>
<td>300 mm (o.c.) along intermediate supports</td>
</tr>
<tr>
<td>Column 1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
</tbody>
</table>

### 9.27.5.6. Expansion and Contraction

Fasteners for metal or vinyl siding shall be positioned to permit expansion and contraction of the siding.

### 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 siding 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

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 not less than 5 mm thick at the top and 12 mm thick at the butt for
sidings 184 mm or less in width, and 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 9.5 mm for matched siding, 25 mm for lapped bevel siding or 12 mm for vertical battens.

9.27.7. Wood Shingles and Machine Grooved Shakes

9.27.7.1. Materials

(1) Shingles and shakes shall conform to CSA O118.1, “Western Red Cedar Shingles and Shakes.”

(2) Shakes shall be not less than No. 1 grade and shingles not less than No. 2 grade, except that No. 3 grade may be used for undercoursing.

9.27.7.2. Width. Shingles and shakes shall be not less than 65 mm nor more than 350 mm wide.

9.27.7.3. Fasteners. Shingles or shakes shall be fastened with nails or staples 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 not less than 40 mm so that joints in any 2 of 3 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

(1) When lath is used with double-course application (see Sentence 9.27.5.1.(5)), 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. The exposure and butt thickness of shingles and shakes shall conform to Table 9.27.7.A.

Table 9.27.7.A.
Forming Part of Article 9.27.7.6.

<table>
<thead>
<tr>
<th>Shake or Shingle Length, mm</th>
<th>Maximum Exposure</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Single Coursing, mm</td>
</tr>
<tr>
<td>400</td>
<td>190</td>
</tr>
<tr>
<td>450</td>
<td>216</td>
</tr>
<tr>
<td>600</td>
<td>292</td>
</tr>
<tr>
<td>Column 1</td>
<td>2</td>
</tr>
</tbody>
</table>

9.27.8. Asbestos-Cement Shingles and Sheets

9.27.8.1. Material Standards

(1) Asbestos-cement shingles and sheets shall conform to

(a) CAN/CGSB-34.4-M, “Siding, Asbestos Cement, Shingles and Clapboards,”

(b) CAN/CGSB-34.5-M, “Sheets, Asbestos Cement, Corrugated,”
9.27.8.2. Weight and Thickness

(1) Asbestos-cement shingles shall weigh not less than 8.06 kg/m².

(2) Asbestos-cement sheet shall be not less than 4.75 mm thick where applied to studs spaced not more than 400 mm o.c., nor less than 6 mm thick where applied to studs spaced not more than 600 mm o.c.

(3) Where applied over sheathing, the thickness of asbestos-cement sheet shall be not less than 3.15 mm.

9.27.8.3. Fastening of Shingles. Asbestos-cement shingles shall be fastened with nails located not less than 25 mm above the exposure line.

9.27.8.4. Joints of Shingles

(1) Asbestos-cement shingles shall be installed so that vertical joints in succeeding courses are staggered.

(2) Asphalt-coated backer strips shall be installed behind each vertical joint.

(3) Shingles referred to in Sentence (1) shall have not less than a 25 mm head lap.

9.27.8.5. Joints in Panels

(1) Vertical joints of asbestos-cement panels shall be protected with batten strips, caulking or other suitable method.

(2) Horizontal joints of asbestos-cement panels shall be lapped, flashed, caulked or otherwise suitably protected.

9.27.9. Plywood


9.27.9.2. Thickness

(1) Plywood siding shall be not less than 6 mm thick when applied directly to sheathing.

(2) When applied directly to framing or over furring strips, plywood siding thickness shall conform to Table 9.27.9.A.

(3) The thickness of grooved or textured plywood siding shall be measured at the point of least thickness.

Table 9.27.9.A.
Forming Part of Sentence 9.27.9.[2]

<table>
<thead>
<tr>
<th>Spacing of Supports, mm</th>
<th>Face Grain Parallel to Supports, mm</th>
<th>Face Grain Right Angles to Supports, mm</th>
</tr>
</thead>
<tbody>
<tr>
<td>400</td>
<td>8</td>
<td>6</td>
</tr>
<tr>
<td>600</td>
<td>11</td>
<td>8</td>
</tr>
</tbody>
</table>

9.27.9.3. Edge Treatment. The edges of plywood siding shall be treated with a suitable paint or sealer.

9.27.9.4. Panel Siding

(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 siding referred to in Sentence (1) shall be protected with batten strips or caulking when the plywood joints are not matched.

(4) Horizontal joints in siding referred to in Sentence (1) shall be lapped not less than 25 mm or shall be suitably flashed.

9.27.9.5. 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.
Wedges shall be inserted under all vertical butt joints and at all corners when horizontal lapped plywood is applied without sheathing.

9.27.10. Hardboard

9.27.10.1. Material Standards

1. Factory-finished hardboard siding shall conform to CAN/CGSB-11.5M, “Hardboard, Pre-coated, Factory-Finished, for Exterior Cladding.”

2. Hardboard siding which is not factory finished shall conform to Types 1, 2 or 5 in CAN/CGSB 11.3-M, “Hardboard.”

9.27.10.2. Thickness

1. Type 1 or 2 hardboard siding shall be not less than 6.0 mm thick when applied over sheathing that provides continuous support and not less than 7.5 mm thick when applied over furring or framing members not more than 400 mm o.c.

2. Type 5 hardboard siding 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 400 mm o.c.

3. Where hardboard siding is grooved, the grooves shall not extend more than 1.5 mm into the minimum required thickness. (See Appendix A.)

9.27.10.3. Panel Siding

1. Hardboard siding applied in panels shall have all edges supported with not less than a 5 mm gap provided between sheets.

2. Vertical joints in siding described in Sentence (1) shall be protected with batten strips or caulking when the joints are not matched.

3. Horizontal joints in siding described in Sentence (1) shall be lapped not less than 25 mm or shall be suitably flashed.

9.27.10.4. 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 moldings.

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.

9.27.10.5. Clearance. Not less than 3 mm clearance shall be provided between hardboard siding and door or window frames.

9.27.11. Waferboard and Strandboard

9.27.11.1. Material Standard. Waferboard and strandboard siding shall conform to CAN3-O437.0 “Waferboard and Strandboard.”

9.27.11.2. Thickness

1. Waferboard and strandboard conforming to grade O-2 shall be not less than 6.0 mm thick where applied directly to sheathing.

2. Grade O-2 waferboard and strandboard applied directly to framing or over furring strips shall conform to the thickness shown for plywood in Table 9.27.9.A. (See Appendix A.)

3. Waferboard and strandboard conforming to grades R-1 and O-1 shall be not less than 7.9 mm thick where applied directly to sheathing.

4. Where applied directly to framing or over furring strips, waferboard and strandboard conforming to grades R-1 and O-1 shall be not less than 9.5 mm thick on supports spaced not more than 400 mm o.c. and 12.7 mm thick on supports spaced not more than 600 mm o.c.

9.27.11.3. Panel Siding

1. Waferboard and strandboard applied in panels shall have all edges supported and treated with a primer or sealer.

2. Not less than a 3 mm gap shall be provided between sheets in siding described in Sentence (1).

3. Vertical joints in siding described in Sentence (1) shall be protected with batten strips or caulking when the waferboard and strandboard joints are not matched.

4. Horizontal joints in siding described in Sentence (1) shall be lapped not less than 25 mm or shall be suitably flashed.
9.27.11.4. Clearance. Not less than a 3 mm clearance shall be provided between waferboard and strandboard siding and door or window frames.

9.27.12. Metal Siding

9.27.12.1. Material Standards

(1) Horizontal and vertical strip steel siding, including flashing and trim accessories, shall conform to CGSB 93-GP-4M, “Siding, Soffits and Fascia, Steel, Galvanized, Prefinished, Residential.”

(2) Steel sheet siding shall have a minimum thickness of 0.3 mm and conform to CGSB 93-GP-3M, “Sheet, Steel, Galvanized, Prefinished, Residential.”

(3) Horizontal and vertical strip aluminum siding, including flashing and trim accessories, shall conform to CGSB 93-GP-2Ma, “Siding, Soffits and Fascia, Aluminum, Prefinished, Residential.”

(4) Aluminum sheet siding shall conform to CAN/CGSB 93.1-M, “Sheet, Aluminum Alloy, Prefinished, Residential” and shall have a thickness of not less than 0.58 mm, except that siding supported by backing or sheathing shall have a thickness of not less than 0.46 mm.

9.27.13. Vinyl Siding


9.27.13.2. Attachment. The attachment of vinyl siding shall conform to the requirements in Subsection 9.27.5. for metal siding.

Section 9.28 Stucco

9.28.1. General

9.28.1.1. Sheathing beneath Stucco

(1) Sheathing shall be provided beneath stucco applied over wood-frame walls except as permitted in Article 9.28.4.2.

(2) Where applied beneath stucco, sheathing shall conform to Subsection 9.23.16.

9.28.1.2. Lath and Reinforcing

(1) Stucco lath or reinforcing shall be used to attach stucco to wood-frame construction.

(2) Stucco lath or reinforcing shall be used to attach stucco to masonry where the masonry is soft-burned tile or brick of less strength than the stucco or if the masonry surface is not sound, clean and sufficiently rough to provide a good key.

(3) Stucco applied over masonry chimneys shall be reinforced.

9.28.1.3. Concrete Masonry Units. Stucco finish shall not be applied over concrete masonry units less than one month old unless the units have been cured by the autoclave process.

9.28.1.4. Clearance over Ground Level.
Stucco shall be not less than 200 mm above finished ground level except when it is applied over concrete or masonry.

9.28.1.5. Flashing and Caulking. Flashing and caulking used with stucco shall conform to Subsections 9.27.3. and 9.27.4., except that if aluminum flashing is used, it shall be separated from the stucco by an impervious membrane or coating. (See Article 9.7.4.2. for caulking around window frames.)

9.28.2. Stucco Materials


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.A.

9.28.2.3. Water. Water shall be clean and free of significant amounts of deleterious material.

9.28.3. Fasteners

9.28.3.1. Materials. 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 or 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 copper-alloy steel coated with rust-inhibitive paint after fabrication or shall be galvanized.

(2) Woven or welded wire mesh shall be galvanized.

9.28.4.2. No Sheathing Required. 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 of not more than 150 mm, or where paper-backed welded wire metal lath is used.

9.28.4.3. Stucco Lath Specifications. Stucco lath shall conform to Table 9.28.4.A.

9.28.4.4. Self-Furring Devices. 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. Horizontal and vertical joints shall be lapped not less than 50 mm.

(2) End joints of stucco lath shall be staggered and shall occur over framing members.

### Table 9.28.2.A
Forming Part of Sentence 9.28.2.2.(2)

<table>
<thead>
<tr>
<th>Aggregate Grading for Stucco</th>
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<tbody>
<tr>
<td>Sieve Sizes, mm</td>
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<tr>
<td>Minimum</td>
</tr>
<tr>
<td>---</td>
</tr>
<tr>
<td>4</td>
</tr>
<tr>
<td>2</td>
</tr>
<tr>
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</tr>
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<td>0.5</td>
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<tr>
<td>0.25</td>
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<td>0.125</td>
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</table>

### Table 9.28.4.A
Forming Part of Article 9.28.4.3.

<table>
<thead>
<tr>
<th>Stucco Lath</th>
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</thead>
<tbody>
<tr>
<td>Location</td>
</tr>
<tr>
<td>---</td>
</tr>
<tr>
<td>Vertical surfaces</td>
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<tr>
<td></td>
</tr>
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<tr>
<td></td>
</tr>
<tr>
<td>Horizontal surfaces</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>Column 1</td>
</tr>
</tbody>
</table>

Note to Table 9.28.4.A.: (1) See Appendix A.
9.28.5. Stucco Mixes

9.28.5.1. Mixes. Stucco mixes shall conform to Table 9.28.5.A.

<table>
<thead>
<tr>
<th>Table 9.28.5.A. Forming Part of Article 9.28.5.1.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stucco Mixes (by volume)</td>
</tr>
<tr>
<td>Portland Cement</td>
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<tr>
<td>1</td>
</tr>
<tr>
<td>Column 1</td>
</tr>
</tbody>
</table>

9.28.5.2. Pigments

1. Pigment if used shall consist of pure mineral oxides inert to the action of sun, lime and cement.

2. Pigment shall not exceed 6 per cent of the portland cement by weight.

9.28.5.3. Mixing

1. Materials shall be thoroughly mixed before and after water is added.

2. Stucco shall be applied not later than 3 h after the initial mixing.

9.28.6. Stucco Application

9.28.6.1. Low Temperature Conditions

1. The base for stucco shall be maintained above freezing.

2. Stucco shall be maintained at a temperature of not less than 10°C during application, and for not less than 48 h afterwards.

9.28.6.2. Number of Coats and Total Thickness. Stucco shall be applied with not less than 2 base coats and one finish coat, providing a total thickness of not less than 15 mm, measured from the face of the lath or face of the masonry where no lath is used.

9.28.6.3. First Coat

1. The first coat shall be not less than 6 mm thick, measured from the face of the lath or masonry, fully embedding the lath.

2. The surface of the first coat shall be scored to provide a key with the second coat.

9.28.6.4. Second Coat

1. The second coat shall be not less than 6 mm thick.

2. The surface of the second coat shall be lightly roughened to provide a key with the finish coat if the finish coat is other than stone dash.

9.28.6.5. Finish Coat

1. When the finish coat is other than stone dash, the base shall be dampened but not saturated before the finish coat is applied.

2. The thickness of the finish coat shall be not less than 3 mm.

3. When a stone dash finish is used, the stone shall be partially embedded in the second coat before the second coat starts to set or stiffen.
Section 9.29 Interior Wall and Ceiling Finishes

9.29.1. General
9.29.1.1. A wall or ceiling finish shall also conform to the appropriate requirements in Sections 9.10 and 9.11, in addition to the requirements in this Section.

9.29.2. Waterproof Wall Finish
9.29.2.1. Where Required. Waterproof finish shall be provided to a height of not less than 1.8 m above the floor in shower stalls, 1.2 m above the rims of bathtubs equipped with showers and 400 mm above the rims of bathtubs not equipped with showers.

9.29.2.2. Materials. Waterproof finish shall consist of ceramic, plastic or metal tile, sheet vinyl, tempered hardboard, laminated thermosetting decorative sheets or linoleum.

9.29.3. Wood Furring
9.29.3.1. Size and Spacing of Furring. Wood furring for the attachment of wall and ceiling finishes shall conform to Table 9.29.3.A.

9.29.3.2. Fastening. Furring shall be fastened to the framing or to wood blocks with not less than 51 mm nails.

9.29.4. Plastering
9.29.4.1. Application of plaster wall and ceiling finishes including installation of metal or gypsum lath, shall conform to CSA A82.30, “Interior Furring, Lathing and Gypsum Plastering.”

9.29.5. Gypsum Board Finish (Taped Joints)
9.29.5.1. Application
(1) The requirements for application of gypsum board in this Subsection apply to the single layer application of gypsum board to wood furring or framing using nails or screws.

(2) Gypsum board applications not described in this Subsection shall conform to CSA A82.31, “Gypsum Board Application.”

9.29.5.2. Materials. Gypsum board shall conform to CSA A82.27, “Gypsum Board Products.”

9.29.5.3. Maximum Spacing of Supports. Maximum spacing of supports for gypsum board applied as a single layer shall conform to Table 9.29.5.A.

9.29.5.4. Support of Insulation. Gypsum board supporting insulation shall be not less than 12.7 mm thick.

9.29.5.5. Length of Fasteners. The length of fasteners for gypsum board shall conform to Table 9.29.5.B., except that lesser depths of penetration are

<table>
<thead>
<tr>
<th>Table 9.29.3.A.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Forming Part of Article 9.29.3.1.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Maximum Spacing of Furring, mm</th>
<th>Maximum Spacing of Furring Supports</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Continuous Support 400 mm (o.c.) 600 mm (o.c.)</td>
</tr>
<tr>
<td>300</td>
<td>19 × 38</td>
</tr>
<tr>
<td>400</td>
<td>19 × 38</td>
</tr>
<tr>
<td>600</td>
<td>19 × 38</td>
</tr>
<tr>
<td>Column 1</td>
<td>2</td>
</tr>
</tbody>
</table>

9.29.5.6. Length of Fasteners.
Table 9.29.5.A. Forming Part of Article 9.29.5.3.

Maximum Spacing of Supports for Gypsum Board

<table>
<thead>
<tr>
<th>Thickness, mm</th>
<th>Orientation of Board to Framing</th>
<th>Maximum Spacing of Supports o.c., mm</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Walls</td>
</tr>
<tr>
<td>9.5</td>
<td>parallel</td>
<td>400</td>
</tr>
<tr>
<td></td>
<td>perpendicular</td>
<td></td>
</tr>
<tr>
<td>12.7</td>
<td>parallel</td>
<td>600</td>
</tr>
<tr>
<td></td>
<td>perpendicular</td>
<td>600</td>
</tr>
<tr>
<td>15.9</td>
<td>parallel</td>
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<td></td>
<td>perpendicular</td>
<td>600</td>
</tr>
<tr>
<td>Column 1</td>
<td>2</td>
<td>3</td>
</tr>
</tbody>
</table>

Table 9.29.5.B. Forming Part of Article 9.29.5.5.

Minimum Fastener Penetration into Wood Supports, mm

<table>
<thead>
<tr>
<th>Required Fire-Resistance Rating of Assembly</th>
<th>Walls</th>
<th>Ceilings</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fire-resistance rating not required</td>
<td>Nails</td>
<td>Screws</td>
</tr>
<tr>
<td></td>
<td>20</td>
<td>15</td>
</tr>
<tr>
<td>45 min</td>
<td>20</td>
<td>20</td>
</tr>
<tr>
<td>1 h</td>
<td>20</td>
<td>45</td>
</tr>
<tr>
<td>1.5 h</td>
<td>20</td>
<td>60</td>
</tr>
<tr>
<td>Column 1</td>
<td>2</td>
<td>3</td>
</tr>
</tbody>
</table>

permitted for assemblies required to have a fire-resistance rating provided it can be shown, on the basis of fire tests, that such depths are adequate for the required rating.


9.29.5.7. Screws. Screws for fastening gypsum board to wood supports shall conform to ASTM C1002, “Steel Drill Screws for the Application of Gypsum Board or Metal Plaster Bases.”

9.29.5.8. Spacing of Nails

(1) For single-layer application nails shall be spaced not more than 180 mm o.c. on ceiling supports and not more than 200 mm apart along vertical wall supports, except that nails may be spaced in pairs about 50 mm apart every 300 mm along such wall or ceiling supports.

(2) Where the ceiling sheets are supported by the wall sheets around the perimeter of the ceiling, this support may be considered as equivalent to nailing at this location.
The uppermost wall nails shall be not more than 200 mm below the ceiling.

Nails shall be located not less than 10 mm from the side or edge of the board.

Nails shall be driven so that the heads are below the plane of the board surface but do not puncture the paper.

**Spacing of Screws.** Where gypsum board is applied with drywall screws, the screws shall be spaced not more than 300 mm o.c. along supports, except that on vertical surfaces the screws may be spaced 400 mm o.c. where the supports are not more than 400 mm o.c.

**Low Temperature Conditions.** In cold weather, heat shall be provided to maintain a temperature of not below 10°C for 48 h prior to taping and finishing and maintained for not less than 48 h thereafter.

### Plywood Finish

**Minimum Thickness of Plywood Interior Finish**

<table>
<thead>
<tr>
<th>Maximum Spacing of Supports, mm (o.c.)</th>
<th>On Supports with no Horizontal Blocking, mm</th>
<th>On Supports with Blocking at Vertical Intervals not Exceeding 1.2 m, mm</th>
</tr>
</thead>
<tbody>
<tr>
<td>400</td>
<td>4.7</td>
<td>4.0</td>
</tr>
<tr>
<td>600</td>
<td>8.0</td>
<td>4.7</td>
</tr>
<tr>
<td>Column 1</td>
<td>2</td>
<td>3</td>
</tr>
</tbody>
</table>

**Grooved Plywood**

Except as permitted in Sentence (2), where plywood for interior finish is grooved, the grooves shall not extend through the face ply and into the plies below the face ply unless the groove is supported by framing or furring.

If the grain of the face ply is at right angles to the supporting members, the groove is permitted to extend into plies below the face ply provided the thickness of the plywood exceeds the value shown in Table 9.29.6.A. by an amount equal to not less than the depth of penetration of the grooves into the plies below the face ply.

Nails for attaching plywood finishes shall not be 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, except that staples providing equivalent lateral resistance may also be used.

All plywood edges shall be supported by furring, blocking or framing.

**Hardboard Finish**

**Material Standard.** Hardboard shall conform to CGSB 11-GP-3M, “Hardboard.”

**Thickness.** Hardboard shall be not less than 3 mm thick where applied over continuous back-up, 6 mm thick when applied over supports spaced not more than 400 mm o.c. and 9 mm thick when applied over supports spaced not more than 600 mm o.c.

**Nails.** 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.

All hardboard edges shall be supported by furring, blocking or framing where the back-up is not continuous.

**Insulating Fibreboard Finish**

**Material Standard.** Insulating fibreboard shall conform to CAN3-A247-M, “Insulating Fibreboard.”
9.29.8.2. Thickness

(1) Insulating fibreboard sheets shall be not less than 11.1 mm thick on supports not more than 400 mm o.c.
(2) Insulating fibreboard tile shall be not less than 12.7 mm thick on supports spaced not more than 400 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. All fibreboard edges shall be supported by blocking, furring or framing.

9.29.9. Particleboard, Waferboard or Strandboard Finish

9.29.9.1. Material Standard

(1) Particleboard finish shall conform to CAN3-O188.1, “Interior Mat-Formed Wood Particleboard.”
(2) Waferboard and strandboard finish shall conform to CAN3-O437.0 “Waferboard and Strandboard.”

9.29.9.2. Minimum Thickness

(1) The minimum thickness of O-2 grade waferboard and strandboard used as an interior finish shall conform to that shown for plywood in Table 9.29.9.A., except that no minimum thickness is required when applied over solid backing.
(2) Thicknesses listed in Table 9.29.9.A. shall permit a manufacturing tolerance of ± 0.4 mm.
(3) Waferboard and strandboard conforming to grades R-1 and O-1, and particleboard shall be
   (a) not less than 6.35 mm thick on supports not more than 400 mm o.c.,
   (b) not less than 9.5 mm thick on supports not more than 600 mm o.c., and
   (c) not less than 6.35 mm thick on supports not more than 600 mm o.c. in walls where blocking is provided at midwall height.

