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Preface

The Alberta Building Code. The Alberta Building Code (ABC) is primarily a code of minimum regulations for public health, fire safety and structural sufficiency but also contains other requirements deemed to be in the interest of the public and its well-being. It was established by the Alberta Building Standards Council and sets the standards for the design and construction of buildings, including additions or alterations, buildings undergoing a change of occupancy classification and upgrading of buildings to remove an unacceptable hazard. It also establishes the standards for demolition, repair and relocation of buildings and the standards for replacement of building materials and equipment. 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 municipal authorities, provincial government departments, associations, 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.

By agreement with the National Research Council, Alberta is committed to using the National Building Code of Canada as its base document in regulating building standards. The following outlines the relationship and development of that document.

The National Building Code. 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. Permission by the Associate Committee on the

National Building Code to reprint extracts from the documents issued by them is gratefully acknowledged.

Under the terms of the Constitution Act, regulation of building in Canada is the responsibility of provincial and territorial governments. The NBC is a model code and used as the base document for the Alberta Building Code. Liaison between the ACNBC and 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.

NBC Committees. The NBC 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.

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 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 ABC has been extensively reorganized to make the requirements more easily understood. Subsection 3.2.2. is reorganized to clearly state the need for fire suppression systems. 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 continued. 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 wash-room 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, barrier-free counters and drinking fountains. Section 3.7 has also been expanded to include greater accessibility, dual audible and visual indicators, telecommunication devices for the deaf and 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.

Requirements for secondary meat processing plants, laboratories using Biological Agents and structures associated with cemeteries have been added to Part 7.

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 unlaw-

ful entry, and requirements to reduce the likelihood of infiltration of water vapour.

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.

An asterisk (*) in the margin indicates an addition or amendment to the National Building Code at the time it was adopted in Alberta as the Alberta Building Code 1990.

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.

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 AFC. An important feature of this Code is its close coordination with the Alberta Fire Code. The Alberta Fire Code is a document used to ensure the maintenance of buildings to standards of fire safety that are compatible with construction requirements of the Alberta Building Code.

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:

Director of Standards
Alberta Labour
705, 10808 - 99 Avenue
Edmonton, Alberta, Canada
T5K 0G5

Related Documents. The National Research Council of Canada publishes the "Supplement to the National Building Code 1990" which contains explanatory material on climatic loads and structural design requirements of Part 4 of the Code.

A Guide to the Use of the Code

The Alberta Building Code 1990 is primarily a set of minimum requirements respecting safety of buildings with reference to public health, fire protection and structural sufficiency. It is not intended to be a textbook of building design, advice upon which should be sought from professional sources. Its purpose is the promotion of public welfare and safety through the application of appropriate uniform building standards.

The Code is divided into eleven Parts. A summary of the contents of these Parts follows:

Part 1: Administration

The scope of the Code, definitions of words that are italicized in the Code and administrative requirements appear in this Part.

The administrative requirements include permits, responsibility for compliance, professional seals on documents, notification, provision of information about equivalent materials, conditions relating to occupancy, correction of unsafe conditions, construction safety, asbestos and prohibitions.

Part 2: General

Part 2 contains requirements of a general semi-administrative nature such as climatic and seismic data, information to be shown on drawings and lists of referenced standards.

Part 3: Use and Occupancy

This Part contains the requirements with respect to 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 protec-

tion. Sections that follow contain specific requirements relating to building size and occupancy and fire safety within floor areas, exit requirements and requirements for service spaces. 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 4 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 4.4 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 and Health

This Part contains requirements for the number and type of plumbing fixtures that were previously

in Parts 3 and 9. Many health related construction requirements previously under other departments of government have been located in this Part. They include requirements for swimming pools, barber-shops, drycleaning establishments, food establishments, milk plants and others. Medical gas system requirements are included in this Part.

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 in height, and applies to all occupancies except assembly, institutional and high hazard industrial.

Part 10: Relocatable Industrial Accommodation

This Part sets out specific modifications of other Parts of the Code and recognizes the special requirements for this class of building. It is emphasized that this Part does not replace or waive requirements of other Parts unless it is stated.

Part 11: Exterior Acoustic Insulation

This Part sets out requirements for alleviating the effects of aircraft noise in locations near specific airports through appropriate use of materials in exterior assemblies.

Appendix A: Explanatory Information

Notes in this appendix provide assistance in understanding the requirements of the Code and are not in themselves mandatory requirements.

Appendix B: Fire Performance Ratings – Chapter 2 – Supplement to the National Building Code 1990

This provides a guide to the determination of the fire resistance, flame spread and smoke-developed ratings of materials in construction in relation to the

provisions of the Code. It gives a procedure for calculating the fire-resistance ratings of construction assemblies based on generic descriptions of materials used in the assemblies.

Appendix C: Uniform Building Standards Act

This shows the legislation under which the Alberta Building Code is adopted, gives the powers of an inspector and the appeal mechanism.

Metric Conversion Table

Part 1

Scope, Definitions and Administration

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Part 1

Scope, Definitions and Administration

Section 1.1 Referencing

1.1.1. Short Title

- * **1.1.1.1. Alberta Building Code.** This Code may be cited as the Alberta Building Code 1990.

1.1.2. Numbering System

1.1.2.1. Nomenclature

- * **(1)** In the numbering system used in this Code the first number indicates the Part, the second number indicates the Section of the Part, the third number indicates the Subsection of the Section, and the fourth number indicates the Article of the Subsection.
- * **(2)** An Article in this Code may be divided into Sentences, which are indicated by numbers in parentheses, the Sentences may be divided into Clauses, which are indicated by lower case letters in parentheses, and the Clauses may be divided into Subclauses, which are indicated by roman numerals in parentheses.
- * **(3)** A reference in this Code by number to two or more Sections, Subsections, Articles, Sentences, Clauses or Subclauses shall be read as including the number first mentioned and the number last mentioned.
- * **(4)** A reference in this Code to a Sentence, Clause or Subclause shall, unless a contrary intention is given, be read as a reference to a Sentence, Clause or Subclause of the Article, Sentence or Clause, as the case may be, in which the reference is made.
- * **(5)** The use of (Reserved) indicates that the National Building Code 1990 requirement was not adopted by Alberta.

Section 1.2 Scope and Application

1.2.1. Application

1.2.1.1. Scope

- (1)** This Code applies to any one or more of the following *
- (a) the design of a *new building*;
- (b) the construction of a *new building*;
- (c) the *occupancy* of any *building*;
- (d) the change in *occupancy* of any *building*;
- (e) an *alteration* to any *building*;
- (f) an addition to any *building*;
- (g) the demolition of any *building*;
- (h) the reconstruction of any *building* that has been damaged by fire, earthquake or other cause;
- (i) the correction of an *unsafe condition* in or about any *building* or property;
- (j) all parts of any *building* affected by a change in *occupancy*;
- (k) the work necessary to ensure safety in parts of any *building*
 - (i) that remain after demolition;
 - (ii) that are affected by, but that are not directly involved in *alterations*;
 - (iii) that are affected by, but that are not directly involved in additions;
- (l) the installation, replacement, or *alteration* of materials regulated by this Code;
- (m) the installation, replacement, or *alteration* of equipment regulated by this Code;
- (n) the *work* necessary to ensure safety in a relocated *building* during and after relocation; and

1.2.1.1.

- (o) safety during construction of a *project*, including protection of the public and neighbouring properties.

* **(2)** This Code, or any amendment to it, shall not affect the right of an *owner* under a *permit* issued before September 1, 1991, if the *owner* has started *work* within 6 months of the date the *permit* was issued and has actively carried out *work* after starting.

* **(3)** This Code does not authorize the construction of a *building* for which a land use is not allowed pursuant to an *AVPA regulation*.

1.2.2. Existing Buildings

1.2.2.1. Application to Existing Buildings (See Appendix A.)

* **(1)** This Subsection applies to a *building* which has been legally built, occupied and used before September 1, 1991.

* **(2)** If a *building* is altered, rehabilitated, refurbished, renovated or repaired, the level of life safety and *building* performance shall not be decreased.

* **(3)** Except as specified in Part 10, the *authority having jurisdiction* shall accept any construction or condition that lawfully existed in Alberta before September 1, 1991 if the construction or condition does not constitute an *unsafe condition*.

* **(4)** A change in *occupancy* or *alteration* of any *building* constructed before September 1, 1991 shall be permitted if the level of safety and *building* performance proposed are acceptable to the *authority having jurisdiction* or to the Director.

* **(5)** For a *building* constructed before September 1, 1991, the *authority having jurisdiction* or the Director may accept an alternative or a proposal that achieves the appropriate level of safety for the specific activity for which the *building* is to be used.

* **(6)** The *authority having jurisdiction* or the Director may accept existing construction not in complete compliance with this Code, in which case it may be accepted subject to conditions.

1.2.3. Exclusions

1.2.3.1. Scope

- (1)** This Code does not apply *
 - (a) except for specific requirements in Part 7, to a *building* of low human occupancy for the housing of livestock or the storage or maintenance of equipment or materials or produce associated with the operation of the farm or acreage on which it is located (see Appendix A);
 - (b) to utility towers and poles, television and radio or other communication antennas or towers, except that loads resulting from those located on or attached to a *building* shall be included in the *building* design;
 - (c) to water conveyance and control structures, except for a *building* provided for *occupancy*;
 - (d) to highway and railway bridges;
 - (e) to mechanical process equipment and *appliances* in an *industrial occupancy* that are not required for *building* services and are not specifically regulated by this Code;
 - (f) to an accessory *building* not greater than 10 m² in *building area* that does not create a hazard; or
 - (g) except for ramps, stairs, platforms and associated *buildings*, to the category of elevating devices and amusement rides regulated under the Elevator and Fixed Conveyances Act.

Section 1.3 Definitions of Words and Phrases

1.3.1. General Definitions

1.3.1.1. General. Definitions in Section 1 of the Uniform Building Standards Act also apply in this Code. *

1.3.1.2. Referenced Dictionary. For definitions of words that are not defined in the Uniform Building Standards Act or in Subsection 1.3.2. reference should be made to Webster's Third New International Dictionary. *

1.3.2. Specific Definitions

- * **1.3.2.1. Italicized Words.** The words and terms in italics in this Code have the following meanings:
- * *Abattoir* means premises where animals are slaughtered and meat is cut, wrapped, frozen, cured, smoked or aged.
- 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*.
- * *Acoustic insulation factor* means a number that is used as a measure of the reduction in the level of aircraft noise provided by the assemblies forming the exterior envelope of a *building*.
- Adfreezing* means the adhesion of soil to a *foundation unit* resulting from the freezing of *soil water*. (Also referred to as "frost grip.")
- 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 electrical energy or fuel into thermal 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.
- Architectural work* means the preparation of designs, graphic representations, plans, drawings, detail drawings or specifications for the erection, construction or *alteration* of, or addition to a *building* but does not include *engineering work*.
- 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.
- Authority having jurisdiction* means an inspector appointed pursuant to Section 2 of the Uniform Building Standards Act.
- AVPA regulation* means an Airport Vicinity Protection Area regulation under the Planning Act that establishes an airport vicinity protection area.
- Barbershop* (see *Hairstyling shop*).
- Barrier-free* means that a *building* and its facilities can be approached, entered, and used by persons with physical, mental or sensory disabilities.
- Basement* means a *storey* or *storeys* of a *building* located below the *first storey*.
- Bather* means a person actually in or on the water of a *swimming pool*.
- Bathing load* means the maximum number of *bathers* allowed in or on the water of a *swimming pool* at any one time.
- 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.

1.3.2.1.

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*).

- * *Campground* means land on which a person is commonly permitted to
 - (a) erect tents, or
 - (b) park recreational vehiclesfor the purpose of overnight camping, and includes any *building*, structure, tent, vehicle or enclosure that is located on the land and is used as part of the facility.
- * *Cemetery* means land that is set apart or land that is used for the burial of dead human bodies or other human remains or in which dead human bodies or other human remains are buried.

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.

- * *Columbarium* means a *building* or part thereof designed for storing the ashes of dead human

bodies or other human remains that have been cremated.

Combustible means that a material fails to meet the acceptance criteria of CAN4-S114-M, "Standard Method of Test for Determination of Non-Combustibility in Building Materials." e

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

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

Commercial bathing place means any natural body of water used by persons for swimming or bathing, together with the shores, *building*, equipment and appurtenances thereto available to the public and for the use of which persons are either: *

- (a) directly charged a fee, or
- (b) indirectly charged a fee through the commercial exploitation of the area adjacent to or in proximity to the body of water.

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.

Crematory means a *building* or part thereof fitted with proper appliances for the purpose of incineration or cremation of dead human bodies, and includes everything incidental or ancillary thereto. *

Dairy manufacturing plant means an establishment in which milk, cream, butter, cheese, ice cream, condensed milk, evaporated milk, milk powder, dry milk, malted milk, sherbet or any other product manufactured wholly or mainly from milk, is processed, manufactured, reprocessed, packed or repacked. *

Day use area means a specifically designated parcel or tract of land where a camper may picnic or partake in day use activities but does not include *

1.3.2.1.

playgrounds, sports grounds, rodeo grounds and exhibition grounds.

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 by one or more persons and usually containing cooking, eating, living, sleeping and sanitary facilities.
- * *Engineering work* means the preparation of designs, plans, drawings, detail drawings, specifications or graphic representations for electrical, mechanical and structural systems or components in *buildings* and includes any applicable geotechnical *engineering work*.

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

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

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

Exit level (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.

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 enclosed by exterior walls or 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*.

1.3.2.1.

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 *breaching*.

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

Foamed plastic means all materials which are homogeneous systems comprised of at least two phases, one of which is a continuous polymeric organic material, and a second of which is deliberately introduced for the purpose of distributing a gas in voids throughout the material, thereby achieving a reduction in density of the base material. Examples include but are not limited to polyisocyanurate foam, polystyrene foam, polyurethane foam and polyvinylchloride foam. *

Foamed plastic interior trim means *foamed plastic* products with a density of at least 320 kg/m³ used around openings or on walls and ceilings, including casing, baseboards, chair rails, and moldings applied for decoration. *

Food area means any area of a *food establishment* where food is prepared, processed, served, stored or packaged. *

Food establishment means a place or premises where in, on or from which food that is intended for consumption by the public is sold, offered for sale, supplied, distributed, displayed, manufactured, prepared, preserved, processed, packaged, served, stored or handled. *

Food handler means a person working in or for a *food establishment* whose functions require or permit him to be in contact with any food or utensil. *

1.3.2.1.

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.

Hairstyling shop means and includes any *barbershop*, beauty salon, or similar establishment, including schools and colleges, wherein the business of shaving, clipping, cutting, trimming, singeing, shampooing, massaging, manicuring, dressing, adorning, or beautifying the human hair, face, scalp or hands is conducted for gain, hire or reward.

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.

1.3.2.1.

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*.

- * *Interior design* means that portion of the practice of architecture that is limited to
- (a) giving advice or preparing designs, plans, drawings, detail drawings, specifications or graphic representations respecting
 - (i) interior finishes in a *building*,
 - (ii) fixed or loose furnishings, equipment or fixtures for use in a *building*, or
 - (iii) *partitions* in a *building* that are used to subdivide a *floor area*;
 - (b) the administering of construction contracts, inspection of *work* and assessment of the performance of *work*, and the quality of materials related to the *work* described in Clause (a);
- but does not include
- (c) services which affect the structural integrity of a *building*, including removal of or *alterations* to floor and roof elements;
 - (d) services which affect the electrical or mechanical systems of a *building*;
 - (e) services which alter the construction or location of a *building* enclosure system;
 - (f) services which add usable floor space through the addition of *mezzanines*, *infill* or similar elements; or
 - (g) services which, through organization or change in *occupancy*, affect the number, location or size of *exits* or stairways within or attached to a *building* or proposed *building*.

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*.

Man-made beach means a basin of water that *

- (a) is artificially created,
- (b) has a depth of more than 600 mm at any point, and
- (c) is used for swimming or recreative bathing as its principal intended use, and includes the shore, grounds, *buildings* and equipment used in connection with the body of water, but does not include a *swimming pool* or *wading pool* as defined in this regulation.

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

Mausoleum means a structure wholly or partly above the level of the ground and designed for the burial or storage of dead human bodies. *

Maximum design bathing load means the maximum number of *bathers* in any 24 hour period based on the capacity of the filtration system of a *swimming pool*. *

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.

* *Mobile home* means a factory constructed detached *dwelling unit* readily relocatable singly or in double modules.

* *New building* means a *building*
 (a) that was not substantially completed, or
 (b) for which an application for a *permit*, was not submitted to the *authority having jurisdiction*,
 on or before September 1, 1991.

* *Noise contour* means the value of the noise exposure forecast or the noise exposure projection at a *building* site as determined from an *AVPA regulation*.

e *Noncombustible* means that a material meets the acceptance criteria of CAN4-S114-M, "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 a person who *

- (a) controls the property under consideration,
- (b) holds himself out as the person having the powers and authority of ownership or who for the time being exercises the powers and authority of ownership,
- (c) is registered under provincial legislation as the *owner* of a freehold estate in possession of land, or
- (d) has purchased or otherwise acquired land, whether he has purchased or otherwise acquired the land directly from a previous *owner* or from another purchaser, and has not yet registered his ownership.

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.

Permit, for the purposes of this regulation, means permission or authorization in writing to commence the use, *occupancy*, relocation, construction or demolition of any *building*. *

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*.

1.3.2.1.

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).

- * *Private swimming pool* means a swimming pool that is constructed for the use of a single family dwelling unit and used only by the owners and their guests.
- * *Professional engineer* means a person who holds a certificate of registration, licence or permit to engage in the practice of engineering under the Engineering, Geological and Geophysical Professions Act.
- * *Project* means any construction, alteration or demolition operation.

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

- * *Public swimming pool* means:
 - (a) a swimming pool generally available for use by the public or any segment of the public, and
 - (b) a swimming pool operated in conjunction with the program of an educational, instructional, physical fitness or athletic institution supported in whole or in part by public funds or public subscription.

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.

- * *Receiving pool* means a swimming pool located to receive sliders at the base of one or more slides in a water theme park.
- * *Recreation camp* means a camp that contains accommodation facilities and is used wholly or partly for recreational purposes, and without limitation, includes the following:
 - (a) trail riding ranches and guest ranches;
 - (b) rural experience camps;
 - (c) nature experience camps;
 - (d) survival training camps;
 - (e) fishing, hunting, skiing, golf or fitness camps;
 - (f) religious camps;
 - (g) nudist camps;
 - (h) camps for disabled persons; and

- (i) rehabilitation camps for mental illness, alcoholism or weight loss.

Registered architect means a person who holds a certificate of registration or a licence to engage in the practice of architecture under the Architects Act. *

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.

Restaurant means a food establishment where food is sold or distributed in a state ready for immediate consumption and that has *

- (a) seating or standing room specifically designed for food consumption by patrons, or
- (b) parking space under the control of the owner specifically provided so that a patron may consume the food supplied while sitting in his vehicle, and includes a canteen, cafeteria, dining room or similar facility provided for employees, staff or students.

Restricted practitioner means: *

- (a) a registered architect under the Architects Act who holds a certificate of authorization issued under the Engineering, Geological and Geophysical Professions Act, or
- (b) a professional engineer registered under the Engineering, Geological and Geophysical Professions Act who holds a certificate of authorization issued under the Architects Act.

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.

* *Secondary meat processing plant* means a *food establishment* where carcasses or primal cuts are converted to saleable products for wholesale distribution.

* *Semi-public swimming pool* means:

- (a) a *swimming pool* provided by a hotel, motel, apartment *building*, condominium, multiple housing unit, *mobile home park*, trailer park, private educational institution or private club, the use of which is restricted entirely to the registered guests, owners, tenants, students or members, as the case may be, and their guests,
- (b) a *swimming pool* operated on the premises of a *recreational camp* for use by campers and their visitors and camp personnel, and
- (c) a *swimming pool* operated in conjunction with
 - (i) a day nursery,
 - (ii) a day camp,
 - (iii) an institution for the care or treatment of the ill, aged or infirm, or
 - (iv) an institution housing persons in custodial care,

and includes a *private swimming pool* that is used by a charitable, religious, community or service organization for the purpose of providing swimming lessons.

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 derives its support from *soil* or *rock* located close to the lowest part of the *building* which it supports.

* *Slider* means a *bather* who is using one or more slides or similar facilities at a *water theme park*.

Slow burning solid fuel fired appliance means a unit that has provision, including gasketed or machined areas on the loading doors, to control the rate of combustion to a point where the formation of creosote in the *chimney flue* is a distinct possibility. (These units are also referred to as air-tight stoves).

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*.

* *Special purpose swimming pool* means a *swimming pool* that is used for cleaning the body, for the practice of healing or therapy, for the observance of religious rituals or other similar purposes.

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.

1.3.2.1.

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, operated under a single tenancy, 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 *assembly, business and personal services*, and *medium and low hazard industrial 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.

* *Swimming pool* means a structure, basin or tank containing an artificially created pool of water that is greater than 600 mm in depth at any point and is used for swimming, recreation, bathing, diving, wading, healing or therapy, religious rituals or other purposes, and includes all *buildings*, equipment and facilities used in connection with it.

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.

Thermal barrier means a membrane used to protect a foamed plastic or other *combustible* material from the effects of heat and flame for a specified period of time.

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, in the opinion of the *authority having jurisdiction*, could endanger the 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 Vapour 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.

* *Wading pool* means a structure, basin or tank containing an artificially created pool of water that is 600 mm or less in depth throughout and is used for swimming, bathing, wading or other similar purposes.

* *Walkway* means a covered or roofed pedestrian thoroughfare used to connect 2 or more *buildings* in which the width of the thoroughfare does not exceed 9 m.

* *Water theme park* means an aquatic recreation facility consisting of recreational water slide flumes and associated *receiving pools*.

- * *Wave pool* means a *swimming pool* in which waves or surf are mechanically generated.
- * *Whirlpool* means a *swimming pool* designed primarily for therapeutic or recreational use that
 - (a) is not drained, cleaned or refilled before use by each individual, and
 - (b) utilizes hydrojet circulation, air induction bubbles or hot water or any combination of them, and includes hot tubs.
- * *Work* means any activity, duty or function, regulated by this Code, carried out on or about a construction site or on, in or about a *building*.

Section 1.4 Abbreviations

1.4.1. Abbreviations of Names of Associations

- * **1.4.1.1. 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.)
ASTM	American Society for Testing and Materials (1916 Race Street, Philadelphia, Pennsylvania 19103 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.)

CCC	Canadian Climate Centre (4905 Dufferin Street, Downsview, Ontario M3H 5T4)	
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)	
FINA	Federation Internationale de Natation Amateur (425 Walnut, Suite 1610, Cincinnati, Ohio 45202 U.S.A.)	*
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)	
IAPMO	International Association of Plumbing and Mechanical Officials (20001 Walnut Drive South, Walnut, CA 91789 2825 U.S.A.)	*
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)	
NSF	National Sanitation Foundation (3475 Plymouth Road, P.O. Box 1468, Ann Arbor, Michigan 48106 U.S.A.)	*

1.4.1.1.

* NSPI	National Spa and Pool Institute (2111 Eisenhower Avenue, Alexandria, Virginia 22314 U.S.A.)
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.)

1.4.2. Symbols and Other Abbreviations

1.4.2.1. 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

Section 1.5 Administration

1.5.1. Permits

1.5.1.1. General

(1) A *permit* is required if *work* regulated by this Code is to be done. *

(2) In addition to the *permit* that is required by Sentence (1) other permits are required for the installation of related *building services*. *

(3) An *owner* shall have all *permits* required in connection with proposed work obtained before starting the work to which they relate. *

1.5.1.2. Permit Fees

(1) *Permit fees* and application procedures shall be as established by regulation or by-law made under the Uniform Building Standards Act. *

(2) The *authority having jurisdiction* may place a valuation on *work* for the purpose of determining fees. *

1.5.1.3. Required Information

(1) Except as otherwise allowed by the *authority having jurisdiction* every applicant for a *permit* shall *

- identify and describe in detail the *project* or *occupancy* to be covered by the *permit* for which application is made,
- describe the land on which the *project* is to be undertaken by a description that will readily identify and locate the *building lot*,

- (c) submit plans, specifications and documents, and show the proposed *occupancy* of all parts of the *building*,
- (d) state the valuation of the proposed *project*, and
- (e) state, as applicable, the names, addresses and telephone numbers of the *owner*, *registered architect*, licensed interior designer, *professional engineer*, or other *designer*, and *constructor*.

* **1.5.1.4. Records.** The *authority having jurisdiction* may keep copies of all applications received, *permits* and orders issued, inspections and tests made, and of all papers and documents connected with the administration of regulations made under the Uniform Building Standards Act.

* **1.5.1.5. Dimensional Tolerances.** If in his opinion safety to life will not be reduced, an *authority having jurisdiction* may accept a minor variation, not more than 2%, in a dimension given in this Code.

* **1.5.1.6. Deviations.** The *owner* shall not deviate, nor authorize a deviation, from the requirements of this Code, or the conditions of a *permit*, without first obtaining permission in writing to do so from the *authority having jurisdiction*.

* **1.5.1.7. Land Survey**

(1) If requested by the *authority having jurisdiction*, the *owner* shall submit an up-to-date plan of survey or real property report, prepared by a registered Alberta Land Surveyor, containing sufficient information regarding the site and the location of the *building*

- (a) to establish before construction starts that all requirements of this Code in relation to this information will be complied with, and
- (b) to verify upon completion of the *work* that all such requirements have been complied with.

* **1.5.1.8. Site Grading.** The *authority having jurisdiction* may require an *owner* to have a *building* site graded in conformance with a surface drainage plan, established by the council of the local authority, for the area in which the *building* is located.

1.5.1.9. Obtaining Permits

(1) The *authority having jurisdiction* shall accept and process an application for a *permit*. *

(2) An *owner* may apply for an order of mandamus to obtain a *permit* if his proposed *building* meets the applicable requirements of the Uniform Building Standards Act, this Code and the by-laws of the local authority made pursuant to Section 5(2) of the Uniform Building Standards Act. *

1.5.1.10. Permission to Proceed in Part

(1) The *authority having jurisdiction* may allow, at the risk of the *owner*, with conditions if necessary, to ensure conformance with this Code, the *owner* to proceed with *excavation* or construction of part of a *building* before the plans of the entire *building* have been submitted. *

(2) If the *authority having jurisdiction* allows *excavation* or construction of part of a *building* under Sentence (1), the *owner* shall submit complete plans and specifications for the *work* which he is being allowed to carry out. *

(3) If an *owner* proceeds to excavate or construct part of a *building* under Sentences (1) and (2), he proceeds without assurance that the *excavation* or construction of other parts of the *building* will be allowed. *

1.5.1.11. Temporary Use

(1) Notwithstanding anything contained elsewhere in this Code, except for *buildings* constructed under Part 10, the *authority having jurisdiction* may allow, for a limited time only, the erection or relocation and existence of a *building* for an *occupancy* which may, because of its nature, exist for a short time, under circumstances which may warrant only selective compliance with this Code. (See Appendix A.) *

(2) The *building* allowed in Sentence (1) shall have posted *

- (a) the time limitations imposed under Sentence (1),
- (b) any conditions of selective compliance imposed under Sentence (1), and
- (c) the *permit*.

1.5.1.11.

- * (3) The *authority having jurisdiction* may by written notice extend the time allowed in Sentence (1).

1.5.1.12. Refusal to Proceed

- * (1) The *authority having jurisdiction* may refuse to allow any *building, project, work* or *occupancy* that would not be permitted by the Uniform Building Standards Act, this Code, the by-laws of the local authority made pursuant to Section 5(2) of the Uniform Building Standards Act or other legislation.
- * (2) The *authority having jurisdiction* may refuse to allow any *building, project, work* or *occupancy* if:
 - (a) incorrect information is submitted, or
 - (b) the information submitted is inadequate to determine compliance with the provisions of the Uniform Building Standards Act, this Code, the by-laws of the local authority made pursuant to Section 5(2) of the Uniform Building Standards Act or other legislation.

1.5.1.13. Permit Revoked

- * (1) The *authority having jurisdiction* may revoke a *permit* if
 - (a) there is a contravention of any condition under which the *permit* was issued,
 - (b) the *permit* was issued in error, or
 - (c) the *permit* was issued on the basis of incorrect information.

1.5.1.14. Responsibility for Compliance

- * (1) Neither the issue of a *permit*, nor inspections made by the *authority having jurisdiction*, shall in any way relieve the *owner* of a *building* from full responsibility for carrying out the construction or having the construction carried out in accordance with the requirements of the Uniform Building Standards Act and regulations made pursuant to that Act, this Code, by-laws of the local authority made pursuant to Section 5(2) of the Uniform Building Standards Act, or the *permit*, including compliance with any special conditions required by the *authority having jurisdiction*.
- * (2) The *owner* shall ensure that the materials and things used in the construction of a *building* meet the requirements of this Code.

- * (3) The *constructor* shall ensure that the materials and things used in the construction of a *building* meet the requirements of this Code.

- * (4) Every vendor or supplier of materials and things used in the construction of a *building* shall ensure that the materials and things he advertises, displays, sells, leases or otherwise disposes of meet the requirements of this Code.

- * 1.5.1.15. **Availability of Documents.** The *owner* shall ensure that the plans and specifications, on which the issue of the *permit* was based, are available continuously at the construction or demolition site during working hours for inspection by the *authority having jurisdiction*.

1.5.1.16. Inspection

- * (1) The *owner* shall give notification to the *authority having jurisdiction*
 - (a) of the intent to undertake construction that has been ordered to be inspected,
 - (b) of intent to cover construction that has been ordered to be inspected before covering, and
 - (c) when construction has been completed so that a final inspection can be made.
- * (2) If required by the *authority having jurisdiction*, an *owner* shall have uncovered and replaced at his own expense any construction that has been covered contrary to an order, or condition of a *permit*, issued by the *authority having jurisdiction*.

- * 1.5.1.17. **Verification of Compliance.** An *owner* shall provide in writing a verification letter from persons engaged to review construction that the construction was in compliance with this Code and with any *permits* issued.

1.5.2. Professional Involvement

1.5.2.1. Complex Structures

- * (1) If site conditions, size or complexity of a *building* warrant, the *authority having jurisdiction* may require
 - (a) that all plans, specifications and documents, or any part of them, be imprinted with a stamp or seal affixed by or on behalf of a *registered architect* or *professional engineer*, or both,

- (b) that the construction or *alteration* be reviewed during construction by a *registered architect*, or *professional engineer*, or both, or
- (c) the appropriate combination of Clauses (a) and (b).