9.29.9.3. Nails. Nails for fastening particleboard, waferboard or strandboard 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. All particleboard, waferboard or strandboard 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 1 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 not less than 3 nor more than 5 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. 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. 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. The joints between wall tiles and a bathtub shall be suitably caulked with material conforming to CGSB 19-GP-22M, “Sealing Compound, Mildew Resistant, for Tubs and Tile.”
Section 9.30 Flooring

9.30.1. General

9.30.1.1. Required Finished Flooring. Finished flooring shall be provided in all residential occupancies.

9.30.1.2. Water Resistance. 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.

9.30.1.3. Sleepers. 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. 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. (See Sentence 9.30.3.2.(1).)

(2) 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. (See Article 9.23.14.3.)

(3) Panel-type underlay shall be provided under resilient flooring on waferboard or strandboard subflooring.

(4) Panel-type underlay shall be provided under ceramic tile applied with adhesive.

9.30.2.2. Materials and Thickness

(1) Panel-type underlay shall be not less than 6 mm thick and shall conform to

(a) CSA O115, “Hardwood and Decorative Plywood,”

(b) CSA O121, “Douglas Fir Plywood,”

(c) CSA O151, “Canadian Softwood Plywood,”

(d) CSA O153, “Poplar Plywood,”

(e) CAN3-O188.1, “Interior Mat-Formed Wood Particleboard,”

(f) CAN3-O437.0 “Waferboard and Strandboard,” or

(g) CAN/CGSB 11.3-M, “Hardboard.”

(2) Panel-type underlay under ceramic tile applied with adhesive shall be not less than

(a) 6 mm thick where the supports are spaced up to 300 mm o.c., and

(b) 11 mm thick where the supports are spaced wider than 300 mm o.c.

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 have not less than a 1.2 mm shank diameter or thickness with a 4.7 mm crown and shall be not less than 22 mm long for 6 mm underlay and 28 mm long for 7.9 mm and 9.5 mm underlay.

9.30.2.4. Joints Offset. Where panel-type underlay is required to be installed over plywood or waferboard or strandboard, the joints in the underlay shall be offset not less than 200 mm from the joints in the underlying subfloor.

9.30.2.5. Surface Defects. Underlay beneath resilient or ceramic floors applied with an adhesive shall have all holes or open defects in 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. The thickness of wood strip flooring shall conform to Table 9.30.3.A.
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 2 adjoining strips break joints in the same space between supports and each strip bears on no fewer than 2 supports.

9.30.3.3. Nailing

(1) When nails are used wood strip flooring shall be toe nailed or face nailed with not less than one nail per strip at the spacings shown in Table 9.30.3.B., except that face nailed strips of more than 25 mm in width shall have no fewer than 2 nails per strip.

(2) Face nails shall be countersunk and the holes filled with suitable filler.

9.30.3.4. Staples. Staples may be used to fasten wood strip flooring not more than 7.9 mm in thickness provided the staples are not less than 29 mm long with a shank diameter of 1.19 mm and with 4.7 mm crowns.

### Table 9.30.3.A.
Forming Part of Article 9.30.3.1.

<table>
<thead>
<tr>
<th>Type of Flooring</th>
<th>Maximum Joist Spacing, mm</th>
<th>Minimum Thickness of Flooring, mm</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>With Subfloor</td>
</tr>
<tr>
<td>Matched hardwood (interior use only)</td>
<td>400</td>
<td>7.9</td>
</tr>
<tr>
<td>Matched softwood (interior or exterior use)</td>
<td>400</td>
<td>19.0</td>
</tr>
<tr>
<td>Square edge softwood (exterior use only)</td>
<td>400</td>
<td>—</td>
</tr>
<tr>
<td>Column 1</td>
<td>2</td>
<td>3</td>
</tr>
</tbody>
</table>

### Table 9.30.3.B.
Forming Part of Sentence 9.30.3.3.(1)

<table>
<thead>
<tr>
<th>Finish Floor Thickness, mm</th>
<th>Minimum Length of Flooring Nails, mm</th>
<th>Maximum Spacing of Flooring Nails, mm</th>
</tr>
</thead>
<tbody>
<tr>
<td>7.9</td>
<td>38 (1)</td>
<td>200</td>
</tr>
<tr>
<td>11.1</td>
<td>51</td>
<td>300</td>
</tr>
<tr>
<td>19.0</td>
<td>57</td>
<td>400</td>
</tr>
<tr>
<td>25.4</td>
<td>63</td>
<td>400</td>
</tr>
<tr>
<td>31.7</td>
<td>70</td>
<td>600</td>
</tr>
<tr>
<td>38.1</td>
<td>83</td>
<td>600</td>
</tr>
<tr>
<td>Column 1</td>
<td>2</td>
<td>3</td>
</tr>
</tbody>
</table>

Note to Table 9.30.3.B.:
(1) See Article 9.30.3.4.

9.30.4. Parquet Flooring

9.30.4.1. 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

(1) Resilient flooring used on concrete slabs supported on ground shall consist of asphalt, rubber,
vinyl-asbestos, 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.

9.30.6. Ceramic Tile

9.30.6.1. Ceramic tile shall be set in a mortar bed or applied to a sound smooth base with a suitable adhesive.

9.30.6.2. Panel-type subfloor to which ceramic tile is to be applied with adhesive shall have its edges supported according to Article 9.23.14.3.

Section 9.31 Plumbing Facilities

9.31.1. Scope

9.31.1.1. Application

(1) This Section applies to the plumbing facilities and plumbing systems within dwelling units.

(2) Plumbing facilities other than those required in dwelling units shall conform to Subsection 3.6.4. (See also Section 3.7 regarding barrier-free plumbing facilities.)

9.31.2. General

9.31.2.1. General. The construction, extension, alteration, renewal or repair of plumbing systems and sewage disposal systems shall conform to Part 7.

9.31.2.2. Corrosion Protection. Metal pipes in contact with cinders or other corrosive material shall be protected by a heavy coating of bitumen or other corrosion protection.

9.31.2.3. Grab Bars. When provided, grab bars shall be capable of resisting a load of not less than 1.3 kN applied vertically or horizontally.

9.31.3. Water Supply and Distribution

9.31.3.1. Required Water Supply. Every dwelling unit shall be supplied with potable water.

9.31.3.2. Required Connections

(1) Where a piped water supply is available, piping for hot and cold water shall be connected to every kitchen sink, lavatory, bathtub, shower, slop sink and laundry area.

(2) Piping for cold water shall be run to every water closet and hose bib.

9.31.4. Required Facilities

9.31.4.1. Required Fixtures. A kitchen sink, lavatory, bathtub and water closet shall be provided for every dwelling unit where a piped water supply is available.

9.31.4.2. Laundry Facilities. Laundry facilities or a space for laundry facilities shall be provided in every dwelling unit, or grouped elsewhere in the building in a location conveniently accessible to occupants of every dwelling unit.

9.31.4.3. Hot Water Supply. Where a piped water supply is available a hot water supply shall be provided in every dwelling unit.

9.31.4.4. Floor Drains

(1) Where gravity drainage to a sewer, drainage ditch or dry well is possible, a floor drain shall be installed in a basement forming part of a dwelling unit.

(2) A floor drain shall be provided in a garbage room, incinerator room or boiler room serving more than one dwelling unit.

9.31.5. Sewage Disposal

9.31.5.1. Building Sewer. Wastes from every plumbing fixture shall be piped to the building sewer.

9.31.5.2. Discharge of Sewage

(1) Building sewers shall discharge into a public sewage system where such system is available.

(2) Where a public sewage system is not available, the building sewer shall discharge into a private sewage disposal system.
9.31.6. Service Water Heating Facilities

9.31.6.1. Hot Water Temperature. Where a hot water supply is required by Article 9.31.4.3., equipment shall be installed which is capable of heating to at least 45°C but not above 60°C an adequate supply of service hot water for every dwelling unit.

9.31.6.2. Supply Source. Service hot water may be distributed from a centrally located heater to supply the entire building or may be supplied by an individual service water heater for each dwelling unit.


9.31.6.4. Corrosion-Resistant Coating. Where storage tanks for service water heaters are of steel, they shall be coated with zinc, vitreous enamel (glass lined), hydraulic cement or other corrosion-resistant material.

9.31.6.5. Fuel-Burning Heaters. Fuel-burning service water heaters shall be connected to a chimney flue conforming to Section 9.21.

9.31.6.6. Heating Coils. 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

(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 only one dwelling unit.

(2) Mechanical ventilation systems, other than self-contained systems serving single dwelling units, 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 5 cars shall be ventilated in accordance with Part 6.

9.32.1.2. General. Rooms or spaces in dwelling units shall be ventilated during the non-heating season by natural means in accordance with Subsection 9.32.2. or by a mechanical ventilation system conforming to Subsection 9.32.3.

9.32.2. Natural Ventilation

9.32.2.1. Natural Ventilation Area

(1) The unobstructed openable ventilation area to the outdoors for rooms and spaces in residential buildings ventilated by natural means shall conform to Table 9.32.2.A.

(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.

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. Required Mechanical Ventilation for Dwelling Units

(1) Every dwelling unit shall be provided with a mechanical ventilation system having a capacity to exhaust inside air or to introduce outside air at the rate of not less than 0.3 air changes per hour averaged over any 24-hour period.

(2) The rate of air change required in Sentence (1) shall be based on the total interior volume of all storeys including the basement, but excluding any attached or built-in garage or unheated crawl space.

9.32.3.2. Mechanical Ventilation of Rooms and Spaces. Where a habitable room or space in a dwelling unit is not provided with natural ventilation described in Article 9.32.1.2., mechanical ventilation shall be provided to exhaust inside air 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.

9.32.3.3. Design and Installation Requirements

(1) Except as provided in Sentence (2), mechanical ventilation shall conform to the requirements in Part 6.

(2) Mechanical ventilation required in Articles 9.32.3.1. and 9.32.3.2., and consisting of one or more exhaust fans without an air circulating ductwork system, need not conform with Part 6, provided

(a) each exhaust fan conforms to CSA C22.2 No. 113, "Fans and Ventilators;"

(b) except as permitted in Sentences (4) and (5), air intake openings for make-up air are installed and are of a size to prevent excessive depressurization in the dwelling unit when all exhaust fans of the system are operating, and

(c) the exhaust fans are controlled either manually by a switch or automatically by a humidistat.

(3) The mechanical ventilation capacity of the system described in Sentence (2) shall be assumed to be the sum of the capacities of the individual fans, as rated at a differential static pressure of at least 25 Pa.

(4) The air intake openings described in Clause (2)(b) are not required if spillage-susceptible fuel-fired heating appliances which are required to be vented are not installed in the dwelling unit.

Table 9.32.2.A.
Forming Part of Sentence 9.32.2.1.(1)

<table>
<thead>
<tr>
<th>Natural Ventilation Area</th>
<th>Minimum Unobstructed Area</th>
</tr>
</thead>
<tbody>
<tr>
<td>Location</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Within dwelling unit</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Bathrooms or water-closet rooms</td>
<td>0.09 m²</td>
</tr>
<tr>
<td>Unfinished basement space</td>
<td>0.2 per cent of the floor area</td>
</tr>
<tr>
<td>Dining rooms, living rooms, bedrooms, kitchens, combined rooms, dens, recreation rooms and all other finished rooms</td>
<td>0.28 m² per room or combination of rooms</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Other than within dwelling unit</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Bathrooms or water-closet rooms</td>
<td>0.09 m² per water closet</td>
</tr>
<tr>
<td>Sleeping areas</td>
<td>0.14 m² per occupant</td>
</tr>
<tr>
<td>Laundry rooms, kitchens, recreation rooms</td>
<td>4 per cent of the floor area</td>
</tr>
<tr>
<td>Corridors, storage rooms and other similar public rooms or spaces</td>
<td>2 per cent of the floor area</td>
</tr>
<tr>
<td>Unfinished basement space not used on a shared basis</td>
<td>0.2 per cent of the floor area</td>
</tr>
</tbody>
</table>

| Column 1 | 2 | 3 |
(5) The air intake openings described in Clause (2)(b) are not required if it can be shown by test that air leakage is sufficient to prevent excessive depressurization in the dwelling unit when all exhaust fans of the system are operating.

(6) Special purpose air exhausting equipment such as central vacuum cleaning systems, downdraft cook tops and clothes dryers shall not be included in the calculation of the capacity of the system described in Sentence (2).

9.32.3.4. Combustion and Dilution Air.
Systems designed to provide combustion and/or dilution air for fuel-burning appliances shall not be used to supply make-up air for ventilation systems unless their capacity is sufficient to serve both functions simultaneously without creating excessive depressurization in the dwelling unit.

9.32.3.5. Exhaust Ducts
(1) Exhaust ducts shall discharge directly to the outdoors.
(2) Where the exhaust duct passes through or is adjacent to unheated space, the duct shall be insulated to prevent moisture condensation in the duct.

9.32.3.6. Accessibility
(1) Ventilation equipment shall be accessible for inspection, maintenance, repair and cleaning.
(2) Kitchen exhaust ducts shall be designed and installed so that the entire duct can be cleaned where the duct is not equipped with a filter at the intake end.

9.32.3.7. Protection from Weather and Insects
(1) Outdoor air intake and exhaust outlets shall be shielded from weather and insects.
(2) Screening shall be of rust-proof material.

9.32.3.8. Requirements for Ducts.
Ventilating ducts shall conform to the requirements of Part 6 for supply ducts, except exhaust ducts that serve only a bathroom or water-closet room may be of combustible material provided the duct is reasonably air tight and constructed of a material impervious to water.

Section 9.33 Heating and Air-Conditioning

9.33.1. General

9.33.1.1. Design and Installation Requirements
(1) The design and installation of central heating systems, including requirements for combustion air, shall conform to the requirements in Part 6 and to this Section. (See Appendix A.) (See also Subsection 9.10.10.)

(2) The design and installation of air-conditioning systems shall conform to the requirements in Part 6.

The installation of solid-fuel burning stoves, ranges and space heaters, including the requirements for combustion air, shall conform to CAN/CSA-B365, “Installation Code for Solid-Fuel Burning Appliances and Equipment.”

9.33.1.3. Design Temperatures
(1) Residential buildings intended for use in the winter months on a continuing basis shall be equipped with heating facilities capable of maintaining an indoor air temperature of 22°C at the outside winter design temperature except as provided in Sentences (4) and (5).

(2) All buildings other than those described in Sentence (1) shall be equipped with heating facilities of sufficient capacity to maintain the desired indoor air temperature, commensurate with the use of the building, at the outside winter design temperature.

(3) Winter design temperatures shall be determined in conformance with Subsection 2.2.1.

(4) Heating facilities shall be provided which shall be capable of maintaining a temperature not below 18°C in an unfinished basement in buildings of residential occupancy.

(5) Where crawl spaces are required to be heated, the heating facilities shall be capable of maintaining a temperature not below 15°C.
9.33.2. Fire Protection for Gas and Electric Ranges

9.33.2.1. Vertical Clearance

(1) Except as provided in Sentence (2), a vertical clearance of not less than 750 mm shall be provided above the elements or burners of electric- and gas-fired domestic ranges.

(2) Where cabinets located above the elements or burners referred to in Sentence (1) are noncombustible or are protected with asbestos millboard not less than 6 mm thick, covered with sheet metal not less than 0.33 mm thick, or by a metal hood with a 125 mm projection beyond the upper cabinets, the vertical clearance may be reduced to 600 mm.

9.33.2.2. Clearance to Wall Framing. Combustible wall framing members within 450 mm of the area where the range is to be located shall be protected above the level of the heating elements by material providing fire resistance not less than that of a 9.5 mm thickness of gypsum board.

9.34.1. General

9.34.1.1. Standard for Electrical Installations. Electrical installations, including the service capacity of the installation and the number and distribution of circuits and receptacles, shall meet the requirements of the appropriate provincial or municipal legislation or, in the absence of such legislation, shall conform to CSA C22.1, “Canadian Electrical Code, Part I.”

9.34.1.2. Required Facilities. Where electrical services are available, electrical facilities shall be provided for every building in conformance with this Section.

9.34.1.3. Location of Equipment in Public Areas. Entrance switches, meters, panel boxes, splitter boxes, time clocks and other similar equipment shall not be located in any public area unless adequate precautions are taken to prevent interference with the equipment.

9.34.1.4. Recessed Lighting Fixtures. Recessed lighting fixtures shall not be located in insulated ceilings unless the fixtures are designed for such installations.

9.34.1.5. Wiring and Cables. Electrical wiring and cables installed in buildings permitted to be of combustible construction shall conform to Sentence 3.1.4.3.(1).

9.34.2. Lighting Outlets

9.34.2.1. Lighting of Entrances. An exterior lighting outlet with fixture controlled by a wall switch located within the building shall be provided at every entrance to buildings of residential occupancy.

9.34.2.2. Outlets in Dwelling Units

(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 dwelling units.

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

9.34.2.3. Stairways

(1) Every stairway shall be lighted.

(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 not less than one lighting outlet with fixture for stairways with 4 or more risers in dwelling units.

(3) The stairway lighting for basements that do not contain finished space or lead to an outside entrance or built-in garage and which serve not more than one dwelling unit may 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 m² or fraction thereof of floor area in unfinished basements.
9.34.2.4.

(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. 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) Outlets required in Sentence (1) shall be controlled by a wall switch near the doorway where the fixture is ceiling mounted above an area normally occupied by a parked car; otherwise a switched lampholder may be used.

(3) 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 shall be provided with lighting outlets with fixtures controlled by a wall switch or panel to illuminate every portion of such areas.

(2) When provided by incandescent lighting, illumination required in Sentence (1) shall conform to Table 9.34.2.A. (See 9.9.11.2. for lighting in means of egress.)

Table 9.34.2.A.
Forming Part of Sentences 9.34.2.7.(2) and (3)

<table>
<thead>
<tr>
<th>Room or Space</th>
<th>lx</th>
<th>W/m² of Floor Area (Incandescent Lighting)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Storage rooms</td>
<td>50</td>
<td>5</td>
</tr>
<tr>
<td>Service rooms and laundry areas</td>
<td>200</td>
<td>20</td>
</tr>
<tr>
<td>Garages</td>
<td>50</td>
<td>5</td>
</tr>
<tr>
<td>Public water-closet rooms</td>
<td>100</td>
<td>10</td>
</tr>
<tr>
<td>Service hallways and stairways</td>
<td>50</td>
<td>5</td>
</tr>
<tr>
<td>Recreation rooms</td>
<td>100</td>
<td>10</td>
</tr>
</tbody>
</table>

9.34.3. Emergency Lighting

9.34.3.1. Emergency lighting shall conform to Subsection 9.9.11.

Section 9.35 Garages and Carports

9.35.1. Scope

9.35.1.1. Application. This Section applies to garages and carports serving not more than one dwelling unit.

9.35.1.2. Construction Requirements. 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. Where a roofed enclosure used for the storage or parking of a car or cars has more than 60 per cent of the total perimeter enclosed by walls, doors or windows, the enclosure shall be considered a garage.

9.35.2.2. Garage Floor. Where an attached or built-in garage is provided, the garage floor shall be sloped to the outdoors.

9.35.3. Foundations

9.35.3.1. Foundation Required. 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.

9.35.3.2. Protection from Damage due to Soil Movement

(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 dwelling unit by a breezeway shall be approximately the same depth as the main building foundation.

(2) Where slab-on-grade 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. Detached garages of less than 50 m\(^2\) floor area and not more than 1 storey in height may be supported on wood mud sills provided the garage is not of masonry or masonry veneer construction.

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. Interior finish need not be applied to garage and carport walls.

9.35.4.2. Columns. 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. 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.
### Table A–1
Forming Part of Sentence 9.23.4.1(1)

**Floor Joists – Living Quarters**

<table>
<thead>
<tr>
<th>Commercial Designation</th>
<th>Grade</th>
<th>Member Size, mm</th>
<th>Strapping Only</th>
<th>Bridging Only</th>
<th>Strapping and Bridging</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>Joist Spacing</td>
<td>Joist Spacing</td>
<td>Joist Spacing</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>300 mm 400 mm 600 mm</td>
<td>300 mm 400 mm 600 mm</td>
<td>300 mm 400 mm 600 mm</td>
</tr>
<tr>
<td></td>
<td>Select Structural</td>
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Forming Part of Sentence 9.23.4.1.(1)
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Forming Part of Sentence 9.23.4.1.(1)

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Forming Part of Sentence 9.23.4.1.(1)

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Forming Part of Sentence 9.23.4.1.(1)

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**Note to Table A-8**

See A-9.23.4.1.(1) in Appendix A

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### Table A-9
Forming Part of Sentence 9.23.4.1.(1)

Maximum Spans (m) for Built-up Floor Beams Supporting not more than Two Floors in Houses

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**Note to Table A-9**
See A-9.23.4.1.(1) in Appendix A

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(1) See A-9.23.4.1.(1) in Appendix A.
### Table A-10
Forming Part of Article 9.23.13.11.

Maximum Clear Spans (m) between End Supports for Fink Trusses

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Appendix A
Explanatory Material for the National Building Code 1990

A-1.1.2.1. Application to Existing Buildings. This Code is most often applied to existing buildings when an owner voluntarily wishes to rehabilitate a building, change its use or build an addition; or when an enforcement authority decrees that the building be altered for reasons of public safety. Whatever the reason, its application to existing buildings requires careful consideration of the level of safety needed for that building.

This consideration involves an analytical process similar to that required to assess alternate design proposals for new construction. First the objective of the Code requirements must be established. To assist the Code user in this regard, Appendix notes are included to clarify the intent of certain requirements. In addition, commentaries on the more complicated Code issues are available. Once the objective is defined, one must then determine to what extent the existing building must be altered to meet the objective.

In developing Code requirements for new buildings, consideration has been given to the cost they impose on a design in relation to the perceived benefits in terms of safety. The former is definable; the latter difficult to establish on a quantitative basis. In applying the Code requirements to an existing building, the benefits derived are the same as in new buildings. On the other hand, the increased cost of implementing in an existing building a design solution that would normally be intended for a new building may be prohibitive.

The successful application of Code requirements to existing construction becomes a matter of balancing the cost of implementing a requirement with the relative importance of that requirement to the overall Code objectives. 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.

Further information on the application of Code requirements to existing buildings may be found in Canadian Building Digest No. 230, "Applying Building Codes to Existing Buildings," available from the Institute for Research in Construction, National Research Council of Canada, Ottawa, K1A 0R6.

A-1.1.3.2. Exit. Exits include doors or doorways leading directly into an exit stair or directly to the outside. In the case of an exit leading to a separate building, exits also include vestibules, walkways, bridges and balconies.

A-1.1.3.2. Farm Building. Farm buildings as defined in Article 1.1.3.2. include but are not limited to produce storage and packing facilities, livestock and poultry housing, milking centres, manure storage facilities, grain bins, silos, feed preparation centres, farm workshops, greenhouses, farm retail centres, and horse riding, exercise and training facilities. Farm buildings may be classed as low or high human occupancy depending on the occupant load.

Examples of farm buildings likely to be classed as low human occupancy as defined in Article 1.2.1.2. of the Canadian Farm Building Code are livestock and poultry housing, manure and machinery storage facilities and horse exercise and training facilities where no bleachers or viewing area are provided.
Examples of buildings that would be classed as other than low human occupancy include farm retail centres for feeds, horticultural and livestock produce, auction barns and show areas where bleachers or other public facilities are provided. Farm work centres where the number of workers frequently exceeds the limit for low human occupancy will also be in this category.

It is possible to have areas of both high and low human occupancy in the same building provided that the structural safety and fire separation requirements for high human occupancy are met in the part thus designated.

A-1.1.3.2. Fire Separation. A fire separation may or may not have a fire-resistance rating.

A-1.1.3.2. Public Corridor. A covered mall is considered to be a public corridor and, as such, is subject to the same requirements as a public corridor.

A-1.1.3.2. 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 to be service rooms.

A-1.1.3.2. 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 nursing 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.

A-2 Relationship of the NBC to Standards Development and Conformity Assessment. The development of many requirements in the National Building Code and the assessment of conformity to those requirements is supported by several of the services provided by the member organizations of Canada’s National Standards System (NSS).

The NSS is a federation of accredited organizations concerned with standards writing, certification and testing, established under the auspices of the Standards Council of Canada Act. Activities of the NSS are coordinated by the Standards Council of Canada (SCC), which has currently accredited 5 standards writing organizations, 7 certification organizations and many testing organizations.

The SCC is a federal non-profit crown corporation responsible for the coordination of voluntary standardization in Canada. It also has responsibilities for Canada’s activities in international standardization.

- Canadian Standards

The NBC contains many references to standards published by accredited standards writing organizations in Canada. As part of the accreditation requirements, these organizations adhere to the principles of consensus. This generally means substantial majority agreement of a committee comprising a balance of producer, user and general interest members and the
consideration of all negative comments. The organizations also have a requirement for second level review of the technical preparation and balloting of standards prepared under their auspices. Standards prepared in this way are eligible for designation by SCC as National Standards of Canada. (The Canadian Commission on Building and Fire Codes follows these same principles of consensus in the operation of its Codes writing process.) The following organizations are accredited as standards writing organizations in Canada for standards referenced in the NBC:

- Bureau de normalisation du Québec (BNQ)
- Canadian Gas Association (CGA)
- Canadian General Standards Board (CGSB)
- Canadian Standards Association (CSA)
- Underwriters’ Laboratories of Canada (ULC)

Foreign Standards

A number of subject areas are covered by the NBC where the Canadian standards writing organizations have chosen not to develop standards. In these cases, the Code often makes reference to standards developed by organizations in other countries, such as the American Society for Testing and Materials (ASTM) and the National Fire Protection Association (NFPA). These standards are developed using processes that may differ from that used by the Canadian standards writing organizations; nevertheless these standards have been reviewed by the relevant standing committees (see below) and found acceptable.

Section 2.7., Referenced Documents, contains Table 2.7.3.A that lists the standards referred to in the NBC. When a standard is to be referred to in the NBC, the committee responsible for the relevant section reviews the content of the standard to ensure that it is compatible with the code. Thereafter, referenced standards are annually reviewed in two ways. The originating organization is asked to confirm the status of the original, amended or new edition of the standard and the relevant standing committee is canvassed for any known problems associated with the standard.

Conformity Assessment

The National Building Code is a set of minimum requirements contained within its own text or that of referenced documents. The process of assessing conformity to the requirements during construction is the responsibility of the authority having jurisdiction and the supervising professional designers.

Those persons responsible for ensuring that a material, appliance, system or equipment meets the performance requirements of this Code have several means available to assist them. These means vary from on-site inspection to the use of certification services provided by accredited third party organizations. Test reports or mill certificates provided by manufacturers or suppliers can assist in the acceptance of products. Engineering reports may be required on more complex products.

Testing - The accreditation programs of the SCC include one for testing organizations. About 85 organizations are accredited, with 51 accredited as capable of reliably testing building products to established standards. The test results produced by these organizations are used in the evaluation, qualification and certification of building products to Code requirements.

Certification - Certification is the confirmation by an independent organization that a product or service meets a requirement. Certification of a product, process, or system entails physical examination, testing as specified in appropriate standards, plant examination and follow-up unannounced plant inspections. This procedure leads to the issuing of a formal assurance or declaration by means of a certification mark or certificate that the product, process or system is in full conformity with specified requirements.

In some cases, a product for which no standard exists can be certified using procedures and criteria developed by the accredited certifying organization and specifically designed to measure the performance of that product.

The following organizations are accredited by the SCC to provide certification services in the field of building products/facilities. They publish lists of certified products:

- Canadian Gas Association (CGA)
- Canadian General Standards Board (CGSB)
- Canadian Standards Association (CSA)
- Council of Forest Industries (COFI)
- Underwriters’ Laboratories of Canada (ULC)
Warnock Hersey Professional Services (WHPS)
Canadian Welding Bureau (CWB)

Facsimiles of the registered certifications marks of these organizations are illustrated below:

**Evaluation** - Evaluation is a written opinion by an independent professional organization that a product will perform its intended function in a building. Evaluation is very often done to determine equivalency of performance of an innovative product to the intent of a Code requirement. Follow-up plant inspections are not part of the evaluation process.

Several organizations, including the Canadian Construction Materials Centre (CCMC) offer evaluation services. To encourage the use of new and innovative proprietary products, CCMC and most of the certification organizations evaluate the equivalency of such products to the Code requirements. CCMC also evaluates products for which a standard exists but for which no other industry supported service is available. It operates under agreements with most of the provincial and territorial governments and with Canada Mortgage and Housing Corporation (CMHC).

**Qualification** - Qualification of building products also evaluates the ability of a product to perform its intended function by verifying that it meets the requirements of a standard. Qualification normally includes some follow-up plant inspection. Some organizations publish lists of qualified products that meet the specified requirements. Some organizations qualify manufacturing and/or testing facilities for building products for compliance with the Code and relevant standards.

**Equivalence**

Article 2.5.1.3 permits equivalence to be determined by past performance, test or evaluation. The determination of the equivalence of materials, appliances, systems, equipment and methods of design and construction not specifically described in the Code usually requires specialized knowledge and evaluation methods. Equivalence can be determined, therefore, through the certification, evaluation and qualification processes.

**A-2.1.6.1. Buildings Divided by Firewalls.**

This concept relates to the provisions directly regulated by this Code and does not apply to electrical service entrance requirements which are regulated by other documents.

**A-2.1.6.2.(1) Buildings on Sloping Sites.**

Application of the definition of grade to stepped buildings on sloping sites often results in such buildings being designated as being greater than 3 storeys in building height even though there may be only 2 or 3 storeys at any one location. The diagrams below illustrate this application compared to a similar building on a flat site.
Under this Sentence, Building A can be considered as being 3 storeys in building height instead of 6 storeys in building height. Both Building A and Building B are comparable with regard to fire safety and egress. This relaxation applies to the determination of building height only. All other requirements continue to apply as appropriate.

A-2.2.1.1.(1) Data for municipalities not listed in the Supplement may be obtained by writing to: Head, Energy and Industrial Application Section, Canadian Climate Service, Environment Canada, 4905 Dufferin Street, Downsview, Ontario M3H 5T4.

A-2.2.1.1.(2) The 2.5 per cent values stated in Sentence 2.2.1.1.(2) are the least restrictive temperatures that can be used. If a designer chooses to use the 1 per cent values given in Chapter 1 of the Supplement to the NBC 1990, they would be in excess of the Code minimums and would be considered acceptable.

A-2.3.5.2. Examples of information that should be shown on architectural plans and plans for heating, ventilating and air-conditioning systems are:
(a) the name, type and location of the building,
(b) the name of the owner,
(c) the name of the architect,
(d) the name of the engineer or designer,
(e) the north point,
(f) the dimensions and height of all rooms,
(g) the intended use of all rooms,
(h) the details or description of the wall, roof, ceiling and floor construction, including insulation,
(i) the details or description of the windows and outside doors, including the size, weatherstripping, storm sashes, sills and storm doors,
(j) the size and continuity of all pipes, ducts, shafts, flues and fire dampers,
(k) the location, size, capacity and type of all principal units of equipment,
(l) the size, shape and height of all chimneys and gas vents,
(m) the size and location of all combustion air and ventilation openings, and
(n) the location and fire-resistance rating of required fire separations.

A-3 Limitation on Application. In applying the requirements of this Part, it is intended that they be applied with discretion in buildings of unusual configurations that do not clearly identify with the specific requirements, or in buildings in which processes are carried out which make compliance with particular requirements in this Part impracticable. The definition of “building” as it applies to this Code is general and encompasses most structures, including those which would not normally be considered as buildings in the layman’s sense. This occurs more often in industrial uses, particularly those involving manufacturing facilities and equipment that require specialized design that may make it impracticable to follow the specific requirements of this Part. Steel mills, aluminum plants, refining, power generation and liquid storage are examples of such operations. A water tank or an oil refinery, for example, has no floor area, so that it is obvious that requirements for exits from floor areas would not apply. Requirements for structural fire protection in large steel mills and pulp and paper mills, particularly in certain portions, may not be practicable to achieve in terms of the construction normally used and the operations for which the space is to be used. In other portions of the same building, however, it may be quite reasonable to require that the provisions of this Part be applied (e.g., the office portions). Similarly, areas of industrial occupancy which may be occupied only periodically by service staff, such as equipment penthouses, normally would not need to have the same type of exit facility as floor areas occupied on a continuing basis. It is expected that judgment will be exercised in evaluating the application of a requirement in those cases when extenuating circumstances appear to require special consideration, provided the occupants’ safety is not endangered.

The provisions in this Part for fire protection features installed in buildings are intended to provide a minimum acceptable level of public safety. They are not intended to be applied to voluntary installations, i.e., those installations that are not specifically required by the Code. For example, a firewall installed for insurance purposes need not comply with the requirements in Subsection 3.1.10. unless it is used as a means to create two buildings for the purposes of other Code requirements. Similarly, it is not in-
tended that voluntary fire alarm, standpipe and sprinkler installations comply with the relevant requirements in Subsections 3.2.4. and 3.2.5. It is assumed that all fire protection features of a building, whether required or not, will be designed in conformance with good fire protection engineering practice and will meet the appropriate installation requirements in relevant standards. Such good design is necessary to ensure that the level of public safety established by the Code requirements will not be reduced by a voluntary installation.

**Fire Fighting Assumptions**

The requirements of this Part are based on the assumption that fire fighting capabilities are available in the event of a fire emergency. These fire fighting capabilities may take the form of a paid or volunteer public fire department or in some cases a private fire brigade. Where such fire fighting capabilities are not available, additional fire safety measures may be required.

Fire fighting capability can vary from municipality to municipality. Generally, larger municipalities have greater fire fighting capabilities than smaller ones. Similarly, older, well established municipalities may have better fire fighting facilities than newly formed or rapidly growing ones. The level of municipal fire protection considered to be adequate will normally depend on both the size of the municipality (i.e. the number of buildings to be protected) and the size of buildings within that municipality. Since larger buildings tend to be located in larger municipalities, they are generally, but not always, favoured with a higher level of municipal protection.

Although it is reasonable to consider that some level of municipal fire fighting capability was assumed in developing the fire safety provisions in Part 3, this was not done on a consistent or defined basis. The requirements in the Code, while developed in the light of commonly prevailing municipal fire protection levels, do not attempt to relate the size of building to the level of municipal protection. The responsibility for controlling the maximum size of building to be permitted in a municipality in relation to local fire fighting capability rests with the municipality. Where a proposed building is too large, either in terms of floor area or building height, to receive reasonable protection from the municipal fire department, fire protection requirements in addition to those prescribed in this Code, may be necessary to compensate for this deficiency. Sprinkler protection may be one option to be considered.

Alternatively, the municipality may, in the light of its fire fighting capability, elect to introduce zoning restrictions to ensure that the maximum building size is related to available municipal fire protection facilities. This is, by necessity, a somewhat arbitrary decision and should be made in consultation with the local fire fighting service, who should have an appreciation of their limitations in fighting fires.

The requirements of Subsection 3.2.3. are aimed at preventing fire spread from thermal radiation provided adequate fire fighting is envisaged. It has been found that periods of from 10 to 30 min usually elapse between the outbreak of fire in a building and the attainment of high radiation levels. During this period, the specified spatial separations will prove adequate to inhibit ignition of the exposed building facade or interior of an adjacent building by radiation. Subsequently, however, reduction of the fire intensity by fire fighting and the protective wetting of the exposed building facade will often be necessary as supplementary measures to inhibit fire spread.

The water supply requirements for fire protection installations are dependent on the requirements of any sprinkler installations and also on the number of fire streams that may be needed at any fire, having regard to the length of time such streams will have to be used. Both these factors are largely influenced by the conditions at the building to be equipped, and it is necessary that the quantity and pressure of water for the protection of both the interior and exterior of the building be ascertained before the water supply is decided upon. Acceptable water supplies may be a public waterworks system where pressure and discharge capacity are adequate, automatic fire pumps, pressure tanks, manually controlled fire pumps in combination with pressure tanks, gravity tanks and manually controlled fire pumps operated by remote control devices at each hose station.
A-3.1.2. Use Classification. The purpose of classification is to determine which requirements apply. This Code requires classification in accordance with every major occupancy for which the building is used or intended to be used. Where necessary, an application clause has been inserted in this Part to explain how to choose between the alternative requirements which multiple occupancy classification may present.

A-3.1.2.A. Major Occupancy Classification. The following are examples of the major occupancy classifications described in Table 3.1.2.A.:

**Group A, Division 1**
- Motion picture theatres
- Opera houses
- Television studios admitting a viewing audience
- Theatres, including experimental theatres

**Group A, Division 2**
- Art galleries
- Auditoria
- Bowling alleys
- Churches and similar places of worship
- Clubs, nonresidential
- Community halls
- Court rooms
- Dance halls
- Exhibition halls
  - (other than classified in Group E)
- Gymnasia
- Lecture halls
- Libraries
- Licensed beverage establishments
- Museums
- Passenger stations and depots
- Recreational piers
- Restaurants
- Dance halls
- Schools and colleges, nonresidential
- Undertaking premises

**Group A, Division 3**
- Arenas
- Indoor swimming pools with or without spectator seating
- Rinks

**Group A, Division 4**
- Amusement park structures
  - (not elsewhere classified)
- Bleachers
- Grandstands
- Reviewing stands
- Stadia

**Group B, Division 1**
- Jails
- Penitentiaries
- Police stations with detention quarters
- Prisons
- Psychiatric hospitals with detention quarters
- Reformatories with detention quarters

**Group B, Division 2**
- Children’s custodial homes
- Convalescent homes
- Hospitals
- Infirmaries
- Nursing homes
- Orphanages
- Psychiatric hospitals without detention quarters
- Reformatories without detention quarters
- Sanitoria without detention quarters

**Group C**
- Apartments
- Boarding houses
- Clubs, residential
- Colleges, residential
- Convents
- Dormitories
- Hotels
- Houses
- Lodging houses
- Monasteries
- Motels
- Schools, residential

**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
- 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
- Feed mills
- Flour mills
- Grain elevators
- Lacquer factories
- Mattress factories
- Paint, varnish and pyroxylin product factories
- Rubber processing plants
- Spray painting operations
- Waste paper processing plants

**Group F, Division 2**
- Aircraft hangars
- Box factories
- Candy plants
- Cold storage plants
- Dry cleaning establishments not using flammable or explosive solvents or cleaners
- Electrical substations
- Factories
- Freight depots
- Helicopter landing areas on roofs
- Laboratories
- Laundries, except self-service
- Mattress factories
- Planing mills
- Printing plants
- Repair garages
- Salesrooms
- Service stations
- Storage rooms
- Television studios not admitting a viewing audience
- Warehouses
- Wholesale rooms
- Woodworking factories
- Workshops

**Group F, Division 3**
- Creameries
- Factories
- Laboratories
- Power plants
- Salesrooms
- Sample display rooms
- Storage garages including open air parking garages
- Storage rooms
- Warehouses
- Workshops

**A-3.1.2.3. Arena Regulation.** The use of an arena is regulated in the National Fire Code of Canada 1990.

**A-3.1.4.2.(1)(c) Thermal Barrier in Combustible Construction.** Any thermal barrier that is accepted under the requirements of Sentence 3.1.5.11.(2) for noncombustible construction is also acceptable for combustible construction.

**A-3.1.4.3.(1)(b)(i) Raceway Definition.** The term raceway is defined in CSA C22.1, “Canadian Electrical Code, Part 1” and includes both rigid and flexible conduit.

**A-3.1.4.3.(1) Wire and Cable Equivalence.** Electrical wires and cables that conform to the requirements of Sentence 3.1.5.17.(1) are deemed to satisfy the requirements of Sentence 3.1.4.3.(1).

**A-3.1.5.2.(1)(b) Gypsum Board.** Gypsum board of the typical thickness used in building construction and that is paper faced will not generally comply with the criteria in CAN4-S114-M for
noncombustible materials even though there are no combustible components in the core. Gypsum board has satisfactory properties for resisting the spread of fire and Clause 3.1.5.2.(1)(b) has been included to specifically permit the use of paper faced gypsum board in a building of noncombustible construction.

**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. Where 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 Cladding.** These requirements allow for exterior wall assemblies incorporating combustible cladding 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. They do not, however, waive other requirements 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.

**A-3.1.5.5.(5) Flame Spread Distance.** The maximum flame spread distance refers to the distance between the top of the opening and the highest observable instance of flaming along the wall assembly and thus allows intermittent flaming to a height of 5 m above the opening.

**A-3.1.5.5.(6) Heat Flux Measurement.** All heat flux measurement should be done using water-cooled transducers installed flush with the outer face of the wall assembly. Not less than three readings should be recorded every minute and a running average calculated for each minute of fire exposure. The heat flux to the assembly in Sentence 3.1.5.5.(6) refers to 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.

Since the exact location of flaming on the exterior surface of a wall assembly can be influenced by the presence of furring strips, cavities, etc. in the assembly which could channel the flame away from a heat flux transducer, sufficient transducers should be located at any given height to intercept any flaming that could occur along the assembly. This should be achieved if not less than three transducers are installed as follows: one within 0.2 m horizontally of the centreline through the opening, and not less than one on each side and within 0.5 ± 0.1 m horizontally of the first one. The exact position of the transducers will depend on the location of cavities, joints, studs or furring strips in the assembly.

**A-3.1.5.11.(2)(e) Foamed Plastic Insulation Protection.** The standard fire exposure temperature in CAN4-S101-M, “Standard Methods of Fire Endurance Tests of Building Construction and Materials” is the same as in CAN4-S124-M, “Standard Method of Test for the Evaluation of Protective Coverings for Foamed Plastic.” A thermal barrier that when tested in conformance with CAN4-S101-M will not exceed an average temperature rise of 140°C on the unexposed face of the thermal barrier after a period of 10 min satisfies this requirement.

**A-3.1.5.17.(1) Wire and Cable Flammability.** In regulating the flammability characteristics of 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 system 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-3.1.6. Tents and Air-Supported Structures. The requirements in this Subsection are intended to be limited to certain types of structures. For instance, the word “tent” as used in the Code is intended to refer to a temporary shelter which is used at open air events such as fairs and exhibitions. 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.

Similarly, the term “air-supported structure” as used in the Code is intended to refer to an envelope which is held up by air pressure alone and which is erected on the ground or above a basement. Such a structure will usually require a ballast or positive ground anchorage system around the entire perimeter to secure it to the ground or basement. To reinforce this intent, the Code prohibits the location of such air-supported structures above the first storey of any building.

The requirements of Subsection 3.1.6. are not intended to apply to air-supported roof assemblies on buildings, such as domed stadia, or to other types of air-supported structures, such as those over swimming pools situated on the roofs of buildings which would not be anchored at or near ground level. Such assemblies or structures are normally designed and evaluated on the basis of equivalents as permitted in Section 2.5.

A-3.1.8.1.(a) 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 openings at the juncture of the assemblies with a material that will ensure the integrity of the fire separation at that location.

A-3.1.8.1.(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. 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-3.1.8.9.(6) 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-3.1.8.14.(2)(d)(ii) Wired Glass Assembly Support. It is intended that the mullions 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 this Subclause.

A-3.1.8.17. Fire-Protection Rating for Door. The provisions in this Article and Articles 3.1.8.15. and 3.1.8.16. do not waive the requirements 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 in Article 3.1.8.16., it is the governing criterion. Conversely, if the area limits in Article 3.1.8.16. are less than the area required to achieve a fire-protection rating, then the area limits in this Article govern.

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 requirement.

A-3.2.1.1.(3) Building Height. Where mezzanines are located at the same level but in different portions of a building, it is the intent of this Sentence that the aggregate area of all such mezzanines be used in relation to the area of the storey in which they are located. For example, mezzanines in suites of residential occupancy are visually obstructed by
interior partitions or fire separations between suites, thus, the requirement in Sentence 3.2.1.1.(3) does not apply.

Where the aggregate area of a mezzanine, consisting of a number of mezzanines in separate suites, exceeds 10 per cent of the area of the storey in which it is located, that mezzanine is considered as an additional storey in the determination of building height.

A-3.2.1.1.(7) Accessible Service Space. These service spaces are often referred to as interstitial spaces and are designed to allow service personnel to enter and undertake maintenance or installation within the space. Catwalks or flooring are usually included to provide a walking or access surface. Even when flooring is included, it is not intended that the interstitial space should be considered as a storey for the purposes of the Code unless the space is used for purposes other than servicing or the storage of materials and equipment to be used for building services within that space.

A-3.2.2.2. Special or Unusual Structure. Examples of structures which cannot be identified with the descriptions of buildings in Articles 3.2.2.16. to 3.2.2.62. include grain elevators, refineries and towers.

A-3.2.3.1.(4) 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 the space below it. If a ceiling membrane is provided, the sprinklers would have to be located below the membrane in order to react quickly to such fires. There may be certain instances, however, where sprinklers may be required within the concealed spaces as well as below the membrane. For example, where a building is required to be sprinklered, NFPA 13 requires sprinklers in certain concealed spaces.