- * **(2)** An *owner* who intends to construct a *building* described in Sentences 1.5.2.6.(5) or (6) shall submit evidence to the *authority having jurisdiction*, before any *work* begins, that he has retained
 - (a) a *registered architect*,
 - (b) a *professional engineer*, or
 - (c) the appropriate combination of professionals described in Clauses (a) and (b)
 to carry out construction review during the construction of the *building*.

e 1.5.2.2. Fire Suppression Systems

- * **(1)** If an automatic fire suppression system is required to be installed in a *building* which requires professional involvement as required by Article 1.5.2.6., the *owner* shall retain one or more *professional engineers* to
 - (a) design the system,
 - (b) review the system during installation, and
 - (c) witness the testing of the system after installation.
- * **(2)** All plans, specifications and other documents produced for an automatic sprinkler system by any *professional engineer* referred to in Sentence (1) shall be imprinted with the stamp or seal of the *professional engineer*.

1.5.2.3. Fire Alarm Systems

- * **(1)** If a fire alarm system is to be installed in a *building* which requires professional involvement as required by Article 1.5.2.6., the *owner* shall retain one or more *professional engineers* to
 - (a) design the system,
 - (b) review the system during installation, and
 - (c) perform verification of the system after installation.
 (See Subsection 3.2.4.)
- * **(2)** All plans, specifications and other documents produced for a fire alarm system by any *professional engineer* referred to in Sentence (1) shall be imprinted with the stamp or seal of the *professional engineer*.

1.5.2.4. Extract from Uniform Building Standards Act

- * **(1)** Notwithstanding anything in any other Act, in a regulation under any other Act, or in a by-law, no permit for
 - (a) the use,
 - (b) the occupancy,
 - (c) the relocation,
 - (d) the construction, or
 - (e) the demolition

of any building shall be issued by a local authority except in accordance with the Uniform Building Standards Act or the regulations.

- * **(2)** Notwithstanding anything in any other Act, in a regulation under any other Act or in a by-law, no person shall submit in support of an application or as an application for a permit under this Code any plans, drawings or specifications for the construction, erection or enlargement of any building that is a category or type of building described in Article 1.5.2.6., unless the plans, drawings or specifications comply with that Article or Sentences 1.5.2.5.(1) to (7).

1.5.2.5. Extract from Ministerial Exemption Regulation

- * **(1)** Notwithstanding Section 5.4 of the Uniform Building Standards Act, a local authority may issue a permit for a building that is not referred to in Sections 5.2 or 5.4 of that Act or in Sentences 1.5.2.6.(3) or 1.5.2.6.(5) of this Code, if the application is accompanied by drawings, plans or specifications that comply with Sentences (2) to (7).

- * **(2)** If a project is restricted to engineering work that includes the cutting, patching or modification of architectural work to permit the incorporation of the engineering work into a building, all drawings, plans or specifications shall not require imprinting with the stamp or seal of other than one or more professional engineers.

- * **(3)** If a project is restricted to architectural work but includes the cutting, patching or modification of engineering work to permit the incorporation of the architectural work into a building, all

1.5.2.5.

drawings, plans or specifications shall not require imprinting with the stamp or seal of other than a registered architect.

- * **(4)** If a project is restricted to interior design work and requires professional involvement, all drawings, plans or specifications shall be imprinted with the stamp or seal of a registered architect or a licensed interior designer pursuant to regulations under the Architects Act.
- * **(5)** If a project is prepared by a restricted practitioner, all drawings, plans and specifications shall be imprinted with the stamp or seal of the restricted practitioner and shall be accompanied by a copy of the restricted practitioner's certificate of authorization.
- * **(6)** If a project is prepared by a registered architect who is authorized by the Council of the Association of Professional Engineers, Geologists and Geophysicists of Alberta to submit drawings, plans or specifications without the seal or stamp of a professional engineer, all drawings, plans and specifications shall be imprinted with the stamp or seal of the registered architect who prepared the project and shall be accompanied by a copy of the authorization.
- * **(7)** If a project is prepared by a professional engineer who is authorized by the Council of the Alberta Association of Architects to submit drawings, plans or specifications without the seal or stamp of a registered architect, all drawings, plans and specifications shall be imprinted with the stamp or seal of the professional engineer who prepared the project and shall be accompanied by a copy of the authorization.

1.5.2.6. Extract from Uniform Building Standards Act

- * **(1)** In this Article gross area means the area of a building that is contained within the outside surface of the exterior walls of the building.
- * **(2)** A local authority may issue a permit to an applicant if the application conforms to this Code and to their by-laws under Section 5(2) of the Uniform Building Standards Act, and if the application is for a building described in Sentence (3).

- (3)** A building referred to in Sentence (2) is *
 - (a) a building, 3 storeys or less in height for assembly occupancy or institutional occupancy that;
 - (i) in the case of a single storey building, has a gross area of 300 m² or less,
 - (ii) in the case of a 2 storey building, has a gross area of 150 m² or less on each floor, or
 - (iii) in the case of a 3 storey building, has a gross area of 100 m² or less on each floor;
 - (b) a building for residential occupancy that
 - (i) is a single family dwelling unit, or
 - (ii) is a multiple family dwelling, containing 4 dwelling units or less;
 - (c) a building, 3 storeys or less in height for residential occupancy as a hotel, motel, or similar use that
 - (i) in the case of a single storey building, has a gross area of 400 m² or less,
 - (ii) in the case of a 2 storey building, has a gross area of 200 m² or less on each floor, or
 - (iii) in the case of a 3 storey building, has a gross area of 130 m² or less on each floor;
 - (d) a building 3 storeys or less in height for business and personal services occupancy, for mercantile occupancy or for industrial occupancy that
 - (i) in the case of a single storey building, has a gross area of 500 m² or less,
 - (ii) in the case of a 2 storey building, has a gross area of 250 m² or less on each floor, or
 - (iii) in the case of a 3 storey building, has a gross area of 165 m² or less on each floor;
 - (e) a building that is a farm building that is not for public use; or
 - (f) a relocatable industrial camp building.

- * **(4)** No local authority shall issue a permit with respect to an application for a building described in Sentence (5) unless
- (a) the application for the permit is accompanied by plans, drawings, or specifications that are
 - (i) imprinted with a stamp or seal affixed by or on behalf of a registered architect or a visiting project architect under the Architects Act, or
 - (ii) imprinted with a stamp or seal affixed by or on behalf of one or more professional engineers or licensees registered under the Engineering, Geological and Geophysical Professions Act and qualified to engage in the appropriate combination of those branches of professional engineering that are applicable to building design and construction, and
 - (b) the application complies with the Uniform Building Standards Act, this Code and the by-laws of the local authority made pursuant to Section 5(2) of the Uniform Building Standards Act.
- * **(5)** A building referred to in Sentence (4) is
- (a) a building 3 storeys or less in height for residential occupancy that is a multiple family dwelling containing at least 5 but not more than 20 units on a single site, unless another number is prescribed in regulations under Section 5(6) of the Uniform Building Standards Act;
 - (b) a building for industrial or warehouse occupancy, or a combination of them, where the occupant load is designed to be a ratio of 28 square metres per person or greater; or
 - (c) a building that is classified for more than one type of occupancy where
 - (i) the major use of the building is industrial occupancy or warehouse occupancy,
 - (ii) the occupant load is designed to be at a ratio of 28 square metres per person or greater, and
- (iii) any occupancy other than major use does not exceed 400 square metres in area.
- (6)** No local authority shall issue a permit for a building that is not referred to in Article 1.5.2.6., unless the application is accompanied by architectural and engineering drawings, plans or specifications that are
- (a) in the case of architectural drawings, plans or specifications imprinted with a stamp or seal affixed by or on behalf of a registered architect or visiting project architect under the Architects Act,
 - (b) in the case of engineering drawings, plans or specifications, imprinted with a seal affixed by or on behalf of a professional engineer or licensee registered under the Engineering, Geological and Geophysical Professions Act, and
 - (c) in the case of combined architectural and engineering drawings, imprinted with a stamp or seal affixed by
 - (i) a registered architect or a visiting project architect under the Architects Act, and
 - (ii) one or more professional engineers or licensees registered under the Engineering, Geological and Geophysical Professions Act and qualified to engage in the appropriate combination of those branches of professional engineering that are applicable to building design and construction or are submitted by a registered architect or professional engineer or licensee who is authorized by the Council under the Architects Act or under the Engineering, Geological and Geophysical Professions Act to submit those drawings, plans or specifications without the seal of the other professional.

1.5.3.1.

1.5.3. Required Notification

1.5.3.1. Notification

- * (1) Before work is started on a construction site, the owner shall give notice to the authority having jurisdiction of the date on which work will start.
- * (2) The owner shall give notice in writing to the authority having jurisdiction
 - (a) before starting work, listing the name, address and telephone number of
 - (i) the constructor or other person responsible for the work,
 - (ii) any professional engineer or registered architect reviewing the work, and
 - (iii) any inspection or testing agency engaged to monitor the work, and
 - (b) of any change in or termination of employment of those persons listed in Clause (a) during the course of construction, immediately after the change or termination occurs.
- * (3) The owner shall give all other notices required by the provisions of this Code to the authority having jurisdiction.

1.5.3.2. Changes

- * (1) The owner shall give notice in writing to the authority having jurisdiction
 - (a) immediately after any change in ownership or change in the address of the owner occurs, until an occupancy permit has been issued, or permission to occupy has been given in writing by the authority having jurisdiction, and
 - (b) before occupying any part of a building if it is to be occupied in stages.

* 1.5.3.3. Fabrication and Erection of Steel.

An owner shall submit evidence to the authority having jurisdiction, before construction begins, that all fabricators and erectors of welded construction for buildings constructed under Part 4, are certified by the Canadian Welding Bureau.

1.5.3.4. Swimming Pool Plans

- * (1) Except for a private swimming pool, every local authority authorized pursuant to Section 5(1) of the Act, and every owner proposing to construct or

alter a swimming pool shall ensure that the plans for the construction or alteration of a swimming pool have been reviewed by the Director or by a person designated by the Director to undertake the review before the commencement of any construction or alteration.

(2) Except for a private swimming pool, where a local authority is not authorized pursuant to Section 5(1) of the Act, every owner proposing to construct or alter a swimming pool shall ensure that the plans for the construction or alteration have been reviewed by the Director or by a person designated by the Director to undertake the review before the commencement of any construction.

1.5.4. Notification to Other Agencies

1.5.4.1. Dairy Manufacturing Plants

(1) Every local authority authorized pursuant to Section 5(1) of the Act and every owner proposing to construct or alter a dairy manufacturing plant shall ensure that:

- (a) the plans and specifications have been reviewed by the Director or by a person designated by the Director to undertake the review, and
- (b) the plans and specifications, including equipment layout, have been submitted to the Dairy Division, Department of Agriculture for approval.

(2) Where a local authority is not authorized pursuant to Section 5(1) of the Act, every owner proposing to construct or alter a dairy manufacturing plant shall ensure that:

- (a) plans and specifications have been reviewed by the Director or by a person designated by the Director to undertake the review, and
- (b) plans and specifications, including equipment layout, have been submitted to the Dairy Division, Department of Agriculture for approval.

1.5.4.2. Abattoir or Secondary Meat Processing Plant.

The owner of an abattoir or secondary meat processing plant shall confirm in writing to the authority having jurisdiction that he has submitted the drawings and specifications for the construction or alteration of an abattoir or secondary meat processing plant to

the Hygiene Branch, Animal Health Division, Department of Agriculture for approval before construction or alteration commences.

1.5.5. Safety during Construction

1.5.5.1. Safety on Site

* (1) The *constructor* shall be responsible for ensuring compliance with Part 8.

* (2) The *constructor* is responsible jointly and severally with the *owner* for any construction or *work* undertaken.

* **1.5.5.2. Occupancy before Completion.**

The *owner* shall ensure that no *unsafe condition* exists or will exist because of construction or *work* being undertaken or not completed should *occupancy* occur before the completion of the construction or *work*.

1.5.5.3. Responsibility for Damage

* (1) The *owner* is responsible for the cost of repair of any damage to public property or works located thereon that may occur as a result of undertaking *work* regulated by this Code.

* (2) The *owner* shall ensure that *work* undertaken does not damage or create a hazard to adjacent properties.

1.5.5.4. Cranes and Equipment

* (1) If cranes or other equipment used in a particular method of construction

- (a) interfere with public safety,
- (b) create a hazardous condition, or
- (c) interfere with or disrupt activities on or disrupt access to
 - (i) adjacent properties, or
 - (ii) public facilities within the municipality,

the *authority having jurisdiction* may order the method of construction to stop and the equipment used in that method of construction to be removed.

1.5.6. Occupancy

1.5.6.1. Occupancy Permit

* (1) An *owner* shall obtain an *occupancy permit*, if required by the *authority having jurisdiction*, or per-

mission in writing to occupy from the *authority having jurisdiction*, before any

- (a) *occupancy* of a *building* after
 - (i) construction,
 - (ii) relocation,
 - (iii) partial demolition, or
 - (iv) *alteration* of that *building*, and
- (b) change in the *occupancy* of a *building*.

(2) An *occupancy permit* or permission to use a *building* issued under the Uniform Building Standards Act shall not be construed to be a licence to operate or engage in any business.

1.5.6.2. Tents and Air Supported Structures

(1) Unless otherwise allowed by the *authority having jurisdiction*, a tent or *air supported structure* shall not be erected unless a certificate of *occupancy*, or permission in writing, has been obtained from the *authority having jurisdiction*.

(2) The *authority having jurisdiction* may issue a certificate of *occupancy* for, or permission in writing to occupy, a tent or an *air supported structure* for a period of 12 months, if he is satisfied that the tent or *air supported structure* complies with the performance required by this Code.

(3) The certificate of *occupancy* for a tent or *air supported structure* may be renewed every 12 months, if the tent or *air supported structure* complies with all laws and regulations in effect at the time of request for renewal.

1.5.6.3. Occupancy before Completion.

The *authority having jurisdiction* may issue an *occupancy permit*, subject to compliance with provisions to safeguard persons in or about the premises, to allow the *occupancy* of a *building* before completion of construction or demolition.

1.5.7. Tests and Equivalents

1.5.7.1. Proof of Compliance. The *authority having jurisdiction* may direct that tests of *buildings*, materials, *appliances*, equipment, protection devices, construction methods, structural assemblies or *foundation* conditions be made, or sufficient evidence or proof be submitted, at the expense of the *owner*, if such evidence or proof is necessary, to determine that

1.5.7.1.

the *building*, material, *appliance*, equipment, protection device, construction method, structural assembly or *foundation* condition meets the requirements of this Code.

- * **1.5.7.2. Testing.** The *owner* shall make, or have made at his own expense, tests or inspections as necessary to prove compliance with this Code and shall promptly file a copy of all such tests or inspection reports with the *authority having jurisdiction*.

1.5.7.3. Equivalency

- * **(1)** If a person submits evidence to the *authority having jurisdiction* in connection with an application for acceptance of an equivalent to satisfy one or more of the requirements of this Code, the *authority having jurisdiction* may accept an equivalent, if he is of the opinion that the evidence demonstrates that the equivalent will provide the level of performance required by this Code.

- * **(2)** A person who submits evidence referred to in Sentence (1) shall forward a copy of the evidence to the Director within 15 days after a decision has been made by the *authority having jurisdiction* to accept the equivalent.

1.5.7.4. Director's Rulings

- * **(1)** Notwithstanding the right of an *authority having jurisdiction* to accept an equivalent, a person who is of the opinion that a *building*, construction, material, *appliance*, equipment, protection device, construction method, or structural assembly provides or will provide the performance intended by this Code, may apply to the Director for a ruling on the acceptability of the *building*, construction, material, *appliance*, equipment, protection device, construction method, or structural assembly in meeting the performance intended by this Code and shall submit sufficient evidence, as required by the Director, for a ruling to be made.
- * **(2)** After the Director has reviewed the evidence referred to in Sentence (1) he may issue a ruling, which may contain conditions, that in his opinion the performance intended by the Code is or is not met.
- * **(3)** If it is the opinion of the Director that a ruling made pursuant to Sentence (2) is applicable to

more than one *project*, he may make the ruling apply to more than one *project* or in more than one municipality.

- * **1.5.7.5. Innovative Testing.** The Director may accept innovative test procedures for properties of materials or assemblies of materials in the absence of appropriate procedures in Standards referenced in this Code.

- * **1.5.7.6. Product Listings.** The Director may issue lists of materials or products that, in his opinion, satisfy the requirements of this Code and, after listing, may be used to fulfil the requirements of this Code.

- * **1.5.7.7. Manufacturers, Constructors or Organizations Listings.** The Director may issue lists of manufacturers, *constructors* or organizations who, in his opinion, are capable of providing materials, products or specialized services that meet the performance required by this Code.

1.5.8. Inspections and Certification

- * **1.5.8.1. Off-Site Inspection.** If a *building* or a component of a *building* is assembled off the *building* site in a manner that it cannot be inspected on site, off-site inspection shall be provided, if required by the *authority having jurisdiction*, to determine compliance with this Code.

1.5.8.2. Third Party Certification

- * **(1)** Every *mobile home* and off-site manufactured house that is constructed after September 1, 1991, shall be certified, by the Canadian Standards Association, or an organization approved for this purpose by the Director, to confirm that the unit complies with the performance required by this Code.

- * **(2)** Every relocatable industrial camp *building* that is constructed after September 1, 1991, shall be certified, by an organization approved for this purpose by the Director, to confirm that the *building* complies with the performance required by this Code.

- * **(3)** The Director may issue lists of products for which a recognized third party inspection and certification programme is in effect if he is satisfied

that the programme confirms that the products provide the performance required by this Code.

1.5.9. Interpretations

1.5.9.1. Director's Interpretations

- * (1) Any person may apply to the Director for an interpretation of a specific requirement of this Code and the application shall
 - (a) give a specific Code reference;
 - (b) include a statement identifying the ambiguity or lack of clarity that requires an interpretation; and
 - (c) identify the *project*, by name and location, for which the interpretation is requested.
- * (2) After the Director has reviewed the application submitted pursuant to Sentence (1) he may issue an interpretation which shall apply to the specific *project*.
- * (3) If the Director is of the opinion that an interpretation is applicable throughout Alberta he may issue that interpretation and it shall apply in all municipalities.

1.5.10. Asbestos

1.5.10.1. Asbestos

- * (1) Except as permitted by Sentence (2), no person shall install any product that has a potential for releasing asbestos fibres in a *building*.
- * (2) Asbestos-cement board and asbestos-cement pipe may be used in a *building* but not in a supply or return air system.
- * (3) A condition in which there is a potential for releasing asbestos fibres in a *building* may be declared by the Director to be an *unsafe condition*.
- * (4) The use of materials containing crocidolite, which is a type of asbestos, is prohibited.
- * (5) Spray application of materials containing asbestos is prohibited.
- * (6) In *buildings* being altered or renovated, any materials having the potential for releasing asbestos fibres found in the area of the alteration or renovation shall be encapsulated, enclosed or removed.

(7) In *buildings* to be demolished, materials having the potential for releasing asbestos fibres shall first be removed. *

1.5.11. Unsafe Condition

1.5.11.1. Correcting an Unsafe Condition

- * (1) If any *building* is in an *unsafe condition*, the *owner* shall forthwith take all necessary action to correct the condition. *
- * (2) The *authority having jurisdiction* may, by notice in writing, order the *owner* of any *building* to correct any *unsafe condition*. *
- * (3) If immediate measures must be taken to avoid an imminent danger of fire or risk of accident, the *authority having jurisdiction* may take any action that he deems necessary to reduce the danger of fire or risk of accident, without notice, and at the expense of the *owner*. *

1.5.12. Failures

1.5.12.1. Failures and Structural Collapse

- * (1) Except as required by Sentence (2), if a failure occurs that causes, or has the potential to cause, injury or loss of life, the *owner* shall submit a report, if requested by the Director or the *authority having jurisdiction*, to the *authority having jurisdiction*, and a copy of the report to the Director, stating,
 - (a) the name and address of the *owner* of the *building*,
 - (b) the name and address of the *building* involved in the failure,
 - (c) the name and address of the *constructor*, if known,
 - (d) the nature of the failure, and
 - (e) remedial action being taken.
- * (2) If a structural collapse occurs, the *owner* shall submit a report to the Director stating:
 - (a) the name and address of the *owner* of the *building*,
 - (b) the name and address of the *building*,
 - (c) the names and addresses, if known, of
 - (i) the *registered architect*,
 - (ii) the *professional engineer*, and
 - (iii) the *constructor*,

1.5.12.1.

- (d) the nature of the structural collapse, and
- (e) remedial action being taken.

1.5.13. Prohibitions

1.5.13.1. Prohibited Actions

- * (1) No person
- (a) shall fail to complete construction or demolition that is regulated by this Code and is shown on the plans, specifications and documents before occupying a *building* without first having obtained in writing the permission of the *authority having jurisdiction*;
- (b) being responsible for the use, *occupancy*, relocation, construction, *alteration*, demolition of, or addition to a *building* shall cause, allow or maintain an *unsafe condition*;
- (c) shall undertake *work on*, over or under public property, or erect or place any construction or store any material thereon, without first having obtained permission from the appropriate authority;
- (d) shall allow the property boundaries, or grading of a *building* lot to be so changed as to place a *building* in contravention of this Code unless the *building* is altered, after obtaining any necessary *permits*, so that no contravention will occur as a result of the change of the property boundary, or grading, of the *building* lot;
- (e) shall knowingly submit false or misleading information;
- (f) shall change the size or scope of a *project* for which a *permit* has been issued, or permission to construct has been given, without first having obtained, in writing, the permission of the *authority having jurisdiction*; or
- (g) shall remove or deface any label or marking on a material or product that has been affixed to show compliance with this Code or a referenced document.

1.5.14. Appeals

1.5.14.1. Extracts from the Uniform Building Standards Act

(1) If an owner of a building or the person responsible for the use, occupancy, relocation, construction or demolition of a building is of the opinion that an order of an inspector made in accordance with the Uniform Building Standards Act is not proper, that person may appeal the order to the Alberta Building Standards Council. *

(2) An appeal must be commenced by serving notice of the appeal on the Director within 15 days from the date that the owner of the building or the person responsible for the use, occupancy, relocation, construction or demolition of the building is given the order of the inspector. *

(3) An appeal does not operate as a stay of the order of an inspector except so far as the chairman or a vice-chairman of the Alberta Building Standards Council so directs. *

Note: Notices of appeal and requests for a stay of the order of an inspector shall be forwarded in writing to:

The Director of Building Standards
Alberta Labour
705, 10808 - 99 Avenue
Edmonton, Alberta, Canada
T5K 0G5

Part 2

General Requirements

Section 2.1	Application	
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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. Application of Parts 10 and 11

2.1.5.1. Part 10

(1) Part 10 applies to a *building* conforming to Sentence (2) in which accommodation is provided for an industrial work force living and working in a temporary location. *

(2) Part 10 applies to a *

- (a) 1 storey *building*
 - (i) without sleeping accommodation, that is not more than 1 200 m² in *building area* and if *sprinklered*, that is not more than 2 400 m² in *building area*, or
 - (ii) with sleeping accommodation, that is not more than 600 m² in *building area* and if *sprinklered*, that is not more than 1 200 m² in *building area*, or
- (b) 2 storey *building*
 - (i) without sleeping accommodation, that is not more than 600 m² in *building area* and if *sprinklered*, that is not more than 1 200 m² in *building area*, or

2.1.5.1.

- (ii) with sleeping accommodation, that is not more than 300 m² in *building area* and if *sprinklered*, that is not more than 600 m² in *building area*.
- * **(3)** Part 10 applies to Group D and Group F Division 3 *occupancies* for a work force working in a temporary location.
- * **(4)** Part 10 does not apply to a relocatable industrial housing unit if the *building area* is not more than 80 m².

2.1.5.2. Part 11

- * **(1)** Except as permitted in Sentence (2), Part 11 applies to a *building* constructed within an airport vicinity protection area that has been established by an *AVPA regulation* under the Planning Act.
- * **(2)** Part 11 does not apply
 - (a) to a *building* for which a land use is allowed by an *AVPA regulation* and the *AVPA regulation* does not place any conditions with respect to acoustic insulation,
 - (b) to any part of a *building* that is not designed for winter use when the outside temperature is below 0°C, or
 - (c) to a *building* that was completed before November 30, 1983 or for which a *building permit* was issued before November 30, 1983.

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 sepa-

rated 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 and Seismic Data

2.2.1. General

2.2.1.1. Climatic Values

(1) The values in Table 2.2.1.A. shall not be considered as providing a complete picture of the variability of local climatic conditions. (See Appendix A.) *

(2) In mountainous areas the values in Table 2.2.1.A. represent typical values for populated communities in which the values were recorded and do not apply to mountain slopes and other remote areas where substantially different conditions may exist. *

(3) In areas with abrupt changes in topography the *designer* should consult the *authority having jurisdiction* and other experienced persons for assistance in determining realistic values. *

(4) Climatic and Seismic data for *building* design in Alberta shall be based on Table 2.2.1.A. or on "Climatic Building Design Data" issued by the Canadian Climate Centre of Environment Canada. *

(5) The outside winter design temperature for heating and ventilating design shall be the January 1% value listed in Table 2.2.1.A. (See Appendix A.) *

2.2.1.A.

Table 2.2.1.A.
Forming Part of Article 2.2.1.1.

Municipality	Design Temperature				Degree Days Below 18°	15 Min Rain mm	One Day Rain mm	Ann. Tot. Pcpn. mm	Ground Snow Load kPa		Hourly Wind Pressures			Seismic Data			
	January		July 2.5%						Zone	Zonal Velocity Ratio, v	S _s	S _R	1/10 kPa	1/30 kPa	1/100 kPa	Z _a	Z _v
	2.5% °C	1% °C	Dry °C	Wet °C													
Acadia Valley	-33	-36	31	20	5625	18	72	300	1.3	0.1	0.33	0.43	0.56	0	0	0	
Airdrie	-32	-34	28	18	5350	17	73	490	1.3	0.1	0.33	0.39	0.46	0	1	0.05	
Athabasca	-35	-38	28	19	6256	18	88	506	1.4	0.1	0.30	0.37	0.45	0	1	0.05	
Banff	-30	-32	27	17	5657	18	53	471	3.3	0.1	0.39	0.45	0.52	0	1	0.05	
Barrhead	-34	-37	28	19	6088	20	102	467	1.6	0.1	0.32	0.39	0.49	0	1	0.05	
Bashaw	-36	-39	27	19	5820	21	90	430	1.8	0.1	0.24	0.32	0.43	0	0	0	
Bassano	-32	-34	28	18	5375	17	69	435	1.2	0.1	0.50	0.60	0.71	0	0	0	
Beaverlodge	-35	-38	28	18	5983	25	101	467	2.2	0.1	0.27	0.33	0.40	0	1	0.05	
Beaumont	-37	-40	27	19	5900	20	94	470	1.8	0.1	0.27	0.35	0.44	0	1	0.05	
Berwyn	-40	-42	27	18	6380	14	63	495	2.4	0.1	0.24	0.30	0.36	0	1	0.05	
Black Diamond	32	-34	28	18	5250	16	75	495	1.0	0.1	0.50	0.60	0.72	0	1	0.05	
Blackfalds	-34	-38	28	19	5740	19	93	450	1.9	0.1	0.25	0.32	0.41	0	1	0.05	
Bon Accord	-37	-40	27	19	6075	19	94	485	1.6	0.1	0.29	0.36	0.45	0	1	0.05	
Bonnyville	-36	-39	28	20	6390	21	65	430	1.6	0.1	0.32	0.38	0.45	0	0	0	
Bow Island	-32	-36	32	20	5000	17	72	342	1.2	0.1	0.52	0.63	0.76	0	0	0	
Bowden	-34	-38	28	19	5625	17	71	500	1.4	0.1	0.31	0.39	0.49	0	1	0.05	
Brooks	-32	-34	32	19	5307	18	89	351	1.1	0.1	0.36	0.43	0.57	0	0	0	
Bruderheim	-37	-40	27	19	6125	19	89	465	1.6	0.1	0.28	0.35	0.43	0	0	0	
Calgary	-31	-33	29	17	5321	23	95	437	1.0	0.1	0.40	0.46	0.54	0	1	0.05	
Calmar	-35	-38	27	19	5870	20	93	492	1.7	0.1	0.32	0.41	0.51	0	1	0.05	
Campsie	-34	-37	28	19	6088	20	111	467	1.6	0.1	0.32	0.39	0.49	0	1	0.05	
Camrose	-33	-35	29	19	5885	20	92	448	1.8	0.1	0.21	0.29	0.39	0	0	0	
Canmore	-30	-32	28	16	5520	10	69	454	3.2	0.1	0.40	0.46	0.54	0	1	0.05	
e Cardston	-30	-33	29	18	4870	20	102	550	1.4	0.1	0.74	0.93	1.15	0	0	0	
Carstairs	-33	-36	28	18	5575	17	76	490	1.3	0.1	0.33	0.39	0.46	0	1	0.05	
Castor	-33	-36	29	20	5880	21	72	352	1.8	0.1	0.21	0.29	0.38	0	0	0	
e Claresholm	-31	-34	29	18	4848	15	97	466	1.2	0.1	0.66	0.80	0.96	0	0	0	
Coaldale	-31	-35	31	19	5000	17	79	390	1.0	0.1	0.57	0.69	0.83	0	0	0	
Cochrane	-32	-34	28	18	5375	17	75	495	1.1	0.1	0.39	0.45	0.52	0	1	0.05	
Cold Lake	-36	-38	28	20	6166	15	94	460	1.6	0.1	0.31	0.37	0.44	0	0	0	
Coleman	-31	-34	28	18	5404	15	62	569	2.5	0.3	0.54	0.69	0.87	1	1	0.05	
Coronation	-31	-33	30	19	5879	20	99	374	2.0	0.1	0.23	0.32	0.43	0	0	0	
e Cowley	-31	-34	29	18	5207	15	74	501	1.4	0.1	0.73	0.91	1.13	0	1	0.05	
Crossfield	-32	-38	28	18	5500	17	106	501	1.3	0.1	0.34	0.41	0.48	0	1	0.05	
Daysland	-36	-34	28	19	5880	21	85	445	1.7	0.1	0.24	0.32	0.42	0	0	0	
Devon	-37	-39	27	19	5990	20	94	490	1.6	0.1	0.32	0.41	0.51	0	1	0.05	
Didsbury	-33	-40	28	18	5525	17	78	390	1.3	0.1	0.29	0.38	0.49	0	1	0.05	
Drayton Valley	-35	-36	27	19	5850	20	83	520	1.8	0.1	0.32	0.39	0.47	0	1	0.05	
Drumheller	-31	-33	29	18	5283	20	73	348	1.1	0.1	0.32	0.39	0.49	0	0	0	
Column 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	

2.2.1.A.

Table 2.2.1.A. (Cont'd).
Forming Part of Article 2.2.1.1.