A-3.2.3.1.(4) Spatial Separation Design. In the application of Sentences 3.2.3.1.(3) and (4) it is intended that Sentence (3) be used first to establish the basic requirements for the exterior wall in terms of fire-resistance rating, type of construction and type of cladding. The percentage of unprotected openings determined from the application of Sentence (3) would be unnecessarily restrictive if the actual unprotected openings occur in a plane that is set back from the front of the building face.

Sentence (4) applies to the calculation of the allowable percentage of unprotected openings based upon projection onto a plane that is in front of all unprotected openings. The application of these two Sentences is shown in the diagram following. The multiplying effect of Article 3.2.3.11. would be applied, if applicable, to the area of unprotected openings derived from Sentence (4).
A-3.2.3.7. (3)(b) Noncombustible Cladding.
The requirement for the exterior protection of foamed plastic insulation on an exposing building face is intended to limit the exposure of the insulation to flames; thereby reducing the possibility of increased radiation to an exposed building. The permission to use combustible cladding systems conforming to Sentence 3.1.5.5.(1) does not waive the requirements for noncombustible construction or noncombustible cladding in Sentences 3.2.3.7.(1) and (2).

A-3.2.3.11. Increased Openings Permitted.
The maximum area of unprotected openings in an exposing building face can be quadrupled if the building conforms to the requirements in both Sentences 3.2.3.11.(1) and (2). No increase should be applied until the requirements of Sentences 3.2.3.7.(1) and (2) have been satisfied in determining the construction of the exposing building face.

A-3.2.3.14.(1) Wall Exposed to Another Wall. The requirements of this Article are to ensure that the purpose of the interior fire separations between fire compartments is not defeated through the spread of fire by thermal radiation outside the building. Minimum spatial separations are specified between the openings in separate fire compartments where the exterior faces of these compartments are deemed to expose each other to a thermal radiation hazard. It is considered that this dangerous situation may arise where the angle, \( \theta \), between the intersecting planes of the exposing building faces is 135° or less. Examples are shown in the accompanying line drawings of situations which would be regulated under the provisions of this Article.

A-3.2.4. Fire Alarm System. When the term “fire alarm system” is used in this Subsection, it 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 3.2.4.22., 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 3.2.4.22., is intended to allow for the provision of voice communication capability as an integral part of a 2 stage fire alarm system. It is intended that the key or special device mentioned in Clause (c) be immediately available to all persons on duty who have been given authority to sound an alarm signal.
A-3.2.4.6.(2) Access to Silencing Switches. This requirement is intended to prevent easy 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. Details on the emergency procedures to be used in case of fire are contained in the National Fire Code of Canada 1990.

A-3.2.4.8.(1) Fire Alarm Zones. Alarm initiating devices in this sentence include fire detectors and manual pull stations. Where a room or space in a building extends through more than 1 storey of the building, such as in the case of multi-level dwelling units and machinery rooms, judgment must be exercised in the zoning and announcement 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 avoid unnecessary delays for the responding fire fighters. Consideration should also be given to the use of numbers or letters on the annunciator that correspond to those used in the building elevators.

A-3.2.4.8.(5) Common Zoning. Common zone indication on the annunciator may be provided for the actuation of alarm initiating devices and the water flow detecting devices in Article 3.2.4.16.

A-3.2.4.12.(1)(f) 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-3.2.4.16.(5)(f) Supervision for Fire Pump. Specific electrical supervision for required fire pumps is stated in NFPA 20, “Standard for the Installation of Centrifugal Fire Pumps” which is referenced in NFPA 13, “Installation of Sprinkler Systems.”

A-3.2.4.17. Manual Pull Station. Only one manual pull station need be provided near a group of doors serving as a single exit facility.

A-3.2.4.20.(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-3.2.5.5.(1)(b) Fire Department Access for Institutional 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 that have an absence of 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 fire fighting 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-3.2.5.7.(1) Fire Department Access Route. The design and construction of fire department access routes involve the consideration of many variables, some of which are specified in the requirements in the 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-3.2.5.10.(6)(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.

A-3.2.5.13.(1) Sprinkler System Design. In NFPA 13 reference is made to other NFPA standards which contain additional sprinkler design criteria. These criteria apply to industrial occupancies with high fire loads, such as warehouses with high piled storage, or industrial occupancies involving the use, manufacture or storage of highly flammable materi-
A-3.2.5.13. 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 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; nursing or convalescent homes; offices, including data processing; residential buildings; restaurant seating areas; theatres and auditoria, excluding stages and proscenia; and unused attics.

Although NFPA 13D as referenced by NFPA 13 is concerned with a specific type of residential occupancy, namely one and two family dwellings and mobile homes, for the purpose of acceptance of combustible sprinkler piping they are considered to be included in the category of residential buildings under light hazard occupancies.

A-3.2.6. High Buildings. Experience with high buildings has shown that the time required for complete evacuation 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 actual fires have shown that present measures for containing a fire on any 1 storey will not usually prevent the movement of smoke through elevator, stair and other vertical shafts to the upper floors of a high building. Occupants of high buildings, and particularly those on upper storeys, may therefore be faced with severe smoke conditions from fires occurring in storeys below them before their own evacuation is possible. The measures described in Subsection 3.2.6. are designed to maintain safe conditions for occupants of a high building who may have to remain in the building during a fire, and to assist the fire fighters by providing efficient access to the fire floor.

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 fire fighting and rescue situations will be under the direct control of the officer-in-charge of the fire department responding to the emergency.

It is also assumed that the owner of the building has complied with the Emergency Planning Section of the National Fire Code of Canada 1990 by preparing a comprehensive fire safety plan to safeguard the building occupants and that the building supervisory staff are familiar with the measures described in Subsection 3.2.6. and with their responsibilities under the fire safety plan.

Subsection 3.2.6. contains only those items that relate to the design and construction of a building. Operation of the facilities and recommended actions to be taken by the building owner, occupant and fire department are subjects covered by the National Fire Code of Canada 1990.

Measures that relate to limiting or controlling the movement of smoke caused by a building fire are described in Chapter 3 of the Supplement to the NBC 1990. Adoption of one of these measures is consid-
ered to be an acceptable means of complying with the requirements of this Subsection. It is not, however, intended that these measures should be regarded as excluding any other equally effective measure that may be developed.

**A-3.2.6.2.(2) to (4) Smoke Control Measures B, D, F, H, or I.** The requirements of Sentences 3.2.6.2.(2), (3) and (4) may be met by the use of Measures B, D, F, H or I described in Chapter 3 of the Supplement to the NBC 1990.

**A-3.2.6.3.(1) Smoke Control Measures K or L.** The requirements in Sentence 3.2.6.3.(1) may be met by the use of Measures K or L, described in Chapter 3 of the Supplement to the NBC 1990.

**A-3.2.6.4.(1) Sprinklered Building.** The requirements in Sentence 3.2.6.4.(1) may be met by the use of Measure A, described in Chapter 3 of the Supplement to the NBC 1990.

**A-3.2.6.5.(1) Exit Stair Safety Area.** The requirements of Sentence 3.2.6.5.(1) may be met by the use of Measures C, E, G or J, described in Chapter 3 of the Supplement to the NBC 1990.

**A-3.2.6.6.(1) Residential Balcony.** The requirements of Sentence 3.2.6.6.(1) may be met by the use of Measure M, described in Chapter 3 of the Supplement to the NBC 1990.

**A-3.2.6.7. Connected Buildings.** The requirements of Article 3.2.6.7. may be met by the use of Measure N, described in Chapter 3 of the Supplement to the NBC 1990.

**A-3.2.6.8.(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-3.2.6.9.(6)(b) Electrical Cable Protection.** Electrical cables that provide continuous operation for 1 h when subjected to the CAN4-S101-M fire test do not need additional protection against exposure to fire.

**A-3.2.7.6. Hospital Emergency Power.** CAN/CSA Z32.4-M, “Essential Electrical Systems for Hospitals” contains requirements other than those that relate specifically to the installation of emergency equipment. Compliance with these other requirements is not intended by the reference in this Article.

**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 the building under fire emergency conditions. Additional fuel for generators or additional battery capacity is required to handle normal testing of the equipment, as indicated in the National Fire Code of Canada 1990. If the operation of emergency generators or batteries is anticipated for other than fire emergency conditions, such as power failures, fuel supplies or battery capacity must be increased to compensate for such use.

**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 Windows,” 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)(b) Stairway Opening.** The phrase “used only for stairways, escalators or moving walkways” is intended to restrict a floor opening to the size that is necessary to accommodate the stairway, escalator or moving walkway.

**A-3.2.8.8.(1) Smoke Exhaust System.** This mechanical exhaust system is intended as an aid to fire fighters in removing smoke and is designed to be actuated manually by the responding fire department. Although smoke is normally removed from the top of the interconnected floor space, exhaust outlets at other locations may be satisfactory.

**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 in Section 3.5. The regulations 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. For example, a building may be classified by major occupancy as an office building and, as such, the provisions for structural fire protection and fire protection equipment for office buildings prescribed in Section 3.2 apply. Within that building a room or floor area may be used for mercantile, institutional, business, residential, industrial or other occupancy.

Life safety for the occupants of any floor area is dependent 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 or other major occupancy.

A-3.3.1.2.(1) Hazardous Substance. Examples of hazardous substances include radioactive materials, corrosive liquids, poisonous gases, reactive substances and explosive or highly flammable materials.

A-3.3.1.4.(1) Occupancy in Corridor. Since this Code regulates new construction, alterations and changes of occupancies, kiosks in public corridors, including malls, are required to be constructed on the same basis as the remainder of the building. This means that the construction of such 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. Special activities of an occasional nature which were not contemplated in the original design of a mall or public corridor, and which represent only a temporary change in occupancy, are regulated in the National Fire Code of Canada 1990. These regulations include maintaining egress paths clear of obstructions, controlling combustible contents and providing measures to ensure quick response for fire fighting.

A-3.3.1.7. 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. Details for such a plan are contained in the National Fire Code of Canada 1990.

The protected elevator in Clause 3.3.1.7.(1)(a) is intended to be used by fire fighters 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 fire fighters.

Where an estimate is to be made of the number of persons with disabilities in a floor area which can be accommodated in each zone in Clause 3.3.1.7.(1)(b), this estimate may be based on Table 3.7.2.A., which is used to determine the minimum number of spaces to be provided for wheelchair occupants in fixed seating areas. Where more precise information is available, it should be used for sizing the zones.

A-3.3.1.9.(4) Obstruction in Corridor. The sweep of a cane used by blind or visually impaired persons 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-3.3.3.1. Safety in Institutional Occupancy. Fire safety for patients in bedroom areas in hospitals and nursing homes is predicated on the ability of staff to carry out at all times essential life safety functions in accordance with the fire safety plan. Details for such a plan are contained in the National Fire Code of Canada 1990.

There are many factors which may affect the abilities of staff to carry out life safety functions, such as the mobility of patients who cannot fend for themselves and the built-in protection for patients who cannot be moved except under exceptional circumstances.
Should a patient area in a hospital or nursing home contain factors which would increase the time normally required for staff to evacuate patients or to undertake other life safety measures, consideration should be given to providing additional fire protection measures to ensure that equivalent safety is available.

A-3.3.3.5. Doorway Width. The 1050 mm minimum clear width of doorways accounts for door stops and, thus, is intended to allow for the use of 1100 mm doors.

A-3.3.3.6.(1) Nursing Home. A nursing home occupancy is intended to include nursing and convalescent homes, skilled nursing facilities, intermediate care facilities and certain homes for the aged. Occupants of nursing 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 nursing home occupancy, it should be recognized that many homes for the aged are in fact nursing homes. The factor that determines whether or not a home for the aged is a nursing home and, therefore, a Group B occupancy as opposed to a Group C occupancy, is whether or not continuous nursing care is required for the occupants. If it is not required, then the occupancy would normally be classified as Group C rather than Group B.

A-3.3.3.6.(6) Refuge Area. Zones are created on floor areas to provide a temporary safe refuge which can be reached by horizontal movement, usually along a corridor. This permits staff to evacuate patients from rooms first into a corridor and then horizontally into an adjacent zone prior to a decision being made to undertake vertical evacuation.

A-3.3.3.6.(9) Door Weatherstripping. “Weatherstripped or otherwise” is intended to provide for adequate draft resistant sealing material to retard the passage of smoke through closure assemblies used in fire separations.

A-3.3.3.7.(1) Sprinklered Hospitals and Nursing 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-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 when the landing is used only for pedestrian travel purposes.

A-3.3.4.5. 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.

A-3.4.1. Type of Exit Facility. The requirements for exits in Section 3.4 were developed for new construction. Where alterations are made to an existing building or where changes of occupancy occur, other design solutions than those in Section 3.4 may have to be developed to maintain an acceptable level of safety where it is not practicable to fully conform to the requirements of this Section. In some cases the use of fire escapes to supplement the existing exit facilities may be the only practicable solution. Because of the variety of conditions that may be encountered in existing buildings, it is difficult to standardize or codify such requirements. Alternative solutions to providing acceptable levels of safety may have to be tailored to the particular building design. In all cases, however, the requirements as described in Section 3.4 are intended to provide the desired level of safety to be achieved. Alternative measures that may be used should develop the level of safety implied in these requirements.

A-3.4.1.6.(2) Sleeping Area. Areas serving patient sleeping rooms include sleeping areas and areas where patients 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 two of the required exits from that storey.
A-3.4.3.1.(2) Door Width. The clear width values of exit doorways in Clauses (d) and (e) account for door stops and, thus, are intended to allow for the use of 1100 mm doors in Clause (d) and 810 mm doors in Clause (e).

A-3.4.3.4.(2) Evacuation of Interconnected Floor Space. This Sentence ensures that egress facilities allow for the simultaneous evacuation of all portions of an interconnected floor space. It does not contemplate the phased evacuation of occupants; thus in buildings where such evacuation is intended, fire protection requirements in addition to those prescribed in the Code may be necessary.

In the first instance, this Sentence provides for cumulative exiting that can accommodate the efficient movement of all occupants in the exit stairs. Clause (a) permits an alternative approach that will accommodate all the occupants in the stairs but will restrict the egress flow rate. Clause (b) provides a second alternative that assumes the occupants must queue before entering the stair. A "protected floor space" conforming to Article 3.2.8.5. is intended to provide an intermediate area of safety that is protected from the hazards of the interconnected floor space. It does not provide a holding or refuge area for all occupants of a floor area for an extended period of time.

To ensure that evacuation is not unduly delayed and that queuing of the occupants in the protected floor space can be accommodated, requires careful consideration in the design of the interface between the interconnected floor space/protected floor space/exit.

It is not appropriate, for example, to share a common vestibule in complying with Sentences 3.2.8.4.(1) and 3.2.8.5.(1). Under evacuation conditions, occupants entering the vestibule would flow towards the exit, as opposed to the protected floor space, thus resulting in queuing outside the vestibule and potential exposure to fire. To comply with the intent, it is necessary to design the egress path such that the occupants enter the protected floor space through a vestibule, then enter the exit stair from the protected floor space. In addition, sufficient space should be provided between the vestibule and the exit to allow for the queuing of occupants in the protected floor space.

A-3.4.3.4.(2)(a) Temporary Safety Area. The objective of Clause 3.4.3.4.(2)(a) 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 m² per person is provided in the stair shaft between the floor level served and the floor level immediately beneath it.

A-3.4.4.2.(2)(e) Requirements for Lobby. Where 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-3.4.6. 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.

A-3.4.6.4.(3) Handrail. Handrails should be easy to grasp. A circular section with a diameter of not more than 40 mm is the preferred shape. Wide or deep handrails are undesirable unless a proper hand-size grasping area is provided.

A-3.4.6.4.(5) Continuity of Handrail. Blind or visually-impaired persons 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 blind or visually-impaired persons.

A-3.4.6.10.(3) Exit Concealment. Hangings or draperies placed over exit doors may conceal or obscure them.

A-3.4.6.15.(3) 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.
A-3.4.6.17.(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-3.5.2.1.(1) Location of Fuel Fired Appliances. This sentence requires that fuel fired appliances be located in service rooms. It does not allow for their installation in service spaces.

A-3.5.2.10. Sprinkler Rating. The requirements of this Article may be met by using sprinklers with a rating of 79°C to 107°C.

A-3.5.4.2.(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-3.5.5.1.(1) Elevator Design. The reference to CAN3-B44-M in this sentence implies conformance with all requirements of that standard for elevator cars, hoistways, pits and machine rooms, including restrictions on other services in these areas and detailed design criteria.

A-3.6.2.1. Window Area Limit. Part 9 requirements for windows cover a number of subjects, however, this Article refers only to the area limits.

A-3.7.1.1. Accessibility. 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 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 3.7 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.

**A-3.7.1.2. Entrances.** An accessible route should exist from the sidewalk or roadway and parking area to an accessible building entrance. This route should be located so that disabled persons do not have to pass behind parked cars.

**A-3.7.1.4. Access to Storeys Served by Escalators.** Some buildings located on a sloping site are accessible from street level on more than one floor. This arrangement does not meet the intent of the requirement. A wheelchair user should not be required to travel outside the building in order to gain access to another level. Where elevators are provided, their location should be clearly indicated from each entrance to the building.

**A-3.7.2.1.(1) Access into Rooms.** Where barrier-free access is required into suites or rooms in Subsection 3.7.2., it is not intended that such access be provided throughout each room or suite.

**A-3.7.2.1.(1)(k) Access to Facilities.** Some examples of service counters used by the general public are ticket counters, refreshment stands, drinking fountains, cafeteria counters, checkout counters and bank service counters.

It is not intended that all facilities be accessible, but that sufficient facilities be accessible to permit a reasonable use of the building.

**A-3.7.2.2.(1a) Access to Exterior Parking.** It is not intended that a separate accessible entrance must be provided from the exterior parking area. The designer may choose to designate the entrance leading to the exterior parking area as the required entrance or provide a properly identified and unobstructed path of travel from the parking area to the entrance which is accessible. The entrance chosen should, in any case, be one normally used by the occupants of the building. Long paths of travel are not recommended.

**A-3.7.2.3. Washrooms.** The primary intent of this requirement is that all regular washrooms be made accessible to all persons, including persons with disabilities, primarily persons who must use a wheelchair. Well-designed washrooms which can accommodate disabled persons need not be much larger than conventional washrooms.

The exception in Clause (2)(b) recognizes situations where several washrooms may be provided on a large floor area. In such a case, not all washrooms need to be barrier-free, provided that a barrier-free washroom is available within a reasonable distance (45 m) of one that is not and that the location of that barrier-free washroom is clearly indicated as required by Sentence 3.7.3.1.(3).

Clause (2)(c) is intended to address “strip malls” (a shopping mall with no public corridor). Section 3.6, which requires plumbing facilities, does not address the concept of suite and could permit, for instance, a shopping mall containing only Group E occupancies (assuming the mall is more than 100 m²) to have only one washroom for each sex located in any one of the suites. It is desirable however that such washrooms be located so as to be accessible at all times, since the owner or tenant of one suite has no control over the activities of another. Such buildings may either provide public barrier-free washrooms in a central location or washrooms which can accommodate disabled persons in each suite. This arrangement relieves any one tenant from having to provide ‘public’ washrooms. Hence, the exception for suites of less than 500 m² is meant as a relaxation to avoid an unnecessary burden on small facilities but should not be construed as meaning that such buildings need not provide accessible washrooms.

Sentence (4) clarifies that special washrooms (“uni-sex”) should not be used as a substitute for making regular washrooms accessible. These washrooms are an alternative which the authority having jurisdiction could require in the course of renovations to an existing building to satisfy the requirements of Sentence (1), where modifying existing washrooms proves impracticable or where Section 3.6 permits the use of a single washroom for both sexes. This does not preclude the provision of such washrooms in
addition to barrier-free regular washrooms; “unisex” washrooms are desirable in such facilities as large shopping and multi-use complexes, as well as transportation terminals, where persons must be accompanied by an attendant because of their degree of disability. These facilities are convenient because they may be used regardless of the gender of the disabled person or the attendant.

**A-3.7.3.1. Accessibility Signs.** The official symbol, as shown below, indicates to disabled persons that they will have reasonable freedom of movement within a building so signed. The symbol is usually white on a blue background; where these colours do not stand out, the sign can be set on a white background. An arrow can be added to indicate direction or the location of an accessible space or facility.

**A-3.7.3.3.(2) Washrooms in Residential Occupancies.** This requirement ensures that the doorway to the washroom in a dwelling unit or a hotel/motel suite is at least large enough to accommodate someone using a wheelchair. The Code does not require these washrooms to be barrier-free, in order to avoid a set of prescriptive requirements which could limit design flexibility. It is relatively simple to make washrooms accessible through careful planning and positioning of fixtures and this can be achieved in an area not much larger than that of conventional washrooms.

**A-3.7.3.3.(3) Lever Handles.** Lever handles are usable by most persons with limited hand mobility and will meet the intent of this requirement. Lever handles with an end return towards the door are less prone to catch the clothing of someone passing through the doorway.

**A-3.7.3.3.(5) Doors with Power Operators.** Doors equipped with a power operator activated by a pressure plate identified with the international symbol for accessibility or, where security is required, by a key, card or radio transmitter, and that can otherwise be opened manually meet the intent of the requirement. The location of these activating devices should ensure that a wheelchair will not interfere with the operation of the door once it is activated.

Swinging doors equipped with power operators which are activated automatically and open into passing pedestrian traffic should be provided with a guard or other device designed to prevent pedestrians from stepping in the swing area of the door. These guards or devices should be detectable by blind persons. For example, inverted U-shaped guards should have an additional rail at a height not more than 680 mm so that it is detectable by the long cane. These doors should also have a device (mat or other sensor) on the swing side to prevent the door from opening if someone is standing in the swing area.

**A-3.7.3.3.(8) Air Pressure Differences.** Differences in air pressure on opposite sides of a door may be due to the operation of mechanical systems such as those associated with smoke control.
So-called "stack action" in buildings in winter can also cause differential pressures due to the buoyancy of warm air. Stack action is usually most noticeable between stairwells and the remainder of the building, and at the entrances to buildings; the taller the building, the greater the effect. Doors with automatic closers have to operate with sufficient opening forces to allow the return action to overcome the differential pressure.