Municipality	Design Temperature				Degree Days Below 18°	15 Min Rain mm	One Day Rain mm	Ann. Tot. Pcpn. mm	Ground Snow Load kPa		Hourly Wind Pressures			Seismic Data		
	January		July 2.5%						Zone	Zonal Velocity Ratio, v	1/10 kPa	1/30 kPa	1/100 kPa	Z _a	Z _v	
	2.5% °C	1% °C	Dry °C	Wet °C												
	S _s	S _r														
Eckville	-34	-37	27	19	5750	17	213	508	1.9	0.1	0.25	0.31	0.38	0	1	0.05
Edmonton	-32	-34	28	19	5782	23	114	488	1.6	0.1	0.32	0.40	0.51	0	1	0.05
Edson	-34	-37	28	18	6027	18	79	563	1.9	0.1	0.36	0.43	0.50	0	1	0.05
Elk Point	-38	-40	28	20	6340	21	71	454	1.7	0.1	0.27	0.32	0.39	0	0	0
Embarras																
Portage	-41	-44	27	19	6937	10	82	409	1.7	0.1	0.31	0.37	0.45	0	0	0
Fairview	-38	-40	27	18	6166	15	64	432	2.4	0.1	0.26	0.32	0.39	0	1	0.05
Falher	-40	-42	27	18	6060	15	58	451	2.0	0.1	0.23	0.29	0.35	0	1	0.05
Foremost	-32	-36	32	20	5000	14	87	356	1.2	0.1	0.57	0.69	0.83	0	0	0
Fort																
Chipewayan	-43	-46	26	19	7530	12	52	381	1.8	0.1	0.32	0.39	0.47	0	0	0
e Fort Macleod	-31	-33	31	18	4692	16	98	434	1.1	0.1	0.68	0.83	1.00	0	0	0
Fort McMurray	-39	-41	28	19	6661	13	61	472	1.3	0.1	0.27	0.32	0.38	0	0	0
Fort																
Saskatchewan	-32	-35	28	19	5783	20	78	423	1.5	0.1	0.31	0.39	0.49	0	1	0.05
Fort Vermilion	-41	-43	28	18	6999	13	60	383	1.9	0.1	0.22	0.26	0.32	0	1	0.05
Fox Creek	-36	-40	27	19	6100	17	73	545	2.0	0.1	0.32	0.39	0.47	0	1	0.05
Gibbons	-37	-40	27	19	6125	19	94	485	1.6	0.1	0.29	0.36	0.45	0	1	0.05
Gliechen	-32	-34	28	18	5375	17	91	387	1.0	0.1	0.37	0.45	0.54	0	0	0
Grand Centre	-36	-39	28	20	6400	21	65	435	1.6	0.1	0.32	0.38	0.45	0	0	0
e Grande Cache	-35	-38	27	15	5790	14	89	602	2.9	0.1	0.36	0.42	0.49	0	1	0.05
Grande Prairie	-36	-39	27	18	6136	23	78	453	2.0	0.1	0.37	0.44	0.52	0	1	0.05
Granum	-33	-36	30	18	4750	17	87	480	1.0	0.1	0.68	0.83	1.00	0	0	0
Grimshaw	-40	-42	27	18	6380	14	63	495	2.3	0.1	0.24	0.30	0.36	0	1	0.05
Habay	-41	-43	28	18	7300	13	63	387	2.2	0.1	0.20	0.24	0.28	0	1	0.05
Hanna	-33	-36	29	20	5755	19	111	388	1.5	0.1	0.29	0.38	0.49	0	0	0
Hardisty	-33	-35	30	19	5965	20	56	412	1.6	0.1	0.24	0.32	0.42	0	0	0
High Level	-46	-47	26	18	7470	11	68	387	2.1	0.1	0.22	0.26	0.31	0	1	0.05
High Prairie	-38	-40	25	19	6062	15	61	468	1.9	0.1	0.36	0.43	0.52	0	1	0.05
e High River	-31	-33	28	17	5455	18	111	455	1.2	0.1	0.51	0.60	0.72	0	1	0.05
Hinton	-34	-38	27	17	5679	13	70	502	2.7	0.1	0.36	0.43	0.50	0	1	0.05
Innisfail	-34	-38	28	19	5700	18	91	480	1.9	0.1	0.31	0.38	0.46	0	1	0.05
Irvine	-32	-36	32	20	5500	17	83	400	1.1	0.1	0.40	0.50	0.61	0	0	0
Jasper	-32	-35	28	18	5570	10	108	475	3.0	0.1	0.37	0.43	0.50	1	1	0.05
Keg River	-40	-42	29	18	6832	13	60	444	2.2	0.1	0.19	0.24	0.29	0	1	0.05
Killam	-35	-38	29	20	6050	21	78	430	1.7	0.1	0.24	0.32	0.43	0	0	0
Kitscoty	-35	-38	29	20	6280	22	64	415	1.7	0.1	0.31	0.38	0.45	0	0	0
Lac La Biche	-35	-38	28	19	6196	15	82	517	1.5	0.1	0.31	0.37	0.44	0	0	0
Column 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17

2.2.1.A.

Table 2.2.1.A. (Cont'd).
Forming Part of Article 2.2.1.1.

Municipality	Design Temperature				Degree Days Below 18°	15 Min Rain mm	One Day Rain mm	Ann. Tot. Pcpn. mm	Ground Snow Load kPa		Hourly Wind Pressures			Seismic Data			
	January		July 2.5%						Zone	Zonal Velocity Ratio, v	S _S	S _R	1/10 kPa	1/30 kPa	1/100 kPa	Z _a	Z _v
	2.5% °C	1% °C	Dry °C	Wet °C													
Lacombe	-33	-35	29	18	5823	23	71	443	1.9	0.1	0.24	0.31	0.40	0	1	0.05	
Lake Louise	-33	-34	27	14	5500	11	53	684	6.3	0.3	0.39	0.45	0.52	1	1	0.05	
Lamont	-37	-40	27	19	6210	19	89	455	1.6	0.1	0.28	0.35	0.43	0	0	0	
Leduc	-35	-38	27	19	5870	20	94	480	1.7	0.1	0.24	0.32	0.42	0	1	0.05	
Lethbridge	-30	-33	31	18	4787	20	93	418	1.1	0.1	0.64	0.76	0.91	0	0	0	
Lloydminster	-35	-38	29	20	6056	18	104	449	1.8	0.1	0.30	0.37	0.46	0	0	0	
Magrath	-31	-35	31	19	5000	17	77	400	1.1	0.1	0.65	0.83	1.04	0	0	0	
Manning	-39	-41	27	18	6850	13	51	404	2.1	0.1	0.21	0.26	0.32	1	1	0.05	
Mayerthorpe	-36	-40	27	19	5900	15	75	520	1.6	0.1	0.30	0.36	0.44	0	1	0.05	
McLennan	-40	-42	27	18	6062	15	62	469	2.1	0.1	0.26	0.32	0.39	0	1	0.05	
Medicine Hat	-31	-34	33	19	4868	23	122	348	1.0	0.1	0.39	0.49	0.60	0	0	0	
Milk River	-31	-35	31	19	4750	16	55	316	1.4	0.1	0.62	0.75	0.89	0	0	0	
Millet	-35	-38	27	19	5810	21	93	475	1.7	0.1	0.24	0.32	0.42	0	1	0.05	
Morinville	-37	-40	27	19	6000	19	94	480	1.7	0.1	0.32	0.41	0.51	0	1	0.05	
Morrin	-34	-38	28	19	5650	19	73	390	1.3	0.1	0.29	0.38	0.48	0	0	0	
Mundare	-37	-40	27	19	6230	20	85	450	1.7	0.1	0.25	0.32	0.41	0	0	0	
Nanton	-32	-34	28	18	5125	17	76	450	1.2	0.1	0.50	0.60	0.71	0	0	0	
Okotoks	-32	-34	28	18	5250	17	71	470	1.2	0.1	0.51	0.60	0.70	0	0	0	
Olds	-33	-36	28	18	5600	17	104	488	1.4	0.1	0.32	0.38	0.45	0	1	0.05	
Oyen	-33	-36	29	20	5575	19	73	354	1.4	0.1	0.33	0.43	0.56	0	0	0	
Peace River	-37	-40	27	18	6469	15	48	375	1.7	0.1	0.24	0.29	0.36	0	1	0.05	
Penhold	-34	-38	28	19	5700	18	91	460	1.7	0.1	0.30	0.36	0.43	0	1	0.05	
Picture Butte	-31	-35	31	19	4750	17	61	413	1.0	0.1	0.65	0.79	0.95	0	0	0	
Pincher Creek	-32	-34	29	18	5028	18	128	551	1.4	0.1	0.70	0.88	1.08	0	0	0	
Ponoka	-34	-37	27	19	5840	21	93	470	1.8	0.1	0.23	0.31	0.40	0	1	0.05	
Provost	-33	-36	29	20	6020	21	63	395	1.6	0.1	0.29	0.39	0.52	0	0	0	
Rainbow Lake	-46	-47	26	18	7375	16	71	440	2.5	0.1	0.22	0.26	0.31	0	1	0.05	
Ranfurly	-34	-37	29	19	6015	18	89	439	1.7	0.1	0.23	0.29	0.36	0	0	0	
Raymond	-31	-35	31	19	4750	17	68	420	1.1	0.1	0.65	0.83	1.04	0	0	0	
Red Deer	-32	-35	29	18	5933	23	154	498	1.8	0.1	0.31	0.37	0.44	0	1	0.05	
Redcliff	-32	-36	32	20	5000	17	77	320	1.2	0.1	0.39	0.48	0.59	0	0	0	
Redwater	-37	-40	27	19	6210	19	90	470	1.6	0.1	0.32	0.39	0.48	0	1	0.05	
Rimbey	-34	-37	27	19	5800	20	67	482	2.0	0.1	0.25	0.31	0.38	0	1	0.05	
Rocky Mountain House	-31	-33	28	18	5613	20	77	556	1.7	0.1	0.26	0.32	0.39	0	1	0.05	
Ryley	-35	-38	27	19	5990	21	84	465	1.7	0.1	0.24	0.32	0.42	0	0	0	
Sangudo	-36	-40	27	19	5930	17	83	520	1.6	0.1	0.32	0.39	0.48	0	1	0.05	
Sedgewick	-35	-38	29	20	5880	21	84	421	1.6	0.1	0.24	0.32	0.43	0	0	0	
Column 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	

2.2.1.A.

Table 2.2.1.A. (Cont'd).
Forming Part of Article 2.2.1.1.

Municipality	Design Temperature				Degree Days Below 18°	15 Min Rain mm	One Day Rain mm	Ann. Tot. Pcpn. mm	Ground Snow Load kPa		Hourly Wind Pressures			Seismic Data				
	January		July 2.5%						Z _a	Z _v	Zonal Velocity Ratio, v	S _s	S _r	1/10 kPa	1/30 kPa	1/100 kPa	Zone	
	2.5% °C	1% °C	Dry °C	Wet °C													Z _a	Z _v
Sexsmith	-38	-41	27	18	6125	18	83	550	2.2	0.1	0.31	0.38	0.46	0	1	0.05		
Sherwood Park	-37	-40	27	19	6000	20	94	480	1.8	0.1	0.32	0.41	0.51	0	1	0.05		
Slave Lake	-36	-39	27	19	6302	15	76	482	1.7	0.1	0.28	0.34	0.41	0	1	0.05		
Smoky Lake	-39	-42	27	20	6280	19	91	460	1.6	0.1	0.31	0.38	0.46	0	0	0		
Spirit River	-38	-41	27	18	6300	18	54	457	2.1	0.1	0.31	0.38	0.46	0	1	0.05		
Spruce Grove	-37	-40	27	19	5910	19	92	497	1.6	0.1	0.32	0.41	0.51	0	1	0.05		
St. Albert	-37	-40	27	19	6000	20	94	480	1.6	0.1	0.32	0.41	0.51	0	1	0.05		
St. Paul	-37	-40	28	20	6300	21	72	440	1.7	0.1	0.32	0.38	0.45	0	0	0		
Stavelly	-33	-36	30	18	5050	17	76	450	1.2	0.1	0.50	0.60	0.71	0	0	0		
Stettler	-32	-34	30	19	5669	20	165	431	2.0	0.1	0.24	0.32	0.42	0	0	0		
Stony Plain	-32	-35	28	19	5713	23	102	529	1.6	0.1	0.32	0.40	0.51	0	1	0.05		
Strathmore	-32	-34	28	18	5575	17	59	450	1.2	0.1	0.40	0.47	0.54	0	0	0		
Suffield	-32	-34	33	19	5095	20	69	338	1.2	0.1	0.43	0.52	0.64	0	0	0		
Sundre	-34	-37	27	19	5690	15	78	530	1.1	0.1	0.32	0.38	0.45	0	1	0.05		
Swan Hills	-36	-40	27	19	6300	15	68	515	2.6	0.1	0.28	0.34	0.40	0	1	0.05		
Sylvan Lake	-34	-37	27	19	5740	18	59	545	1.9	0.1	0.25	0.31	0.38	0	1	0.05		
Taber	-31	-33	31	19	4772	20	93	382	1.1	0.1	0.57	0.69	0.82	0	0	0		
Thorhild	-37	-40	27	19	6240	17	88	480	1.6	0.1	0.32	0.39	0.47	0	1	0.05		
Three Hills	-34	-38	28	19	5625	19	76	391	1.3	0.1	0.31	0.38	0.45	0	0	0		
Tofield	-37	-40	27	19	6200	21	94	465	1.7	0.1	0.25	0.32	0.42	0	0	0		
Trochu	-34	-38	28	19	5625	18	58	408	1.3	0.1	0.31	0.38	0.45	0	0	0		
Turner Valley	-31	-33	28	17	5786	20	82	574	1.3	0.1	0.51	0.60	0.71	0	1	0.05		
Two Hills	-38	-40	28	20	6300	21	78	435	1.6	0.1	0.26	0.32	0.39	0	0	0		
Valleyview	-37	-40	27	18	5770	18	51	519	2.1	0.1	0.35	0.43	0.51	0	1	0.05		
Vauxhall	-31	-35	31	19	5375	17	93	338	1.0	0.1	0.53	0.63	0.76	0	0	0		
Vegreville	-34	-36	29	19	6208	18	69	404	1.7	0.1	0.25	0.32	0.40	0	0	0		
Vermilion	-35	-38	29	20	6168	18	75	438	1.6	0.1	0.23	0.28	0.34	0	0	0		
Viking	-38	-40	28	20	6030	21	66	454	1.7	0.1	0.23	0.30	0.39	0	0	0		
Vulcan	-31	-34	30	18	5125	17	87	405	1.2	0.1	0.49	0.58	0.69	0	0	0		
Wagner	-36	-39	27	19	6264	15	72	476	1.7	0.1	0.28	0.34	0.41	0	1	0.05		
Wainwright	-33	-36	29	19	6000	20	63	380	1.8	0.1	0.24	0.32	0.41	0	0	0		
Wamer	-31	-35	31	19	4750	16	73	367	1.2	0.1	0.61	0.73	0.87	0	0	0		
Wembley	-38	-41	27	18	6100	18	85	540	2.1	0.1	0.36	0.43	0.52	0	1	0.05		
Westlock	-37	-40	27	19	6000	17	84	490	1.6	0.1	0.30	0.38	0.47	0	1	0.05		
Wetaskiwin	-33	-35	29	19	5741	23	78	494	1.8	0.1	0.24	0.32	0.42	0	1	0.05		
Whitecourt	-35	-38	27	18	6151	20	89	553	1.7	0.1	0.32	0.39	0.48	0	1	0.05		
Wimbome	-31	-34	29	18	5783	23	89	458	1.5	0.1	0.30	0.37	0.45	0	0	0		
Column 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17		

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. Plans and Specifications

(1) 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) Plans and specifications shall include, so far as is applicable

- (a) floor plans on a scale of not less than 1:100,
- (b) dimensions of all rooms,
- (c) a description of the purpose of all rooms,
- (d) the location of all walls, *partitions*, doorways, windows and other openings,
- (e) the finish of all floors, walls and ceilings,
- (f) the location and description of all fixed equipment, and
- (g) *building* sections, elevations and details sufficient to determine the proposed construction meets the requirements of 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 fire dampers and other required *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 to a *building* for which a *professional engineer* or *registered architect* or both is required to be involved in accordance with Subsection 1.5.2.

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.

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 Article 2.3.4.6. 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.)

2.3.6. Electrical Drawings and Specifications

2.3.6.1. Application. Requirements of this Subsection apply to *appliances*, systems and equipment that are required to be installed in a *building* and are operated by either the regular or emergency electrical power supply.

2.3.6.2. Information Required on Architectural and Electrical Drawings. The information shown on architectural plans and on plans for electrical systems shall be clear and legible and shall contain all the 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 re-

quirements 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. The *owner* shall retain the *designer* or another suitably qualified person to review the construction of any *building* or part thereof to determine whether or not the construction conforms to the design. *

2.6.3. Review of Shop Drawings

2.6.3.1. The *owner* shall retain the *designer* or another suitably qualified person to review all shop *

2.6.3.1.

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. The *owner* shall retain the *designer* or another suitably qualified person to review workmanship, materials and all reports of material tests 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.

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 1990.

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.

Table 2.7.3.A.
Forming Part of Article 2.7.3.2.

Documents Referenced in the Alberta Building Code 1990			
Issuing Agency	Document Number	Title of Document	Code Reference
*ASHRAE	62-1989	Ventilation for Acceptable Indoor Air Quality	6.2.2.1.(4) 10.5.1.3.
e ASTM	A123-89A	Zinc (Hot-dip Galvanized) Coatings on Iron and Steel Products	Table 9.20.16.A.
e ASTM	A153-82(1987)	Zinc Coating (Hot-Dip) on Iron and Steel Hardware	Table 9.20.16.A.
ASTM	A252-90	Welded and Seamless Steel Pipe Piles	4.2.3.8.
ASTM	A283/A283M-88	Low and Intermediate Tensile Strength Carbon Steel Plates	4.2.3.8.
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Table 2.7.3.A. (Cont'd)

Issuing Agency	Document Number	Title of Document	Code Reference
ASTM	A525-87	Steel Sheet, Zinc-coated (Galvanized) by the Hot-Dip Process	9.3.3.2.
ASTM	A570/A570M-88	Steel, Sheet and Strip, Carbon, Hot Rolled, Structural Quality	4.2.3.8.
ASTM	A611-89	Steel, Cold-Rolled Sheet, Carbon Structural	4.2.3.8.
ASTM	C4-62(1986)	Clay Drain Tile	9.14.3.1.(1)
ASTM	C5-79(1988)	Quicklime for Structural Purposes	9.20.3.1.(1)
ASTM	C27-84(1988)	Classification of Fireclay and High-Alumina Refractory Brick	9.21.3.4.
ASTM	C126-86	Ceramic Glazed Structural Clay Facing Tile, Facing Brick, and Solid Masonry Units	9.20.2.1.(1)
ASTM	C207-79(1988)	Hydrated Lime for Masonry Purposes	9.20.3.1.(1)
ASTM	C212-60(1986)	Structural Clay Facing Tile	9.20.2.1.(1)
ASTM	C315-87(1983)	Clay Flue Linings	9.21.3.3.(1)
ASTM	C411-82(1987)	Hot-Surface Performance of High-Temperature Thermal Insulation	6.2.3.6.(3) 6.2.9.2.(2)
ASTM	C412M-90	Concrete Drain Tile	9.14.3.1.(1)
ASTM	C444M-87	Perforated Concrete Pipe (Metric)	9.14.3.1.(1)
ASTM	C700-89	Vitrified Clay Pipe, Extra Strength, Standard Strength and Perforated	9.14.3.1.(1)
ASTM	C1002-88	Steel Drill Screws for the Application of Gypsum Board or Metal Plaster Bases	9.24.1.4. 9.29.5.7.
ASTM	D323-89	Vapour Pressure of Petroleum Products (Reid Method)	1.3.2.1.
ASTM	D2898-81(86)	Test Method for Accelerated Weathering of Fire-Retardant-Treated Wood for Fire Testing	3.1.5.5.(7) 3.1.5.5.(8)
ASTM	E90-90	Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions	9.11.1.1.
ASTM	E336-90	Measurement of Airborne Sound Insulation in Buildings	9.11.1.1.
ASTM	E413-87	Classification for Rating Sound Insulation	9.11.1.1.
ASTM	F476-84	Test Methods for Security of Swinging Door Assemblies	9.6.6.10.
*CGSB	CAN/CGSB-4.162 -M80	Hospital Textiles Flammability Performance Requirements	3.3.1.24.(2)
CGSB	CAN/CGSB-7.1-M86	Cold Formed Steel Framing Components	9.24.1.2.
Col 1	2	3	4

2.7.3.A.

Table 2.7.3.A. (Cont'd)

Issuing Agency	Document Number	Title of Document	Code Reference
CGSB	CAN/CGSB-7.2-M88	Adjustable Metal Columns	9.17.3.4.
CGSB	10-GP-3Ma-1981	Refractory Mortar, Air Setting	9.21.3.4. 9.21.3.9.(1) 9.22.2.2.(1)
CGSB	CAN/CGSB-11.3-M87	Hardboard	9.27.10.1.(2) 9.29.7.1. 9.30.2.2.(1)
CGSB	CAN/CGSB-11.5-M87	Hardboard, Precoated, Factory Finished, for Exterior Cladding	9.27.10.1.(1)
CGSB	CAN2-12.1-M79	Glass, Safety, Tempered or Laminated	3.3.1.18.(2) 3.4.6.14.(3) 9.6.5.2.(2) 9.7.3.1.(1)
CGSB	CAN2-12.2-M76	Glass, Sheet, Flat, Clear	9.7.3.1.(1)
CGSB	CAN2-12.3-M76	Glass, Polished Plate or Float, Flat, Clear	9.7.3.1.(1)
CGSB	CAN2-12.4-M76	Glass, Heat Absorbing	9.7.3.1.(1)
CGSB	CAN2-12.8-M76	Insulating Glass Units	9.7.3.1.(1)
CGSB	CAN2-12.10-M76	Glass, Light and Heat Reflecting	9.7.3.1.(1)
CGSB	CAN2-12.11-M76	Glass, Wired, Safety	3.3.1.18.(2) 3.4.6.14.(3) 9.6.5.2.(2) 9.7.3.1.(1)
CGSB	CAN/CGSB-12.20-M89	Structural Design of Glass for Buildings	4.3.6.1. 9.7.3.2.
CGSB	19-GP-5M-1976	Sealing Compound, One Component, Acrylic Base, Solvent Curing	9.27.4.2.(2)
CGSB	CAN/CGSB-19.13-M87	Sealing Compound, One Component, Elastomeric, Chemical Curing	9.27.4.2.(2)
CGSB	19-GP-14M-1976	Sealing Compound, One Component, Butyl-Polyisobutylene Polymer Base, Solvent Curing	9.27.4.2.(2)
CGSB	CAN/CGSB-19.22-M89	Mildew Resistant Sealing Compound for Tubs and Tile	9.29.10.5.
CGSB	CAN/CGSB-19.24-M90	Multi-Component, Chemical Curing Sealing Compound	9.27.4.2.(2)
CGSB	CAN/CGSB-34.4-M89	Siding, Asbestos Cement, Shingles and Clapboards	9.27.8.1.(1)
CGSB	CAN/CGSB-34.5-M89	Sheets, Asbestos Cement, Corrugated	9.27.8.1.(1)
Col 1	2	3	4

Table 2.7.3.A. (Cont'd)

Issuing Agency	Document Number	Title of Document	Code Reference
CGSB	CAN/CGSB-34.14-M87	Sheets, Asbestos Cement, Decorative	9.27.8.1.(1)
CGSB	CAN/CGSB-34.16-M89	Sheets, Asbestos Cement, Flat, Fully Compressed	9.27.8.1.(1)
	CAN/CGSB-34.17-M89	CGSB Sheets, Asbestos-Cement, Flat, Semicompressed	9.27.8.1.(1)
CGSB	CAN/CGSB-34.21-M89	Panels, Sandwich, Asbestos-Cement with Insulating Cores	9.27.8.1.(1)
CGSB	CAN/CGSB-34.22-M87	Pipe, Asbestos-Cement, Drain	9.14.3.1.(1)
CGSB	CAN/CGSB-37.2-M88	Emulsified Asphalt, Mineral Colloid Type, Unfilled, for Dampproofing and Waterproofing and for Roof Coatings	9.13.2.1.(1)
CGSB	CAN/CGSB-37.3-M89	Application of Emulsified Asphalt for Dampproofing or Waterproofing	9.13.1.3.(1)
e CGSB	CAN/CGSB-37.4-M89	Fibrated, Cutback Asphalt, Lap Cement for Asphalt Roofing	9.26.2.1.(1)
CGSB	CAN/CGSB-37.5-M89	Cutback Asphalt Plastic Cement	9.26.2.1.(1)
CGSB	37-GP-6Ma-1983	Asphalt, Cutback, Unfilled, for Dampproofing	9.13.2.1.(1)
CGSB	CAN/CGSB-37.8-M88	Asphalt, Cutback, Filled, for Roof Coating	9.26.2.1.(1)
CGSB	37-GP-9Ma-1983	Primer, Asphalt, Unfilled, for Asphalt Roofing, Dampproofing and Waterproofing	9.26.2.1.(1)
CGSB	37-GP-12Ma-1984	Application of Unfilled Cutback Asphalt for Dampproofing	9.13.1.3.(1)
CGSB	CAN/CGSB-37.16-M89	Filled Cutback Asphalt for Dampproofing and Waterproofing	9.13.2.1.(1)
CGSB	37-GP-18Ma-1985	Tar, Cutback, Unfilled, for Dampproofing	9.13.2.1.(1)
CGSB	37-GP-21M-1976	Tar, cutback, Fibrated, for Roof Coating	9.26.2.1.(1)
CGSB	CAN/CGSB-37.22-M89	Application of Unfilled Cutback Tar Foundation Coating for Dampproofing	9.13.1.3.(1)
CGSB	CAN/CGSB-37.50-M89	Hot Applied Rubberized Asphalt for Roofing and Waterproofing	9.26.2.1.(1)
CGSB	37-GP-51M-79	Application of Rubberized Asphalt, Hot Applied for Roofing and Waterproofing	9.26.15.1.
CGSB	37-GP-52M-84	Roofing and Waterproofing Membrane, Sheet Applied, Elastomeric	9.26.2.1.(1)
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CGSB	37-GP-55M-79	Application of Sheet Applied Flexible Polyvinyl Chloride Roofing Membrane	9.26.16.1.
CGSB	37-GP-56M-80	Membrane, Modified, Bituminous, Prefabricated, and Reinforced for Roofing	9.26.2.1.(1)
CGSB	41-GP-6M-1976	Sheets, Thermosetting Polyester Plastics, Glass Fiber Reinforced	9.26.2.1.(1)
CGSB	41-GP-24Ma-1983	Siding, Soffits and Fascia, Rigid Vinyl	9.27.13.1.
CGSB	41-GP-29Ma-1983	Tubing, Plastic, Corrugated, Drainage	9.14.3.1.(1)
e CGSB	CAN/CGSB-51.20-M87	Thermal Insulation, Polystyrene, Boards and Pipe Covering	Table 9.23.16.A. 9.25.3.1.(1) 9.25.3.3.
CGSB	51-GP-21M-1978	Thermal Insulation, Urethane and Isocyanurate, Unfaced	Table 9.23.16.A. 9.25.3.1.(1)
CGSB	CAN/CGSB-51.25-M87	Thermal Insulation, Phenolic, Faced	Table 9.23.16.A. 9.25.3.1.(1)
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CGSB	CAN/CGSB-82.5-M88	Insulated Steel Doors	9.6.4.3.	
CGSB	CAN/CGSB-82.6-M86	Doors, Mirrored Glass, Siding or Folding Wardrobe	9.6.5.3.	
CGSB	CAN/CGSB-93.1-M85	Sheet, Aluminum Alloy, Prefinished, Residential	9.27.12.1.(4)	
CGSB	93-GP-2Ma-1983	Siding, Soffits and Fascia, Aluminum, Prefinished, Residential	9.27.12.1.(3)	
CGSB	93-GP-3M-1978	Sheet, Steel, Galvanized, Prefinished, Residential	9.27.12.1.(2)	
CGSB	93-GP-4M-1978	Siding, Soffits and Fascia, Steel, Galvanized, Prefinished, Residential	9.27.12.1.(1)	
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	CSA	CAN/CSA-A82.1-M87	Burned Clay Brick (Solid Masonry Units Made from Clay or Shale)	9.20.2.1.(1)
	CSA	A82.3-M1978	Calcium Silicate (Sand-Lime) Building Brick	9.20.2.1.(1)
	CSA	A82.4-M1978	Structural Clay Load-Bearing Wall Tile	9.20.2.1.(1)
	CSA	A82.5-M1978	Structural Clay Non-Load-Bearing Tile	9.20.2.1.(1)
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CSA	A123.17-1963	Asphalt-Saturated Felted Glass-Fibre Mat for Use in Construction of Built-Up Roofs	9.26.2.1.(1)
CSA	CAN3-A123.51-M85	Asphalt Shingle Application on Roof Slopes 1:3 and Steeper	9.26.1.2.
CSA	CAN3-A123.52-M85	Asphalt Shingle Application on Roof Slopes 1:6 to less than 1:3	9.26.1.2.
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e CSA	CAN/CSA-B44-M90	Safety Code for Elevators, Escalators, Dumbwaiters, Moving Walks and Freight Platform Lifts	3.5.5.2. 3.7.3.5.(1) Table 4.1.10.A.
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e CSA	CAN/CSA-O80.15-M89	Preservative Treatment of Wood for Building Foundation Systems, Basements, and Crawl Spaces by Pressure Processes	4.2.3.2. 9.3.2.9.(1)
e CSA	CAN3-O86-M84	Engineering Design in Wood (Working Stress Design)	4.3.1.1.
e CSA	CAN/CSA-O86.1-M89	Engineering Design in Wood (Limit States Design)	4.3.1.1.
e CSA	O115-M1982	Hardwood and Decorative Plywood.	9.27.9.1. 9.30.2.2.(1)
e CSA	O118.1-M88	Western Red Cedar Shingles and Shakes	9.26.2.1.(1) 9.27.7.1.(1)
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e e	CSA	CAN3-O437.0-M85	Waferboard and Strandboard	9.23.14.2.(1) 9.23.14.4.(2) 9.23.15.1.(1) 9.23.15.2.(2) Table 9.23.16.A. 9.27.11.1. 9.29.9.1.(2) 9.30.2.2.(1)
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CSA	CAN3-S367-M81	Air Supported Structures	4.4.1.1.
CSA	CAN3-S406-M83	Construction of Preserved Wood Foundations	9.15.1.3.(3) 9.15.1.3.(5) 9.15.1.3.(6)
CSA	CAN/CSA-S413-87	Parking Structures	4.4.2.1.
e CSA	CAN/CSA-Z32.4-M86	Essential Electrical Systems for Hospitals	3.2.7.6.
*CSA	CAN/CSA-Z91-M90	Safety Code for Window Cleaning Operations	4.1.6.14.(2)
*CSA	Z240.5	Oil Requirements for Mobile Housing and Recreational Vehicles	6.2.1.4.(1)
*CSA	CAN3-Z271-M84	Safety Code for Suspended Powered Platforms	4.1.6.14.(2)
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*FINA	Handbook 1988-1992	Technical Specifications for Diving Facilities	7.3.3.13.(6)
*IAPMO	1988	Uniform Swimming Pool, Spa and Hot Tub Code	7.3.3.41.(2)
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e ULC	ULC-S102.3-M1982	Standard Method of Fire Test of Light Diffusers and Lenses	3.1.13.4.(1)
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ULC	CAN/ULC-S107-M87	Standard Methods of Fire Tests of Roof Coverings	3.1.15.1.
e ULC	C199P-M1988	Combustible Piping for Sprinkler Systems	3.2.5.14.(2)
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ULC	CAN/ULC-S126-M86	Standard Method of Test For Fire Spread under Roof-Deck Assemblies	3.1.14.1.(1) 3.1.14.2.(1)
e ULC	ULC-S505-1974	Standard for Fusible Links for Fire Protection Service	3.1.8.9.(2)
ULC	CAN/ULC-S524-M86	Standard for the Installation of Fire Alarm Systems	3.2.4.5.(1) 10.6.3.1.(1)
ULC	CAN/ULC-S526-1987	Visual Signal Appliances	3.2.4.20.(1)
e *ULC	ULC-S528-1978	Standard for Manually Actuated Signaling Boxes for Fire Alarm Systems	10.6.3.2.
e *ULC	CAN/ULC-S529-M1987	Standard for Smoke Detectors for Fire Alarm Systems	10.6.3.4.
e *ULC	ULC-S530-1978	Standard for Heat Actuated Fire Detectors for Fire Alarm Systems	10.6.3.3.
ULC	CAN/ULC-S531-M87	Standard for Smoke Alarms	3.2.4.21.(1) 9.10.18.1. 10.6.3.5.
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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 3.1.2.7., 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 Childrens' Custodial Homes. Convalescent homes and children's custodial homes are permitted to be classified as Group C *major occupancies* provided that occupants are ambulatory, mentally capable of making decisions to evacuate during an emergency and live as a single housekeeping unit in a *dwelling unit* with sleeping accommodation for not more than 10 persons.

* **3.1.2.6. Pre-School Facilities.** Facilities for pre-school programmes, involving not more than 3 h attendance per day, in which no child is less than 3.0 years old, shall be classified as Group A, Division 2 *occupancy*.

* **3.1.2.7. Drama Facilities.** A drama facility located in an elementary, junior or high school for the purpose of educating students of the facility, including public performances associated with the students' education programme, shall be classified as a Group A, Division 2 *major occupancy*.

3.1.3.1.

Table 3.1.2.A.
Forming Part of Sentence 3.1.2.1.(1)

Group	Division	Description of <i>Major Occupancies</i> ⁽¹⁾
A	1	<i>Assembly occupancies</i> intended for the production and viewing of the performing arts
A	2	<i>Assembly occupancies</i> not elsewhere classified in Group A
A	3	<i>Assembly occupancies</i> of the arena type
A	4	<i>Assembly occupancies</i> in which provision is made for the congregation or gathering of persons for the purpose of participating in or viewing open air activities
B	1	<i>Institutional occupancies</i> in which persons are under restraint or are incapable of self preservation because of security measures not under their control
B	2	<i>Institutional occupancies</i> in which persons because of mental or physical limitations require special care or treatment
C	—	<i>Residential occupancies</i>
D	—	<i>Business and personal services occupancies</i>
E	—	<i>Mercantile occupancies</i>
F	1	<i>High hazard industrial occupancies</i>
F	2	<i>Medium hazard industrial occupancies</i>
F	3	<i>Low hazard industrial occupancies</i>
Col. 1	2	3

Note to Table 3.1.2.A.:

⁽¹⁾ See Appendix A.

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*.

(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 rela-

tive 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.

Table 3.1.3.A.
Forming Part of Sentence 3.1.3.6.(1)

Major Occupancy	Minimum Fire-Resistance Rating of Fire Separation, ⁽¹⁾ h											
	Adjoining Major Occupancy											
	A-1	A-2	A-3	A-4	B-1	B-2	C	D	E	F-1	F-2	F-3
A-1	—	1	1	1	2	2	1	1	2	⁽²⁾	2	1
A-2	1	—	1	1	2	2	1	1	2	⁽²⁾	2	1
A-3	1	1	—	1	2	2	1	1	2	⁽²⁾	2	1
A-4	1	1	1	—	2	2	1	1	2	⁽²⁾	2	1
B-1	2	2	2	2	—	2	2	2	2	⁽²⁾	2	2
B-2	2	2	2	2	2	—	2	2	2	⁽²⁾	2	2
C	1	1	1	1	2	2	—	1	2 ⁽³⁾	⁽²⁾	2 ⁽⁴⁾	1
D	1	1	1	1	2	2	1	—	—	3	—	—
E	2	2	2	2	2	2	2 ⁽³⁾	—	—	3	—	—
F-1	⁽²⁾	⁽²⁾	⁽²⁾	⁽²⁾	⁽²⁾	⁽²⁾	⁽²⁾	3	3	—	2	2
F-2	2	2	2	2	2	2	2 ⁽⁴⁾	—	—	2	—	—
F-3	1	1	1	1	2	2	1	—	—	2	—	—
Column 1	2	3	4	5	6	7	8	9	10	11	12	13

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).

3.1.3.6.

(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.

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) 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 750°C provided the building does not contain a Group B or Group C major occupancy, or
- (b) 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 the Vertical Flame Test in Clause 4.11.1. of CSA C22.2 No. 0.3-M, "Test Methods for Electrical Wires and Cables," or
- (b) be located in
 - (i) totally enclosed noncombustible raceways,
 - (ii) masonry walls,
 - (iii) concrete slabs, or
 - (iv) a raceway conforming to Clause 3.1.5.15.(1)(a).

(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."

3.1.4.6.

(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 tongued 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 tongued and grooved flooring not less than 19 mm thick laid cross-wise or diagonally, or tongued and grooved phenolic-bonded plywood, strandboard or waferboard not less than 12.5 mm thick, and

Table 3.1.4.A.
Forming Part of Sentence 3.1.4.6.(3)

Supported Assembly	Structural Element	Solid Sawn (width × depth), mm × mm	Glued-Laminated (width × depth), mm × mm	Round (diam), mm
Roofs only	Columns	140 × 191	130 × 190	180
	Arches supported on the tops of walls or abutments	89 × 140	80 × 152	—
	Beams, girders and trusses	89 × 140	80 × 152	—
	Arches supported at or near the floor line	140 × 140	130 × 152	—
Floors, floors plus roofs	Columns	191 × 191	175 × 190	200
	Beams, girders, trusses and arches	140 × 241 or 191 × 191	130 × 228 or 175 × 190	—
Column 1	2	3	4	5

3.1.4.6.

- (b) 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

- (a) not less than 38 mm thick, splined or tongued and grooved, or
- (b) not less than 38 mm wide and 64 mm deep set on edge and laid so that no continuous line of end joints will occur except at the points of support.

(7) Wood columns shall be continuous or superimposed throughout all *storeys*.

(8) Superimposed wood columns shall be connected by

- (a) reinforced concrete or metal caps with brackets,
- (b) steel or iron caps with pintles and base plates, or
- (c) timber splice plates fastened to the columns by metal connectors housed within the contact faces.

(9) Where beams and girders 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. 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 construction shall be made from *noncombustible* materials.

3.1.5.2. Minor Combustible Components

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

- (a) paint,
- (b) 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)
- (c) mastics and caulking materials applied to provide flexible seals between the major components of exterior wall construction,
- (d) fire stop materials conforming to Sentence 3.1.9.1.(1) and Article 3.1.11.7.,
- (e) tubing for pneumatic controls provided it has an outside diameter not more than 10 mm,
- (f) adhesives, vapour barriers and sheathing papers,
- (g) electrical outlet and junction boxes, and
- (h) similar minor components.

3.1.5.3. Combustible Roofing Materials

(1) *Combustible* roof covering 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*.

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

- (a) the concrete deck is not less than 50 mm thick,
- (b) the height of the roof space above the deck is not more than 1 m,
- (c) the roof space is divided into compartments by fire stops in conformance with Article 3.1.11.5.,
- (d) openings through the concrete deck other than for *noncombustible* roof drains and plumbing piping are protected by masonry or concrete shafts 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,

- (e) the perimeter of the roof is protected by a *noncombustible* parapet extending from the concrete deck to not less than 150 mm above the adjacent sheathing, and
- (f) except as permitted in Clause (d), the roof space does not contain any *building* services.

(3) *Combustible* cant strips, roof curbs, nailing strips and similar components used in the installation of roofing are permitted on a *building* required to be of *noncombustible* construction.

(4) Wood nailer facings to parapets, not more than 600 mm high, are permitted on a *building* required to be of *noncombustible* construction, if the facings and any roof membranes covering the facings are protected by sheet metal.

3.1.5.4. Combustible Glazing and Skylights

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

- (a) 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
- (b) 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.)

(2) *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 permit-

ted to be not more than 150 where the aggregate area of the glazing is not more than 25 per cent of the wall area of the *storey* in which it is located, and

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

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

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

3.1.5.5. Combustible Cladding

(1) Except when *noncombustible* cladding is required by Subsection 3.2.3., an exterior non-load-bearing wall assembly that includes *combustible* cladding components is permitted to be used in a *building* required to be of *noncombustible* construction that is not more than 3 *storeys* in *building height*; if not *sprinklered*, and not more than 6 *storeys* in *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. (2) 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,

3.1.5.5.

- (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 wall assembly shall be exposed on its exterior face to a flame issuing from the opening that, on a *noncombustible* wall having a density of not less than 700 kg/m³ to a depth of 12 mm from the exposed surface, generates an average heat flux between

- (a) 42 and 48 kW/m² measured 0.5 m above the opening, and
- (b) 25 and 29 kW/m² 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 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/m² measured 3.5 m above the opening. (See Appendix A.)

(7) A wall assembly permitted by Sentence (1) that includes *combustible* cladding of *fire-retardant treated wood* shall be tested for fire exposure after the cladding has been subjected to an accelerated weathering test as specified in ASTM D2898, "Test Method for Accelerated Weathering of Fire-Retardant-Treated Wood for Fire Testing."

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

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

3.1.5.7. Combustible Millwork. *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) and (3).

(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,
- (e) any thermal barrier that meets the requirements of classification A when tested in conformance with CAN4-S124-M, "Standard Method of Test for the Evaluation of

Protective Coverings for Foamed Plastic" (see Appendix A), or

- (f) any thermal barrier that, when tested in conformance with CAN/ULC-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). (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 and 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).

(4) *Combustible* insulation, including *foamed plastics*, is permitted to be used in a *building* required to be of *noncombustible construction*

- (a) when installed above concrete roof decks, outside of *foundation* walls below ground level and beneath concrete slabs-on-ground, and
- (b) when installed above metal roof decks if the assembly complies with the requirement of Article 3.1.14.2.

(5) 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 CAN/ULC-S101-M, "Standard Methods of Fire Endurance Tests of Building Construction and Materials,"

3.1.5.11.

- (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 en-

closed 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 in a *building* required to be of *noncombustible construction* provided

- (a) the wires and cables exhibit a vertical char of not more than 1.5 m when tested in conformance with the Vertical Flame Test - Cables in Cabletrough in Clause 4.11.4. of CSA C22.2 No. 0.3-M, "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) in Appendix A),
 - (ii) masonry walls,
 - (iii) concrete slabs,
 - (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*, or
 - (v) a raceway conforming to Clauses 3.1.5.15.(1)(a) and (b).

(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 S109-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 CAN/ULC-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

3.1.7.3.

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 CAN/ULC-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 CAN/ULC-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 3.1.8.A.
Forming Part of Sentence 3.1.8.4.(2)

Fire-Resistance Rating of Fire Separation	Required Fire-Protection Rating of Closure
45 min	45 min
1 h	45 min
1.5 h	1 h
2 h	1.5 h
3 h	2 h
4 h	3 h
Column 1	2

3.1.8.5. Installation of Closures

(1) Except where fire dampers, window assemblies and glass block are used as closures, closures of the same fire-protection rating installed on opposite sides of the same opening are deemed to have a fire-protection rating equal to the sum of the fire-protection ratings of the closures.

(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 non-combustible 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 noncombustible duct having a melting point above 760°C that pierces a vertical fire separa-

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tion 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* provided the duct is tightly sealed at the penetration on all sides and extends for at least 1 m on both sides of the *fire separation* without any openings.

(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.

(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.,

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Table 3.1.8.B.
Forming Part of Articles 3.1.8.15. and 3.1.8.16.

Location	Minimum Required Fire-Protection Rating of Door	Maximum Temperature Rise on Unexposed Side of Door, °C	Maximum Area of Glass in Door, cm ²	Maximum Aggregate Area of Wired Glass Panels and Glass Block not in Door, cm ²
Between an <i>exit</i> enclosure and the remainder of the <i>floor area</i> in <i>buildings</i> not more than 3 <i>storeys</i> in <i>building height</i>	All ratings	No limit	8 000	8 000
Between an <i>exit</i> enclosure and the remainder of the <i>floor area</i> (except as permitted above) or between a dead-end corridor and an adjacent <i>occupancy</i> where the corridor provides the only <i>access to exit</i> and is required to have a <i>fire-resistance rating</i>	Less than 45 min	No limit	No limit	No limit
	45 min	250 after 30 min	645	645
	1.5 h	250 after 1 h	645	645
	2 h	250 after 1 h	645	645
In a <i>firewall</i>	1.5 h	250 after 30 min	645	0
	3 h	250 after 1 h	0	0
Column 1	2	3	4	5

- (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-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., where the concrete provides not less than 50 mm of cover between the raceway and the bottom of the slab.

(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

3.1.9.4.

the fire test method in CAN4-S115-M, "Standard Method of Fire Tests of Fire-stop 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) Except as permitted by Sentence (7), *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.

* (7) Where *noncombustible* vertical drain, waste or vent piping is located within a vertical *fire separation* or within a *vertical service space*, *combustible* piping may be used to make connections to plumbing fixtures, on both sides of the vertical *fire separation* or *vertical service space*, but no *combustible* piping shall pass through the wall of or be located within the *fire separation* or the *vertical service space*.

* (8) A part of a *plumbing system* that is located within a *basement* used as a *storage garage* may contain *combustible* drain, waste or vent piping provided

- (a) the *combustible* piping is within the *basement* and is restricted to a single *fire compartment*, and
- (b) the *basement* is not more than one *storey* in height.

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
 - (i) fire-resistance rating of not less than 1 h if the firewall is required to have a fire-resistance rating of not less than 2 h, or
 - (ii) fire-resistance rating of not less than 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) A firewall may terminate at the underside of a steel roof provided

- (a) the roofing material is metal on both sides of the firewall,
- (b) connections between the roof structure and the firewall are designed in such a way that collapse of the roof during a fire will not cause the collapse of the firewall or the roof structure on the other side of the firewall,
- (c) all gaps or concealed spaces between the top of the firewall and the roof deck are sealed with noncombustible fire stopping material, and
- (d) the depth of gaps or concealed spaces between the firewall and the roof deck is not more than 50 mm.

(4) In a building of noncombustible construction, a firewall may be offset at any intermediate floor construction provided

- (a) the fire separation for the complete firewall assembly is continuous,
- (b) the offset floor construction and all supporting elements have a fire-resistance rating not less than that required for the firewall, and
- (c) the materials conform to Sentence 3.1.10.2.(3).

3.1.10.4. Parapets

(1) Except as provided in Sentences (2), 3.1.10.3.(2) and 3.1.10.3.(3), 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.)

3.1.11.1.

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 un-sprinklered 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 CAN/ULC-S101-M, "Standard Methods of Fire Endurance Tests of Building Construction and Materials."

(2) Gypsum board not less than 12.7 mm thick and sheet steel not less than 0.38 mm thick need not be tested in conformance with Sentence (1) provided all joints have continuous support.

(3) In *buildings* required to be of *noncombustible construction*, wood nailing elements described in Article 3.1.5.6. need not be tested in conformance with Sentence (1).

(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 developed 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 horizontal position with only its top surface exposed to air,
- (b) cannot be tested in conformance with Sentence (1) without the use of supporting material that is not representative of the intended installation, or
- (c) is thermoplastic.

(3) A material, assembly 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,

3.1.13.1.

- (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.

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

Occupancy, Location or Element	Maximum <i>Flame-Spread Rating</i> for Walls and Ceilings	
	<i>Sprinklered</i>	<i>Unsprinklered</i>
Group A, Division 1 <i>occupancies</i> , including doors, skylights, glazing and light diffusers and lenses	150	75
Group B <i>occupancies</i>	150	75
<i>Exits</i> ⁽¹⁾	25	25
Lobbies described in Sentence 3.4.4.2.(2)	25	25
Covered vehicular passageways, except for roof assemblies of <i>heavy timber construction</i> in such passageways	25	25
<i>Vertical service spaces</i>	25	25
Column 1	2	3

Note to Table 3.1.13.A.:

⁽¹⁾ See Articles 3.1.13.8. and 3.1.13.10.

(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.

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

- (a) 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,"
- (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

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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* 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

Table 3.1.13.B.
Forming Part of Sentence 3.1.13.7.(1)

Location or Element	Maximum <i>Flame-Spread Rating</i>			Maximum Smoke Developed Classification		
	Wall Surface	Ceiling Surface ⁽¹⁾	Floor Surface	Wall Surface	Ceiling Surface ⁽¹⁾	Floor Surface
<i>Exit</i> stairways, vestibules to <i>exit</i> stairs and lobbies described in Sentence 3.4.4.2.(2)	25	25	25	50	50	50
Corridors not within <i>suites</i>	—	—	300	100	50	500
Elevator cars and vestibules	25	25	300	100	100	300
<i>Service spaces</i> and <i>service rooms</i>	25	25	25	50	50	50
Other locations and elements	—	—	No limit	300	50	No limit
Column 1	2	3	4	5	6	7

Notes to Table 3.1.13.B.:

⁽¹⁾ See Sentence 3.1.13.4.(1) for lighting elements.

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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.

3.1.13.10. Exterior Exit Passageway.

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 3.1.5.11.(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.

Type of Use of <i>Floor Area</i> or Part Thereof	Area per Person, m ²
Assembly uses	
space with fixed seats	See Clause (1)(a)
space with nonfixed seats	0.75
<i>stages</i> for theatrical performances	0.75
space with nonfixed seats and tables	0.95
standing space	0.40
stadia and grandstands	0.60
bowling alleys, pool and billiard rooms	9.30
classrooms	1.85
school shops and vocational rooms	9.30
reading or writing rooms or lounges	1.85
dining, beverage and cafeteria space	1.20
laboratories in schools	4.60
Institutional uses	
treatment and sleeping room areas	10.00
detention quarters	11.60
Residential uses	
<i>dwelling units</i>	See Clause (1)(b)
dormitories	4.60
Business and personal services uses	
personal service shops	4.60
offices	9.30
Mercantile uses	
<i>basements</i> and <i>first storeys</i>	3.70
second <i>storeys</i> having a principal entrance from a pedestrian thoroughfare or a parking area	3.70
other <i>storeys</i>	5.60
Industrial uses	
manufacturing or process rooms	4.60
<i>storage garages</i>	46.00
storage spaces (warehouse)	28.00
aircraft hangars	46.00
Other uses	
cleaning and repair goods	4.60
kitchens	9.30
storage	46.00
<i>public corridors</i> intended for <i>occupancies</i> in addition to pedestrian travel	3.70 ⁽¹⁾
Column 1	2

Note to Table 3.1.16.A.:

⁽¹⁾ See A-3.3.1.4.(1) in Appendix A.

3.2.1.1.

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* and 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).

3.2.1.6. Automatic Fire Suppression Systems

- * (1) Except for *buildings* constructed under Articles 3.2.2.59. and 3.2.2.60. and except for curling rinks or arenas used exclusively for sports activities, a place of worship, a community hall, a gymnasium or a space containing a swimming pool, a *building* shall be protected with an automatic fire suppression system if it has a *fire compartment* more than 2 000 m² in area.
- * (2) Where a *building* is divided into more than one *fire compartment* with respect to Sentence (1), the compartments shall be divided by *fire separations* having a *fire-resistance rating* of not less than 1 h.
- * (3) A *building* containing an *institutional occupancy*, except for day care centres or a children's custodial home, which is more than 600 m² in *building area* or which is more than two *storeys* in *building height* shall be *sprinklered*.
- * (4) In addition to the requirement for *sprinklers* under Subsection 3.2.2., all *floor areas* or parts of *floor areas* of *residential occupancy* shall be *sprinklered*.

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

- * (1) 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.)

(2) Underground service tunnels shall be considered unusual structures under Sentence (1). *

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, marquees 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

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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*.

(4) 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*.

(5) 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) *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.

3.2.2.12. Sprinklers in Lieu of Roof and Mezzanine Floor 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),
- (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), and
- (d) the roof does not support an *occupancy* other than for servicing or maintenance.

(See Appendix A.)

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

- * (2) The requirements in Articles 3.2.2.16. to 3.2.2.62. for *mezzanines* to have a *fire-resistance rating* are permitted to be waived where the *building* is *sprinklered* and the *mezzanine* is 240 m² or less in area.

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 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 gymnasias, 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.

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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 *non-combustible 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 per cent of the area of the *building* as 2 *storeys* 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 performance,

- (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 *non-combustible 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

(See also Article 3.2.1.6.)

(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 be *sprinklered* if it exceeds 3 *storeys* in *building height* (see Article 3.2.2.12.), 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

3.2.2.21.

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 non-combustible 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

(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 non-combustible construction used either singly or in combination.

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

(See also Articles 3.2.1.6. and 3.2.2.14.)

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

Table 3.2.2.A.

Forming Part of Sentence 3.2.2.21.(1)

No. of Storeys	Unsprinklered Maximum Area, m ²		
	Facing 1 Street	Facing 2 Streets	Facing 3 Streets
1	1 600	2 000	2 400
2	800	1 000	1 200
Column 1	2	3	4

(2) Except as provided in Article 3.2.2.14., 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 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

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- (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

(See also Articles 3.2.1.6. and 3.2.2.14.)

(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) or Article 3.2.2.14., the building shall be of noncombustible construction and be sprinklered if it exceeds 3 storeys in building height (see Article 3.2.2.12.), 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

(See also Articles 3.2.1.6. and 3.2.2.14.)

(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) Except as provided in Article 3.2.2.14., the building shall be of noncombustible construction and be sprinklered if it exceeds 3 storeys in building height (see Article 3.2.2.12.), 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 non-combustible construction used either singly or in combination. (See also Article 3.2.2.25.)

3.2.2.25. Assembly Buildings, Division 3, 1 Storey

(See also Articles 3.2.1.6. and 3.2.2.14.)

(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)** Except as provided in Article 3.2.2.14., 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 1 800 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
 - (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
(See also Articles 3.2.1.6. and 3.2.2.14.)

- (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).

- * **(2)** Except as provided in Clauses (c), (d) and Article 3.2.2.14. 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,

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

No. of Storeys.	Unsprinklered Maximum Area, m ²		
	Facing 1 Street	Facing 2 Streets	Facing 3 Streets
1	4 000	5 000	6 000
2	2 000	2 500	3 000
Column 1	2	3	4

- (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 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) Except as provided in Article 3.2.2.14. the building shall be of *noncombustible construction* and be *sprinklered* if it exceeds 3 storeys in *building height* (see Article 3.2.2.12.), 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).

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(2) The building shall be of *noncombustible construction*, except that

- (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 (See also Article 3.2.1.6.)

* (1) A building classified as Group B, Division 1 shall conform to Sentence (2) and (3).

(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) The building shall be *sprinklered* throughout if it exceeds 600 m² in *building area* or if it exceeds 2 storeys in *building height*.

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, and
- (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)

No. of Storeys	Unsprinklered Maximum Area, m ²	Sprinklered Maximum Area, m ²
1	600	2 400
2	600	1 600
Column 1	2	3

(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

(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.

3.2.2.34.

Table 3.2.2.D.
Forming Part of Sentence 3.2.2.32.(1)

No. of Storeys	Sprinklered Maximum Area, m ²
1	unlimited
2	12 000
3	8 000
Column 1	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 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 (See also Article 3.2.1.6.)

(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 be sprinklered if it is greater than 2 storeys in building height or greater than 600 m² in building area (see Article 3.2.2.12.), 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) is sprinklered, and
- (c) has a building area not more than the value in Table 3.2.2.E.

Table 3.2.2.E.
Forming Part of Sentence 3.2.2.34.(1)

No. of Storeys	Sprinklered Maximum Area, m ²		
	Facing 1 Street	Facing 2 Streets	Facing 3 Streets
1	3 600	4 500	5 400
2	1 800	2 250	2 700
3	1 200	1 500	1 800
Column 1	2	3	4

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

(3) 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 assem-

3.2.2.34.

blies, 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*.

(4) 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.

* 3.2.2.35. Residential Buildings, up to 3 Storeys, Increased Area

(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) is *sprinklered*, and
- (c) has a *building area* not more than the value in Table 3.2.2.F.

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

No. of Storeys	Sprinklered Maximum Area, m ²		
	Facing 1 Street	Facing 2 Streets	Facing 3 Streets
1	4 800	6 000	7 200
2	2 400	3 000	3 600
3	1 600	2 000	2 400
Column 1	2	3	4

(2) The *building* shall be of *combustible* or *non-combustible 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 (see Article 3.2.2.12.), 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*.

(4) 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*.

3.2.2.36. Residential Buildings, 4 Storeys

(1) 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) has a *building area* not more than the value in Table 3.2.2.G.

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

No. of Storeys	Sprinklered Maximum Area, m ²		
	Facing 1 Street	Facing 2 Streets	Facing 3 Streets
4	1 200	1 500	1 800
Column 1	2	3	4

(2) The *building* shall be of *combustible* or *non-combustible 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 (see Article 3.2.2.12.), 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*.

(4) 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*.

3.2.2.37. Residential Buildings, up to 6 Storeys

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

- (a) is not more than 6 *storeys* in *building height*,
- (b) is *sprinklered*, and
- (c) has a *building area* not more than the values in Table 3.2.2.H.

(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.), 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 assem-

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

No. of Storeys	Sprinklered Maximum Area, m ²		
	Facing 1 Street	Facing 2 Streets	Facing 3 Streets
1	unlimited	unlimited	unlimited
2	12 000	unlimited	unlimited
3	8 000	10 000	12 000
4	6 000	7 500	9 000
5	4 800	6 000	7 200
6	4 000	5 000	6 000
Column 1	2	3	4

blies 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*,
- (b) is not limited in *building area*, and
- (c) is *sprinklered*.

(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 (see Article 3.2.2.12.), and
- (d) all *loadbearing* walls, columns and arches shall have a *fire-resistance rating* not less than that required for the supported assembly.

3.2.2.38.

(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)

No. of Storeys	Unsprinklered Maximum Area, m ²		
	Facing 1 Street	Facing 2 Streets	Facing 3 Streets
1	1 000	1 250	1 500
2	800	1 000	1 200
Column 1	2	3	4

(2) The building shall be of combustible or non-combustible 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.

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

(See also Article 3.2.1.6.)

(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)

No. of Storeys	Unsprinklered Maximum Area, m ²		
	Facing 1 Street	Facing 2 Streets	Facing 3 Streets
1	4 800	6 000	7 200
2	2 400	3 000	3 600
3	1 600	2 000	2 400
Column 1	2	3	4

(2) The building shall be of combustible or non-combustible 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*.

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

(See also Article 3.2.1.6.)

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

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

No. of Storeys	Unsprinklered Maximum Area, m ²		
	Facing 1 Street	Facing 2 Streets	Facing 3 Streets
1	unlimited	unlimited	unlimited
2	7 200	unlimited	unlimited
3	4 800	6 000	7 200
Sprinklered Maximum Area, m ²			
1	unlimited	unlimited	unlimited
2	14 400	unlimited	unlimited
3	9 600	12 000	14 400
4	7 200	9 000	10 800
5	5 600	7 200	8 640
6	4 800	6 000	7 200
Column 1	2	3	4

(2) The *building* shall be of *noncombustible construction* and be *sprinklered* if it exceeds 3 storeys in *building height* (see Article 3.2.2.12.), 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, 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

(See also Article 3.2.1.6.)

(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 be *sprinklered* if it exceeds 3 storeys in *building height* (see Article 3.2.2.12.), 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*,

3.2.2.43.

- (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)

No. of Storeys	Unsprinklered Maximum Area, m ²		
	Facing 1 Street	Facing 2 Streets	Facing 3 Streets
1	1 000	1 250	1 500
2	600	750	900
Column 1	2	3	4

(2) The *building* shall be of *combustible* or *non-combustible 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.

(2) The *building* shall be of *combustible* or *non-combustible 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,

Table 3.2.2.M
Forming Part of Sentence 3.2.2.44.(1)

No. of Storeys	Unsprinklered Maximum Area, m ²		
	Facing 1 Street	Facing 2 Streets	Facing 3 Streets
1	1 500	1 500	1 500
2	1 200	1 500	1 500
3	8 00	1 000	1 200
Sprinklered Maximum Area, m ²			
1	4 800	6 000	7 200
2	2 400	3 000	3 600
3	1 600	2 000	2 400
Column 1	2	3	4

- (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 3.2.2.N
Forming Part of Sentence 3.2.2.45.(1)

No. of Storeys	Sprinklered Maximum Area, m ²		
	Facing 1 Street	Facing 2 Streets	Facing 3 Streets
1	unlimited	unlimited	unlimited
2	7 500	unlimited	unlimited
3	5 000	6 250	7 500
4	3 750	4 688	5 625
5	3 000	3 750	4 500
6	2 500	3 125	3 750
Column 1	2	3	4

- (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.

3.2.2.46. Mercantile Buildings, Any Height, Any Area

- (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

(See also Article 3.2.1.6.)

- (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) has a building area not more than the value in Table 3.2.2.O., and
 - (c) is equipped with an automatic fire suppression system.

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

No. of Storeys	Maximum Area, m ²		
	Facing 1 Street	Facing 2 Streets	Facing 3 Streets
1	1 600	2 000	2 400
2	800	1 000	1 200
Column 1	2	3	4

3.2.2.47.

(2) The building shall be of *combustible* or *non-combustible 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

(See also Article 3.2.1.6.)

* (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 equipped with an automatic fire suppression system, 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 *non-combustible 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.

Table 3.2.2.P

Forming Part of Sentence 3.2.2.48.(1)

No. of Storeys	Maximum Area, m ²		
	Facing 1 Street	Facing 2 Streets	Facing 3 Streets
1	2 400	3 000	3 600
2	1 200	1 500	1 800
3	800	1 000	1 200
Column 1	2	3	4

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

(See also Article 3.2.1.6.)

(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) has a *building area* not more than the value in Table 3.2.2.Q., and
- (c) is equipped with an automatic fire suppression system.