A-3.7.3.3.(9) Delayed Action on Door Closers. In some circumstances, closers with a delay feature which keeps the door open for several seconds before it begins to close might be desirable. However, closers with this feature have limited back-check, a feature of a normal door closer where resistance to opening increases as the door reaches the full arc of swing. Doors equipped with this type of closer are therefore more susceptible to damage should the door be opened with too much force or should someone try to force it closed, thinking the closer has failed to operate. Delayed action closers are not recommended for such occupancies as schools.

A-3.7.3.3.(10) Clearances at Doorways. Sufficient clearance must be provided on the latch side of doors for a user to operate the door opening mechanism and open the door without interference from the wheelchair. This is particularly important where the door swings towards the approach side. Although the requirement applies to doors equipped with closers only, this clearance should be provided for all doors.

A-3.7.3.4.(1(b) Ramp Slopes. Ramps with a gradient of more than 1 in 16 can be very difficult for disabled persons with upper body mobility to manage. Even though they pose less of a problem for people in motorized wheelchairs, such ramps can be unsafe to descend, especially in cold climates. Although Article 3.7.3.4. permits slopes on ramps as great as 1 in 12 for distances of up to 9 m, gradients of 1 in 20 are safer and less strenuous. When limited space is available, as may be the case during renovations, ramps of up to 1 in 12 should be restricted to lengths not exceeding 3 m whenever possible.

A-3.7.3.4.(1)(c) Level Areas at Doorways on Ramps

A-3.7.3.7. Assistive Listening Systems. 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. The diagrams 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 or the Canadian Co-ordinating Council on Deafness.

A-3.7.3.8.(1) Water Closet Stalls. Doors to water closet stalls for disabled persons should swing outward, preferably against a side wall.
A-3.7.3.8. (b) (iv) Door Pulls. The door pull should consist of a D-shaped handle mounted either horizontally or vertically. The centerlines are the lines drawn through the long axis and the short axis of the handle. If the handle is installed in the horizontal position, the short or transverse axis is the centerline which must be located at between 200 and 300 mm from the hinged side of the door, and the long or longitudinal axis is the one which is located between 900 and 1000 mm from the floor. If the handle is installed in the vertical position, the distance is measured from the longitudinal axis to the hinged side of the door, while the distance from the floor is measured to the transverse axis.

A-3.7.3.9. (1) Water Closets. Wall-mounted water closets or floor models with receding bases are preferable because they provide the least amount of obstruction.

A-3.7.3.10. (1) Clearances Below Lavatories.

A-3.7.3.11. (1) Special Washrooms. Unobstructed areas in front of the lavatory, in front of the water closet and on one side of the water closet are necessary for maneuverability of a wheelchair.

A-3.7.3.12. (1) (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.
Sink can infringe on clear space but would make lateral transfer difficult if seat was mounted on same side.

**A-3.7.3.12.(1)(f) 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 back against the wall, while one located on the wall opposite the seat cannot be reached from the seated position. The seat itself may be used in conjunction with the bar for transfer.

**A-3.7.3.14. Telephone Counters.** Built-in shelves or counters for public telephones must be designed to accommodate persons using telecommunication devices for the deaf (TDD). These devices require a level surface at least 350 mm deep by 250 mm wide with no obstruction above that space within 250 mm. If a wall-hung telephone or other obstruction extends to less than 250 mm from the shelf or counter, an equivalent clear space must be provided on either side of each telephone. At least one telephone should be equipped with a volume control on a receiver that generates a magnetic field compatible with the T-switch of a hearing aid. The lower portion of the shelf or counter is intended for persons using a wheelchair; therefore all parts of the operating mechanism of the telephone above this portion should be within reach of a wheelchair user. The telephone should also be equipped with a volume control and be compatible with a hearing aid. Where only one telephone is provided, it must satisfy all the requirements set out in this Article.

**A-4.1.1.2.(2) Structural Designer.** Part 4 has been written on the assumption that structural design will be carried out by a professional who is qualified for such design under appropriate provincial or territorial legislation. Sentence 4.1.1.2.(2) is not intended to imply that a professional may not also be required in the application of requirements in other Parts of the NBC.

**A-4.1.1.3.(1) Structural Integrity.** The requirements of Part 4 of the National Building Code, 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 on Structural Integrity in Chapter 4 of the Supplement to the NBC 1990.

**A-4.1.1.5.(1) Deflections.** Information on deflections can be found in the Commentary on Serviceability Criteria for Deflections and Vibrations in Chapter 4 of the Supplement to the NBC 1990.

**A-4.1.1.5.(5) Lateral Deflection of Tall 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 of tall buildings may be found in the Commentary on Wind Loads in Chapter 4 of the Supplement to the NBC 1990.

**A-4.1.1.6.(1) Floor Vibration.** Information on floor vibration can be found in the Commentary on Serviceability Criteria for Deflections and Vibrations in Chapter 4 of the Supplement to the NBC 1990.

**A-4.1.1.6.(2) Lateral Vibrations and Acceleration Under Dynamic Wind Loads.** Information on lateral vibrations and accelerations under dynamic wind loads can be found in the Commentary on Wind Loads in Chapter 4 of the Supplement to the NBC 1990.

**A-4.1.2.1.(1) Temperature Changes.** Information on effects due to temperature changes can be found in the Commentary on Effects of Deformations in Building Components in Chapter 4 of the Supplement to the NBC 1990.

**A-4.1.3.3. Load Combinations.** Information on load combinations can be found in the Commen-
A-4.1.3.3.

A-4.1.4. Limit States Design. Information on limit states design can be found in the Commentary on Limit States Design in Chapter 4 of the Supplement to the NBC 1990.

A-4.1.6.A. Floor Areas That Could Be Used As Viewing Areas. Some interior balconies, mezzanines, corridors, lobbies and aisles that are not intended to be used for the assembly of people as viewing areas are sometimes used as such and, consequently, are subject to loadings much higher than those for the occupancies they serve. Floor areas which may be subject to such higher loads must, therefore, be designed for a loading of 4.8 kPa.

A-4.1.6.9 Tributary Area. Information on tributary area can be found in the Commentary on Tributary Area in Chapter 4 of the Supplement of the NBC 1990.

A-4.1.6.B. 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 driveways and sidewalks over areaways and basements. Where appropriate the designer should refer to CAN3-S6, “Design of Highway Bridges.”

A-4.1.7.1.(1)-(7) Coefficients for Snow Loads on Roofs. Information on coefficients for snow loads on roofs can be found in the Commentary on Snow Loads in Chapter 4 of the Supplement to the NBC 1990.

A-4.1.7.2.(2) Full and Partial Loading Under Snow Loads. Information on full and partial snow loading on roofs can be found in the Commentary on Snow Loads in Chapter 4 of the Supplement to the NBC 1990.

A-4.1.7.3.(1) Rain Loads. Information on rain loads can be found in the Commentary on Rain Loads in Chapter 4 of the Supplement to the NBC 1990.

A-4.1.8.1.(1), (2) Pressure Coefficient for Wind Loads. Information on pressure coefficients can be found in the Commentary on Wind Loads in Chapter 4 of the Supplement to the NBC 1990.
can be found in the Commentary on Effects of Earthquakes in Chapter 4 of the Supplement to the NBC 1990.

A-4.1.9.D. Horizontal Force Factor, Sp. Lower values of Sp may be used for towers, chimneys, smokestacks and penthouses when connected to or forming part of a building if the lower values can be proven by analysis. Information on the seismic design of towers, chimneys, smokestacks and penthouses can be found in the Commentary on Effects of Earthquakes in Chapter 4 of the Supplement to the NBC 1990.

A-4.1.9.E. Seismic Coefficient, C_p. Lower values of C_p may be used for machinery, fixtures and equipment, pipes and tanks, when connected to or forming part of a building if the lower values can be proven by analysis. Information on the seismic design of machinery, fixtures and equipment, pipes and tanks can be found in the Commentary on Effects of Earthquakes in Chapter 4 of the Supplement to the NBC 1990.

A-4.1.9.1.(22) Modal Coupling. Severe modal coupling may occur in symmetrical or nearly symmetrical structures when the fundamental lateral and torsional periods are almost equal. Information on this phenomenon is given in the Commentary on Effects of Earthquakes in Chapter 4 of the Supplement to the NBC 1990.

A-4.1.9.1.(25) Setbacks. A definition of setback together with a recommended design procedure for buildings having setbacks is contained in the Commentary on Effects of Earthquakes in Chapter 4 of the Supplement to the NBC 1990.

A-4.1.9.4.(3) 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.

A-4.1.9.4.(5) Seismic 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 on Effects of Earthquakes in Chapter 4 of the Supplement to the NBC 1990.

A-4.1.10.3. Loads on Firewalls. Information on loads on firewalls can be found in the Commentary on Structural Integrity of Firewalls in Chapter 4 of the Supplement to the NBC 1990.

A-4.1.10.5.(1) Dynamic Analyses of Floor Vibrations. Information on a dynamic analysis of floor vibrations from rhythmic activities can be found in the Commentary on Serviceability Criteria for Deflections and Vibrations in Chapter 4 of the Supplement to the NBC 1990.

A-4.2.2.1. Subsurface Investigation. Where acceptable information on subsurface conditions already exists, the investigation may not require further physical subsurface exploration or testing.

A-4.2.2.3.(1) Responsibilities of the Designer as Defined in Part 4. Under some situations, such as highly technical designs, it may be necessary for the "other suitably qualified person" to be someone responsible to the designer. In these cases the authority having jurisdiction may wish to order that the review be done by the designer.

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 gives 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.

A-4.2.4.6.(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 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.

A-4.2.5.1. Excavations. Information on excavations can be found in the Commentary on Foundations in Chapter 4 of the Supplement to the NBC 1990.
A-4.2.6.1. Shallow Foundations. Information on shallow foundations can be found in the Commentary on Foundations in Chapter 4 of the Supplement to the NBC 1990.

A-4.2.7.1. 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.

A-4.2.7.2.(1) Deep Foundations. Information on deep foundations can be found in the Commentary on Foundations in Chapter 4 of the Supplement to the NBC 1990.

A-4.2.7.2.(2) Load Testing of Piles. ASTM D1143, “Standard Method of Testing Piles Under Static Axial Compressive Load” defines routine load test procedures which have been used extensively.

A-4.3.3.1. Precast Concrete. CAN3-A23.3, “Design of Concrete Structures for Buildings” requires that precast concrete members be constructed in plants conforming to CSA A251, “Qualification Code for the Manufacturers of Architectural and Structural Precast Concrete.”

A-4.3.4.1. Welded Construction. Qualification for fabricators and erectors of welded construction is found in Clause 23.3 of CAN/CSA-S16.1, “Limit States Design of Steel Structures.”

A-4.3.6.1. Glass Design. Information on glass design can be found in the Commentary on Glass Design in Chapter 4 of the Supplement to the NBC 1990.

A-5.5.2.1. Dampproofing and Waterproofing. For simple structures, requirements in Part 9 may be referred to as a guide in dampproofing and waterproofing below ground level. More complex structures may require additional provisions not contained in Part 9.

A-5.5.3.1. Crawl Spaces. For simple structures, requirements in Part 9 may be referred to as a guide for providing ground cover for crawl spaces. More complex structures may require additional provisions not contained in Part 9.

A-5.6.1.1. Materials. Part 3 contains additional requirements to regulate fire properties. Part 4 contains requirements to regulate the structural design.

A-5.7.1.1. Installation. For simple structures, requirements in Part 9 may be referred to as a guide for the installation of exterior claddings, vapour barriers, thermal insulations, sheathing papers, flashings and fastening devices. More complex structures may require additional provisions not contained in Part 9.

A-5.7.1.2. Glass Design. Information on the design of glass can be found in the Commentary on Glass Design in Chapter 4 of the Supplement to the NBC 1990.

A-5.7.1.3.(3) Deformations in Building Components. Information on the effects of deformations in building components can be found in the Commentary on Effects of Deformations in Building Components in Chapter 4 of the Supplement to the NBC 1990.

A-6.2.2.5. 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 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,
NFPA 51A, Acetylene Cylinder Charging Plants,
NFPA 61A, Fire and Dust Explosions in Facilities Manufacturing and Handling Starch,
NFPA 61B, Prevention of Fires and Explosions in Grain Elevators and Facilities Handling Bulk Raw Agricultural Commodities,
NFPA 61C, Prevention of Fire and Dust Explosions in Feed Mills,
NFPA 65, Processing and Finishing of Aluminum,
NFPA 68, Venting of Deflagrations,
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.

A-6.2.4.4. Clearances for Warm-Air Supply Ducts.

(a) Applicable to forced-air furnaces where permissible clearance $C$ above plenum is 75 mm or less. Refer to Sentence 6.2.4.4. (2)

(b) Applicable to forced-air furnaces where permissible clearance $C$ above plenum is more than 75 mm but not more than 150 mm. Refer to Sentence 6.2.4.4.(3)

(c) Applicable to forced-air furnaces where permissible clearance $C$ above plenum is more than 150 mm. Refer to Sentence 6.2.4.4.(4)

A-6.2.4.5.(2) 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.
A-6.2.9.2 (6) Temperature of Exposed Piping. Normally piping carrying steam or high-temperature hot water at pressures above atmospheric (corresponding temperature 100°C or above) will be insulated to reduce heat losses as an economy measure. Above a temperature of approximately 70°C, however, a bare pipe can cause a burn to human flesh coming in contact with the pipe. If pipes above this temperature are normally out of reach of all persons other than maintenance personnel or are properly guarded, it would be expected that no insulation would be needed for public safety.

A-8.1.2.1. Application. The use of streets or public property and vehicular traffic during construction or demolition is normally controlled by regulations of authorities other than the building department (i.e., police department).

A-8.2.2.1(1) Demolition during Renovation. When renovation is taking place, only the portion of the building undergoing demolition is covered by this Subsection. The requirements for the portion undergoing construction are covered by Subsection 8.2.3.

A-8.2.2.1(2) Demolition. In certain buildings which do not pose an exposure hazard to other buildings, or in which there is little fire hazard to staff, such as in small buildings, the degree of application of this Subsection may be minimal. The degree of application should be determined in advance in conjunction with the authority having jurisdiction.

A-8.2.2.3(2) Access for Fire Fighting. Fire fighting in storeys above the first requires prompt vertical movement by fire department personnel. Provision should be made for the use of elevators, hoists or lifts to assist such personnel in reaching upper storeys of the building.

A-8.2.2.5. Standpipe System. During freezing conditions, the standpipe may be drained to prevent damage to the equipment. It is not anticipated that hose will be available in the building being demolished, but that it will be brought to the relevant floor by the responding fire department.

A-8.2.2.12(3) Purging of Tank. Guidance on methods of rendering inert tanks, piping and machinery reservoirs is available in NFPA 327, “Standard Procedures for Cleaning or Safeguarding Small Tanks and Containers.”

A-8.2.3.1. Construction Sites. Construction sites can range from a large multi-storey building to small single-storey residences and may include additions or renovations to an existing building. The degree to which this Subsection should apply to each site should be determined in advance, as part of the fire safety plan for the construction site, taking into consideration such issues as the size of the project and condition of the site.

A-9.3.2.1. Grade Marking of Lumber. Lumber is generally grouped for marketing into the species combinations contained in the following table. The maximum allowable spans for those combinations are listed in the span tables for joists, rafters and beams. Some species of lumber are also marketed individually. Since the allowable span for the northern species combination is based on the weakest species in the combination, the use of the span for this combination is permitted for any individual species not included in the Spruce-Pine-Fir, Douglas Fir-Larch, Hem-Fir combinations.

Facsimiles of typical grade marks of lumber associations and grading agencies accredited by the Canadian Lumber Standards (CLS) Accreditation Board to grade mark lumber in Canada are shown in the following table. Accreditation by the CLS Accreditation Board applies to the inspection, grading and grade marking of lumber, including mill supervisory service, in accordance with CSA Standard 0141, "Softwood Lumber.”

The grade mark of a CLS accredited agency on a piece of lumber indicates its assigned grade, species or species combination, moisture condition at the time of surfacing, the responsible grader or mill of origin and the CLS accredited agency under whose supervision the grading and marking was done.

Canadian lumber is graded to the NLGA Standard Grading Rules for Canadian Lumber, published by the National Lumber Grades Authority. The NLGA rules specify standard grade names and grade name
abbreviations for use in grade marks to provide positive identification of lumber grades. In a similar fashion standard species names or standard species abbreviations, symbols or marks are provided in the rules for use in grade marks.

Grade marks denote the moisture content of lumber at the time of surfacing. “S-Dry” in the mark indicates the lumber was surfaced at a moisture content not exceeding 19 per cent. “MC 15” indicates a moisture content not exceeding 15 per cent. “S-GRN” in the grade mark signifies that the lumber was surfaced at a moisture content higher than 19 per cent at a size to allow for natural shrinkage during seasoning.

Each mill or grader is assigned a permanent number. The point of origin of lumber is identified in the grade mark by use of a mill or grader number or by the mill name or abbreviation. The CLS certified agency under whose supervision the lumber was grade marked is identified in the mark by the registered symbol of the agency.

A-9.3.2.A. Lumber Grading. To identify board grades the paragraph number of the NLGA rules under which the lumber is graded must be shown in the grade mark. Paragraph 113 is equivalent to WWPA rules and paragraph 114 is equivalent to WCLIB rules. When graded in accordance with WWPA or WCLIB rules, the grade mark will not contain a paragraph number.

A-9.3.2.B. Non-Standard Lumber. The NLGA “Standard Grading Rules for Canadian Lumber” permit lumber to be dressed to sizes below the standard sizes (38 x 89, 38 x 140, 38 x 184, etc.) provided the grade stamp shows the reduced size. This Article permits the use of the span tables for such lumber provided the size indicated on the stamp is not less than 95 per cent of the corresponding standard size. Allowable spans in the tables must be reduced a full 5 per cent even if the undersize is less than the 5 per cent permitted.

<table>
<thead>
<tr>
<th>Commercial Designation of Species or Species Combination</th>
<th>Abbreviation Permitted on Grade Stamps</th>
<th>Species Included</th>
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<tr>
<td>Douglas Fir – Larch</td>
<td>D Fir – L (N)</td>
<td>Douglas Fir, Western Larch</td>
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<td>Hemlock – Fir</td>
<td>Hem – Fir (N)</td>
<td>Western Hemlock, Amabilis Fir</td>
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<td>Northern Species</td>
<td>North Species</td>
<td>Any Canadian softwood covered by the NLGA Standard Grading Rules</td>
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Facsimiles of Grade Marks Used by Canadian Lumber Manufacturing Associations and Agencies Authorized To Grade Mark Lumber in Canada

<table>
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<tr>
<th>FACSIMILES OF GRADE MARK</th>
<th>ASSOCIATION OR AGENCY</th>
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| A.F.P.A.® 00             | Alberta Forest Products Assoc.  
                           | 204 – 11710 Kingsway Avenue  
                           | Edmonton, Alberta T5G 0X5    |
| S-P-F S-DRY STAND        |                       |
| C.L.A 1                  | Canadian Lumbermen's Association  
                           | 27 Goulburn Avenue          
                           | Ottawa, Ontario K1N 8C7     |
| S-P-F 100                |                       |
| No. 2 S-GRN.             |                       |
| LMA® 1                   | Cariboo Lumber Mfrs. Association  
                           | 1200 – 555 Burrard Street   
                           | Vancouver, British Columbia V2L 4Y2 |
| D FIR-N 1                |                       |
| S-GRN.-(N) 100 No. 3    | Council of Forest Industries of British Columbia  
                           | 1200 – 555 Burrard Street   
                           | Vancouver, British Columbia V7X 1S7 |
| W. CEDAR 100 No. 3       | and                   |
| S-GRN.- (N)              | Council of Forest Industries of British Columbia  
                           | Northern Interior Lumber Sector  
                           | 400 – 1488 Fourth Avenue     
                           | Prince George, British Columbia V2L 4Y2 |
| C.F.D.A.® 00             | Central Forest Products Association  
                           | P.O. Box 1169               
                           | Hudson Bay, Saskatchewan S0E 0Y0 |
| S-P-F S-DRY CONST        |                       |
| M L B S-P.F No. 1 S-GRN  | Maritime Lumber Bureau  
                           | P.O. Box 459                
<pre><code>                       | Amherst, Nova Scotia B4H 4A1 |
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<td><strong>O.L.M.A.® 01-1</strong></td>
<td>Newfoundland Lumber Producers Association</td>
</tr>
<tr>
<td><strong>CONST. S-DRY</strong></td>
<td>P.O. Box 8</td>
</tr>
<tr>
<td><strong>SPRUCE - PINE - FIR</strong></td>
<td>Glovertown, Newfoundland A0G 2L0</td>
</tr>
<tr>
<td><img src="image" alt="" /></td>
<td></td>
</tr>
<tr>
<td><strong>NLGA RULE</strong></td>
<td></td>
</tr>
<tr>
<td><strong>No 1</strong></td>
<td>L’association des manufacturiers des bois de sciage du Québec</td>
</tr>
<tr>
<td><strong>S-DRY</strong></td>
<td>Quebec Lumber Manufacturers Association</td>
</tr>
<tr>
<td><strong>00 HEM-FIR-N</strong></td>
<td>5055, boul. Hamel ouest, bureau 200</td>
</tr>
<tr>
<td><img src="image" alt="" /></td>
<td>Québec, Québec G2E 2G6</td>
</tr>
<tr>
<td><strong>ILMA® S-DRY 1</strong></td>
<td>Pacific Lumber Inspection Bureau</td>
</tr>
<tr>
<td><strong>00 S-P-F</strong></td>
<td>1110 – 355 Burrard Street</td>
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<tr>
<td><img src="image" alt="" /></td>
<td>Vancouver, British Columbia V6C 2G8</td>
</tr>
<tr>
<td><strong>0 D FIR (N)</strong></td>
<td>Interior Lumber Manufacturers Association</td>
</tr>
<tr>
<td><strong>NLGA RULE</strong></td>
<td>203 – 2350 Hunter Road</td>
</tr>
<tr>
<td><strong>No 1</strong></td>
<td>Kelowna, British Columbia V1X 6C1</td>
</tr>
<tr>
<td><strong>S-DRY</strong></td>
<td>MacDonald Inspection</td>
</tr>
<tr>
<td><strong>00 D FIR (N)</strong></td>
<td>c/o Warnock Hersey Professional Services Ltd.</td>
</tr>
<tr>
<td><strong>NLGA RULE</strong></td>
<td>211 School House Street</td>
</tr>
<tr>
<td><img src="image" alt="" /></td>
<td>Coquitlam, British Columbia V3K 4X9</td>
</tr>
<tr>
<td><strong>10 CONST S-P-F</strong></td>
<td>Northwest Territories Forest Industries Association</td>
</tr>
<tr>
<td><strong>S-GRN</strong></td>
<td>6301 Silverthorne Road</td>
</tr>
<tr>
<td><img src="image" alt="" /></td>
<td>P.O. Box 346</td>
</tr>
<tr>
<td></td>
<td>Sardis, British Columbia V2R 2N1</td>
</tr>
</tbody>
</table>
A-9.4.4.A. **Classification of Soils.** Sand or gravel may be classified by means of a picket test in which a 38 mm by 38 mm 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-9.6.5.A. **Glass in Doors.** Maximum areas in Table 9.6.5.A, for other than fully tempered glazing are cut off at 1.50 m², as this would be the practical limit after which safety glass would be required by Sentence 9.6.5.2.(3).

A-9.6.5.3. **Mirrored Glass Doors.** Standard CAN/CGSB-82.6 covers mirrored glass doors for use on reach-in closets. It specifies that such doors are not intended to be used for walk-in closets.

A-9.6.6.1. **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. The sketch 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 9.6.6.1., in windows located within 900 mm of locks in such doors, and in basement windows.

Underwriters’ Laboratories of Canada have produced a document ULC Subject C972-1974, “Guide for the Investigation of 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.
the type of building and the crime rate of the area in which it is located. The NBC 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.

**A-9.7.1.5. Double Glazing.** In a cold climate such as Canada’s, windows which separate heated space from unheated space or the exterior must be at least double glazed to prevent the accumulation of significant amounts of condensation on the inside surface of the glazing. Although glazing materials are generally unharmed by such condensation, the water can run down and damage the materials in the window frame and in the wall below the window. Water accumulating in these materials can also lead to the growth of moulds.

Because of the potential for damage to the structure, this measure is required in any heated building, whether or not there is normally human occupancy.

**A-9.7.2.1. Windows.** The CSA Standard CAN3-A440, “Windows,” includes a window classification system that rates the assembly according to air leakage, water leakage and wind load resistance. The ratings, shown below, are marked on the window and indicate the level of performance that can be expected. Units can then be selected which are most appropriate for design conditions.

**Air Leakage**

- A1 – intended for use primarily in low-rise residential (i.e. buildings of 3 storeys or less and having an area not exceeding 600 m²), industrial, and light commercial use.
- A2 – intended for use primarily in medium- to high-rise residential, institutional, and commercial use.

**Water Leakage**

- B1 – moderate climatic conditions
- B2 – severe climatic conditions
- B3 – extreme climatic conditions

**Wind Resistance**

- C1 – lowest wind load resistance
- C2 – medium wind load resistance
- C3 – highest wind load resistance

Article 9.7.2.1. has specified the lowest grades, since the NBC is a collection of minimum requirements only. Designers or builders should consider windows with higher ratings depending on the height of buildings, climatic conditions and occupancy classification.

**A-9.7.3.2. Maximum Glass Area.** Subject to the restrictions noted, tables A-9.7.3.2.A. and A-9.7.3.2.B. may be used to select glass thickness for windows. These tables are based on Standard CAN/CGSB-12.20-M. In many cases, glass design based on these tables will be conservative due to conservative assumptions on which the tables are based. More exact design using the Standard directly could result in reduced glass thickness.

**A-9.7.6.1. Resistance of Windows To Forced Entry.** Although this Article 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 Article 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.

### Table A-9.7.3.2.A

<table>
<thead>
<tr>
<th>Glass Thickness mm</th>
<th>Type of Glass</th>
<th>Maximum Glass Area for Windows, m²</th>
<th>Maximum Glass Area for Windows, m²</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Wired</td>
<td></td>
<td></td>
</tr>
<tr>
<td>0.20</td>
<td>Annealed</td>
<td>0.31</td>
<td>0.31</td>
</tr>
<tr>
<td>0.32</td>
<td>Factory-sealed</td>
<td>0.49</td>
<td>0.49</td>
</tr>
<tr>
<td></td>
<td>Heat strengthened</td>
<td>0.76</td>
<td>0.76</td>
</tr>
<tr>
<td>0.50</td>
<td>IG Units</td>
<td>1.16</td>
<td>1.16</td>
</tr>
<tr>
<td>0.50</td>
<td>Heat strengthened</td>
<td>1.38</td>
<td>1.38</td>
</tr>
<tr>
<td>0.66</td>
<td>Tempered</td>
<td>1.62</td>
<td>1.62</td>
</tr>
</tbody>
</table>

**Restrictions on use of Tables A-9.7.3.2.A and A-9.7.3.2.B:**

1. The tables apply to buildings which have essentially uniform distribution of openings, i.e. no large opening such as a loading door.
2. The tables do not apply to buildings in exposed locations such as hilltops or the shores of large bodies of water.
3. The tables apply to buildings 12 m or less from grade to the uppermost roof.
A-9.8.8.1. Loads on Guards. Guards should be constructed so as to be strong enough to provide protection from falling under normal use. Such guards may be accepted on the basis of experience or by structural design. Loading criteria for the structural design of guards can be found in Article 4.1.10.1.

A-9.10.1.4. Commercial Cooking Equipment. Part 6 refers to NFPA 96, “Standard for the Installation of Equipment for the Removal of Smoke and Grease-laden Vapours from Commercial Cooking Equipment,” which in turn references “Commercial Cooking Equipment.” However, the deciding factor as to whether or not NFPA 96 applies is the potential for production of grease-laden vapours and smoke, rather than the type of equipment used. While NFPA 96 does not apply to domestic equipment for normal residential family use, it should apply to domestic equipment used in commercial, industrial, institutional and similar cooking applications where the potential for the production of smoke and grease-laden vapours exceeds that for normal residential family use.

A-9.10.3.1. Fire and Sound Resistance of Building Assemblies. The following tables may be used to select building assemblies for compliance with Article 9.10.3.1. and Subsection 9.11.2. However, these tables are provided only for the convenience of Code users. Assembles not listed in these tables are equally acceptable provided their fire and sound resistance can be demonstrated to meet the above-noted requirements on the basis of tests described in 9.10.3.1. and 9.11.1. or by using the data in Chapter 2 of the Supplement to the NBC 1990.

<table>
<thead>
<tr>
<th>Table A-9.10.3.A.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fire and Sound Resistance of Walls</td>
</tr>
<tr>
<td>Type of Wall</td>
</tr>
<tr>
<td>Hollow concrete block (normal weight aggregate)</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
</tbody>
</table>
### Table A-9.10.3.A (Cont’d)  
*Fire and Sound Resistance of Walls*

<table>
<thead>
<tr>
<th>Type of Wall</th>
<th>No.</th>
<th>Description</th>
<th>Finish on Each Side&lt;sup&gt;(1)&lt;/sup&gt;</th>
<th>Fire-Resistance Rating</th>
<th>Typical Sound Transmission Class&lt;sup&gt;(2)&lt;/sup&gt;</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>8</td>
<td>Same as 6, with both surfaces fastened directly, or both on metal resilient channels, or both on metal resilient channels with absorptive material&lt;sup&gt;(4)&lt;/sup&gt;</td>
<td>A</td>
<td>2.5 h</td>
<td>49</td>
</tr>
<tr>
<td></td>
<td>9</td>
<td>Same as 6, with metal resilient channels and absorptive material on one side&lt;sup&gt;(4)&lt;/sup&gt;</td>
<td>A</td>
<td>2.5 h</td>
<td>53</td>
</tr>
<tr>
<td></td>
<td>10</td>
<td>Same as 6, with 38-mm x 38-mm wood strapping on at least one side</td>
<td>A&lt;sup&gt;(6)&lt;/sup&gt;</td>
<td>2.5 h</td>
<td>53</td>
</tr>
<tr>
<td></td>
<td>11</td>
<td>Same as 6, with 38-mm x 38-mm wood strapping and absorptive material on both sides&lt;sup&gt;(4)&lt;/sup&gt;</td>
<td>A&lt;sup&gt;(6)&lt;/sup&gt;</td>
<td>2.5 h</td>
<td>59</td>
</tr>
<tr>
<td></td>
<td>12</td>
<td>Same as 6, with 50-mm metal Z-bars (or 38-mm x 38-mm wood strapping plus metal resilient channels) and absorptive material on both sides&lt;sup&gt;(4)&lt;/sup&gt;</td>
<td>A</td>
<td>2.5 h</td>
<td>64</td>
</tr>
<tr>
<td></td>
<td>13</td>
<td>Same as 6, with studs (65-mm steel or 38-mm x 64-mm wood) and absorptive material on both sides&lt;sup&gt;(4)&lt;/sup&gt;</td>
<td>A&lt;sup&gt;(6)&lt;/sup&gt;</td>
<td>2.5 h</td>
<td>70</td>
</tr>
<tr>
<td></td>
<td>14</td>
<td>Same as 6, with metal resilient channels and absorptive material on one side</td>
<td>D (finish one side only)</td>
<td>2.5 h</td>
<td>55</td>
</tr>
<tr>
<td></td>
<td>Concrete 15</td>
<td>150 mm</td>
<td>None&lt;sup&gt;(5)&lt;/sup&gt;</td>
<td>3 h</td>
<td>55</td>
</tr>
<tr>
<td></td>
<td>Concrete 16</td>
<td>200 mm</td>
<td>None&lt;sup&gt;(5)&lt;/sup&gt;</td>
<td>4 h</td>
<td>5</td>
</tr>
<tr>
<td>Type of Wall</td>
<td>No.</td>
<td>Description</td>
<td>Finish on Each Side</td>
<td>Fire-Resistance Rating</td>
<td>Typical Sound Transmission Class</td>
</tr>
<tr>
<td>-------------</td>
<td>-----</td>
<td>-------------</td>
<td>---------------------</td>
<td>------------------------</td>
<td>---------------------------------</td>
</tr>
<tr>
<td>Interior wood stud single row</td>
<td>17</td>
<td>38-mm x 89-mm studs 400 mm o.c.</td>
<td>C</td>
<td>1 h</td>
<td>34</td>
</tr>
<tr>
<td></td>
<td>18</td>
<td>38-mm x 89-mm studs 400 mm o.c., with absorptive material (5)</td>
<td>A (6)</td>
<td>45 min</td>
<td>36</td>
</tr>
<tr>
<td></td>
<td>19</td>
<td>Same as 18 (4)</td>
<td>C</td>
<td>1 h</td>
<td>36</td>
</tr>
<tr>
<td></td>
<td>20</td>
<td>Same as 18, with resilient metal channels on at least one side (5)</td>
<td>A (6)</td>
<td>45 min</td>
<td>48</td>
</tr>
<tr>
<td></td>
<td>21</td>
<td>Same as 18, with resilient metal channels on at least one side (4)</td>
<td>C</td>
<td>1 h</td>
<td>48</td>
</tr>
<tr>
<td></td>
<td>22</td>
<td>Same as 18, with resilient metal channels on at least one side (4)</td>
<td>D</td>
<td>1 h</td>
<td>54</td>
</tr>
<tr>
<td>Interior wood stud two rows staggered on 38-mm x 140-mm plate</td>
<td>23</td>
<td>Two rows 38-mm x 89-mm studs, each set 400 or 600 mm o.c., staggered on common 38-mm x 140-mm plate, with absorptive material on both sides (5)</td>
<td>A (6)</td>
<td>45 min</td>
<td>50</td>
</tr>
<tr>
<td></td>
<td>24</td>
<td>Same as 23, but with absorptive material on one side (4)</td>
<td>C</td>
<td>1 h</td>
<td>51</td>
</tr>
<tr>
<td></td>
<td>25</td>
<td>Same as 23, but with absorptive material on one side (4)</td>
<td>D</td>
<td>1 h</td>
<td>54</td>
</tr>
<tr>
<td>Interior wood stud two rows on separate plates</td>
<td>26</td>
<td>Two rows 38-mm x 89-mm studs, each set 400 or 600 mm o.c. on separate 38-mm x 89-mm plates set 25 mm apart, with absorptive material one side (6)</td>
<td>C</td>
<td>1 h</td>
<td>53</td>
</tr>
<tr>
<td></td>
<td>27</td>
<td>Same as 26, but absorptive material on both sides (5)</td>
<td>A (6)</td>
<td>45 min</td>
<td>57</td>
</tr>
</tbody>
</table>
Table A-9.10.3.A. (Cont’d)

<table>
<thead>
<tr>
<th>Type of Wall</th>
<th>No.</th>
<th>Description</th>
<th>Finish on Each Side</th>
<th>Fire-Resistance Rating</th>
<th>Typical Sound Transmission Class</th>
</tr>
</thead>
<tbody>
<tr>
<td>Exterior wood stud</td>
<td>30</td>
<td>38-mm 89-mm or 38 mm x 140-mm stud spaced up to 600 mm o.c., mineral fiber with mass of at least 1.22 kg/m², wall sheathing and siding</td>
<td>A (interior side)</td>
<td>45 min</td>
<td>N/A</td>
</tr>
<tr>
<td></td>
<td>31</td>
<td>Same as 30</td>
<td>C or D (interior side)</td>
<td>1 h</td>
<td>N/A</td>
</tr>
<tr>
<td>Non-loadbearing steel studs</td>
<td>32</td>
<td>90-mm steel studs spaced up to 600 mm o.c.</td>
<td>C</td>
<td>45 min</td>
<td>39</td>
</tr>
<tr>
<td></td>
<td>33</td>
<td>Same as 32, with absorptive material in cavity</td>
<td>C</td>
<td>1 h</td>
<td>45</td>
</tr>
<tr>
<td></td>
<td>34</td>
<td>Same as 32, with absorptive material in cavity</td>
<td>D</td>
<td>1 h</td>
<td>53</td>
</tr>
</tbody>
</table>

Addendum to Table A-9.10.3.A.:

(1) Finishes designated by letter as follows:
A = 12.7-mm gypsum board with joints taped and filled,
B = 12.7-mm gypsum-sand plaster,
C = 15.9-mm special fire-resistant Type X gypsum board conforming to CSA A82.27, “Gypsum Board Products” with joints taped and filled,
D = two layers of 12.7-mm gypsum board with joints taped and filled.

(2) Sound ratings listed are based on the most reliable laboratory test data available. Results of specific tests may differ slightly because of measurement precision and minor variations in construction details. Constructions 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 brick.

(3) Sound ratings require no discernible cracks or voids. For concrete blocks, surfaces must be sealed by at least 2 coats of paint or other surface finish described in Section 9.29 to prevent sound leakage.

(4) Sound absorptive material includes fibre processed from rock, slag, or glass, and must fill at least three-quarters of the cavity space to provide the listed STC.

(5) Absorptive material required to achieve fire-resistance rating and STC rating and includes mineral fibre processed from rock or slag with mass of at least 1.22 kg/m² and completely filling the wall cavity.

(6) Regular gypsum board shall be installed so that all edges are supported.
<table>
<thead>
<tr>
<th>Type of Assembly</th>
<th>No.</th>
<th>Description</th>
<th>Finish on Ceiling (1)</th>
<th>Fire Resistance Rating</th>
<th>Typical Sound Transmission Class (2)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Concrete slabs</td>
<td>1</td>
<td>90-mm reinforced concrete with 20-mm minimum cover over reinforcing steel</td>
<td>None (3)</td>
<td>1 h</td>
<td>48</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>130-mm reinforced concrete with 25-mm minimum cover over reinforcing steel</td>
<td>None (5)</td>
<td>2 h</td>
<td>52</td>
</tr>
<tr>
<td>Open web steel joists</td>
<td>3</td>
<td>Open web steel joists at 400 mm o.c. with minimum 50-mm thick concrete deck, ceiling secured to furring channels spaced not more than 600 mm o.c. wired to underside of joists (4)</td>
<td>C</td>
<td>45 min</td>
<td>53</td>
</tr>
<tr>
<td>Wood floor joists</td>
<td>4</td>
<td>Subfloor of 19-mm T&amp;G lumber or 15.5-mm plywood, waferboard or strandboard, ceiling finish attached to metal resilient channels spaced at 200 mm o.c., absorptive material in cavity (4)</td>
<td>C</td>
<td>45 min</td>
<td>48</td>
</tr>
<tr>
<td>or</td>
<td>5</td>
<td>Same as 4, with additional layer of 11 mm sanded plywood, waferboard or strandboard on floor</td>
<td>C</td>
<td>45 min</td>
<td>50</td>
</tr>
<tr>
<td>Wood floor trusses (5)</td>
<td>6</td>
<td>19-mm gypsum-concrete topping (at least 34 kg/m²) on subfloor of 19-mm T&amp;G lumber or 15.5-mm plywood waferboard or strandboard</td>
<td>D</td>
<td>45 min</td>
<td>52</td>
</tr>
<tr>
<td></td>
<td>7</td>
<td>Same as 6</td>
<td>E</td>
<td>1 h</td>
<td>52</td>
</tr>
<tr>
<td></td>
<td>8</td>
<td>Same as 6, with absorptive material in cavity (4), ceiling finish attached to metal resilient channels spaced at 200 mm o.c.</td>
<td>C</td>
<td>45 min</td>
<td>55</td>
</tr>
<tr>
<td>Type of Assembly</td>
<td>No.</td>
<td>Description</td>
<td>Finish on Ceiling(^{(1)})</td>
<td>Fire Resistance Rating</td>
<td>Typical Sound Transmission Class (^{(2)})</td>
</tr>
<tr>
<td>------------------</td>
<td>-----</td>
<td>------------------------------------------------------------------------------</td>
<td>-----------------------------</td>
<td>------------------------</td>
<td>---------------------------------</td>
</tr>
<tr>
<td></td>
<td>9</td>
<td>38-mm lightweight concrete topping (at least 70 kg/m²) on subfloor of 19-mm T&amp;G lumber or 15.5-mm plywood, waferboard or strandboard</td>
<td>D</td>
<td>45 min</td>
<td>54</td>
</tr>
<tr>
<td></td>
<td>10</td>
<td>Same as 9</td>
<td>E</td>
<td>1 h</td>
<td>56</td>
</tr>
<tr>
<td></td>
<td>11</td>
<td>Same as 9, except ceiling finish attached to metal resilient channels</td>
<td>C</td>
<td>45 min</td>
<td>57</td>
</tr>
<tr>
<td></td>
<td>12</td>
<td>Same as 9, with absorptive material in cavity (^{(4)}), ceiling finish attached to metal resilient channels spaced at 200 mm o.c.</td>
<td>C</td>
<td>45 min</td>
<td>60</td>
</tr>
<tr>
<td>Rating provided by membrane only</td>
<td>13</td>
<td>Supporting members spaced not more than 600 mm o.c.</td>
<td>C</td>
<td>30 min</td>
<td>N/A</td>
</tr>
<tr>
<td></td>
<td>14</td>
<td>Same as 11</td>
<td>E</td>
<td>1 h</td>
<td>N/A</td>
</tr>
<tr>
<td>Wood roof trusses spaced not more than 600 mm o.c.</td>
<td>15</td>
<td>38-mm x 89-mm framing members with metal connector plates not less than 1 mm thick with teeth not less than 8 mm in length</td>
<td>C</td>
<td>45 min</td>
<td>N/A</td>
</tr>
</tbody>
</table>

**Addendum to Table A-9.10.3.B.:**

\(^{(1)}\) Finishes designated by letter as follows:
- **C** = 15.9-mm special fire-resistant Type X gypsum board conforming to CSA A82.27, “Gypsum Board Products” with joints taped and filled.
- **D** = two layers of 12.7-mm gypsum board with joints taped and filled, and
- **E** = two layers of 15.9-mm special fire-resistant Type X gypsum board with joints taped and filled.

\(^{(2)}\) Sound ratings listed are based on the most reliable laboratory test data available. Results of specific tests may differ slightly because of measurement precision and minor construction details. Constructions with sound transmission class ratings of 50 or more require acoustical sealant applied around electrical and other openings, and at the junction of intersecting walls and floors, except intersection of walls constructed of concrete or solid brick.

\(^{(3)}\) Sound ratings assume no cracks or voids.

\(^{(4)}\) Sound absorptive material includes fibre processed from rock, slag or glass and must fill at least three-quarters of the cavity space to provide the listed STC.

\(^{(5)}\) Floor trusses have 38-mm x 89-mm wood framing members with metal connector plates not less than 1 mm thick with teeth not less than 8 mm in length.
A-9.10.9.6.(1) Penetration of Fire-Rated Assemblies By Service Equipment. This Article, together with Article 3.1.9.1., is intended to ensure that the integrity of fire-rated assemblies is maintained where they are penetrated by various types of service equipment.

For buildings regulated by the requirements in Part 3, fire stop materials used to seal openings around building services, such as pipes, ducts and electrical outlet boxes, must meet a minimum level of performance demonstrated by standard test criteria.

This is different from the approach in Part 9. Because of the type of construction normally used for buildings regulated by the requirements in Part 9, it is assumed that this requirement is satisfied by the use of generic fire stop materials such as mineral wool, gypsum plaster or Portland cement mortar.

A-9.10.9.16.(3) Separation Between Dwelling Units and Garages. The gas-tight barrier between a dwelling unit and an attached garage is intended to provide reasonable protection from carbon monoxide and gasoline fumes entering the dwelling unit. Construction assemblies incorporating a vapour barrier will perform adequately with respect to gas tightness provided reasonable care is exercised where the wall or ceiling is pierced by service assemblies. Where a garage is open to the adjacent attic space above the dwelling unit it serves, a gas-tight barrier in the dwelling unit ceiling will also provide protection. Unit masonry walls forming the separation between a dwelling unit and an adjacent garage should be provided with two coats of sealer or plaster or covered with gypsum wallboard on the side of the wall exposed to the garage.


A-9.10.13.2.(1) Wood Doors in Fire Separations. CAN4-S113 provides construction details to enable manufacturers to build wood core doors that will provide a 20 min fire-protection rating without the need for testing. The Standard requires each door to be marked with

(1) manufacturer's or vendor's name or identifying symbol,
(2) the words "Fire Door", and
(3) a reference to the fire-protection rating of 20 min.

A-9.11.1. Sound Transmission Class Ratings. The specified STC rating of 50 is considered the minimum acceptable value, but many builders prefer to design for STC 55 or more in high quality accommodation.

Another reason to choose assemblies rated higher than STC 50 is that the STC ratings of assemblies are based on laboratory tests, but the sound transmission of any assembly as constructed in the field may be significantly less than its rating. This can be due to sound leaks, departures from design, poor workmanship or indirect (flanking) transmission paths overlooked in design. To provide a margin of safety to compensate for these builders often select wall and floor systems that have been rated at least 5 points higher than the design STC rating in laboratory tests.