Table 3.2.2.Q.

Forming Part of Sentence 3.2.2.49.(1)

No. of Storeys	Maximum Area, m ²		
	Facing 1 Street	Facing 2 Streets	Facing 3 Streets
1	4 800	6 000	7 200
2	2 400	3 000	3 600
3	1 600	2 000	2 400
4	1 200	1 500	1 800
Column 1	2	3	4

(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 (See Article 3.2.2.12.), and
- (d) all *loadbearing walls*, columns and arches shall have a *fire-resistance rating* not less than that required for the supported assembly.

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

(See also Article 3.2.1.6.)

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

3.2.2.52.

- (a) is not more than 4 storeys in building height,
- (b) has a building area not more than the value in Table 3.2.2.R., and
- (c) is equipped with an automatic fire suppression system.

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

No. of Storeys	Maximum Area, m ²		
	Facing 1 Street	Facing 2 Streets	Facing 3 Streets
1	6 000	7 500	9 000
2	3 000	3 750	4 500
3	2 000	2 500	3 000
4	1 500	1 875	2 250
Column 1	2	3	4

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

3.2.2.51. 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.

(2) The building shall be of combustible or non-combustible construction used either singly or in combination, and

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

No. of Storeys	Unsprinklered Maximum Area, m ²		
	Facing 1 Street	Facing 2 Streets	Facing 3 Streets
1	1 000	1 250	1 500
2	600	750	900
Sprinklered Maximum Area, m ²			
1	3 000	3 750	4 500
2	1 200	1 500	1 800
Column 1	2	3	4

- (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.

3.2.2.52. Industrial Buildings, Division 2, up to 4 Storeys (See also Article 3.2.1.6.)

(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, and
- (b) has a building area not more than the value in Table 3.2.2.T.

(2) The building shall be of combustible or non-combustible construction used either singly or in combination and be sprinklered if it exceeds 3 storeys in building height, 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,

3.2.2.52.

Table 3.2.2.T.
Forming part of Sentence 3.2.2.52.(1)

No. of Storeys	Unsprinklered Maximum Area, m ²		
	Facing 1 Street	Facing 2 Streets	Facing 3 Streets
1	3 200	4 000	4 800
2	1 600	2 000	2 400
3	1 070	1 340	1 600
Sprinklered Maximum Area, m ²			
1	6 400	8 000	9 600
2	3 200	4 000	4 800
3	2 140	2 680	3 200
4	1 600	2 000	2 400
Column 1	2	3	4

- (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 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

(See also Article 3.2.1.6.)

- (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*, and
 - (b) has a *building area* not more than the value in Table 3.2.2.U.

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

No. of Storeys	Unsprinklered Maximum Area, m ²		
	Facing 1 Street	Facing 2 Streets	Facing 3 Streets
1	6 000	7 500	9 000
2	3 000	3 750	4 500
3	2 000	2 500	3 000
Sprinklered Maximum Area, m ²			
1	12 000	15 000	18 000
2	9 000	7 500	9 000
3	4 000	5 000	6 000
4	2 000	3 750	4 500
Column 1	2	3	4

- (2) The *building* shall be of *noncombustible construction* and be *sprinklered* if it exceeds 3 storeys in *building height* (see Article 3.2.2.12.), 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.
- (See also Article 3.2.2.52.)

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

(See also Article 3.2.1.6.)

- * **(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, and
 - (b) has a building area not more than the value in Table 3.2.2.V.

Table 3.2.2.V.

Forming Part of Sentence 3.2.2.54.(1)

No. of Storeys	Unsprinklered Maximum Area, m ²		
	Facing 1 Street	Facing 2 Streets	Facing 3 Streets
1	9 000	11 250	13 500
2	4 500	5 625	6 750
3	3 000	3 750	4 500
Sprinklered Maximum Area, m ²			
1	18 000	22 500	27 000
2	9 000	11 250	13 500
3	6 000	7 500	9 000
4	4 500	5 625	6 750
5	3 600	4 500	5 400
6	3 000	3 750	4 500
Column 1	2	3	4

- * **(2)** The building shall be of noncombustible construction and be sprinklered if it exceeds 3 storeys in building height (see Article 3.2.2.12.), 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

(See also Article 3.2.1.6.)

- (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.

3.2.2.56.

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

No. of Storeys	Unsprinklered Maximum Area, m ²		
	Facing 1 Street	Facing 2 Streets	Facing 3 Streets
1	1 600	2 000	2 400
2	800	1 000	1 200
Sprinklered Maximum Area, m ²			
1	4 800	6 000	7 200
2	1 600	2 000	2 400
Column 1	2	3	4

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

(See also Article 3.2.1.6.)

- * **(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, and
 - (b) has a building area not more than the value in Table 3.2.2.X.

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

No. of Storeys	Unsprinklered Maximum Area, m ²		
	Facing 1 Street	Facing 2 Streets	Facing 3 Streets
1	4 800	6 000	7 200
2	2 400	3 000	3 600
3	1 600	2 000	2 400
Sprinklered Maximum Area, m ²			
1	9 600	12 000	14 400
2	4 800	6 000	7 200
3	3 200	4 000	4 800
4	2 400	3 000	3 600
Column 1	2	3	4

(2) The building shall be of combustible or non-combustible construction used either singly or in combination and be sprinklered if it exceeds 3 storeys in building height, 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

(See also Article 3.2.1.6.)

- (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).

3.2.2.61.

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

No. of Storeys	Unsprinklered Maximum Area, m ²		
	Facing 1 Street	Facing 2 Streets	Facing 3 Streets
1	5 600	7 000	8 400
Column 1	2	3	4

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

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

(See also Article 3.2.1.6.)

- (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, and
 - (b) has a building area not more than the value in Table 3.2.2.Z.

Table 3.2.2.Z.
Forming Part of Sentence 3.2.2.61.(1)

No. of Storeys	Unsprinklered Maximum Area, m ²		
	Facing 1 Street	Facing 2 Streets	Facing 3 Streets
1	unlimited	unlimited	unlimited
2	7 200	9 000	10 800
3	4 800	6 000	7 200
Sprinklered Maximum Area, m ²			
1	unlimited	unlimited	unlimited
2	14 400	18 000	21 600
3	9 600	12 000	14 400
4	7 200	9 000	10 800
5	5 760	7 200	8 640
6	4 800	6 000	7 200
Column 1	2	3	4

- (2) The building shall be of noncombustible construction and be sprinklered if it exceeds 3 storeys in building height (see Article 3.2.2.12.), 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,

3.2.2.61.

- (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

(See also Article 3.2.1.6.)

(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 be *sprinklered* if it exceeds 3 storeys in *building height* (see Article 3.2.2.12.), 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.

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

3.2.3.A.

Table 3.2.3.A.
Forming Part of Subsection 3.2.3.

Exposing Building Face		Area of Unprotected Opening for Groups A, B, C, D and F, Division 3 Occupancies, Per Cent																										
Max. Area, m ²	Ratio (L/H or H/L) ⁽¹⁾	Limiting Distance, m																										
		0	1.2	1.5	2.0	2.5	3	4	5	6	7	8	9	10	11	12	13	14	16	18	20	25	30	35	40	45	50	
10	Less than 3 : 1	0	8	10	18	29	46	91	100																			
	3 : 1 to 10 : 1	0	8	12	21	33	50	96	100																			
	Over 10 : 1	0	11	18	32	48	68	100																				
15	Less than 3 : 1	0	7	9	14	22	33	63	100																			
	3 : 1 to 10 : 1	0	8	10	17	25	37	67	100																			
	Over 10 : 1	0	10	15	26	39	53	87	100																			
20	Less than 3 : 1	0	7	9	12	18	26	49	81	100																		
	3 : 1 to 10 : 1	0	8	10	15	21	30	53	85	100																		
	Over 10 : 1	0	9	14	23	33	45	72	100																			
25	Less than 3 : 1	0	7	8	11	16	23	41	66	98	100																	
	3 : 1 to 10 : 1	0	8	9	13	19	26	45	70	100																		
	Over 10 : 1	0	9	13	21	30	39	62	90	100																		
30	Less than 3 : 1	0	7	8	11	15	20	35	56	83	100																	
	3 : 1 to 10 : 1	0	7	9	12	17	23	39	61	88	100																	
	Over 10 : 1	0	8	12	19	27	36	56	79	100																		
40	Less than 3 : 1	0	7	8	10	13	17	28	44	64	89	100																
	3 : 1 to 10 : 1	0	7	8	11	15	20	32	48	69	93	100																
	Over 10 : 1	0	8	11	17	24	31	47	66	88	100																	
50	Less than 3 : 1	0	7	8	9	12	15	24	37	53	72	96	100															
	3 : 1 to 10 : 1	0	7	8	10	14	18	28	41	57	77	100																
	Over 10 : 1	0	8	10	15	21	28	41	57	76	97	100																
60	Less than 3 : 1	0	7	8	9	11	14	21	32	45	62	81	100															
	3 : 1 to 10 : 1	0	7	8	10	13	16	25	36	49	66	85	100															
	Over 10 : 1	0	8	10	14	20	25	38	51	67	85	100																
80	Less than 3 : 1	0	7	7	8	10	12	18	26	36	48	62	79	98	100													
	3 : 1 to 10 : 1	0	7	8	9	11	14	21	29	40	52	67	84	100														
	Over 10 : 1	0	8	9	13	17	22	32	44	56	70	86	100															
100	Less than 3 : 1	0	7	7	8	9	11	16	22	30	40	51	65	80	97	100												
	3 : 1 to 10 : 1	0	7	8	9	11	13	18	25	34	44	56	69	84	100													
	Over 10 : 1	0	7	9	12	16	20	29	39	49	61	74	89	100														
150	Less than 3 : 1	0	7	7	8	9	10	13	17	22	29	37	46	56	67	79	93	100										
	3 : 1 to 10 : 1	0	7	7	8	10	11	15	20	26	33	41	50	60	71	84	97	100										
	Over 10 : 1	0	7	8	11	13	17	24	31	39	48	57	68	79	91	100												
250	Less than 3 : 1	0	7	7	7	8	9	10	13	16	20	25	30	36	43	51	59	68	87	100								
	3 : 1 to 10 : 1	0	7	7	8	9	10	12	15	19	24	28	34	40	47	55	63	72	92	100								
	Over 10 : 1	0	7	8	9	11	14	19	24	30	36	43	50	57	65	73	82	92	100									
350	Less than 3 : 1	0	7	7	7	8	8	9	11	14	16	20	24	28	33	38	44	50	64	81	99	100						
	3 : 1 to 10 : 1	0	7	7	8	8	9	11	13	16	19	23	27	32	37	42	48	55	69	85	100							
	Over 10 : 1	0	7	8	9	10	12	16	21	25	30	36	41	47	53	59	66	73	88	100								
500	Less than 3 : 1	0	7	7	7	7	8	9	10	12	14	16	19	22	25	29	33	37	47	59	71	100						
	3 : 1 to 10 : 1	0	7	7	7	8	8	10	12	14	16	19	22	25	29	33	37	41	52	63	76	100						
	Over 10 : 1	0	7	7	8	9	11	14	18	22	25	30	34	38	43	48	53	58	70	82	96	100						
1000	Less than 3 : 1	0	7	7	7	7	7	8	9	9	10	12	13	14	16	18	20	22	27	33	39	58	82	100				
	3 : 1 to 10 : 1	0	7	7	7	7	8	9	10	11	12	14	15	17	19	21	23	26	31	37	43	63	86	100				
	Over 10 : 1	0	7	7	8	8	9	11	13	16	19	21	24	27	30	33	36	39	46	53	60	82	100					
2000	Less than 3 : 1	0	7	7	7	7	7	7	8	8	9	9	10	11	12	13	14	15	17	20	23	33	44	58	74	93	100	
	3 : 1 to 10 : 1	0	7	7	7	7	7	8	8	9	10	11	12	13	14	15	16	17	19	23	27	37	49	63	79	97	100	
	Over 10 : 1	0	7	7	7	8	8	9	11	12	14	16	18	19	21	23	25	27	32	36	40	53	66	82	99	100		

Note to Table 3.2.3.A.
⁽¹⁾ L = Length of Exposing Building Face
H = Height of Exposing Building Face
(Apply whichever ratio is greater)

3.2.3.B.

Table 3.2.3.B.
Forming Part of Subsection 3.2.3.

Exposing Building Face		Area of Unprotected Opening for Groups E and F, Division 1 and 2 Occupancies, Per Cent																														
Max. Area, m ²	Ratio (L/H or H/L) ⁽¹⁾	Limiting Distance, m																														
		0	1.2	1.5	2.0	2.5	3	4	5	6	7	8	9	10	11	12	13	14	16	18	20	25	30	35	40	45	50	55	60	65	70	
10	Less than 3 : 1	0	4	5	9	15	23	46	77	100																						
	3 : 1 to 10 : 1	0	4	6	10	17	25	48	79	100																						
	Over 10 : 1	0	5	9	16	24	34	58	91	100																						
15	Less than 3 : 1	0	4	5	7	11	16	32	53	79	100																					
	3 : 1 to 10 : 1	0	4	5	8	13	18	34	55	82	100																					
	Over 10 : 1	0	5	8	13	19	26	43	66	93	100																					
20	Less than 3 : 1	0	4	4	6	9	13	25	40	61	85	100																				
	3 : 1 to 10 : 1	0	4	5	7	11	15	27	43	63	87	100																				
	Over 10 : 1	0	5	7	11	17	22	36	53	74	99	100																				
25	Less than 3 : 1	0	4	4	6	8	11	20	33	49	69	92	100																			
	3 : 1 to 10 : 1	0	4	5	7	9	13	22	35	51	71	94	100																			
	Over 10 : 1	0	4	6	10	15	20	31	45	62	82	100																				
30	Less than 3 : 1	0	4	4	5	7	10	18	28	42	58	77	100																			
	3 : 1 to 10 : 1	0	4	4	6	9	12	20	30	44	60	80	100																			
	Over 10 : 1	0	4	6	10	14	18	28	40	54	71	91	100																			
40	Less than 3 : 1	0	4	4	5	6	8	14	22	32	44	59	76	94	100																	
	3 : 1 to 10 : 1	0	4	4	6	8	10	16	24	34	47	61	78	97	100																	
	Over 10 : 1	0	4	5	8	12	15	23	33	44	57	72	89	100																		
50	Less than 3 : 1	0	4	4	5	6	7	12	18	26	36	48	61	76	93	100																
	3 : 1 to 10 : 1	0	4	4	5	7	9	14	20	29	38	50	63	79	95	100																
	Over 10 : 1	0	4	5	8	11	14	21	29	38	48	61	74	90	100																	
60	Less than 3 : 1	0	4	4	4	5	7	11	16	23	31	40	52	64	78	94	100															
	3 : 1 to 10 : 1	0	4	4	5	6	8	12	18	25	33	43	54	66	81	96	100															
	Over 10 : 1	0	4	5	7	10	13	19	26	34	43	53	64	77	92	100																
80	Less than 3 : 1	0	4	4	4	5	6	9	13	18	24	31	40	49	60	71	84	98	100													
	3 : 1 to 10 : 1	0	4	4	5	6	7	10	15	20	26	33	42	51	62	74	86	100														
	Over 10 : 1	0	4	5	6	9	11	16	22	28	35	43	52	62	73	85	98	100														
100	Less than 3 : 1	0	4	4	4	5	5	8	11	15	20	26	32	40	48	58	68	79	100													
	3 : 1 to 10 : 1	0	4	4	4	5	6	9	13	17	22	28	35	42	51	60	70	81	100													
	Over 10 : 1	0	4	4	6	8	10	14	19	25	31	37	44	52	61	71	81	92	100													
150	Less than 3 : 1	0	4	4	4	4	5	6	8	11	14	18	23	28	33	40	46	54	70	89	100											
	3 : 1 to 10 : 1	0	4	4	4	5	6	8	10	13	16	20	25	30	36	42	49	56	73	92	100											
	Over 10 : 1	0	4	4	5	7	8	12	16	20	24	29	34	39	46	52	59	67	84	100												
250	Less than 3 : 1	0	4	4	4	4	4	5	7	8	10	12	15	18	22	25	29	34	44	55	68	100										
	3 : 1 to 10 : 1	0	4	4	4	4	5	6	8	10	12	14	17	20	24	27	32	36	46	57	70	100										
	Over 10 : 1	0	4	4	5	6	7	9	12	15	18	21	25	28	32	37	41	46	56	68	81	100										
350	Less than 3 : 1	0	4	4	4	4	4	5	6	7	8	10	12	14	16	19	22	25	32	40	49	77	100									
	3 : 1 to 10 : 1	0	4	4	4	4	4	5	7	8	10	12	14	16	18	21	24	27	34	43	52	79	100									
	Over 10 : 1	0	4	4	4	5	6	8	10	13	15	18	21	23	26	30	33	36	44	53	62	90	100									
500	Less than 3 : 1	0	4	4	4	4	4	4	5	6	7	8	9	11	13	14	16	19	24	29	36	55	78	100								
	3 : 1 to 10 : 1	0	4	4	4	4	4	4	5	6	7	8	9	11	13	14	16	18	21	26	31	38	57	80	100							
	Over 10 : 1	0	4	4	4	5	5	7	9	11	13	15	17	19	21	24	26	29	35	41	48	68	92	100								
1000	Less than 3 : 1	0	4	4	4	4	4	4	4	4	5	5	6	6	7	8	9	10	11	14	16	22	29	41	55	71	89	100				
	3 : 1 to 10 : 1	0	4	4	4	4	4	4	4	5	5	6	7	8	9	10	11	12	13	15	18	20	31	43	57	73	91	100				
	Over 10 : 1	0	4	4	4	4	5	6	7	8	9	11	12	13	15	16	18	20	23	26	30	41	53	68	84	100						
2000	Less than 3 : 1	0	4	4	4	4	4	4	4	4	4	4	5	5	5	6	7	7	9	10	12	16	22	29	37	46	56	68	80	94	100	
	3 : 1 to 10 : 1	0	4	4	4	4	4	4	4	4	4	5	5	5	6	6	7	8	9	10	12	13	18	24	31	39	49	59	70	83	96	100
	Over 10 : 1	0	4	4	4	4	4	5	5	6	7	8	9	10	11	12	13	14	16	18	20	26	33	41	50	59	70	81	94	100		

Note to Table 3.2.3.B.
⁽¹⁾ L = Length of Exposing Building Face
H = Height of Exposing Building Face
(Apply whichever ratio is greater)

3.2.3.8.

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* or wall at zero *limiting distance* shall be constructed as a *firewall* in accordance with Subsection 3.1.10.

3.2.3.5. Wall with Limiting Distance Less Than 1.2 m

- * (1) Exterior walls within a *limiting distance* of less than 1.2 m shall be of concrete or masonry.

(2) 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 required in Article 3.2.3.5. and 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 CAN/ULC-S101-M, "Standard Methods of Fire Endurance Tests of Building Construction and Materials."

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.

3.2.3.8.

(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 = corrected area of *unprotected openings* including actual and equivalent openings,

A = actual area of *unprotected openings*,

A_f = 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} = an equivalent opening factor derived from the following expression:

$$F_{EO} = \frac{(T_u + 273)^4}{(T_e + 273)^4}$$

where

T_u = 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°C for a *fire-resistance rating* of not less than 45 min, 927°C for a *fire-resistance rating* of not less than 1 h, and 1 010°C 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) and in *sprinklered buildings*, 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

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

- D = the greater required *limiting distance* for the *exposing building faces* of the 2 *fire compartments*, and
- θ = 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, $\theta = 0^\circ$). (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.

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

- (a) 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) A walkway connected to a building required to be of noncombustible construction is permitted to be of heavy timber construction provided

- (a) not less than 50 per cent of the area of any enclosing perimeter walls is open to the outdoors, and
- (b) the walkway is at ground level.

(4) A walkway of noncombustible construction used only as a pedestrian thoroughfare need not conform to the requirements of Articles 3.2.3.14. and 3.2.3.15.

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).

3.2.3.22. Ammonium Nitrate

(1) This Article applies to ammonium nitrate mixtures that contain 60 per cent or more by weight of ammonium nitrate in quantities exceeding 1 000 kg. *

(2) The distance between an ammonium nitrate storage facility and the nearest property line shall conform to Canadian Transport Commission General Order No. 0-36, "Ammonium Nitrate Storage Facilities Regulations," but in no case shall this distance be less than 8 m. *

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,

Table 3.2.4.A.
Forming Part of Sentence 3.2.4.1.(1)

Major Occupancy Classification	Occupant Load Above which a Fire Alarm System Is Required
Group A, Division 2 (licensed beverage establishments and restaurants only)	150
Group A, Division 2 (schools and colleges only)	40
Group A, Division 4	300 below the seating area
Group B, Division 1	0
Group B, Division 2	10 receiving care or treatment
Group C	10 having sleeping accommodation
Group F, Division 1	25
Group F Division 2 and 3	75 above or below the first storey
Column 1	2

- (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,
- (g) a child care facility with an occupant load of more than 40, or
- (h) a day care centre with an occupant load of more than 10.

(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 and Group B, Division 1 occupancies having an occupant load less than 10,

3.2.4.3.

- (b) 2 stage systems in Group B *occupancies* other than those described in Clauses (a) and (c),
- (c) single or 2 stage systems in *buildings* 3 storeys or less in *building height* used for children's custodial homes, convalescent homes, day care centres 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.

3.2.4.5. Installation and Testing of Fire Alarm Systems

(1) Fire alarm and voice communication systems shall be installed in conformance with CAN/ULC-S524-M, "Standard for the Installation of Fire Alarm Systems."

(2) Fire alarm systems shall be tested to ensure satisfactory operation in conformance with CAN/ULC-S537-M, "Standard for the Verification of Fire Alarm Systems."

3.2.4.6. Silencing of Alarm Signals

(1) Required fire alarm systems shall be designed so that when an *alarm signal* is actuated, it cannot be silenced automatically for at least

- (a) 5 min for *buildings* having fire alarm systems not required to be equipped with an annunciator, and
- (b) 20 min for all other *buildings*.

(2) Except as permitted in Sentence 3.2.4.22.(2), a required fire alarm system shall not incorporate manual silencing switches other than those installed inside the fire alarm control unit. (See Appendix A.)

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 con-

3.2.4.10.

formance 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 Signalling Systems," or
 - (c) a proprietary control centre conforming to NFPA-72D, "Installation, Maintenance, and Use of Proprietary Protective Signalling 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 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 Sentences (3) and (4) and 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) *Fire detectors* need not be installed in a room used for storage if the room is less than 1 m² in area unless

- (a) the room is a janitor's closet, or
- (b) the room is used for the storage of hazardous substances.

(4) A clothes closet not more than 800 mm in depth shall not be considered as a storage room for the purposes of this Article.

3.2.4.11.

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 washrooms in 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* (see Sentence 3.2.4.20.(4),
- (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).

* (2) A duct-type *smoke detector* shall be installed in the main *supply duct* of every corridor and stairwell pressurization system or air make-up unit and shall shut down fans in the system or unit if the *smoke detector* is actuated.

3.2.4.14. Vacuum Cleaning System Shut-down. 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 waterflow 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 and in *buildings* required to be *barrier-free*,

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 shall conform to CAN/ULC S526, "Standard for Visual Signal Appliances." *

(2) Visual signal appliances required in a *building* or portion thereof intended for use primarily by persons with hearing impairments shall be installed so that the signal from not less than one appliance is visible throughout the *floor area* or portion thereof in which they are installed. *

(3) In *buildings* required to be *barrier-free*, a visual signal appliance shall be installed in close proximity to each required audible signal appliance. *

(4) In addition to the requirements for fire alarm and detection systems in this Subsection, a separate visual indicator from each *smoke detector* 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

3.2.4.21.

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 emer-

gency 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. Except as required in Article 3.5.4.7., 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.

(5) Compliance with this Article is not required for an existing *building* in which construction was started before May 31, 1981 and for which access routes were neither required nor provided at the time of construction. *

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

- (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, and
- (g) be connected with a public thoroughfare. (See Appendix A.)

3.2.5.8. Water Supply

(1) Except as required in Sentence (3) and except for a *building* that is neither more than 3 *storeys* in *building height* nor more than 600 m² in *building area*, a *building* shall have a supply of water available for fire fighting purposes not less than the quantity derived from the following formula. *

3.2.5.8.

where $Q = V \times O \times S$

Q = minimum water supply (litres) (see Appendix A)

V = total building volume (cubic metres)

O = water supply coefficient (from Table 3.2.5.A.)

S = spatial coefficient whose value is 1.5 for a building which has any limiting distance less than 7.5 m, otherwise whose value is 1.0.

* (2) The water supply required by Sentence (1) shall be capable of being delivered at a rate of not less than 45 L/s for a building required to have a quantity less than 75 000 L and at a rate of not less than 60 L/s

for a building requiring a quantity not less than 75 000 L.

(3) Water supply for a sprinklered building and for a standpipe and hose system shall conform to the requirements of the standards referenced in Sentences 3.2.5.10.(1) and 3.2.5.13.(1).

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.B. for the applicable

Table 3.2.5.A.
Forming Part of Sentence 3.2.5.8.(1)

Water Supply Coefficient					
Classification by Group or Division in Accordance with Table 3.1.2.A.					
Type of Construction	A-1, A-3 F-3	A-2, B-1 B-2, C, D	A-4	E, F-2	F-1
A building of noncombustible construction with all loadbearing walls, columns, and arches, having a fire-resistance rating at least equivalent to that required for the supported assembly, but not less than 45 min	11	10	14	17	23
A building of noncombustible construction in accordance with Article 3.1.5.1	17	15	20	25	34
A building having all structural members of noncombustible material, or if of combustible material, a fire-resistance rating of at least 45 min or of heavy timber construction.	22	19	27	34	45
A building of combustible construction.	34	27	40	50	67
Column 1	2	3	4	5	6

Table 3.2.5.B.
Forming Part of Sentence 3.2.5.9.(1)

Occupancy Classification	Building Area, m ²		
	1 storey	2 storeys	3 storeys
A	2 500	2 000	1 500
B (except hospitals and nursing homes)	2 000	1 500	1 000
Hospitals and nursing homes	600	600	600
C	2 000	1 500	1 000
D	4 000	3 000	2 000
F, Division 1	1 000	1 000	1 000
F, Division 2	2 000	1 500	1 000
F, Division 3	3 000	2 000	1 000
Column 1	2	3	4

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 (13) 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."

(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 measured between *grade* and the ceiling level of the top *storey*.

(5) Where a standpipe and hose system is required, 65 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
- (c) fire protection equipment is available to deliver, by means of the fire department connection, the full demand flow rate at a residual water pressure of 450 kPa at the topmost outlet of the standpipe and hose system. (See Appendix A.)

(7) Except as permitted by Sentence (8), a hose cabinet shall be provided with a glass viewing panel not less than 5 mm thick and not less than 70% of the door area.

(8) A hose cabinet located in a part of a *floor area* used only for *industrial occupancy* may have a solid door with no glass viewing panel provided

- (a) the door is painted red, and
- (b) the words "FIRE HOSE" are
 - (i) in raised lettering on the front of the door,
 - (ii) painted in white, and
 - (iii) at least 100 mm high with 12 mm strokes.

(9) The requirements of NFPA 14, "Installation of Standpipe and Hose Systems," do not apply to the pressure at the most remote hose connection outlet in *buildings* permitted by Sentence (5) to have only 38 mm diameter hose outlets provided

- (a) a residual pressure of not less than 350 kPa is available at every hose connection outlet,
- (b) the hose outlet is designed to discharge a flow not less than 6.3 L/s,

3.2.5.10.

- (c) the standpipe riser is designed to carry a flow not less than 15 L/s,
- (d) all portions of each *storey* of the *building* are not more than 3.5 m from the end of a hose nozzle connected to the standpipe system with not more than 30 m of hose, and
- (e) a fire department connection is provided to supply water to each standpipe if more than one hose is required on a *storey* to satisfy Clause (d).

* **(10)** Hose cabinets equipped with 38 mm diameter hose are required in *buildings* that are not *sprinklered* in conformance with Article 3.2.1.6. but are not required in *buildings* that have automatic sprinkler systems conforming to Article 3.1.2.6. and Sentences 3.2.5.13.(1) and 3.2.5.13.(5) to (7).

* **(11)** If hose cabinets and 38 mm diameter hose are not installed in *sprinklered buildings* pursuant to Sentence 3.2.5.10.(10), the standpipe shall be equipped with hose stations having both 65 mm and 38 mm diameter hose connections and valves located so that no part of the *building* is more than 9 m from a nozzle attached to not more than 30 m of hose attached to the standpipe system.

* **(12)** Fittings for inlets and outlets for fire fighting use shall conform to Fire Prevention Branch Technical Bulletin 88-TB-001.

* **(13)** When a fire pump is required to provide sufficient pressure for the proper operation of sprinklers, standpipes and hose systems, the fire pump

- (a) shall be installed according to NFPA 20, "Installation of Centrifugal Fire Pumps,"
- (b) shall be tested to ensure satisfactory operation in conformance with 11.2 of NFPA 20, "Installation of Centrifugal Fire Pumps," and
- (c) shall be provided with emergency power meeting the requirements of Article 3.2.7.9.

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), (3) and (4), 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) Sprinkler systems for *floor areas* of *residential occupancy* in *buildings* of 4 *storeys* or less may be designed and installed to NFPA 13R, "Standard for

the Installation of Sprinkler Systems in Residential Occupancies up to Four Storeys in Height."

e* (5) 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.

* (6) If a *building* is required to have a fire alarm annunciator, and an automatic sprinkler system is required by Article 3.2.1.6., the automatic sprinkler system shall be electrically supervised to indicate a trouble signal on the fire alarm 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; and
- (g) a temperature approaching the freezing point in any dry pipe valve enclosure or water storage container used for fire fighting purposes.

* (7) If a trouble signal is received at the fire alarm annunciator in accordance with the requirements of Sentence (6) a signal indicating this shall

- (a) activate a bell on the exterior of the *building*,
- (b) be sent to the fire department by one of the means specified in Sentences 3.2.4.7.(3) and (4), or
- (c) be sent to another acceptable location.

* (8) If a *sprinklered building* receives its water supply for the sprinkler system from sources other than a piped municipal water system, external provision shall be made for the fire department to use the water supply for fighting exterior fires.

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 *storey*.

(3) The waterflow detecting devices required by Sentence (2) shall be connected to the fire alarm system, if required, to

- (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.

3.2.5.17. Portable Fire Extinguishers

- * (1) Portable extinguishers shall be provided and installed in conformance with NFPA 10, "Standard for Portable Fire Extinguishers," the Fire Prevention Act and regulations made pursuant to that Act.
- * (2) Except as permitted in Sentence (3), in *assembly, business and personal services, institutional, mercantile and residential occupancies*, each portable fire extinguisher shall be located in a cabinet that
 - (a) is not lockable,
 - (b) is not obscured or obstructed from view, and
 - (c) has a door that, if the door is not glazed,
 - (i) is painted red, and
 - (ii) is clearly marked with the words "FIRE EXTINGUISHER" in raised white lettering on the front with letters not less than 100 mm high and with 12 mm strokes.
- (3) 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) and (3).

(2) Every *building* shall be designed so that during a fire each *exit* stair serving *storeys* below the lowest *exit level* shall not contain for a period of 2 h after the start of a fire 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 Part 2. (See Appendix A.)

- (3) Every *building* shall be designed so that:
 - (a) each stairway that serves *storeys* above the lowest *exit level* is vented to the outdoors at or near the bottom of the stair shaft,
 - (b) movement of smoke from a fire in a *floor area* below the lowest *exit storey* into upper *storeys* is limited, and
 - (c) 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., in the event of a fire air moving 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.)

* **3.2.6.3. (Reserved)****3.2.6.4. Sprinkler Signal System**

- * **(1)** Every sprinkler system shall be equipped with a waterflow and supervisory signal system that will
- (a) transmit automatically a water flow signal directly to the fire department, or through an independent central station,
 - (b) transmit automatically other supervisory signals to a proprietary control centre or to an independent station, and
 - (c) actuate a signal at the central alarm and control facility described in Article 3.2.6.12.

* **3.2.6.5. (Reserved)**

3.2.6.6. Connected Buildings. Where a *building* described in Sentence 3.2.6.1.(1) is connected to any other *building*, measures shall be taken to limit movement of contaminated air from one *building* into another during a fire. (See Appendix A.)

3.2.6.7. Elevators

- * **(1)** Elevators shall comply with the Elevator and Fixed Conveyances Act and regulations made pursuant to that Act.
- * **(2)** Electrical conductors for the operation of elevators shall be protected to ensure continuous operations when subjected to the standard fire exposure described in CAN/ULC-S101-M, "Standard Methods of Fire Endurance Tests of Building Construction and Materials" for a period of not less than 1 h.
- * **(3)** All elevators shall be capable of operation on emergency power.
- * **(4)** Not more than one elevator at one time is required to operate on emergency power.
- * **(5)** Special Emergency Service as defined in regulations under the Elevator and Fixed Conveyances Act shall be provided in all elevators.

3.2.6.8. Emergency Operation of Elevators

(1) Manual emergency recall shall be provided for all elevators serving *storeys* above the *first storey*.

(2) Key-operated switches for emergency recall described 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 additional key, or keys, shall be kept at the central alarm and control facility.

3.2.6.9. Elevator for Use by Fire Fighters

(1) Not less than one elevator shall be provided for use by fire fighters in conformance with Sentences (2) to (5).

(2) The elevator required in Sentence (1) shall have a usable 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)** The elevator required in Sentence (1) 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 separation* 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 remainder of the *building* by a *fire separation* having a *fire-resistance rating* of not less than 1 h.

3.2.6.9.

(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 CAN/ULC-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, smoke shafts or 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. (Reserved)

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 messages to be sent 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 9.34.2.7.

(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) Lighting required in Sentence (1) shall be designed to be automatically activated when the electric lighting in the affected area is interrupted.

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

3.2.7.4.

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 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

- e No. 141-M, "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-M, "Essential Electrical Systems for Hospitals." (See Appendix A.)

- e **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*.

(See Appendix A.)

(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 in a *building* required to conform to Subsection 3.2.6., assuming that only one elevator will operate at a time,
- (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) Fuel supply storage for a generator prime mover shall be provided on site and shall be independent of fuel supplies for other *building* services.

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 room or space 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 room or space 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 per cent of the area of the room or space 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

3.2.8.2.

- (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 4-4.7.2.3. 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) The sprinklers required in Article 3.2.8.7. *
around the opening of an *interconnected floor space*

- (a) shall be spaced not more than 1.8 m apart,
- (b) shall be located 150 mm to 300 mm from the draft stop on the side away from the opening,
- (c) shall be designed to provide a discharge of not less than 0.6 L/s for each metre measured around the opening, but no sprinkler shall be capable of discharging less than 0.9 L/s, and
- (d) shall be of ordinary temperature classification.

3.2.8.7. Draft Stops and Closely Spaced Sprinklers

- * (1) The opening or openings at each floor level in a *building* containing an *interconnected floor space* shall be protected by draft stops in combination with closely spaced sprinklers.
- * (2) The draft stops required by Sentence (1) shall be
 - (a) located immediately adjacent to the opening, and
 - (b) not less than 500 mm deep measured from the underside of the ceiling to the bottom of the draft stop.
- * (3) If the closely spaced sprinklers required by Sentence 3.2.8.6.(3) are spaced less than 1.8 m apart, cross baffles shall be located midway between the closely spaced sprinklers and designed so that the operation of one sprinkler head does not wet adjacent heads.

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*.

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 Fire Prevention Act and regulations made pursuant to that Act. (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*.

3.3.1.2.

* **(4)** Sentence (5) applies to the storage and handling of *flammable liquids* and *combustible liquids* in portable tanks, drums, portable containers and prepackaged containers not covered elsewhere in this Part, except that it shall not apply to the following:

- (a) containers in service stations, bulk plants, and process plants, including refineries and distilleries,
- (b) fuel tanks for motors or engines,
- (c) prepackaged containers of alcoholic beverages, foods and pharmaceutical products, or other products such as detergents, insecticides and fungicides containing not more than 50 per cent by volume of water-miscible *flammable liquids* or *combustible liquids*, with the remainder of the solution being non-flammable.

* **(5)** Except as provided in Sentence (6), where *flammable liquids* and *combustible liquids* are stored in rooms in a *building*, the storage densities averaged over the total room areas and the total quantities of such liquids shall conform to Table 3.3.1.A.

* **Table 3.3.1.A.**
Forming Part of Sentence 3.3.1.2.(5)

Maximum Total Quantity of Liquid, L	Minimum Fire Separation Around Storage Room, h	Maximum Density L/m ²
10 000	2	200
1 500	1	100
Column 1	2	3

* **(6)** The maximum quantities and densities of *flammable liquids* and *combustible liquids* permitted in Sentence (5) may be doubled provided the storage room is protected by an approved automatic sprinkler system or equivalent fixed extinguishing system.

* **(7)** Storage rooms referred to in Sentence (5) shall be liquid-tight where the walls join the floor and be designed to accommodate possible spills.

* **(8)** Storage rooms referred to in Sentence (5) shall be designed to prevent possible spills of *flammable liquids* or *combustible liquids* from entering public sanitary and storm sewer systems.

* **(9)** Every storage room referred to in Sentence (5) shall be ventilated in conformance with the requirements of Part 6. (See Sentence 6.2.2.5.(2)).

* **(10)** Mechanical ventilation shall be used if *flammable liquids* are dispensed within storage rooms referred to in Sentence (5).

* **(11)** Portable extinguishers shall be provided for storage rooms described in Sentence (5) in conformance with the requirements of Sentence 3.2.5.17.(1).

* **(12)** Storage of *flammable liquids* and *combustible liquids* in storage rooms described in Sentence (5) shall be arranged to provide aisle widths of at least 1 m.

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*.

3.3.1.5.

(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*.

* (10) No *access to exit* for patrons in an *assembly occupancy* shall pass through a kitchen, *service space* or storage room.

* (11) Compliance with Sentence (10) is not required for an existing *building* in which construction was started before May 31, 1981.

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.B.

Table 3.3.1.B.
Forming Part of Sentence 3.3.1.5.(1)

Occupancy of Room or Suite	Maximum Area of Room or Suite, m ²	Maximum Distance to Egress Doorway, m
Group A	150	15
Group B, Division 1	75	10
Group B, Division 2 sleeping rooms	75	10
Group B, Division 2 other than sleeping rooms	150	15
Group C	100 ⁽¹⁾	15 ⁽¹⁾
Group D	200	25
Group E	150	15
Group F, Division 2	150	10
Group F, Division 3	200	15
Column 1	2	3

Note to Table 3.3.1.B.:

⁽¹⁾ See Article 3.3.4.4. for *dwelling units*.

3.3.1.6.

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) or (c),
- (b) be divided into not less than 2 zones by *fire separations* conforming to Sentences 3.3.3.6.(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 that
 - (i) are not less than 1.5 m deep from the outside face of the exterior wall to the inside edge of the balcony, and
 - (ii) provide not less than 0.5 m² of balcony space for each occupant of the *suite*, except on the *storey* containing the access entrance described in Article 3.7.1.2., or
- (d) have an exterior *exit* at ground level or a ramp leading to ground level.

(See Appendix A.)

(2) In a *barrier-free* path of travel a downward change in elevation shall be signalled by the use of a 600 mm wide tactile warning strip placed 250 mm from the edge and for the full width of a stair, escalator, moving walkway, ramp or platform and identified using colour and brightness contrast.

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 travelling adjacent to walls.

(4) The horizontal projection of an obstruction 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 *occupancies*, 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) Where the *occupancy* referred to in Sentence (6) is immediately adjacent to a room or *suite* fronting the *public corridor*, it shall be separated from such room or *suite* in accordance with Article 3.3.1.1.

(8) 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 3 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 open-

ing 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) Except as provided in Sentence (2), electromagnetic locks may be used on egress doors located in an *access to exit* provided

- (a) the locks and doors are installed in conformance to Sentence 3.4.6.15.(4), and
- (b) if electromagnetic locks are also used on the *exit* doors in the same *means of egress*, then the total time delay for all electromagnetic locks in the *means of egress* does not exceed 30s.

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.

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 in height 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 constructed so that the existence and position of such door is readily apparent by attaching thereto nontransparent 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. (See also Article 4.2.4.15.)

(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.** Except when the *building* is *sprinklered*, 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).

3.3.1.23. Storage Rooms

* (1) A storage room more than 1 m² in area serving an *institutional* or an *assembly occupancy*, shall be separated from the remainder of the *building* by a *fire separation* having a *fire-resistance rating* not less than 1 h, except that the *fire-resistance rating* may be reduced to 45 min if the *fire-resistance rating* of the floor assembly is permitted to be less than 1 h.

(2) A clothes closet not exceeding 800 mm in depth shall not be considered as a storage room for the purpose of this Article.

3.3.1.24. Drapes, Curtains and Decorative Materials

(1) Except as required in Sentence (2), drapes, curtains and other decorative materials, including textiles and films, used in a *building* shall meet the requirements of CAN/ULC-S109-M, "Standard for Flame Tests of Flame Resistant Fabrics and Films," when such drapes, curtains or other decorative materials are used in

- (a) a Group A or Group B, Division 1 *occupancy*,
- (b) a lobby or *exit*, or
- (c) an open *floor area* in a Group D, E and F *occupancy* exceeding 500 m², except when the *floor area* is divided into *fire compartments* not exceeding 500 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.

(2) Window drapes and cubicle curtains used in Group B, Division 2 *occupancies* shall conform to CAN/CGSB-4.162-M, "Hospital Textiles - Flammability Performance Requirements."

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

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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 the floor or roof assembly is not required to be more than 45 min,
- (b) no *fire-resistance rating* is required if the *floor area* is *sprinklered*, and
- (c) 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 660 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*.

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(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 1 200 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 provided so that

- (a) the total width of the footboards shall be not less than three quarters of the centre-to-centre spacing between rows of seats, and
- (b) the spacing between footboard members shall be not more than 25 mm.

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-resistance rating* of not less than 1 h, except for a proscenium 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,"
- (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) have each leaf 1 100 mm wide and be not less than 2 030 mm high.

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.

3.3.3.6.

(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.

(12) Ducts penetrating the fire separation between zones referred to in Sentence (6) shall be equipped with dampers designed to retard the passage of fire and smoke.

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 each.

(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.

(11) Ducts penetrating the *fire separation* referred to in Sentence (2) shall be equipped with dampers designed to retard the passage of fire and smoke.

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*.

3.3.3.10. **Window.** Except in sleeping rooms where persons are under legal restraint, a sleeping room in an *institutional occupancy* shall be provided with a window whose unobstructed glass area is not less than 5% of the area served.

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*,

3.3.4.2.

- (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.** Except where the *building* is *sprinklered* 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

(See Appendix A.)

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 appropri-

ate automatic fire extinguishing system shall be installed in every *floor area* to provide protection compatible with the nature of the risk.

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

(1) 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.

* (2) Welding and cutting operations in *buildings* shall be carried out in areas with walls, ceilings and floors of *noncombustible construction* or lined with *noncombustible* materials.

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 1 070 mm high shall be provided at every garage floor opening and around the perimeter of every floor where the exterior walls are omitted.

(7) 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

(1) 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

3.3.5.8.

- (a) be not less than 1.8 m long,
- (b) be mechanically pressurized, 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 as determined by the cup method 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 as determined by the cup method 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 or to a *building* of Group F *occupancy* that complies with regulations made pursuant to the Fire Prevention Act.

3.3.5.10. Industrial Ovens

* (1) This Article applies to industrial baking and drying ovens which during operation contain flammable vapours given off by the product being dried or baked.

* (2) An industrial oven shall not be located in a *storey* of a *building* if any part of the *storey* is below *ground level*.

* (3) The requirements of NFPA 86, "Ovens and Furnaces, Location and Construction" shall apply to the following items associated with an industrial oven:

- (a) clearances between *combustible* elements of *building* assemblies and ovens, furnaces and associated ductwork,
- (b) explosion vents,
- (c) oven ductwork,
- (d) fire protection, and
- (e) ventilation and ventilation fan interlocks.

* (4) Ducts, stacks and associated insulation in systems for the removal of flammable vapours shall be of *noncombustible* materials, shall not pass through *firewalls* and shall not discharge within 500 mm of windows or within 6 m of other air intake openings.

3.3.5.11. Tire Storage

(1) This Article shall apply to *buildings* or parts of *buildings* used for the storage of rubber tires. *

(2) A tire storage area designed to contain more than 375 m³ of rubber tires shall be separated from the remainder of the *building* by a *fire separation* having a *fire-resistance rating* of not less than 2 h. (See Appendix A.) *

(3) *Buildings* regulated by this Article shall be *sprinklered* in conformance with NFPA 231D, "Storage of Rubber Tires," whenever *

- (a) the aggregate of individual storage areas in the *building* exceeds 500 m²,
- (b) any individual storage area exceeds 250 m², or
- (c) the height of storage is more than 3.6 m, and the total volume of tires in the *building* is more than 375 m³.

(4) A clearance of not less than 900 mm shall be maintained between the top of storage and sprinkler deflectors. *

(5) Multipurpose dry chemical portable extinguishers, rated 4-A 20-B shall be installed in conformance with NFPA 10, "Portable Fire Extinguishers," except that there shall be one such extinguisher for every 500 m² of *floor area*, and the travel distance to any extinguisher shall not exceed 25 m. *

3.3.5.12. Industrial Trucks. A fuel-fired industrial truck shall be stored in a detached *building* or in an area separated from the remainder of the *building* by a *fire separation* having a *fire-resistance rating* of not less than 1.5 h. *

3.3.5.13. Compressed Gas Cylinders

(1) Cylinders of compressed gas containing propane or natural gas for use with fuel-burning appliances or equipment shall comply with the Gas Protection Act and regulations made pursuant to that Act and others shall comply with Sentences (2) to (10). *

(2) Where containers of compressed gas are stored, they shall be secured to prevent dislodgement and when stored outdoors, they shall be supported on raised concrete or other *noncombustible* platforms in a fenced enclosure. *

* **(3)** The fence required by Sentence (2) shall be designed to discourage climbing and shall be substantially constructed, with a minimum height of 1.8 m, with a gate which shall be kept locked when the enclosure is not staffed.

* **(4)** Except as provided in Sentences (5), (6) and (7), containers of flammable compressed gas stored indoors shall be located in a room that shall

- (a) be separated from the remainder of the *building* by a *fire separation* having a *fire-resistance rating* of at least 2 h,
- (b) be located on an exterior wall of the *building*,
- (c) be designed to be entered from the exterior, and any other doors into the interior of the *building* shall be equipped with self-closing devices, and be constructed so as to prevent migration of gases from the room into other parts of the *building*,
- (d) be constructed so that an exterior wall provides explosion venting in the ratio of 0.2 m² of vent area for each cubic metre of room volume,
- (e) be provided with natural ventilation with non-closing louvred openings at the floor and ceiling in an outside wall,
- (f) not contain fuel-fired equipment of high temperature heating elements, and
- (g) be used for no purpose other than for the storage of compressed gas.

* **(5)** The storage area of flammable, lighter than air, compressed gas shall be limited to

- (a) 60 m³ in an unsprinklered *building* of *combustible construction*, and
- (b) 170 m³ in a *sprinklered building* of *combustible construction* or in a *building* of *noncombustible construction*.

* **(6)** Where a flammable compressed gas is heavier than air, only one cylinder of gas may be located in any room of a *building*, and cylinders shall not be located in *basements* or other areas below *grade*.

* **(7)** A storage *building* for propane tanks used to fuel hot air balloons shall meet requirements set by the Director. (See Appendix A.)

* **(8)** A room for the storage of poisonous or corrosive compressed gas shall

- (a) be separated from the remainder of the *building* by *gas-tight fire separations* having a *fire-resistance rating* of at least 1 h,
- (b) be located on an exterior wall, and
- (c) be designed to be entered from the exterior, and any doors into the interior of the *building* shall be equipped with self-closing devices, and be constructed so as to prevent migration of gases from the room into other parts of the *building*.

* **(9)** Cylinders containing poisonous compressed gas shall not be located in a room containing *combustible* or flammable material.

* **(10)** Cylinders of gases that may react with one another shall not be located in the same area.

* **(11)** Cylinders of flammable gases shall not be located in the same area with oxidizing materials or with cylinders containing gases that support combustion.

* **3.3.5.14. Dust Explosions.** A *building* in which manufacturing activities create significant concentrations of *combustible* dusts shall have explosion venting to the outdoors of not less than 650 cm² for each cubic metre of room or *building* volume, with the vents designed to release at a pressure of not more than 1 kPa.

* **3.3.5.15. Oxidizing Materials.** A part of a *building* intended for the storage of oxidizing materials shall be cool, ventilated, and dry and separated from the remainder of the *building* by a *fire separation* having a *fire-resistance rating* of not less than 2 h.

* **3.3.5.16. Corrosive Liquids.** A *building* intended for the storage of corrosive liquids shall be designed so that the corrosive liquids are located in a room separated from the remainder of the *building* by a *fire separation* having a *fire-resistance rating* of not less than 1 h and the corrosive liquids are isolated from any oxidizing material.

3.3.5.17. Reactive Substances

* **(1)** Reactive substances, which for the purpose of this Article are unstable and susceptible to reaction, such as polymerization, or self-accelerating decomposition initiated by heat, shock, vibration,

3.3.5.17.

light or sound waves, shall be stored in a manner that will prevent the undesired reaction.

(2) Reactive substances described in Sentence (1) shall be stored in a cool, well-ventilated room separated from the remainder of the *building* by a *fire separation* having a *fire-resistance rating* of at least 2 h or in a separate *building*.

(3) Every *building* or part of a *building* that is used for the storage or use of any substance that reacts violently with water shall be plainly and conspicuously marked on the outside with the words "REACTIVE SUBSTANCE, USE NO WATER" using letters of strongly contrasting colours that are a minimum of 450 mm in height and 50 mm in stroke.

3.3.5.18. Flammable and Combustible Liquid Storage Tanks

(1) Except as provided in Sentence (5) storage tanks for *flammable liquids* or *combustible liquids* shall be

- (a) located in dedicated rooms conforming to Sentence (6), and
- (b) located in conformance with Table 3.3.5.A.

(2) When quantities greater than are permitted for incidental use are required for special process operations, storage tanks for *flammable liquids* or *combustible liquids* are permitted to be located outside of a storage room conforming to Sentence (6), provided that

- (a) total quantities are not more than one-half the quantities permitted in Table 3.3.5.A.,
- (b) they are located on the *first storey*, and
- (c) provisions are available in close proximity for suppression.

(3) Quantities permitted in Sentence (2) to be outside of a storage room shall be included in the total quantity allowed per *storey* in Table 3.3.5.A.

Table 3.3.5.A.
Forming Part of Sentence 3.3.5.18.(1)

Tank Storage of Flammable Liquids and Combustible Liquids in Rooms			
Class of Liquid	Location of Dedicated Room	Maximum Quantity per Storey, L One or more Tanks	
		Protected ⁽¹⁾ Storage	Unprotected Storage
(Flash point below 37.8°C)	First storey	40 000	25 000
	Storeys above the first storey	7 500	Not Permitted
	Basement	Not Permitted	Not Permitted
(Flash point at or above 37.8°C and below 93.3°C)	First storey	200 000	100 000
	Storeys above the first storey	20 000	Not Permitted
	Basement	20 000	Not Permitted
Column 1	2	3	4

Note to Table 3.3.5.A.:

⁽¹⁾ Where protection is required, storage areas shall be protected by an acceptable automatic sprinkler system or equivalent fixed fire suppression system.

* (4) When two or more types of *flammable liquids* or *combustible liquids* are stored together, the total permitted quantities shall be calculated in accordance with the Fire Prevention Act and regulations made pursuant to that Act.

* (5) Where storage tanks for *flammable liquids* or *combustible liquids* are located outside of storage rooms conforming to Sentence (6),

- (a) provision shall be made to contain 100 per cent of the volume of the largest storage tank, or to drain away spilled *flammable liquids* or *combustible liquids* safely,
- (b) all electrical equipment and wiring in the vicinity of the storage tank shall be installed in conformance with regulations made pursuant to the Electrical Protection Act, and
- (c) the *floor area* in which the storage tank is located shall be ventilated.

* (6) Rooms for storage tanks inside *buildings* shall be

- (a) separated from the rest of the *building* by a *fire separation* having a *fire-resistance rating* of at least 2 h,
- (b) designed to contain 100 per cent of the volume of the largest storage tank, or to drain away spilled *flammable liquids* or *combustible liquids* safely,
- (c) made liquid-tight where the walls join the floor,
- (d) provided with natural or mechanical ventilation, and
- (e) used for no other purposes than the storage and handling of *flammable liquids* or *combustible liquids*.

* (7) A minimum clear space of 550 mm shall be maintained between the walls of a room described in Sentence (6) and the sides of any storage tanks within the room.

3.3.5.19. Nitrocellulose Plastics

* (1) *Buildings* where nitrocellulose is manufactured or stored in quantities exceeding 50 kg shall be protected by an automatic fire suppression system.

* (2) A room for the storage of up to 3 400 kg of nitrocellulose plastics shall

- (a) be separated from the remainder of the *building* by a *fire separation* having a *fire-resistance rating* of not less than 1 hr,
- (b) be designed to resist an internal pressure of not less than 3.5 kPa,
- (c) be not greater than 40 m³ in volume,
- (d) have explosion venting to the exterior of not less than 1 000 cm² of venting area for every cubic metre of vault volume, and
- (e) be ventilated to the exterior to provide not less than 200 cm² of ventilating area for each cubic metre of vault volume.

(3) A room for the storage of up to 9 000 kg of nitrocellulose plastics shall

- (a) be separated from the remainder of the *building* by a *fire separation* having a *fire-resistance rating* of not less than 4 h,
- (b) be designed to resist an internal pressure of not less than 28 kPa,
- (c) have explosion venting to the exterior of not less than 650 cm² of venting area for every cubic metre of vault volume, and
- (d) be ventilated to the exterior to provide not less than 200 cm² of ventilation area for each cubic metre of vault volume.

(4) Quantities greater than 9 000 kg shall not be stored in the same room.

3.3.5.20. Dust Collectors

(1) Except as provided in Sentence (2), dust collectors shall be located outside *buildings* or shall be equipped with exhaust stacks or ducts leading to the outside.

(2) Dust collecting equipment located inside *buildings* shall be designed in conformance with good engineering practices such as described in The National Fire Protection Association Standards on dust explosion hazards. (See Appendix A.)

* 3.3.5.21. **Structure.** Exterior walls and structural members of a *building* in which unstable liquids or *flammable liquids* having a *flash point* below 22.8°C are processed shall be designed and constructed to accommodate the pressure from an explosion so that all principal load carrying members will remain intact.

3.3.5.22.

3.3.5.22. Ammonium Nitrate

* (1) A *building* designed for the storage of ammonium nitrate shall not be more than 1 *storey* in *building height*, shall not have a *basement*, crawl space, open floor drains, tunnels or other pockets in which molten ammonium nitrate could be trapped in the event of a fire.

* (2) A *building* intended for the storage of ammonium nitrate shall have not less than 70 cm² in openable vent area for each square metre of storage area unless mechanical ventilation is provided by equipment protected from the storage area by a *fire separation* having a *fire-resistance rating* of not less than 1 h.

* (3) The floor of a *building* or room for the storage of ammonium nitrate shall be of *noncombustible construction* or lined with *noncombustible materials*.

* **3.3.5.23. Spray Applications.** A part of a *building* in which there is spray application of flammable or combustible paints, coatings or finishings shall conform to the requirements of NFPA 33, "Standard for Spray Application Using Flammable and Combustible Materials."

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*.

(2) 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*.

3.4.1.10. Combustible Glazing. *Combustible glazing* shall not be used in wall or ceiling assemblies of an *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 (5), 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)

Occupancy of Floor Area	Maximum Floor Area, m ²	Maximum Travel Distance, m
Group A	150	15
Group B	75	10
Group C	100	15
Group D	200	25
Group E	150	15
Group F, Division 2	150	10
Group F, Division 3	200	15
Column 1	2	3

(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. Exiting from Mezzanines

(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.B., and
- (d) the distance limits in Table 3.3.1.B. 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*.

(See Appendix A.)

(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.

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*. (See A-3.1.8.1.(1)(b) in Appendix A.)

(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.

(4) *Exits* shall be located and arranged so that they are clearly visible or their locations are clearly indicated and they are accessible at all times.

3.4.3. Width and Height of Exits

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) 1 100 mm for
 - (i) corridors and passageways, and
 - (ii) stairs and ramps that serve more than 3 *storeys* above *grade* or more than 1 *storey* below *grade*,
- (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) 1 650 mm for stairs and ramps serving patients' sleeping rooms,
- (d) 1 050 mm for doorways serving patients' sleeping rooms, and
- (e) 790 mm for doorways not serving patients' sleeping rooms.

(See Appendix A.)

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).

(2) The required *exit* width for *exit* stairs that serve an *interconnected floor space* as provided in Articles 3.2.8.3. to 3.2.8.9. shall be cumulative, except where

- (a) such stairs provide not less than 0.3 m² of area of treads and landings for each occupant of the *interconnected floor space* (see Appendix A), or
- (b) protected floor spaces conforming to Article 3.2.8.5. are provided at each floor level and such protected floor spaces provide not less than 0.5 m² per occupant of the *interconnected floor space*.

(See Appendix A.)

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) 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 2 100 mm.

(2) The headroom clearance for stairways measured vertically above any landing or the nosing of any stair tread shall be not less than 2 050 mm.

(3) The headroom clearance for doorways shall be not less than 2 030 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 1 980 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

3.4.4.1.

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) Except where the *authority having jurisdiction* is satisfied that the main entrance to a room or *building* is readily recognizable as a required *exit* and therefore needs no *exit* sign, an *exit* door that is installed to satisfy the requirements of Subsections 3.4.1. to 3.4.4. shall have an *exit* sign placed over it when the *exit* serves

- (a) a building exceeding 2 storeys in building height,
- (b) a building having an occupant load greater than 150,
- (c) a room or floor area that has a fire escape as part of a required means of egress, or
- (d) a corridor exceeding 25 m in length and serving sleeping rooms in Group B, Division 2 occupancies.

* (2) Every *exit* sign shall

- (a) be visible from the *exit* approach,
- (b) have the word EXIT displayed in plain legible letters, and
- (c) be designed to 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 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.

(7) Except when alterations are made to the main entrance, Sentence (1) and (6) do not apply to a main entrance door in other than a new *building*.

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.

(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

3.4.6.3.

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 1 100 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* ramp or stairway shall have a handrail on at least one side, and where 1 100 mm or more in width, shall have handrails on both sides.

(2) Where the required width of a ramp or flight of stairs is more than 2 200 mm, one or more intermediate handrails continuous between landings shall be provided, and the number and position of these intermediate handrails shall be such that there will be not more than 1 650 mm between handrails.

(3) Handrails shall be constructed so that there will be no obstruction on or above them which will break a hand hold. (See Appendix A.)

(4) Handrails on stairs and ramps shall be not less than 800 mm and not more than 920 mm high, 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 handrail.

(5) At least 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 Appendix A.)

(6) 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.)

(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.)

(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 1 070 mm around landings.

(3) The height of *guards* on *exit* ramps and their landings shall be not less than 1 070 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 1 500 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 where children may be present, 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 1 070 mm above the landing shall be protected by a barrier or railing located approximately 1 070 mm above such landing.

3.4.6.6. Ramp Gradients

- (1) The maximum gradient of ramps shall be
- 1 in 10 in any Group A, B or C *occupancy*,
 - 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.

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 1 000 and 1 500 mm above the floor, is placed on each face of each door leaf indicating the method for collapsing the door leaf in an emergency, and
- (e) glass used for door leaves and enclosure panels is safety glass conforming to 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) Except as permitted by Sentence (5), 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) Except as permitted by Sentence (14), electromagnetic locks that do not incorporate latches, pins or other similar devices to keep the door in the

3.4.6.15.

closed position are permitted to be installed on *exit* doors other than doors leading directly from a Group F, Division 1 *occupancy* provided

- (a) the *building* is equipped with a fire alarm system,
- (b) the locking device releases immediately
 - (i) upon initiation of a *fire alarm signal*,
 - (ii) in the event of a power failure, and
 - (iii) upon actuation of a manually operated switch accessible only to authorized personnel,
- (c) a force of not more than 90 N applied to the door opening hardware initiates an irreversible process that will release the locking device within 15 s and not relock until the door has been opened,
- (d) upon release, the locking device must be reset manually by the actuation of the switch in Subclause (b)(iii), and
- (e) a legible sign is permanently mounted on the *exit* door to indicate that the locking device will release within 15 s of applying pressure to the door-opening hardware. (See Appendix A.)

* (5) The requirements of Sentence (3) may be waived for *exit* and egress doors, complying with Sentences (6) to (13) that serve a *floor area* or part of a *floor area* used exclusively for

- (a) a bank, or
- (b) the sale of retail merchandise if the *building* in which they are located is equipped throughout by a fire alarm and detection system or by a supervised automatic sprinkler system.

* (6) *Exit* and egress doors shall not be locked at any time when the public is present in or may be admitted to the part of the *floor area* that they serve.

* (7) *Exit* and egress facilities complying with Sentences (8) to (13) may be incorporated for use by the staff of the part of the *floor area* being considered during times when the public is neither present nor being admitted to the area that they serve.

* (8) The aggregate width of required *exit* and egress facilities for evacuation of the staff shall be determined in accordance with Articles 3.4.3.2. and 3.4.3.5. and shall be based on the maximum number of staff.