Sound leaks can occur where one wall meets another, the floor, or the ceiling. Leaks may also occur where the wall finish is cut for the installation of equipment or services. 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 drywall 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. Sound-absorbing material inside a well-designed wall decreases sound transmission. It has another advantage; it also helps to reduce the effects of leaks due, perhaps, to poor workmanship.

Indirect or flanking transmission arises where the parts of a building are rigidly connected together and where cavities in hollow walls or floors, or continuous lightweight layers connect apartments. Sound travels in cavities, as vibration along surfaces and through walls, ceilings and floors to adjacent rooms.
Many paths other than the direct one through the party wall or floor may be involved. To achieve good sound insulation, transmission along flanking paths must be minimized by introducing breaks and resilient connections in the construction. Some examples of bad and good details are shown in the illustration.

Changes to constructions should not be made without consultation with someone competent in the field of acoustical design. Adding extra layers of drywall to walls in an attempt to reduce sound transmission, can actually increase it if done incorrectly. For example, attaching drywall on resilient channels directly to an existing wall or ceiling usually increases low frequency sound transmission. Adding an additional layer of drywall inside a double layer wall will also seriously increase sound transmission. Adding blocking inside walls to reduce the risk of firespread should be done so it does not increase vibration transmission from one part of a wall or floor to the other.

To verify that acoustical privacy is being achieved, a field test can be done at an early stage in the construction; ASTM E336 will give a complete measurement. A simpler and less expensive method is ASTM E597, “Standard Practice for Determining a Single Number Rating of Airborne Sound Insulation in Multi Unit Building Specifications.” The rating provided by 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 multifamily 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 vibration.

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**Cross section through wall floor junctions**

Wall and floor get good STC ratings in laboratory tests and the sealing procedures are good. The system performance is low, however, because of flanking paths A and B.

This detail is better. There is no hollow cavity and the break in the floor prevents transmission along the floor. The same techniques should be applied to walls.
noise transmission. Good footstep noise rejection requires fairly heavy floor slabs or floating floors. Impact noise requirements are being considered for inclusion in future versions of the NBC.


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.

A-9.12.2.A. 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-9.13 Exclusion of Soil Gas (see also A-9.16.2.1.) Outdoor air entering a dwelling through above-grade leaks in the building envelope normally improves the indoor air quality in the dwelling by reducing the concentrations of pollutants and water vapour. It is only undesirable because it cannot be controlled. On the other hand, air entering a dwelling through below-grade leaks in the envelope may increase the water vapour content of the indoor air and may also bring in a number of pollutants which it picks up from the soil. This mixture of air, water vapour and pollutants is sometimes referred to as “soil gas.” One pollutant often found in soil gas is radon.

Radon is a colourless, odourless, radioactive gas that occurs naturally as a result of the decay of radium. It is found to varying degrees as a component of soil gas in all regions of Canada and is known to enter dwelling units by infiltration into basements and crawl spaces. The presence of the decay products of radon in sufficient quantity can lead to increased risk of lung cancer.

The potential for high levels of radon infiltration is very difficult to evaluate prior to construction and thus a radon problem may only become apparent once the building is completed and occupied. Therefore various sections of Part 9 require the application of certain radon exclusion measures in all dwellings. These measures are

1. low in cost,
2. difficult to retrofit, and
3. desirable for other benefits they provide.

There are two principal methods of excluding soil gas:

1. Sealing the interface between the soil and the occupied space, so far as is reasonably practicable.

   Sections 9.13 and 9.18 include requirements for dampproofing of slabs and ground covers in crawl spaces, which are intended to help in isolating the occupied space from the soil.

   Providing control joints to reduce cracking of foundation walls and airtight covers for sump pits are other measures which can help achieve this objective.

2. Ensuring that the pressure difference across the soil/space interface is positive (i.e., towards the outside) so that inward soil gas flow through any remaining leaks will be prevented.

Section 9.16 includes requirements related to this objective.

The measures covered in Section 9.13 are illustrated on the following drawings. The measures covered in Section 9.18 are similar. The measures covered in Section 9.16 are discussed in a separate Appendix note.

The requirement in 9.13.6.5. regarding sealing of penetrations of the slab also applies to hollow metal and masonry columns. Not only the perimeters but also the centres of such columns must be sealed or blocked.

The requirement in Article 9.13.6.6. regarding drainage openings in slabs can be satisfied with any of a number of proprietary devices which prevent soil gas entry through floor drains. Some types of floor
drains incorporate a trap which is connected to a nearby tap so that the trap is filled every time the tap is used. This is intended to prevent the entry of sewer gas but would be equally effective against the entry of soil gas.

**A-9.14.2.1.(2) Insulation Applied to the Exterior of Foundation Walls.** In addition to the prevention of heat loss, some types of mineral fibre insulation, such as rigid glass fibre, are installed on the exterior of basement walls for the purpose of moisture control. This is sometimes used instead of crushed rock as a drainage layer between the basement wall and the surrounding soil in order to facilitate the drainage of soil moisture. Water drained by this drainage layer must be carried away from the foundation by the footing drains or the granular drainage layer in order to prevent it from developing hydrostatic pressure against the wall. Provision must be made to permit the drainage of this water either by extending the insulation or crushed rock to the drain or by the installation of granular material connecting the two. The installation of such drainage layer does not eliminate the need for normal waterproofing or damproofing of walls as specified in Section 9.13.

**A-9.15.1.1.(1) Installation of Mobile Homes.** CSA has prepared a standard entitled CAN3-Z240.10.1, “Recommended Practice for the Site Preparation, Foundation and Anchorage of Mobile Homes.” This document is intended to provide guidance to inspectors, installers and owners of mobile homes and includes information on site preparation, foundations, anchorage and skirting.

**A-9.15.1.3.(4) Preserved Wood Foundations – Design Assumptions.** Tabular data and figures in CAN3-S406, “Construction of Preserved Wood Foundations” are based upon the general principles provided in CAN3-O86, “Code for Engineering Design in Wood” with the following assumptions:

1. soil bearing capacity: 75 kPa or more,
2. clear spans for floors: 5,000 mm or less,
3. floor loadings: 1.9 kPa for first floor and suspended floor, and 1.4 kPa for second storey floor,
4. foundation wall heights: 2,400 mm for slab floor foundation, 3,000 mm for suspended wood floor foundation,
(5) top of granular layer to top of suspended wood floor: 600 mm,
(6) lateral load from soil pressure: equivalent to fluid pressure of 4.7 kPa per metre of depth,
(7) ground snow load: 3 kPa,
(8) basic snow load coefficient: 0.6,
(9) roof loads are carried to the exterior wall,
(10) dead loads: roof 0.50 kPa,
      floor 0.47 kPa,
      wall (with siding) 0.32 kPa,
      wall (with masonry veneer) 1.94 kPa,
      foundation wall 0.27 kPa,
      partitions 0.20 kPa.

A-9.16.2.1. Control of Infiltration of Soil Gas. (See also A-9.13.)

As noted in A-9.13, one method of excluding soil gas from below-grade living space is to ensure that the pressure difference across the soil/space interface is positive (i.e., towards the outside) so that inward soil gas flow through any leaks will be prevented. This requires consideration of the air pressure on the inside of the envelope and the pressure within the soil. Each is affected by quite different factors.

There is a safe range for the interior pressure in a house. The upper limit is primarily due to the need to minimize outward leakage of the warm, moist interior air through leaks in the building envelope. The lower limit depends on the type of combustion heating equipment present in the house. It also follows from the need to avoid drawing in soil gas, as discussed in Appendix Notes A-9.13 and A-9.33.

Controlling the entry of soil gas by house or basement pressurization is therefore problematic, since it could lead to exfiltration-caused condensation problems in the building envelope. This leaves the option of reducing the pressure outside the envelope as the most practical method of achieving the desired outward pressure difference. The remainder of this note describes how this may be accomplished.

At least in areas which are prone to higher than normal radon levels, or other ground pollutants, the practice described below should be followed:

(1) Any slab-on-ground should have not less than 100 mm of coarse granular fill beneath the slab (as required in Article 9.16.2.1.) if no perforated tile is laid within the fill. If tile is used, not less than 50 mm of fill is required and no point in the filled area should be more than 3 m from the tile. The tile should not be connected to any drainage tile.

(2) A short length of pipe, of not less than 100 mm diameter, should be cast vertically into the slab. If no tile is used, this pipe should be located near the centre of the slab and the fill around the pipe location should not be less than 150 mm deep for a radius of 300 mm. If tile is used, the bottom end of the pipe should connect to the tile at its lowest point. The top end of the pipe should have a removable cap.

(3) When the house is completed, a test should be carried out to determine the radon concentration. (Local health authorities can provide guidance as to whether the test results indicate the need for remedial measures.)

(4) If radon concentrations are above guideline levels, the sub-slab space should be ventilated. This requires that the pipe connection to the sub-slab space be uncapped and connected to a ventilation system exhausting to the outside. Exhaust pipes passing through unheated spaces should be insulated. The fan should be located where noise will not be a nuisance and outside the occupied space. It is also best to locate the fan as close to the final outlet end of the ventilation system as possible so that the pressurized portion of the system downstream of the fan will not be located in or adjacent to the living space. If the pressurized portion of the system were to pass through the living space, then any leak in the system would have the potential to spill high radon concentration soil gas into the living space, thus exacerbating the situation the system was intended to correct. The fan should be of a type suitable for the application and capable of continuous operation. This sub-slab ventilation system is illustrated on the following page.

(5) The house should be re-tested for radon after completion of the ventilation system.
One type of sub-slab ventilation system

A-9.21.1.2. Factory-Built Chimneys. Under the provisions of Section 2.5, certain solid-fuel burning appliances may be connected to factory-built chimneys other than those specified in Article 9.21.1.2. if tests show that the use of such a chimney will provide an equivalent level of safety.

A-9.21.3.6. Metal Chimney Liners. Under the provisions of Section 2.5, 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.

A-9.21.4.4. Location of Chimney Top.

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. (See Article 9.25.5.2. for vapour barriers with foamed plastic insulation.)

A-9.20.1.3.(1) Seismic Zones. Information on seismic zones for various localities can be found in Chapter 1 of the Supplement to the National Building Code 1990.

A-9.20.13.10.(3) Damproofing 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.
The following information is from CAN/CSA-A405.

(1) Engineering calculations show that free-standing chimneys constructed with Type N mortar and with least dimension not less than 400 mm can extend to a height of 3.6 m.

(2) The number of flues contained within the same stack does not affect the height given in (1).

(3) The height shall be taken from the last point of lateral support for the chimney. For example,

(a) on frame construction of interior chimneys, the height measurement is taken from the bottom of the lowest flue liner;

(b) in solid or brick veneer construction, the height measurement is taken from the point where the chimney stack leaves the masonry which forms part of the exterior wall.

(4) Where a chimney is fastened to the house framing with metal anchors, in accordance with CSA Standard CAN3-A370 "Connectors for Masonry," it shall be considered to have adequate lateral support. The portion of the chimney stack above the roof shall be considered as free standing.

The intent of this Article is to allow the fireplace to be operated without affecting, or being affected by, other appliances or exhaust equipment. For this to occur, the fireplace must be provided with a supply of combustion air dedicated to the fireplace only; an opening to the exterior should be provided at or near the fireplace opening. The opening of a window is not considered to be sufficient, as discomfort from drafts is likely to inhibit its use. Factory built fireplaces should have combustion air provided in accordance with manufacturers' installation instructions. In the case of site-built masonry fireplaces, this Article will be satisfied if the following procedures are followed:

(1) The combustion air in Article 9.22.1.4. is supplied by a duct having a minimum diameter of 100 mm or equivalent area.

(2) The air supply duct is noncombustible, corrosion-resistant and, where exposed to room air, insulated for its entire length with insulation having a thermal resistance value of RSI 1.41.

(3) The air supply outlet is located as close to the fireplace opening as possible.

(4) When the air supply outlet is placed inside the fire chamber, it is located at the front centre of the chamber hearth and is equipped with a noncombustible hood which when open will direct air away from the fire, and designed to prevent embers from entering the supply duct.

(5) The supply duct contains a damper that fits tightly when in the closed position and is located close to the outlet end.

(6) The damper is operable from the room containing the fireplace and the control mechanism clearly indicates the actual position of the damper.
A-9.22.1.4.

(7) Any portion of the air supply duct within 1 m of its outlet in the fire chamber has a minimum 50 mm clearance from combustibles.

(8) The exterior air supply duct is protected against the entry of rain and direct wind and the inlet opening has an insect screen of corrosion-resistant material.

(9) The exterior air supply duct inlet is located to avoid being blocked by either snow or fallen leaves.

A-9.23.4.1.(1) Span Tables for Wood Joists and Rafters. 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 design roof snow load than shown in the tables, the maximum member spacing may be calculated as the product of the member spacing and snow load shown in the span tables divided by the design snow load for the locality being considered. The following are examples of how this principle can be applied:

(1) For a 3.0 kPa design snow load, use spans for 1.5 kPa and 600 mm o.c. spacing but space members 300 mm o.c., or use spans for 2.0 kPa and 600 mm o.c. spacing but space members 400 mm o.c.

(2) For a 3.5 kPa design snow load, use spans for 2.5 kPa and 600 mm o.c. spacing but space members 400 mm o.c.

(3) For a 4.0 kPa design snow load, use spans for 2.0 kPa and 600 mm o.c. spacing but space members 300 mm o.c.

The allowable spans in the span tables are measured from the face or edge of support to the 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 and A-9 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.

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 CAN3-O86, “Code for the Engineering Design of Wood.”

A-9.23.4.1.(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 allowable span.
The K factor is determined from the following relationship:

\[ \ln(K) = A - B \cdot \ln\left(\frac{S_i}{S_{184}}\right) + G \]

where

- \(A\) = a constant, the value of which is determined from Table A,
- \(B\) = a constant, the value of which is determined from Table B,
- \(S_i\) = span which results in 2-mm deflection of the joist in question under 1 kN concentrated midpoint load,
- \(S_{184}\) = span which results in 2-mm deflection of 38 x 184-mm joist of same species and grade as the joist in question under 1 kN concentrated midpoint load,
- \(G\) = a constant, the value of which is determined from Table G.

For any joist size, species and grade, the value of \(K\) which results in a vibration controlled span of 3 m is the largest allowed value.

Note that, for a sawn lumber joist, the ratio \(S_i/S_{184}\) is equivalent to its depth (mm) divided by 184.

Due to rounding differences, the method, as presented here, might produce results slightly different from those produced by the computer program used to generate the span tables.

### Table A

| Sheathing Thickness, mm | Strapping Only | | Bridging Only | | Strapping + Bridging |
|-------------------------|----------------|----------------|----------------|----------------------|
|                         | Joist Spacing, mm |                           | Joist Spacing, mm |                           | Joist spacing, mm |
|                         | 300 | 400 | 600 |       | 300 | 400 | 600 |       | 300 | 400 | 600 |
| 12.5                    | 0.28 | 0.24 | 0.19 |       | 0.36 | 0.30 | 0.24 |       | 0.40 | 0.33 | 0.27 |
| 15.5                    | 0.30 | 0.25 | 0.20 |       | 0.37 | 0.31 | 0.25 |       | 0.42 | 0.35 | 0.28 |
| 19.5                    | 0.36 | 0.30 | 0.24 |       | 0.45 | 0.37 | 0.30 |       | 0.50 | 0.42 | 0.33 |

### Table B

<table>
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<th>Constant B</th>
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<tbody>
<tr>
<td>Basic floor - 15.5-mm plywood sheathing (or equivalent in Table 9.23.14.A.)</td>
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<tr>
<td>Basic floor - 400-mm joist spacing</td>
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</tr>
<tr>
<td>- no bridging</td>
<td></td>
</tr>
<tr>
<td>Basic floor with bridging</td>
<td>0.38</td>
</tr>
<tr>
<td>Basic floor with bridging and strapping</td>
<td>0.41</td>
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</table>

### Table G

<table>
<thead>
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<th>Floor Description</th>
<th>Constant G</th>
</tr>
</thead>
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<tr>
<td>Floors with nailed subfloor</td>
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</tr>
<tr>
<td>Floor with field-glued subfloor, *</td>
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</tr>
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<td>vibration-controlled span greater than 3 m</td>
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</tr>
<tr>
<td>Floor with field-glued subfloor, *</td>
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<tr>
<td>vibration-controlled span 3 m or less</td>
<td>0.15</td>
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</tbody>
</table>

* Subfloor glued to floor joists with elastomeric adhesive complying with CGSB Standard 71-GP-26M, "Standard for Adhesives for Field-gluing Plywood to Lumber Framing for Floor Systems."
Additional background information on this method can be found in the following publications:


A-9.23.4.2.(1) Maximum Spans for Steel Beams Supporting Floors in Dwellings. A beam may be considered to be laterally supported if wood joists bear on its top flange at intervals of 600 mm or less over its entire length, if all the load being applied to this beam is transmitted through the joists and if 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 joists supported. Other additional methods of positive lateral support are acceptable.

For supported joist lengths intermediate between those in the table, straightline interpolation may be used in determining the maximum beam span.

A-9.23.4.A. Spans for Steel Beams. The spans are based on the following assumptions:

1. Simply supported beam spans
2. Laterally supported top flange
3. Yield strength 300 MPa
4. Deflection limit L/360
5. Live load = 1.9 kPa/1st floor, 1.4 kPa/2nd floor
6. Dead load 1.5 kPa

A-9.23.4.5. Concrete Topping. Spans given in Tables A-1 and A-2 were based on an assumed dead load for conventional wood frame floor construction. The addition of 50 mm of concrete topping can impose an additional dead load of about 0.8 to 1.2 kPa, depending on the density of the concrete. The spacing of joists in the span tables can be adjusted to allow for the increased load in accordance with the following example: for a topping dead load of 0.80 kPa on floor joists for living quarters, live load plus dead load becomes 2.7 kPa. Use spans for 1.9 kPa and 600 mm spacing but space members 400 mm apart.

Spans for floor joists in living quarters are based on a live load of 1.9 kPa. Spans for floor joists in bedrooms are based on a live load of 1.4 kPa.

A-9.23.10.4. Fingerjoined Lumber. The NLGA “Standard Grading Rules for Canadian Lumber,” referenced in 9.3.2.1. refers to two special product standards, SPS-1, “Fingerjoined Structural Lumber,” and SPS-3, “Fingerjoined Stud Lumber – Vertical Use Only,” produced by NLGA. Material identified as conforming to these standards is considered to meet the requirements in this Article for joining with a structural adhesive. Lumber fingerjoined in accordance with SPS-3 should be used as a vertical end-loaded member in compression only, where sustained bending or tension-loading conditions are not present, and where the moisture content of the wood will not exceed 19 per cent. Fingerjoined lumber may not be visually regraded or remanufactured into a higher stress grade even if the quality of the lumber containing fingerjoints would otherwise warrant such regrading.

A-9.23.13.11.(1) Span Tables for Wood Roof Trusses. In these Tables the term “Fink” truss refers to the common “W” type truss and the term “Howe” truss refers to the type which has a vertical member extending from its peak. Schematic drawings of the simplest version of each type are shown on the following page. Each type may have web members additional to those shown, in which case the distances between panel points can be decreased.

The span tables in this Appendix have been calculated for wood species equivalent in strength to Spruce-Pine-Fir, Douglas Fir-Larch or Hem-Fir. The spans are not appropriate for the weaker species, which are included in the northern species combination.

The spans are based on 600 mm o.c. truss spacing.
Where wood roof trusses are intended for use in a locality having a design roof snow load higher than shown in the tables, the maximum truss spacing may be adjusted to allow for the higher loading in the same manner as described for roof rafters and roof joists.

Where wood roof trusses are to be used in an area where the design roof snow load falls between the values shown in the tables, the spans may be interpolated between the spans shown in the tables. The truss spans in these tables are valid only where the design live load on the bottom member does not exceed 0.5 kPa of ceiling area. This applies to trusses in buildings whose attic spaces have limited access through an access hatch and not to attics that are accessible by stairways. The spans do not apply to trusses which may be subject to concentrated loads, such as those required to support hoisting equipment. In addition, the top members of the trusses must be constructed to prevent lateral buckling by the provision of roof sheathing or by other suitable bracing.
A-9.23.14.2. Water Absorption Test. A method for determining water absorption is described in ASTM D1037, "Standard Methods of Evaluating the Properties of Wood-Base Fiber and Particle Panel Materials." The treatment to reduce water absorption may be considered to be acceptable if a 300 mm x 300 mm sample when treated on all sides and edges does not increase in weight by more than 6 per cent when tested in the horizontal position.

A-9.23.14.4. Oriented Waferboard and Strandboard. The CSA Standard requires that Type O (aligned) panels be marked to show the grade and the direction of face alignment.

A-9.23.17.3. Omission of Sheathing Paper Under Metal Siding. The purpose of sheathing paper is to prevent drafts and the entry of wind-driven rain into the wall cavity. Certain types of metal siding consisting of large sheets or panels will perform this function, eliminating the need for sheathing paper. This requirement applies to siding such as that commonly used on mobile homes but does not apply to metal siding installed in strips which is intended to simulate the appearance of lapped wood siding. Such material does not act as a substitute for sheathing paper since it incorporates provision for venting the wall cavity and has many joints.

A-9.23.18. Bracing. Traditionally, diagonal bracing has been provided at the corners of wood framed walls to provide resistance against wind racking forces. Laboratory tests have indicated, however, that the bracing that had been traditionally used contributed relatively little to the overall strength of the wall. Most of the racking resistance was in effect provided by the interior finish. Because of this, the requirements for bracing were deleted in the late 1950's. (See "Shear Resistance of Wood Frame Walls," by A.T. Hansen, Building Practice Note 61, Institute for Research in Construction, National Research Council, Ottawa.) Where the interior is not finished, however, bracing is necessary if the siding itself or the sheathing does not provide the required racking strength. If panel type siding is used, or if the sheathing consists of plywood, waferboard, strandboard, gypsum board, diagonal lumber, or fibreboard sheathing, additional bracing is not considered necessary because of the wind bracing provided by these materials.

Where bracing is provided, it must be installed at roughly a 45° angle on each wall and in each storey, extending the full height of the storey. This type of bracing provides considerably greater resistance to wind forces than the traditional bracing that was found to be relatively ineffective.

The permission to omit bracing assumes typical house designs. Some houses may have reduced resistance to racking forces as a result of their configuration. These include tall narrow houses in exposed locations with large door or window openings located in the short sides. In such cases racking resistance can be improved by ensuring that paneled sections are placed adjacent to the openings.