(9) Travel distance to an *exit* for use by the staff shall not exceed the travel distance determined in accordance with Subsection 3.4.2. *

(10) At any time that staff or other non-public occupants are present in the part of the *floor area* being considered, not less than one door at each *exit* and egress location shall *

- (a) be operable in conformance with Sentence (5), or
- (b) be equipped with locks conforming to Sentence 3.4.6.15.(4) that release immediately if an *alert* or *alarm signal* is initiated in the fire alarm system or the sprinkler system is actuated.

(11) The door referred to in Sentence (10) shall be permanently and distinctively marked to indicate that it is an emergency *exit*. *

(12) Facilities complying with Sentence (13) may be incorporated for use during times when no occupants are present. *

(13) *Exit* and egress doors may be equipped with locks that require keys, special devices or specialized knowledge of the door opening mechanism if *

- (a) the doors do not lead into *exit* stairs,
- (b) the doors do not lead from *exit* stairs to the exterior of the *building*,
- (c) the doors do not serve any other *occupancy*,
- (d) the area served contains not less than one telephone
 - (i) that is accessible and in operation at all times,
 - (ii) that is not coin operated,
 - (iii) marked to indicate that it is for emergency use, and
 - (iv) illuminated by normal power or by emergency power when the doors are locked, and
- (e) there are provisions to enable an announcement to be made throughout the area served before the locks are fastened.

(14) Clauses (c), (d) and (e) of Sentence (4) need not apply in Group B Division 2 *occupancies* for the housing and care of cognitively impaired persons. *

3.4.6.16.

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 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 0.75 mm above the surface,
 - (c) be located 1 350 mm from the finished floor and beginning not more than 150 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 Electrical Protection Act and regulations made pursuant to that Act.

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 *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*.

3.5.2.1.

(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, roof-top *appliances* or suspended area heaters serving only one room or space.

* (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* where the *floor area* of the room or *suite* is not more than 400 m² and the height of the *suite* is not more than 2 *storeys*, 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 wa-*

ter 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 shall 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 the Electrical Protection Act and regulations made pursuant to that Act, 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 shall be

- (a) *sprinklered* and the equipment may be shielded from sprinkler discharge, or
- (b) protected by some other suitable type of automatic fire suppression system.

(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) An electrical equipment vault that contains a dielectric-liquid filled piece of electrical equipment shall not be drained to a storm drain, a *sanitary drainage system* or a *private sewage disposal system* and shall have

- (a) a floor that drains to a sump with sufficient capacity for all the liquid in the transformers, or
- (b) a curb of sufficient height around each transformer so that all the liquid in the transformer can be contained within the curb system.

(8) Where a liquid filled pad-mounted distribution transformer is located near a *building*, it shall be located at not less than 3 m from any *combustible* surface and not less than 6 m from any window, door or ventilation opening on the *building*.

(9) Where clearances required in Sentence (8) are not practical, a solid concrete block barrier not less than 200 mm thick or a reinforced concrete barrier not less than 150 mm thick shall be erected between the *building* and the transformer. (See Appendix A.)

(10) When a transformer is installed below *grade*, the walls of an adjacent *building* shall not have

- (a) *combustible* surfaces within a distance of 3 m, or
- (b) doors, vents, or openings adjacent to the grills in the sidewalk within a 6 m distance of the transformer.

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.
Forming Part of Sentence 3.5.3.1.(1)

Fire-Resistance Rating of Fire Separation Required for Floor Assembly	Minimum Fire-Resistance Rating of Vertical Service Space	Minimum Fire-Resistance Rating of Elevator Shaft
less than 45 min	—	45 min
45 min	45 min	45 min
1 h	45 min	45 min
1.5 h	1 h	1 h
2 h	1 h	1.5 h
3 h	1.5 h	2 h
Column 1	2	3

(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

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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

- e **3.5.4.1. Scope.** This Subsection applies to *horizontal service spaces* and service facilities, including ceiling spaces, duct spaces, crawl spaces, *attic or roof spaces* and roofs on which service equipment is located.

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 900 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. (See also Article 3.2.5.4.)

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.

3.5.4.7.

3.5.4.7. Roof Access

- * (1) A *building* shall be provided with direct access to the roof by an interior stairway where
 - (a) heating, ventilating or air-conditioning equipment is installed on the roof, and
 - (b) the roof elevation is more than 4 m above *grade*.
- * (2) Access shall be provided to roof areas in which tie back and anchor systems are provided for window cleaning suspended power platforms and
 - (a) where access is through the roof, it shall be by means of an interior staircase, or
 - (b) where access is through a wall, the panels shall be openable from the outside without the use of keys or any specialized device or knowledge.

(See Appendix A.)

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 the Elevator and Fixed Conveyances Act and regulations made pursuant to that Act.
 - * (2) Elevators in *buildings* within the scope of Subsection 3.2.6. shall conform to Articles 3.2.6.7., 3.2.6.8. and 3.2.6.9.
 - * (3) Provision shall be made in the design and construction of all elevator hoistways for adequate support for guide rail fastenings in the form of reinforced concrete or structural steel. (See Appendix A.)
- 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 CAN/CSA-B44-M, "Safety Code for Elevators, Escalators, Dumbwaiters, Moving Walks and Freight Platform Lifts."

Section 3.6 (Reserved) *

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, which are not used in social programmes such as group homes, halfway houses and shelters,
 - (b) relocatable industrial accommodations,
 - (c) *buildings* of Group F, Division 1 *major occupancy*, where only the requirements dealing with hearing sensory provisions would apply, and
 - (d) *buildings* which are not intended to be occupied on a daily or full time basis, including automatic telephone exchanges, pump houses and substations, where only the requirements dealing with hearing sensory provisions would apply.

(See Appendix A.)

- * (2) The Director may grant relaxation of one or more of the requirements of this Section if an *owner* can demonstrate to the satisfaction of the Director that
 - (a) the specific requirements are unnecessary, or
 - (b) extraordinary circumstances prevent conformance.
- * (3) *Buildings* required to be *barrier-free* must comply with all requirements designed to assist those persons with physical, sensory and mental disabilities.

- * (4) If a residential *project* is funded in part or in whole by the Government of Alberta, *dwelling units* meeting *barrier-free* design requirements shall be provided as follows;

3.7.2.1.

- (a) 2 or more in a *project* of 10 to 25 *dwelling units*,
- (b) 5 or more in a *project* of 26 to 50 *dwelling units*,
- (c) 10 or more in a *project* of 51 to 100 *dwelling units*,
- (d) 15 or more in a *project* of 101 to 200 *dwelling units*, and
- (e) 20 or more in a *project* exceeding 200 *dwelling units*.

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) Where entrances are equipped with security systems, both visual and audible signals shall be used to indicate when the door lock is released.

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.

(3) 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 1 400 mm above the floor.

3.7.2. Occupancy Requirements

3.7.2.1. Areas Requiring Barrier-Free Access

(1) Except as provided in Sentence (2), a *barrier-free* path of travel shall be provided

- (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 outpatient facilities, and sleeping rooms in hospitals and nursing homes,
- (g) into not less than one passenger type 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.)

(See Article 3.3.1.7. for additional requirements for *floor areas* above the *first storey* to which a *barrier-free* path of travel is required.)

3.7.2.1.

(2) Except as provided in Sentence (3), Sentence (1) does not apply to *storeys* above or below the *first storey* of a *building* that does not exceed 2 *storeys* in *building height*, where the *storey* does not exceed 600 m² in area.

(3) Sentence (1) does not apply to *storeys* above or below the *first storey* in *buildings* of Group C *occupancy* which do not exceed 3 *storeys* in *building height* or 600 m² in *building area* and are not served by a passenger type elevator or other platform equipped passenger elevating device.

(4) A *barrier-free* path of travel shall be provided from the entrance described in Article 3.7.1.2. to

- an exterior parking area, where exterior parking is provided (see Appendix A), and
- at least one parking level, where parking is provided in a parking structure, and to every level of the parking structure, where it is served by a passenger elevator.

3.7.2.2. Seating. The number of spaces designated for wheelchair use in Clause 3.7.2.1.(1)(b) shall be one space for every 125 seats or part thereof. (See Appendix A.)

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

- they are located within *suites* of *residential occupancy*,
- other *barrier-free* washrooms are provided on the same *floor area* within 45 m, or
- 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 Part 7, a *barrier-free* washroom

shall be provided on the entrance *storey*, except if a *barrier-free* path of travel is provided to a *barrier-free* washroom on 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. (See Appendix A.)

(5) In addition to the requirements to Sentence (3), special washrooms conforming to Article 3.7.3.11. shall be provided in airports and train depots.

3.7.2.4. Parking

(1) Except as provided in Sentence (2), where on-site parking will be provided pursuant to the Planning Act, one parking stall for disabled persons shall be provided for each *dwelling unit* required in Sentence 3.7.1.1.(4) and for each viewing position in *assembly occupancies* required in Article 3.7.2.2.

(2) Where on-site parking will be provided pursuant to the Planning Act, and more than 50 stalls are required, parking stalls for use by disabled persons shall be provided in the ratio of 1 for every 100 or part thereof.

(3) Stalls in Sentences (1) and (2) shall

- be at least 3.7 m wide,
- have a firm, slip-resistant and level surface,
- be located close to an entrance required to conform with Article 3.7.2.1., and
- be clearly marked as being for the use of disabled persons only.

(See Appendix A.)

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.)

* (4) Where special equipment is provided for disabled persons, such as special door opening controls, variable volume controls on telephones, or telecommunication devices for the deaf (TDD), they shall be identified by an appropriate symbol and provided with instructions for their use. (See Appendix A.)

* (5) Doors and openings that lead from public places and through which the public is permitted to enter shall be identified by specific tactile signs with letters

- (a) not less than 60 mm high and raised 0.75 mm above the surface, and
- (b) located 1 350 mm above the floor surface and beginning not more than 150 mm from the door or openings.

3.7.3.2. Exterior Walks

* (1) Exterior walks that form part of a *barrier-free* path of travel shall

- (a) be provided by means of a continuous plane not interrupted by steps or abrupt changes in level,
- (b) have a permanent, firm and slip-resistant surface,
- (c) have a minimum uninterrupted width of 1 100 mm, and a gradient not exceeding 1 in 20,
- (d) have a minimum 75 mm high curb where, in the absence of walls, railings, or other barriers on either or both sides of the walk, the vertical drop from the walk exceeds 75 mm,
- (e) have a minimum 1 100 mm wide surface of a different texture to that surrounding it, where the line of travel is level and even with adjacent walking surfaces,

(f) be free from obstructions for the full width of the walk to a minimum height of 1 980 mm, except that handrails are permitted to project not more than 100 mm from either or both sides into the clear area,

(g) be designed as a ramp where the gradient of the walk is greater than 1 in 20, and

(h) have a level area adjacent to the entrance doorway conforming to Clause 3.7.3.4.(1)(c).

(See Appendix A.)

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 and the door shall be openable with one hand.

(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,
- (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.,
- (f) have a slip-resistant, continuous and even surface, and
- (g) have walls, railings or other barriers that extend to within 75 mm of the finished ramp surface or a 75 mm high curb.

(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 CAN/CSA-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) The passenger-type elevator referred to in Sentence (1) shall have

- (a) hall or in-car audible signals that indicate at not less than 50 dBA the direction the elevator is moving when it stops at a landing by sounding once for the up direction or twice for the down direction or a similar verbal annunciator acceptable to the *authority having jurisdiction*,

- (b) in-car audible signals that indicate at not less than 50 dBA the arrival at, or passing of, each floor, and
- (c) an alarm bell button that visually indicates the operation of the alarm bell.

3.7.3.6. Spaces in Seating Area

(1) Spaces designated for wheelchair use in Article 3.7.2.1. 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 to the space,
- (c) arranged so that at least two 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
- (e) situated, as part of the designated seating plan, to provide a choice of viewing location.

3.7.3.7. Assistive 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 in width by 1 500 mm in depth,
- (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 in length located so that its midpoint is between 200 mm and 300 mm from the hinged side of the door and between 900 mm and 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 as described in Sentence (2),
- (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 wash-room door and 1 400 mm between the outside of the stall face and any wall-mounted fixture, and
- (g) have ancillary items such as a toilet paper dispenser located on the wall nearest to the water closet below the grab bar, not less than 460 mm above the floor, and within easy reach of a person seated on the water closet.

(See Appendix A.)

- (2) A grab bar required in Sentence (1) shall
 - (a) be mounted horizontally on the wall behind the water closet so that it extends the full width of the water closet bowl if the water closet does not have a tank, and be mounted
 - (i) horizontally on the wall beside the water closet, and be not less than 1 200 mm in length, located with its centreline between 815 mm and 865 mm above the floor and with its

3.7.3.8.

- (ii) midpoint located in line with the front edge of the water closet, or be mounted on the wall beside the water closet and have a horizontal portion 600 mm in length with a 600 mm extension extending upwards to the front and away from the horizontal portion at an angle of 60° to the horizontal with the centreline of the horizontal portion between 815 mm and 865 mm above the floor and the intersection of the horizontal and sloping portions located in line with the front edge of the water closet.

- * **(3)** A grab bar described in Sentence (2) shall
 - (a) be installed to resist a load of not less than 1.3 kN applied vertically or horizontally,
 - (b) be not less than 30 mm and not more than 40 mm in diameter, and
 - (c) have a clearance of 35 to 45 mm from the wall.

3.7.3.9. Water Closets and Urinals

- * **(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.)

- * **(2)** If urinals are provided in a washroom required by Sentence 3.7.2.3.(1) to accommodate disabled persons, a vertically mounted grab bar shall be installed on the wall beside the urinal and at least one urinal shall be either
 - (a) wall mounted with the opening of the basin between 488 mm and 512 mm above the finished floor, or
 - e (b) floor mounted at the same level as the finished floor, with no step being permitted in front of either type of urinal.

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 and hot water supply pipes where these pipes present a burn hazard,
 - (e) be equipped with faucet handles of the lever type without spring loading, and
 - (f) have washroom accessories, such as soap and 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 or adjacent to lavatories shall be located so they will not present a hazard to visually impaired persons.

- (3)** If mirrors are provided in a washroom required to accommodate physically disabled persons, at least one mirror shall be mounted with its bottom edge not more than 1 000 mm above the finished floor, or shall be tilted to be usable by a person in a wheelchair.

- (4)** In a washroom required to accommodate physically disabled persons, washroom accessories shall be available that are of a type, and are installed, so as to be usable by a person in a wheelchair and shall be not more than 1 200 mm from the finished floor to the operating part.

3.7.3.11. Special Washrooms

- (1)** In existing *buildings* where special washrooms are intended to be provided, such washrooms shall

3.7.3.13.

- (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 between 900 and 1 000 mm from the floor, and
 - (ii) on outward swinging doors, a door pull not less than 140 mm in length located on the inside so that its mid-point is between 200 and 300 mm from the hinged side of the door and between 900 and 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 an overall width and length not 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.)
- (e) 13 mm in height above the finished floor, be equipped with a hinged seat that is not spring-loaded or a fixed seat that is
 - (i) not less than 450 mm in width and 400 mm in depth,
 - (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 in length,
 - (ii) be mounted approximately 850 mm above the floor,
 - (iii) 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 Sentence 3.7.3.8.(3), (see Appendix A)
 - (g) be equipped with a pressure-equalizing or thermostatic mixing valve controlled by 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 or a fixed head mounted at a height of 1 500 mm, and
 - (i) have fully recessed soap holders which can be reached from the seated position.

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 in width and 900 mm in depth,
- (b) have a clear floor space at the entrance to the shower of not less than 900 mm in depth 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 exceeding

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.

3.7.3.14. Shelves, Counters and Telephone Equipment

(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, coin slot and controls are not more than 1 200 mm above the floor.

(See Appendix A.)

* (4) Where public telephones are provided, at least one telephone shall be provided with a variable volume control on the receiver.

* (5) Where public telephones are provided in entrance foyers of *buildings* classified as Group A, Group B Division 1, hospitals in Group B Division 2, police stations in Group D, or Group E, or in lobbies of hotels and motels, at least one telephone shall be provided with a built-in telecommunication device for the deaf (TDD).

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 *registered architect* licensed to practice in the Province of Alberta. (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 nonstructural 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.(1)(a) to (d),
- (b) 0.75 for the combinations in Clauses 4.1.3.1.(1)(e) to (g), and
- (c) 0.66 for the combination in Clause 4.1.3.1.(1)(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 exceed-

ing 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, ψ , 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, γ , 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.

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, α , in Sentence (4), a load combination factor, ψ , in Sentences (5) and (6) and an importance factor, γ , in Sentence (7), and the factored load combinations shall be taken as

$$\alpha_D D + \gamma \psi [\alpha_L L + \alpha_Q Q + \alpha_T T]$$

- (4) The load factors, α , shall be equal to
- (a) $\alpha_D = 1.25$, except that when the *dead load* resists overturning, uplift or reversal of load effect, $\alpha_D = 0.85$,
 - (b) $\alpha_L = 1.5$,
 - (c) $\alpha_Q = 1.5$ for wind or 1.0 for earthquake, and
 - (d) $\alpha_T = 1.25$.

- (5) The load combination factor, ψ , 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, γ , 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

$$D + \psi [L + Q + T]$$

where ψ 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.

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 dining 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

$$0.5 + \sqrt{20/A}$$

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

4.1.6.A.

Table 4.1.6.A.
Forming Part of Article 4.1.6.3.

Specified Uniformly Distributed Live Loads on an Area of Floor or Roof	
Use of Area of Floor or Roof	Minimum Specified Load, kPa
Assembly Areas (a) Except for those areas listed under (b) and (c), assembly areas with or without fixed seats including Arenas Auditoria Churches Dance floors Dining areas ⁽⁴⁾ Foyers and entrance halls Grandstands, reviewing stands and bleachers Gymnasias Museums Promenades Rinks Stadia Stages Theatres and other areas with similar uses	4.8
(b) Assembly areas with fixed seats that have backs over at least 80 percent of the assembly area for the following uses: Churches Courtrooms Lecture Halls Theatres	2.4
(c) Classrooms with or without fixed seats	2.4
Attics Accessible by a stairway in <i>residential occupancies</i> only	1.4
Having limited accessibility so that there is no storage of equipment or material	0.5
Balconies, exterior	4.8
Balconies, interior and <i>mezzanines</i> that could be used for the assembly of people as a viewing area (See Appendix A.)	4.8
Balconies, interior other than above	(1)
Column 1	2

Table 4.1.6.A. (Cont'd)

Use of Area of Floor or Roof	Minimum Specified Load, kPa
<i>Mezzanines</i> other than above	(1)
Corridors, lobbies and aisles other than those listed below	4.8
Corridors, lobbies and aisles not more than 1 200 mm in width and all upper floor corridors of residential areas only of apartments, hotels and motels (that cannot be used for the assembly of people as viewing area) (See Appendix A.)	(1)
Equipment areas and <i>service rooms</i> including Generator rooms Mechanical equipment exclusive of elevators Machine rooms Pump rooms Transformer vaults Ventilating or air-conditioning equipment	3.6 ⁽²⁾
<i>Exits</i> and fire escapes	4.8
Factories	6.0 ⁽²⁾
Footbridges	4.8
Garages for Passenger cars Unloaded buses and light trucks Loaded buses and trucks and all other trucking spaces	2.4 6.0 12.0
Kitchens (other than residential)	4.8
Libraries Stack rooms Reading and study rooms	7.2 2.9
Office areas in office <i>buildings</i> and other <i>buildings</i> (not including record storage and computer rooms) located in <i>Basement</i> and <i>first storey</i> Floors above <i>first storey</i> All floors in temporary office <i>buildings</i>	4.8 2.4 2.4
Operating rooms and laboratories	3.6
Column 1	2

4.1.6.9.

Table 4.1.6.A. (Cont'd)

Use of Area of Floor or Roof	Minimum Specified Load, kPa
Patients' bedrooms	1.9
Recreation areas that cannot be used for assembly purposes including Billiard rooms Bowling alleys Pool rooms	3.6
Residential areas (within the scope of Subsection 2.1.2.) Sleeping and living quarters in apartments, hotels, motels, boarding schools and colleges	1.9
Residential areas (within the scope of Subsection 2.1.3.) Bedrooms Other areas Stairs within <i>dwelling units</i>	1.4 1.9 1.9
Retail and wholesale areas	4.8
Roofs	1.0 ⁽³⁾
Sidewalks and driveways over areaways and <i>basements</i>	12.0
Storage areas	4.8 ⁽²⁾
Toilet areas	2.4
Underground slabs with earth cover	(2)
Warehouses	4.8 ⁽²⁾
Column 1	2

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.

$$0.3 + \sqrt{9.8/B}$$

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 4.1.6.B.
Forming Part of Article 4.1.6.10.

Specified Concentrated Live Loads on an Area of Floor or Roof	
Area of Floor or Roof	Minimum Specified Concentrated Load, kN
Roof surfaces	1.3
Floors of classrooms	4.5
Floors of offices, manufacturing buildings, hospital wards and stages	9.0
Floors and areas used by passenger cars	11
Floors and areas used by vehicles not exceeding 3 600 kg gross weight	18
Floors and areas used by vehicles exceeding 3 600 kg but not exceeding 9 000 kg gross weight	36
Floors and areas used by vehicles exceeding 9 000 kg gross weight (See Appendix A.)	54
Driveways and sidewalks over areaways and basements (See Appendix A.)	54
Column 1	2

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.

4.1.6.13. 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.

4.1.6.14. Roof Suspended Platforms

(1) This Article applies to a *building* that is more than 12 m in height between *grade* and the edge of the roof or a parapet around the edge of the roof. *

(2) Roof tie back anchors and *building* face anchor systems shall be provided for window cleaning suspended powered platforms and such platforms shall comply with *

- (a) CAN/CSA-Z91-M, "Safety Code for Window Cleaning Operations," and e
- (b) CAN3-Z271-M, "Safety Code for Suspended Powered Platforms." e

(See Sentence 3.5.4.7.(2).)

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), and
- 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.

4.1.7.1.

(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

- (a) 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,
- (b) the area of roof under consideration is exposed to the wind on all sides with no significant obstructions on the roof, such as parapet walls, within a distance of at least 10 times the difference between the height of the obstruction and $C_b C_w S_s / \gamma$ metres, where γ is the unit weight of snow on roofs, and
- (c) 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, α , is equal to or less than 30° ,
- (b) $\left(\frac{70^\circ - \alpha}{40^\circ}\right)$ when α is greater than 30° , but not greater than 70° , and
- (c) 0 when α exceeds 70° .

(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, α , is equal to or less than 15° ,
- (b) $\left(\frac{60^\circ - \alpha}{45^\circ}\right)$ when α is greater than 15° , but not greater than 60° , and
- (c) 0 when α exceeds 60° .

(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 ,

- (a) shall be 1.0, and
- (b) here appropriate for the shape of the roof, assigned other values which account for
 - (i) nonuniform snow loads on gable, arched or curved roofs and domes,

- (ii) increased snow loads in valleys,
- (iii) increased nonuniform 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 nonuniform snow loads on areas adjacent to roof projections, such as penthouses, large *chimneys* and equipment, and
- (v) increased snow or ice loads due to snow sliding or drainage of melt-water 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 $C_a = 1.0$, distributed on any one portion of the loaded area, and half of this load on the remainder of the loaded area, in such a way as to produce the 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

$$p = qC_eC_gC_p$$

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

$$p_i = qC_eC_gC_{pi}$$

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 are 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 probability of being exceeded in any one year of 1 in 10,

(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.)

(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.)

4.1.8.1.

Table 4.1.8.A.
Forming Part of Sentence 4.1.8.1.(5)

Exposure Factors, C_e		
Height, m		Exposure Factor
Over	0 to 6	0.9
"	6 to 12	1.0
"	12 to 20	1.1
"	20 to 30	1.2
"	30 to 44	1.3
"	44 to 64	1.4
"	64 to 85	1.5
"	85 to 140	1.6
"	140 to 240	1.8
"	240 to 400	2.0
Column 1		2

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_s = dimension of wall or braced frame which constitutes the main lateral load-resisting system in a direction parallel to the applied forces.

4.1.9.1.

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_x = lateral force applied to level x .
 h_i, h_n, h_x = the height above the base ($i = 0$) to level "i," "n," or "x," respectively.
 h_s = 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_{tx} = 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 $\alpha_0 = 1.0$.
 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.

4.1.9.1.

(6) The seismic response factor, S , shall conform to Table 4.1.9.A.

Table 4.1.9.A.
Forming Part of Sentence 4.1.9.1.(6)

Seismic Response Factors		
T	Z_a/Z_v	S
≤ 0.25	> 1.0	4.2
	1.0	3.0
	< 1.0	2.1
> 0.25 but < 0.50	> 1.0	$4.2 - 8.4(T - 0.25)$
	1.0	$3.0 - 3.6(T - 0.25)$
	< 1.0	2.1
≥ 0.50	All values	$1.5\sqrt{T}$
Col. 1	2	3

(7) The fundamental period, T , in Sentence (6) shall be determined by

- (a) the formula $0.1 N$ where the lateral force-resisting system consists of a moment-resisting space frame which resists 100 per cent of the required lateral forces and the frame is not enclosed by or adjoined by more rigid elements that would tend to prevent the frame from resisting lateral forces,
- (b) the formula $0.09h_n/\sqrt{D_s}$, for other structures, where h_n and D_s are in metres and D_s = length of wall or braced frame which constitutes the main lateral load resisting system in the direction parallel to the applied forces; if the main lateral load resisting system does not have a well-defined length then D shall be used in lieu of D_s , or
- (c) other established methods of mechanics provided they do not result in a value that exceeds 1.2 times the period calculated in Clause (a) or (b).

(8) Except as provided for in Sentences 4.1.9.3.(1), (2) and (3), values of the force modification factor, R , shall conform to Table 4.1.9.B. (See Appendix A.)

- (9) For the purpose of applying Table 4.1.9.B.
- (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;
 - (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).
 - (d) if one of the lateral-load-resisting systems of the structure is designed to take 100 per cent 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 loads under seismically induced deformations.
 - (e) if it can be demonstrated through research or experience that the seismic performance of a structural system is at least equivalent to one of Cases 1-5, 7-10, 12-14 or 16 in Table 4.1.9.B., then such a structural system will qualify for a value of R corresponding to the equivalent case in that Table.

(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.)

Table 4.1.9.B.
Forming Part of Sentence 4.1.9.1.(8)

Force Modification Factors		
Case	Type of Lateral Load Resisting System	R
Steel Structures Designed and Detailed According to CAN/CSA-S16.1-M		
1	ductile moment-resisting space frame	4.0
2	ductile eccentrically braced frame	3.5
3	ductile braced frame	3.0
4	moment-resisting space frame with nominal ductility	3.0
5	braced frame with nominal ductility	2.0
6	other lateral-force-resisting systems not defined in Cases 1 to 5	1.5
Reinforced Concrete Structures Designed and Detailed According to CAN3-A23.3-M		
7	ductile moment-resisting space frame	4.0
8	ductile flexural wall	3.5
9	moment-resisting space frame with nominal ductility	2.0
10	wall with nominal ductility	2.0
11	other lateral-force-resisting systems not defined in Cases 7 to 10	1.5
Timber Structures Designed and Detailed According to CAN/CSA-086.1-M		
12	nailed shear panel with plywood, waterboard or strandboard	3.0
13	concentrically braced heavy timber space frame with ductile connections	2.0
14	moment-resisting wood space frame with ductile connections	2.0
15	other systems not included in 12 to 14	1.5
Masonry Structures Designed and Detailed According to CAN3-S304-M		
16	reinforced masonry	1.5
17	unreinforced masonry	1.0
18	Other Lateral Load-resisting Systems not Defined in Cases 1 to 17	1.0
Col. 1	2	3

(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_t , shall be assumed to be concentrated at the top of the structure and

equal to $0.07 TV$, except that F_t need not exceed $0.25 V$ and may be considered as zero where T does not exceed $0.7 s$; the remainder, $V - F_t$, shall be distributed along the height of the building, including the top level, in accordance with the formula

$$F_x = (V - F_t)W_x h_x / \left(\sum_{i=1}^n W_i h_i \right); \text{ or}$$

- (b) by dynamic analysis. (See Appendix A.)

4.1.9.1.

Table 4.1.9.C.
Forming Part of Sentence 4.1.9.1.(11)

Foundation Factors		
Categories	Type and Depth of Soil Measured from the <i>Foundation</i> or <i>Pile</i> Cap Level	F
1	Rock, dense and very dense coarse-grained soils, very stiff and hard fine-grained soils; compact coarse-grained soils and firm and stiff fine-grained soils from 0 to 15 m deep	1.0
2	Compact coarse-grained soils, firm and stiff fine-grained soils with a depth greater than 15 m; very loose and loose coarse-grained soils and very soft and soft fine-grained soils from 0 to 15 m deep	1.3
3	Very loose and loose coarse-grained soils with depth greater than 15 m	1.5
4	Very soft and soft fine-grained soils with depth greater than 15 m	2.0
Col. 1	2	3

(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 nonstructural 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.

(17) The values of S_p in Sentence (15) for mechanical/ electrical components shall be equal to:

$$S_p = C_p A_r A_x$$

where:

$$A_x = 1.0 + \frac{h_x}{h_n}$$

$$A_r = 1.0 \text{ for components that are both rigid and rigidly connected,}$$

= 2.0 for flexible components, or flexibly mounted components located on ground,
= 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.

(18) 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).

(19) 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.

(20) The overturning moment, M , at the base of the structure shall be multiplied by a reduction coefficient, J , where

- (a) $J = 1$ where T is less than 0.5,
- (b) $J = (1.1 - 0.2T)$ where T is not less than 0.5, but not more than 1.5, and
- (c) $J = 0.8$ where T is greater than 1.5.

(21) The overturning moment M_x at any level x shall be multiplied by J_x where:

Table 4.1.9.D.
Forming Part of Sentence 4.1.9.1.(16)

Values of S_p for Architectural Parts or Portions of Buildings			
Category	Architectural Part or Portion of <i>Building</i>	Direction of Force	Value of S_p
1	All exterior and interior walls except those of Categories 2 and 3	Normal to flat surface	1.5
2	Cantilever parapet and other cantilever walls except retaining walls; horizontally cantilevered floors, balconies, beams, etc.	Normal to flat surface	6.5
3	Exterior and interior ornamentations and appendages	Any direction	6.5
4	Connection/attachments for Categories 1, 2 and 3	Any direction	15
5	Floors and roofs acting as diaphragms	Any direction	0.7 ⁽¹⁾
6	Towers, chimneys, smokestacks and penthouses when connected to or forming part of a <i>building</i> having $h_n / D < 5$ $h_n / D \geq 5$ (See Appendix A.)	Any direction	2.0 3.0
Column 1	2	3	4

Note to Table 4.1.9.D.:

⁽¹⁾ See Sentence 4.1.9.1.(18).

$$J_x = J + (1 - J)(h_x/h_n)^3$$

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*.