The Code does not address the issue of bracing of the structure during construction. It is often necessary to provide temporary bracing until the interior finish or sheathing is installed, however, this is not a Code requirement.

A-9.24.3.2. Framing Above Doors in Steel Stud Fire Separations

![Diagram of Framing Above Doors in Steel Stud Fire Separations]

Where the interior is not finished, however, bracing is necessary if the siding itself or the sheathing does not provide the required racking strength. If panel type siding is used, or if the sheathing consists of plywood, waferboard, strandboard, gypsum board, diagonal lumber, or fibreboard sheathing, additional bracing is not considered necessary because of the wind bracing provided by these materials.

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A-9.24.3.2. Framing Above Doors in Steel Stud Fire Separations

![Diagram of Framing Above Doors in Steel Stud Fire Separations]
A-9.25 Control of Condensation. The majority of moisture problems resulting from condensation of water vapour in walls and ceiling/attic spaces are caused by the leakage of moist interior heated air into these spaces rather than by the diffusion of water vapour through the building envelope.

Protection against such air leakage must be provided by a system of air-impermeable materials joined with leak free joints. Generally, air leakage protection can be provided by the use of air-impermeable sheet materials such as gypsum board or polyethylene of sufficient thickness. However, the integrity of the air barrier protection can be compromised at the joints and here special care must be taken in the design and construction of an effective air barrier system.

Although this Section refers separately to vapour barrier protection and air barrier protection, these functions in a wall or ceiling assembly of conventional wood frame construction are often combined as a single membrane which acts as a barrier against moisture diffusion and the movement of interior air into insulated wall or roof cavities. Openings cut through this membrane, such as for electrical boxes, provide opportunities for air leakage into concealed spaces and special measures must be taken to make such openings as airtight as possible. Attention must also be paid to less obvious leakage paths, such as holes for electric wiring, plumbing installations, wall/ceiling/floor intersections and gaps created by shrinkage of framing members.

In some constructions the air barrier protection is provided by the interior finish, such as gypsum board, which is sealed to framing members and adjacent components by gaskets, caulking, tape or other methods to complete the air barrier protection. In such cases, special care in sealing joints in a separate vapour barrier is not critical. These techniques often use no separate vapour barrier but rely on appropriate paint coatings to give the interior finish sufficient resistance to water vapour diffusion that it can provide the required vapour barrier protection.

The wording in this Section allows for such innovative techniques, as well as the more traditional approach of using a continuous sheet, such as polyethylene, to act as an “air/vapour barrier.”


A-9.25.4.3.(2) Loose-Fill Insulation in Masonry Walls. Typical masonry cavity wall construction techniques do not lend themselves to the prevention of entry of rainwater into the wall space. For this reason, loose-fill insulation used in such space must be of the water repellent type. A test for water-repellancy of loose-fill insulation suitable for installation in masonry cavity walls can be found in ASTM C516, “Specification for Vermiculite Loose Fill Insulation.”

A-9.25.4.3.(3) Loose-Fill Insulation in Existing Wood Frame Walls. The addition of insulation into exterior walls of existing wood frame buildings increases the likelihood of damage to framing and cladding components as a result of moisture accumulation. Many older homes were constructed with little or no regard for protection from vapour transmission or air leakage from the interior. Adding thermal insulation will substantially reduce the temperature of the siding or sheathing in winter months, possibly leading to condensation of moisture at this location.

Defects in exterior cladding, flashing and caulking could result in rain entering the wall cavity. This moisture, if retained by the added insulation, could initiate the process of decay.
Steps should be taken therefore, to minimize these effects prior to the retrofit of any insulation. Any openings in walls that could permit leakage of interior heated air into the wall cavity should be sealed. The inside surface should be coated with a low-permeability paint to reduce moisture transfer by diffusion. Finally, the exterior siding, flashing and caulking should be checked and repaired if necessary to prevent rain penetration.

A-9.25.5.2. Location of Low Permeance Air Barriers. Generally the location in a building assembly of the air barrier is not critical; it can restrict outward movement of indoor air whether it is located near the outer surface of the assembly, near the inner surface or at some intermediate location. However, if the material chosen to act as the air barrier also has the characteristics of a vapour barrier (i.e., low permeability to water vapour), its location must be chosen more carefully in order to avoid moisture problems. Any moisture from the indoor air which diffuses through the inner layers of the assembly or is carried by air leakage through those layers is likely to be trapped at such an air barrier. This will not cause a problem if the air/vapour barrier is located where the temperature is above the dew point of the indoor air; the trapped water vapour will remain as vapour and no harm will be done. But if the air/vapour barrier is located where the temperature is below the dew point of the indoor air, the trapped water vapour will condense as liquid water or ice. If this temperature remains below the dew point for any length of time, significant moisture could accumulate.

Moisture which remains into warmer weather can allow the growth of decay organisms. Therefore 9.25.5.2. specifies that the temperature at such an air/vapour barrier be checked when the outdoor temperature is at a fairly low value. The January 2.5 per cent value is a temperature below which the temperature in an average January can be expected to go only 2.5 per cent of the hours in the month. Using this value would certainly be safe; however, modelling studies have indicated that moisture accumulation is unlikely to be significant if the location of the air/vapour barrier is based on exterior temperatures up to 10°C above this temperature. The method of carrying out this check is illustrated in the following example (see illustration next page):

Consider this wall on a house located in an area where the January 2.5 per cent temperature, as listed in the Supplement to the National Building Code, is -30°C. The designated air barrier is a material with low water vapour permeance (extruded polystyrene); therefore, the wall should be checked for compliance with 9.25.5.2., (i.e., the wall should be checked to ensure that the temperature at the location of the air/vapour barrier is above the dew point of the interior air when the outdoor temperature is -20°C).

Thus, in this example, the temperature at the location of the air/vapour barrier is below the dew point of the interior air and the design is not acceptable for use in this area. However, similar calculations would show that, if the extruded polystyrene were 100 mm thick, its surface temperature would be 4.7°C and the design would be acceptable in this area. Similarly, if the extruded polystyrene were 50 mm thick, the wall could be used in an area where the January 2.5 per cent temperature is -20°C.

A-9.25.6.2. Location of Vapour Barriers. Assemblies in which the vapour barrier is located partway through the insulation meet the intent of this Article provided it can be shown that the temperature of the vapour barrier will not fall below the dew point of the heated interior air.

A-9.25.6.3. Low Permeance Insulation. Where foamed plastic provides the resistance to water vapour specified in this Article, then no additional vapour barrier is necessary to reduce the rate of water vapour diffusion. Most serious problems resulting from moisture condensation, however, are the result of the leakage of moist air from inside the building into concealed wall spaces during colder weather. (See Appendix Note A-9.25.) In most cases, vapour diffusion accounts for only a small fraction of the total moisture.

If the insulation is installed by spot applied adhesives, large areas of the wall can share common interconnected air spaces between the insulation and the masonry. These can allow openings in the interior finish (due to holes, cracks, electrical boxes and other discontinuities) to communicate with openings in the exterior masonry surface (e.g. from cracks, joints and weep holes). Any air pressure differential between the inside and outside due to wind effects, mechanical equipment or buoyancy of
Surface designated as air barrier by virtue of sealing joints in extruded polystyrene.

- 20°C
- 35% RH
dew point 4°C

| RSI value | 0.12 | 0.08 | 2.11 | 0.87 | 0.17 | 0.07 | 0.03 |
| RSI / (total RSI) | 0.04 | 0.02 | 0.61 | 0.25 | 0.05 | 0.02 | 0.01 |
| Temp. drop, K | 1.60 | 0.80 | 24.40 | 10.00 | 2.00 | 0.80 | 0.40 |
| Surf. Temp., °C | +20 | +18.4 | +17.6 | -6.8 | -16.8 | -18.8 | -19.6 | -20 |

Warm air (stack effect) can cause room air to leak into the cavity between the insulation and masonry and condense as water or eventually as ice. The stack effect increases with the height of the building and is greatest at the top of the building. While this may not eliminate potential problems, it reduces the risk of an air leak in the interior finish affecting a large area of wall surface. (See Article 9.20.13.10. for dampproofing masonry walls insulated with foamed plastic.)
A-9.26.2.(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-9.27.10.2.(3) **Grooves in Hardboard Siding.** Grooves deeper than that specified may be used in thicker siding providing they do not reduce the thickness to less than the required thickness minus 1.5 mm. Thus for type 1 or 2 siding, 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-9.27.11.2.(2) **Thickness of Grade O-2 Waferboard and Strandboard.** In using Table 9.28.9.A to determine the thickness of Grade O-2 waferboard and strandboard cladding, substitute “face orientation” for “face grain” in the column headings.

A-9.28.4.A. **Stucco Lath.** Paper-backed welded wire lath may also be used on horizontal surfaces provided its characteristics are suitable for such application.

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. For the past 50 years or so, however, houses have become progressively more airtight through the introduction of new products such as plywood and waferboard, polyethylene film, improved caulking materials, tighter windows and doors, more efficient heating systems and generally improved construction methods. 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.

A significant portion of the air change rate in houses is due to air flow up the flue. Electric heating, however, eliminates the need for flues and high efficiency combustion furnaces greatly reduce the air flow up the flue through more efficient combustion and by restricting flue air leakage between firing periods. The increased use of such heating systems combined with increased emphasis on sealing the building envelope led to concern that the natural air change in dwelling units might be inadequate in some instances to provide a healthful environment. Condensation problems resulting from higher humidity levels were also a concern.

Exhaust fans were specified for electrically heated houses in the 1980 edition of the NBC to reduce the incidence of excessive humidity levels in these houses. However, with the continuing emphasis on reduced air leakage and the development of more efficient fuel burning systems, health concerns became paramount. These concerns led to the current requirements for mechanical ventilation in all dwelling units regardless of the type of heating system used.

(1) **Capacity**

The system must be capable of providing at least 0.3 air changes per hour (ach). This value is approximately equal to the rate called for in the preliminary CSA Standard F326.1 (Residential Mechanical Ventilation Requirements) and is about equal to the rate that would be achieved using ASHRAE Standard 62, “Ventilation for Acceptable Indoor Air Quality,” which relates ventilation rate to occupant load.

Because many ventilation systems designed to run essentially continuously must nevertheless be shut down for brief periods (e.g., the defrost cycle of a heat recovery ventilator), the rate is specified as the rate averaged over 24 h. In other words, if the system must be periodically shut down, the air change rate when it is running must be proportionately higher in order to achieve the specified average rate.

It should be emphasized that this air change rate refers to the installed capacity of the system, not the rate of ventilation that is actually used in the house. In many households, ventilating at 0.3 ach would provide more ventilation than required, resulting in higher than necessary heating bills and perhaps excessively low indoor relative humidity. Thus, although a system with the minimum capacity must be installed, it can incorporate controls that allow the system to be used at less than its full capacity most of the time.
(a) The simplest form of control is a manual on/off switch. While acceptable, this is not the best solution, since the occupants might turn the system off and forget to turn it back on or might turn it off to save on heating bills or to reduce noise, not realizing the importance of proper ventilation.

(b) A better form of control is a humidistat-activated on/off switch, which turns the ventilation system on in response to rising humidity. Humidity is often the main reason that ventilation is required, but not always. Depending on the activities of the occupants and the relative strengths of other sources of pollutants and humidity, the amount of ventilation required to control humidity may not be enough to control other pollutants.

c) Ventilation systems in large buildings are sometimes controlled by carbon dioxide (CO₂) sensors and this technology is just beginning to be available at a residential scale. Increasing CO₂ concentration is usually a good indication of decreasing air quality. But even this form of control may not be satisfactory in cases where there are unusual pollutants, such as those generated by certain hobbies.

Mechanical ventilation systems can be as simple as a ductless kitchen or bathroom fan exhausting air directly to the outdoors, or they may be as elaborate as a completely ducted system distributing a balanced supply of fresh air to each room. All are permitted provided the air change capacity requirements are met.

(2) Simple Exhaust Systems

Where an exhaust system depends on natural air leakage through the building envelope to replace the exhaust air, the exhaust fan may have to operate against a substantial pressure difference if the building is relatively airtight. This can reduce the air flow through the fan significantly below its rated capacity. Also, the resulting negative pressure may cause spillage of combustion products from certain types of combustion appliances.

The types of appliances that are susceptible to pressure-induced spillage are those which draw combustion and/or draft dilution air from the dwelling. Thus a gas furnace with a draft hood is susceptible to spillage, as is an oil furnace with a barometric damper. On the other hand, appliances such as gas furnaces with induced draft venting systems and the “sealed combustion” oil furnaces commonly used in mobile homes, are more resistant to spillage and do not require make-up air openings. Almost all fireplaces are spillage-susceptible, even those with so-called “airtight” glass doors and outside combustion air intakes, since most “airtight” doors are not really airtight. Certain types of gas combustion appliances, such as cooking appliances and “decorative appliances,” are not required to be vented. Their operation will not be significantly affected by depressurization of the house so make-up air openings are not required.

To reduce the risk of pressure-induced spillage from spillage-susceptible combustion appliances, tight buildings which incorporate such appliances must be provided with air intake openings to facilitate the inward flow of replacement air. The intake openings should be located a reasonable distance from the exhaust outlets to allow adequate mixing of the replacement air with the inside air and should be sized to prevent excessive negative pressure from being created by the exhaust fans. The following table provides suggested intake opening areas based on an allowable level of depressurization of 5 Pa.

<table>
<thead>
<tr>
<th>Sum of Fan Capacities, L/s</th>
<th>Size of Intake Openings Necessary to Avoid Excessive Depressurization in Dwellings with Spillage-Susceptible Heating Equipment, m²</th>
</tr>
</thead>
<tbody>
<tr>
<td>25</td>
<td>0.014</td>
</tr>
<tr>
<td>30</td>
<td>0.016</td>
</tr>
<tr>
<td>35</td>
<td>0.019</td>
</tr>
<tr>
<td>40</td>
<td>0.022</td>
</tr>
<tr>
<td>50</td>
<td>0.027</td>
</tr>
<tr>
<td>60</td>
<td>0.033</td>
</tr>
<tr>
<td>70</td>
<td>0.038</td>
</tr>
<tr>
<td>80</td>
<td>0.044</td>
</tr>
<tr>
<td>90</td>
<td>0.049</td>
</tr>
<tr>
<td>100</td>
<td>0.055</td>
</tr>
<tr>
<td>110</td>
<td>0.060</td>
</tr>
<tr>
<td>120</td>
<td>0.066</td>
</tr>
<tr>
<td>130</td>
<td>0.071</td>
</tr>
<tr>
<td>140</td>
<td>0.076</td>
</tr>
<tr>
<td>150</td>
<td>0.082</td>
</tr>
</tbody>
</table>
Air intake openings are not required where tests show that spillage of combustion products is not likely to be a problem. Canada Mortgage and Housing Corporation has developed the “Venting System Test,” which is suitable for this purpose.

Generally such intake openings are not required in dwellings that do not incorporate spillage-susceptible combustion appliances. However, even in these dwellings, some control on the potential for high levels of depressurization created by the ventilation system is recommended since, as mentioned above, high levels can impair the ability of the system to function. Also, high levels of depressurization can result in contaminants being drawn into the dwelling from the envelope itself (e.g., formaldehyde from some building materials) or from the soil (e.g., radon and other constituents of soil gas). Thus, in dwellings which have very low leakage areas (e.g., special low energy houses) and which incorporate exhaust-only ventilation systems, some intake opening should be provided even if the heating system is not prone to spillage. The following table provides suggested intake opening areas based on an allowable level of depressurization of 20 Pa.

<table>
<thead>
<tr>
<th>Sum of Fan Capacities, L/s</th>
<th>Size of Intake Openings Necessary to Avoid Excessive Depressurization in Airtight Dwellings without Spillage-Susceptible Heating Equipment, m²</th>
</tr>
</thead>
<tbody>
<tr>
<td>20</td>
<td>0.004</td>
</tr>
<tr>
<td>30</td>
<td>0.008</td>
</tr>
<tr>
<td>50</td>
<td>0.012</td>
</tr>
<tr>
<td>80</td>
<td>0.018</td>
</tr>
<tr>
<td>125</td>
<td>0.024</td>
</tr>
<tr>
<td>170</td>
<td>0.031</td>
</tr>
</tbody>
</table>

Indoor barbecue-type ranges incorporate an exhaust fan with a capacity so high that the operation of other exhaust equipment and appliances requiring combustion air may be affected. Where such ranges are installed, a separate make-up air supply installed near the appliance may be necessary. The capacity of these fans is so high (>150 L/s) that it is often impractical to provide a large enough intake air opening to avoid excessive depressurization. In such cases, one solution is to incorporate a make-up air fan with a capacity similar to that of the exhaust fan.

(3) Location of Intake Openings and Tempering of Make-up Air

In cold weather, the make-up air should be tempered before it reaches living areas in the house or it may create so much discomfort that the occupants will simply block the intake openings. In some ventilation systems, fresh air is ducted to the return air side of the furnace, so that it is drawn into the furnace plenum. This has the advantages of heating the fresh air before it reaches the living areas, thereby eliminating cold drafts, and distributing the fresh air to all parts of the house served by the heating ducts. Although this method has been successfully used for many years to control surface condensation problems, it can cool the furnace heat exchanger to the point where condensation may occur within the furnace. This can lead to corrosion unless the furnace is designed with adequate corrosion resistance. This problem can be avoided if the incoming air is mixed with return air and/or is tempered (e.g., with an electrical in-duct heating coil) before it comes in contact with the heat exchanger. A minimum temperature of 12°C is recommended by the heating industry.

Another method of tempering the make-up air is to have it enter the house in some room not normally occupied, such as a storage room, so that it mixes with indoor air before migrating to the living areas. Where this method is used, the amount of separation (i.e., restriction to air flow) between the room chosen and the rest of the house is critical. With too little separation, not enough pre-mixing will take place and draft problems are likely. With too much separation, the fresh air may not get to where it is needed and the room with the intake could become extremely cold. It is difficult to provide much guidance in this area except to suggest normal interior partition construction practice and normally fitted interior doors with no attempt at air sealing. Another method of tempering the make-up air is to have it enter the house through ducts which incorporate electrical or hydronic in-duct heating coils.
Intake ducts should be insulated and wrapped with an air/vapour barrier (on the side of the insulation away from the duct) to prevent the formation of condensation on the cold surface of the duct.

(4) Choice of Fans

The flow capacity of some types of fans decreases quite dramatically when the fan is required to work against a significant pressure difference. Therefore in selecting fans for a ventilation system, the fan capacity when rated at a 25 Pa pressure difference must be compared with the required system capacity.

Another important characteristic that should be borne in mind when selecting fans is the noise rating. If the ventilation system is too noisy, the occupants may just turn it off. Although much can be accomplished in reducing noise by locating the fans away from occupied areas and by mounting them in a manner that isolates them from the structure, the first step is to choose quiet fans. The noise disturbance created by a fan is usually expressed as its “sone” rating. Fans used in ventilation systems should have sone ratings of less than 2.0.

(5) Fully Ducted Balanced Systems

Fully ducted “balanced” ventilation systems with both intake and exhaust fans have the advantage of providing better control of the ventilation rate and more effective distribution of the fresh air within the dwelling. Such systems can be relatively expensive; however this need not be the case in houses with forced warm air heating systems since the heating ducts can also be used for ventilation.

In fact, it is very difficult to achieve a perfect balance between the intake and exhaust flows in “balanced” systems. It is therefore best to err on the side of slightly higher exhaust flow in order to avoid pressurizing the house, which can lead to interstitial moisture problems in the roof and wall structures.

These systems may also incorporate heat recovery equipment to reduce the energy loss due to ventilation.

Section 6.2 deals with design and installation of ventilation systems and includes references to relevant standards and manuals that are considered representative of good practice.

(6) Summer Ventilation

When windows are not openable, the mechanical ventilation system must provide fresh air on a year-round basis. While 0.3 ach is adequate for health purposes, it may not be adequate in summer to keep the indoor temperatures from climbing to uncomfortable levels as a result of solar heating. Unless the dwelling unit is air-conditioned, therefore, the mechanical ventilation rate to individual rooms must be increased to 1 ach if the windows are not designed to provide summer ventilation. Even this rate is marginal in warm weather. Fortunately most houses incorporate openable windows.

(7) Fan Sizes

The specified ventilation rates are additional to the natural infiltration that also occurs. The rates are based on the total volume enclosed within the building envelope.

A 2-storey house with openable windows has 100 m² of floor area on each of the first and second storeys and in the basement. Exhaust fans are to be provided in each of 2 bathrooms and if necessary in the kitchen. The ceiling height is 2.4 m.

Find the fan capacity required for winter ventilation.

Volume of house

\[
(100 + 100 + 100) \times 2.4 = 720 \text{ m}^3.
\]

Required rate of ventilation

\[
720 \times 0.3 = 216 \text{ m}^3/\text{h}.
\]

Required total fan capacity

\[
(216 \text{ m}^3/\text{h} \times 1000 \text{ L/m}^3)/3600 \text{ s/h} = 60 \text{ L/s}.
\]

In this case, a 30 L/s (60 cfm) exhaust fan in each bathroom will provide adequate capacity, or a 60 L/s (120 cfm) kitchen exhaust fan can be used.

If the dwelling incorporates naturally-aspirating fuel-fired heating equipment, intake openings with a total area of at least 0.033 m² should be installed.

(8) Reference Sources

Information on acceptable levels of air quality in dwelling units and methods of design to control air
quality can be found in the documents listed below. Designs which comply with these methods can be expected to meet or exceed the requirements in 9.32.3.

Health and Welfare Canada, “Exposure Guidelines for Residential Indoor Air Quality,”

ASHRAE 62-81, “Ventilation for Acceptable Indoor Air Quality,”


CSA preliminary standard F326.1- “Requirements for Residential Ventilation,”

Institute for Research in Construction, Canadian Building Digest 245, “Mechanical Ventilation and Air Pressure in Houses.”

A-9.32.3.1. 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 Sentence 6.2.1.4.(1). In the case of solid fuel-burning stoves, ranges and space heaters, CSA B365-M84 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.
Items contained in the Index are referenced to the numbering system used in this Code instead of to page numbers. For more information on the numbering system, refer to "A Guide to the Use of the Code" at the front of the document.
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to foundations, 9.23.6., 9.36.4.
masonry, 9.20.11.
mechanical/electrical
components, 4.1.9.1.(15), (17)
roof, floors and intersecting walls, 9.20.11.
Annunciators, fire alarm, 3.2.4.8.
Appliances, installation (see also Equipment and
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roof top, 3.5.2.2.(1), 6.2.3.16.(2), 6.2.5.2., 9.10.1.9.
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