(22) Torsional moments in the horizontal plane of the *building* shall be computed in each *storey* using the following formula:

$$M_{tx} = \left(F_t + \sum_{i=x}^n F_i \right) e_x$$

(See Appendix A.)

(23) The design eccentricity, e_x , in Sentence (22) shall be computed by one of the following equations, whichever provides the greater stresses:

- (a) $e_x = 1.5e + 0.10D_n$, or
(b) $e_x = 0.5e - 0.10D_n$.

4.1.9.1.

Table 4.1.9.E.
Forming Part of Sentence 4.1.9.1.(17)

Values of C_p for Mechanical/Electrical Parts or Portions of Buildings			
Category	Mechanical/Electrical Part or Portion of <i>Building</i>	Direction of Force	Value of c_p
1	Machinery, fixtures, equipment and pipes that are both rigid and rigidly connected to or forming part of a <i>building</i> . Tanks or bins containing nonliquids, rigidly connected.	Any direction	1.0
2	Tanks plus contents when resting on the ground within a <i>building</i> .	Any direction	0.7
3	Tanks plus contents when resting on the ground within a <i>building</i> and containing toxic or explosive materials or fire fighting fluids.	Any direction	1.0
4	Machinery, fixtures, equipment, pipes and tanks including contents other than those listed above. (See Appendix A.)	Any direction	1.0
5	Pipes and containers plus contents for toxic or explosive materials, for materials having a <i>flash point</i> below 38°C or for fire fighting fluids.	Any direction	1.5
Column 1	2	3	4

(24) 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.

(25) 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 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 4.1.1.5.(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 $S \cdot I$ 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/m^2 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.

4.1.9.4.

(5) Except in velocity-related seismic Zones 0 and 1, *basement* walls shall be designed to resist seismic lateral pressures from backfill or natural ground. (See Appendix A.)

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.

(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.

Table 4.1.10.A.
Forming Part of Sentence 4.1.10.4.(2)

Factors for the Calculation of Impact Loads	
Impact Due to	Factor
Operation of motor driven cranes	1.25
Operation of hand driven cranes	1.10
Operation of elevators	See CAN/CSA-B44-M, Clauses 2.6.2. and 2.10.3.
Supports for light machinery, shaft or motor driven	1.20
Supports for reciprocating machinery (e.g. compressors) or power driven units (e.g. piston engines)	1.50
Column 1	2

(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) The *owner* shall retain the *designer* or another suitably qualified person to review the construction 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

4.2.2.3.

- (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 CAN/CSA-A23.1-M, "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 CAN/CSA-A23.1-M, "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. 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 *foundations*.

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.

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 cal-

4.2.7.6.

- (b) culated or anticipated limits, the integrity of previously installed *deep foundation units*, or
- (c) the integrity of neighbouring structures and services.

4.2.7.7. 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, any necessary changes made and action taken as required in Article 2.3.4.7.

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 conform to CAN3-O86-M, "Engineering Design in Wood (Working Stress Design)" or CAN/CSA-O86.1-M, "Engineering Design in Wood (Limit States Design)."

4.3.1.2. Glued-Laminated Members. Glued-laminated members shall be fabricated in plants conforming to CAN/CSA O177-M, "Qualification Code for Manufacturers of Structural Glued-Laminated Timber."

4.3.1.3. Termites. In areas known to be infested by termites, the requirements in Articles 9.3.2.9., 9.12.1.1., 9.15.5.1. and 9.18.4.1. shall apply.

4.3.2. Plain and Reinforced Masonry

4.3.2.1. Design Basis for Plain and Reinforced 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. Plain, Reinforced and Prestressed Concrete

4.3.3.1. Design Basis for Plain, Reinforced and Prestressed 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."

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."

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. Parking Structures

4.4.2.1. Design Basis for Parking Structures. Parking structures shall be designed in conformance with CAN/CSA-S413, "Parking Structures."



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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 be designed

to retard vapour transmission sufficiently to 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

(See Appendix A.)

5.3.1.1. Locations

(1) Where a *building* assembly will be subjected to a temperature differential, a differential in

5.3.1.1.

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 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. Water Shedding

(1) Exterior wall cladding shall be so installed that it sheds water to prevent its entry into other components of the *building* assembly.

(2) 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 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.

(b) *building*, or
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.)

Section 5.7 Practices

5.7.1. Installation

* **5.7.1.1. General.** Building envelope components shall be installed in such a manner as to effectively perform their intended functions. (See Appendix A.)

5.7.1.2. Envelope Components

* **(1)** Glass and air barrier components shall be designed and installed to resist the loads specified in Section 4.1.

* **(2)** Exterior cladding and glazing shall be designed, constructed and attached so as to accommodate stresses and deformations outlined in Section 4.1 and in addition, to accommodate surface temperature effects. (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



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Heating, Ventilating and Air-Conditioning

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Part 6

Heating, Ventilating and Air-Conditioning

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

(1) Heating, ventilating and air-conditioning systems, including mechanical refrigeration equipment, shall be designed, constructed and installed to conform to good engineering practice such as de-

scribed 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.

(2) Where a health or safety hazard to a worker could result from the production or dissemination of airborne contaminants or from oxygen deficiency in the air, the ventilation systems serving these spaces shall conform to the Ventilation Regulations pursuant to the Occupational Health and Safety Act.

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-M, "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) In addition to the requirements of this Code, heating, ventilating and air-conditioning equipment shall conform to the appropriate requirements of

- (a) the Boilers and Pressure Vessels Act and regulations made pursuant to that Act,
- (b) the Gas Protection Act and regulations made pursuant to that Act,

6.2.1.4.

- (c) the Electrical Protection Act and regulations made pursuant to that Act,
- (d) CAN/CSA B139-M, "Installation Code for Oil Burning Equipment,"
- (e) CSA Z240.5, "Oil Requirements for Mobile Housing and Recreational Vehicles,"
- (f) CSA B52-M, "Mechanical Refrigeration Code,"
- (g) CAN/CSA-B365-M, "Installation Code for Solid-Fuel Burning Appliances and Equipment," except as amended by Sentence (2), and
- (h) the Agricultural Chemicals Act and regulations made pursuant to that Act.

* (2) CAN/CSA B365-M, "Installation Code for Solid-Fuel Burning Appliances and Equipment," is amended by striking out Clauses 5.2.7. and 5.3.2. and Appendix C.

6.2.1.5. Solid-Fuel Burning Stoves, Ranges and Space Heaters

(1) The design and installation of solid-fuel burning *stoves, ranges* and *space heaters* shall conform to the requirements of Section 9.33.

* (2) A solid-fuel burning *appliance* shall not be installed in a location where there is or could be a corrosive or explosive atmosphere.

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-M, "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.

6.2.1.13. Heat Exchanger Material. If the mixed air temperature upstream of a fuel-fired heat exchanger is less than 6°C, the heat exchanger shall be of corrosion resistant material.

6.2.1.14. Exit Stairway HVAC. An enclosed *exit* stairway that serves more than 1 *storey* shall not be heated, ventilated or air-conditioned using an air system that serves other parts of the *building*.

6.2.1.15. Indoor Design Parameters

(1) Except as provided in Sentences (6) and (7), a *building* used for *residential occupancy* intended for use in the winter months on a continuing basis and shall be equipped with heating facilities capable of maintaining an indoor air temperature of 22°C at the outside winter design temperature.

- * (2) A *building* used for *institutional occupancy* shall be equipped with heating facilities capable of maintaining in sleeping rooms an indoor air temperature of 22°C at the outside winter design temperature.
- * (3) Except as required by Sentence (2), a *building* other than a *building* used for *residential occupancy* shall be equipped with heating facilities capable of maintaining the designed indoor air temperature, commensurate with the use of the *building* at the outside winter design temperature.
- * (4) Thermostatic control of the heat supply shall be provided in each *dwelling unit*.
- * (5) Devices shall be provided that enable the heat supply to be controlled to each sleeping room in a *building* used for *institutional occupancy* and to each room in a *residential occupancy* that is used or intended to be used for living, sleeping, eating or cooking purposes.
- * (6) In an unfinished *basement* of a *building* used for *residential occupancy*, heating facilities shall be provided which shall be capable of maintaining a temperature of not less than 18°C.
- * (7) If a crawl space is required to be heated, the heating facilities shall be capable of maintaining a temperature of not less than 15°C.

6.2.2. Ventilation

6.2.2.1. Required Ventilation

- * (1) Except as provided in Sentences (2) and (3), and Article 6.2.2.2., all rooms and spaces in *buildings* shall be mechanically ventilated in accordance with this Part.
- * (2) The ventilation of rooms or spaces by natural methods in *residential occupancies* shall conform to Section 9.32.
- * (3) 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.
- * (4) Air quantities for ventilation purposes shall be not less than the value given in ASHRAE 62, "Ventilation for Acceptable Indoor Air Quality."

6.2.2.2. Natural Ventilation. The ventilation of rooms and spaces in *occupancies* other than *residential occupancies* by natural methods in lieu of mechanical ventilation will only be permitted where sufficient engineering data have been submitted to demonstrate that such ventilation will provide sufficient air change to provide healthful conditions in that *occupancy*.

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 1 200 mm from the floor, or
 - (b) limit the concentration of nitrogen dioxide to not more than 3 parts per million parts of air when measured between 900 mm and 1 200 mm above the floor, where the majority of the vehicles stored are powered by diesel fuel engines.
- * (2) Mechanical ventilation systems provided in accordance with Clause (1)(a) shall be controlled by carbon monoxide monitoring devices and systems provided in accordance with Clause (1)(b) shall be controlled by carbon dioxide or other acceptable monitoring devices. (See Appendix A.)
- * (3) Mechanical ventilation systems provided in accordance with Sentence (1) shall be designed such that the pressure in the *storage garage* is less than the pressure in adjoining *buildings* of other *occupancy*, or in adjacent portions of the same *building* having a different *occupancy*.
- * (4) In *storage garages* subject to the requirements of 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) are waived for an *open-air storey* in a *storage garage* in which
 - (a) no portion of the *storey* is more than 1 m below the adjacent ground level, and

6.2.2.3.

- (b) no tarpaulins, glass or other materials are used to close the required openings at any time.

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.

- * (3) Air contaminants in spaces where workers will be present shall not exceed the occupational exposure limits set out in the Chemical Hazards Regulations pursuant to the Occupational Health and Safety Act.

6.2.2.5. Hazardous Gases, Dusts or Liquids

- * (1) 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 this Code or, in the absence of specific requirements, to good engineering practice.

- * (2) Mechanical ventilation in storage rooms where *flammable liquids* or *combustible liquids* are stored in compliance with Sentence 3.3.1.2.(4) shall provide at least 5 L/s of exhaust air per square metre of room area, but not less than 70 L/s.

- * (3) Exhaust air from a ventilation system required in Sentence 3.3.1.2.(9) shall be discharged outdoors and shall be taken from a point within 300 mm of the floor near a wall, with at least one makeup air inlet located near the opposite wall.

- * (4) Where makeup air for a mechanical ventilation system described in Sentence (2) is taken from within the *building*, the opening shall be protected in conformance with the requirements of Subsection 3.1.8.

(5) Makeup air for a gravity ventilation system described in Sentence (2) shall be supplied directly from outside the *building* remote from any discharge referred to in Sentence (3).

(6) Ducts used to ventilate a *flammable liquids* or *combustible liquids* storage room described in Sentence (2) shall be used solely for that purpose.

(7) A *building* intended for the storage of ammonium nitrate shall have not less than 70 cm² in openable vent area for each square metre of storage area unless mechanical ventilation is provided by equipment protected from the storage area by a *fire separation* having a *fire-resistance rating* of not less than 1 h.

(8) Industrial ovens in which flammable vapours may be present or through which products of combustion are circulated shall be ventilated in accordance with NFPA 86, "Ovens and Furnaces."

6.2.2.6. Commercial Cooking Equipment

(1) 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 Vapours from Commercial Cooking Equipment," except as required by Sentence 3.5.3.1.(1) and Article 3.5.4.2.

(2) A ventilation system for a *food establishment* shall not have components that allow drips to fall onto surfaces where food is prepared or into food.

(3) A ventilation system for a *food establishment* shall have all openings to the exterior of the *building* located and protected to prevent the entry of vermin, dust, dirt and other contaminating material into the *food establishment*.

(4) Canopies, hoods and ductwork for a ventilation system exposed within a *food establishment* shall be constructed of stainless steel.

(5) A *food establishment* in which food is prepared and the process generates odours, smoke, steam or heat shall have a mechanical ventilation system that includes canopies, ductwork and fans to remove odours, smoke, steam or heat to the exterior of the *building*.

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.

6.2.2.8. Projection Rooms

- * (1) This Article applies to a projection room in which equipment is used to handle film more than 16 mm in width.
- * (2) The temperature of a projection room shall be thermostatically controllable from within the projection room to maintain the temperature of the room at any value within the range of 18°C to 25°C.
- * (3) A projection room exhaust air system shall be independent of any other air system in the *building*.
- * (4) A projection room exhaust duct shall terminate at the exterior of a *building* in a location where exhaust air cannot readily enter any supply or make-up air system and shall be located not less than 3 m from any air intake.
- * (5) A ventilation system for a projection machine shall conform to the instructions of the projection machine manufacturer and the external temperature of the lamp housing shall be not more than 54°C when the machine is operating.
- * (6) The supply air to a projection room shall be ducted directly to the projection room and shall not be circulated through other rooms or spaces to the projection room.
- * (7) If items of equipment that generate heat while in operation, other than projection machines, are to be located in a projection room, the air supply requirements of the projection room shall be increased by not less than 60 L/s for each such item of equipment.

6.2.3. Air Duct Systems

- * **6.2.3.1. Application.** Except as varied by Subsection 6.2.4., the design, construction and installation of all air duct systems shall conform to 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, 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.

6.2.3.3.

(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-M, "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-M, "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

(1) 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.

(2) A duct in or under a slab-on-ground shall be of metal and of a gauge recommended by ASHRAE or SMACNA and it shall be surrounded by concrete with a minimum thickness of 50 mm.

(3) If a perimeter warm air duct is installed in or under a slab within 900 mm of ground level, not less than 25 mm thickness of rigid water-resistant type insulation with a thermal conductivity not more than $0.04 \text{ W}\cdot\text{m}^{-1}\cdot\text{C}^{-1}$ shall be installed between the duct and the outside edge of the *building*.

(4) A clean-out or pump-out shall be included in an underground duct system at every low point of the duct system.

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.

(2) *Exhaust ducts* of nonmechanical ventilating systems serving similar *occupancies* may be combined immediately below the point of final delivery to the outside, such as the base of a roof ventilator.

(3) *Exhaust ducts* of ventilating systems shall have provision for the removal of condensation where this may be a problem.

(4) Exhaust outlets shall be designed to prevent back draft under wind conditions.

* (5) Clothes dryer vents will meet the following conditions:

- (a) all clothes dryer vents shall be ducted to the outside,
- (b) where clothes dryer vents are collectively vented, a sheet metal duct shall be provided and a continuously operating fan positioned downstream from all dryer vents shall be provided to exhaust all moisture and lint positively whenever any of the connected dryers are operating,
- (c) screens are not permitted on clothes dryer vents,
- (d) suitable access doors shall be installed in clothes dryer vents for cleaning purposes,
- (e) a clothes dryer vent shall not be secured with screws protruding into the vent, and
- (f) a clothes dryer vent shall not be connected to any other exhaust system *gas vent* or *chimney*.

(6) 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*.

(7) Except as provided in Sentence (8) and except for self-contained systems serving individual *dwelling units*, *exhaust ducts* serving rooms containing residential cooking equipment shall be independent of other *exhaust ducts*.

(8) 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.

(9) 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.

6.2.3.11. Interconnection of Systems

(1) Except as permitted by Sentence (2), air duct systems serving garages shall not be directly interconnected with other parts of the *building*.

(2) *Exhaust ducts* referred to in Sentence 6.2.3.10.(6) may be exhausted through an enclosed parkade or *boiler* room prior to being exhausted to the outdoors.

(3) In the case of an enclosed parkade, the exhaust system must run continuously unless a backdraft damper is provided near the duct outlet location to prevent garage vapours from entering the ductwork system when the exhaust fan is not in operation.

(4) In a *residential occupancy*, air from one *suite* shall not be circulated to any other *suite* nor to a *public corridor*.

6.2.3.12. Make-up Air

(1) In ventilating systems that exhaust air to the outdoors, provision shall be made for the admission of a supply of make-up air in sufficient quantity so that the operation of the exhaust system and other exhaust equipment or combustion equipment is not adversely affected. (See Appendix A.)

(2) During winter operation, make-up air that is introduced into a *building* shall be preheated.

6.2.3.13.

6.2.3.13. Supply, Return, Intake and Exhaust Air Openings

(1) 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.

(2) *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.

(3) Outdoor air intakes and exhaust outlets at the *building* exterior shall be designed or located so that the air entering the *building* system will not contain more contaminants than the normal exterior air of the locality in which the *building* is situated. (See Appendix A.)

(4) Unless provisions are made for screening in a serviceable area prior to the prefilters, 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.

(5) Screens required in Sentence (4) shall be accessible for maintenance.

6.2.3.14. Filters and Odour Removal Equipment

(1) Air filters for air duct systems shall conform to the requirements for Class 2 air filter units as described in CAN4-S111-M, "Standard Method of Fire Tests For Air Filter Units."

(2) When electrostatic-type filters are used, they shall be installed so as to ensure that the electric circuit is automatically de-energized when filter access doors are opened or, in *dwelling units*, when the furnace circulating fan is not operating.

(3) When odour removal equipment of the adsorption type is used it shall be

- (a) installed to provide access so that adsorption material can be reactivated or renewed, and

(b) protected from dust accumulation by air filters installed on the inlet side.

(4) Facilities for flushing and drainage shall be provided where filters are designed to be washed in place.

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, except as varied by this Subsection, 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.

* **Table 6.2.4.A.**
Forming Part of Sentence 6.2.4.2.(1)

Minimum Metal Thickness of Ducts, mm			
Shape and Location of Duct	Size of Duct, mm	Galvanized Steel	Aluminum
Round ducts serving single family <i>dwelling units</i>	125 or under	0.254	0.30
All round ducts other than above and enclosed rectangular ducts	350 or under over 350	0.33 0.41	0.30 0.41
Exposed rectangular ducts having a required clearance of up to 12 mm and serving single family <i>dwelling units</i>	350 or under over 350	0.33 0.41	0.41 0.48
Other exposed rectangular ducts	350 or under over 350	0.41 0.48	0.41 0.48
Column 1	2	3	4

6.2.4.3.

(6) Trunk *supply ducts* shall not be nailed directly to wood members.

(7) Branch ducts shall be supported at suitable spacings to maintain alignment and prevent sagging.

(8) *Combustible* ducts in concrete slabs-on-ground that are connected to a *furnace supply plenum* shall be located not closer than 600 mm to that *plenum* and not less than 600 mm from its connection to a riser or register.

(9) Ducts in or beneath concrete slabs-on-ground shall be watertight 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.

(See Appendix A.)

(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.

(See Appendix A.)

(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.

(See Appendix A.)

(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.

* (8) *Air supply ducts* shall be complete from the *furnace* to the room supply outlet.

* (9) A crawl space shall not be used as a supply air *plenum*.

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 louvred 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.

(15) When more than one *furnace* system serves * a *dwelling unit*, the return-air system for each *furnace* shall be independent.

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.

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
- (a) designed for outdoor use,
 - (b) installed not less than 1.2 m from the property line, measured horizontally, and
 - (c) installed not less than 3 m from an adjacent wall of the same *building* when such wall contains an opening or openings within 3 *storeys* above and 5 m horizontally from the *appliance*, unless such openings are protected by a *closure assembly* having a 45 min *fire-protection rating* determined in conformance with Article 3.1.8.4., or by wired glass conforming to Article 3.1.8.14.

6.2.6. Incinerators

6.2.6.1. Applicable Standard. The design, construction, installation and *alteration* of every indoor incinerator shall conform to NFPA 82, "Incinerators, Waste and Linen Handling Systems and Equipment."

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.

(2) Insulation and coverings on pipes in which the temperature of the fluid exceeds 120°C

- (a) shall be made of *noncombustible* material, or
- (b) shall not flame, glow, smoulder or smoke when tested in accordance with 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.

(3) Except as provided in Sentence (7), where *combustible* insulation is used on piping in a *horizontal* or *vertical service space*, the insulation and coverings on such pipes shall have a *flame-spread rating* throughout the material of not more than 25 in *buildings* of *noncombustible construction* and not more than 75 in *buildings* of *combustible construction*.

(4) Except as provided in Sentence (7), insulation and coverings on piping located in rooms and spaces other than the *service spaces* described in Sentence (3) shall have a *flame-spread rating* not more

than that required for the interior finish for the ceiling of the room or space.

(5) Except as provided in Sentence (7), where *combustible* insulation and covering is used on piping in *buildings* described in Subsection 3.2.6., they shall have a smoke developed classification of not more than 100.

(6) Pipes that are exposed to human contact shall be insulated so that the exposed surface does not exceed 70°C. (See Appendix A.)

(7) No *flame-spread rating* or smoke developed classification limitations are required where *combustible* insulation and coverings are used on piping when such piping is

- (a) located within a concealed space in a wall,
- (b) located in a floor slab, or
- (c) enclosed in a *noncombustible* raceway or conduit.

6.2.9.3. Clearances. Clearances between *combustible* material and bare pipes carrying steam or hot water shall conform to Table 6.2.9.A.

Table 6.2.9.A.
Forming Part of Article 6.2.9.3.

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
Column 1	2

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.

6.2.9.5. Protection

(1) Where a pipe carrying steam or hot water at a temperature above 120°C passes through a *com-*

bustible 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.

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.

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.

6.3.1.6. Common Flue. A *chimney flue* serving a * fireplace, incinerator or *slow burning solid-fuel fired appliance* shall not serve any other *appliance*.

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."

6.3.1.3. Metal Smoke Stacks. Single wall metal smoke stacks shall be designed and installed in conformance with 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 CAN/CSA-B72-M, "Installation Code for Lightning Protection Systems" and to the Fire Prevention Act and regulations made pursuant to that Act.

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Part 7

Plumbing Services and Health

Section 7.1 General

7.1.1. Height and Area of Rooms

- * **7.1.1.1. Room Height.** The unobstructed height of rooms and spaces in a *building* used for *residential occupancy* and sleeping rooms in a *building* used for *institutional occupancy* shall conform to Table 9.5.2.A.
- * **7.1.1.2. Area.** Except as required by Article 7.1.1.3., the minimum area of rooms and spaces in a *building* used for *residential occupancy* and sleeping rooms in a *building* used for *institutional occupancy* shall conform with the requirements of Section 9.5.

7.1.1.3. Day Care and Nursery Schools

- * **(1)** Rooms or areas that are used for playing, resting or sleeping shall have a net floor area of
 - (a) not less than 3.0 m² per child in day care facilities, or
 - (b) not less than 2.5 m² per child in nursery schools.

7.1.2. Windows

7.1.2.1. Windows

- * **(1)** Except as permitted in Article 3.3.3.10., every room used for sleeping in any *building*, and every principal room in a *dwelling unit*, including living rooms and dining rooms or combinations thereof, shall be provided with windows conforming to Table 9.7.1.A.
- * **(2)** All openable windows in a *dwelling unit* shall be screened against the entry of insects.

7.1.3. Ventilation

7.1.3.1. Ventilation. Except in a *building* regulated by Article 9.32.1.1., ventilation shall conform to Part 6. *

7.1.3.2. Insect Screens. Except for a *food establishment* in which the only food kept or served is food in sealed containers, every doorway, window or other opening to the outside that is used to provide ventilation for a *food establishment* shall be screened against insects or contain protection against the entry of insects. *

7.1.3.3. Cooking and Sleeping. A cooking appliance installed in a room intended for sleeping and also for cooking shall be of the electrical type. *

7.1.4. Food Establishments

7.1.4.1. Separation of Functions

(1) Laundry facilities in a *food establishment* shall be completely separated from a *food area*. *

(2) There shall be no direct access from a sleeping room to a *food area* in a *food establishment*. *

(3) No parts of a *food area* or a place from which there is direct access to a *food area* shall be used as sleeping rooms. *

7.1.4.2. Provision of Storage Space

- * **(1)** Adequate storage space shall be provided in a *food establishment* for
 - (a) food,
 - (b) personal items of the staff,
 - (c) unused articles, and
 - (d) cleaning equipment and supplies.

7.1.4.2.

* (2) The storage space for food required in Clause (1)(a) shall be a separate room or *building* and the room or *building* shall be adequately ventilated in accordance with Part 6.

* (3) Storage spaces provided in conformance with Sentence (1) shall enable each class of item to be kept distinctly separate from each other and from other areas of the *food establishment*.

* **7.1.4.3. Layout Plans.** Plans showing the layout of food preparation equipment shall be submitted by the *owner* to the local Board of Health for review.

7.1.4.4. Cleaning and Storage of Mobile Units

* (1) A *building* in which a mobile *restaurant* or vending cart is cleaned and stored shall have

- (a) floors, walls and ceilings with impervious finishes,
- (b) a sink supplied with hot and cold potable water,
- (c) a floor drain, and
- (d) any related food storage and preparation area fully separated by a wall or *partition* from the cleaning area.

7.1.5. Hairstyling Shops

* **7.1.5.1. Separate Facilities.** A *hairstyling shop* shall be in a room entirely separate from a room used for living, dining or sleeping purposes, or for the preparation or storage of food.

* **7.1.5.2. Separate Room.** A *hairstyling shop* shall be in a room entirely separate from a *restaurant* or other business handling unwrapped food.

* **7.1.5.3. Water Supply.** A system for supplying an adequate amount of hot and cold potable water shall be provided in a *hairstyling shop* for operating and cleaning purposes.

7.1.6. Commercial Bathing Places and Man Made Beaches

7.1.6.1. Underwater Hazards

* (1) Piers, wharfs, fixed platforms and floats in the water at a *commercial bathing place* or *man made beach* shall be constructed with

- (a) an air space of not less than 300 mm underneath,

- (b) as little underwater construction as is consistent with strength requirements, and
- (c) all braces, struts and other below water items designed to prevent entanglement or trapping of a *bather* underneath the structure.

7.1.6.2. Changing Facilities

(1) A change house provided at a *commercial bathing place* or *man made beach* shall

- (a) provide sufficient space for *bathers* to change,
- (b) provide privacy for each sex,
- (c) have floors that slope to drains, and
- (d) provide showers in conformance with Article 7.3.3.29.

7.1.6.3. Storm Water Retaining Ponds and Man Made Lakes. Portions of on site storm water retention ponds and man made lakes shall be fenced where changes in elevation pose a hazard. (See Appendix A.)

Section 7.2 Plumbing Facilities

7.2.1. General

7.2.1.1. Plumbing and Drainage Act. The construction, extension, *alteration*, renewal or repair of *plumbing systems* and *private sewage disposal systems* shall conform to the Plumbing and Drainage Act and regulations made pursuant to that Act.

7.2.1.2. Plumbing Systems and Fixtures

(1) A *building* situated on property that abuts on a street in which a municipal water main is located shall be provided with a *plumbing system* including an adequate potable water supply, a *sanitary drainage system* and plumbing fixtures.

(2) An accessible adequate supply of potable water, suitable sanitary facilities and plumbing fixtures shall be provided for the use of the occupants of a *building* situated on a property that does not abut on a street in which a municipal water main is located.

* **(3)** A *dwelling unit* in a *building* complying with Sentence (1) or intended to be used as a domicile shall have

- (a) its own supply of potable water,
- (b) a kitchen sink,
- (c) a bathtub,
- (d) a lavatory,
- (e) a water closet, and
- (f) a supply of hot water.

* **(4)** In a *building* complying with Sentence (1) or intended for human occupancy

- (a) piping for hot and cold water shall be connected to every
 - (i) kitchen sink,
 - (ii) lavatory,
 - (iii) bathtub,
 - (iv) shower,
 - (v) slop sink, and
 - (vi) laundry area, and
- (b) piping for cold water shall be connected to every
 - (i) water closet
 - (ii) urinal, and
 - (iii) hose bibcock.

* **(5)** Water, other than potable water, shall not be connected to lavatories, kitchen sinks, *appliances*, bathtubs or showers.

* **(6)** Except for *dwelling units* complying with Sentence (3) and day care centres complying with Sentence (7), a *building* of *residential* or *institutional occupancy* shall have available to its occupants at least one bath or shower, water closet and lavatory.

* **(7)** Day care centres shall have available to occupants at least one water closet lavatory and a sink suitable for the washing of toys.

* **7.2.1.3. Laundry Facilities.** Laundry facilities or a space for laundry facilities shall be provided in every *dwelling unit*, or grouped elsewhere in a *building* in a location conveniently accessible to occupants of every *dwelling unit*.

* **7.2.1.4. Alternates for a Sanitary Drainage System.** When the installation of a *sanitary drainage system* is not possible because of the absence of a water supply, sanitary privies, chemical toilets or other means for the disposal of human waste shall be provided.

7.2.1.5. Floor Drains

(1) A floor drain shall be provided in a garage room, incinerator room, laundry room or *boiler room* serving more than one *dwelling unit*. *

(2) 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*. *

7.2.1.6. 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. *

7.2.1.7. Common Bathrooms and Water Closets. Bathroom and water closet accommodation for the use of more than one *dwelling unit* in an apartment *building*, or more than one *suite* in a hotel, motel, institution or lodging house shall be accessible only from a common corridor. *

7.2.1.8. Washroom Ventilation and Door Closers. In other than *dwelling units* and *suites* in *buildings* of *residential occupancy*, a room in which a water closet or urinal is installed must be mechanically ventilated to the exterior of the *building* and have a self-closing door. *

7.2.1.9. Location Restriction. No water closet or urinal shall be located in a room used for the preparation, processing, serving or storage of food or for the cleaning, sanitizing or storing of utensils. *

7.2.1.10. Privies

- (1)** A sanitary privy shall be provided with
 - (a) a self-closing door,
 - (b) natural lighting,
 - (c) seats and covers of nonabsorbent, easily cleanable material,
 - (d) a ventilated pit which is protected from surface water and *groundwater*,
 - (e) insect proof screens on ventilation openings, and
 - (f) a toilet paper dispenser.

(2) A sanitary privy shall not be located closer than

- (a) 0.6 m to a property line,
- (b) 6 m to a *dwelling unit*, store, *restaurant*, or other place where food is stored, prepared or consumed, or

7.2.1.11.

- (c) 15 m to a well.

7.2.1.11. Washroom Accessories

- * **(1)** A room or cubicle containing a water closet shall have installed
 - (a) toilet paper dispensers, and
 - (b) receptacles for the disposal of sanitary napkins where the facilities are to be used by females.
- * **(2)** A room in which one or more lavatories are installed shall have not less than
 - (a) one electric hot air dryer or paper or cloth towel dispenser,
 - (b) one receptacle for paper towels where a paper towel dispenser is provided, and
 - (c) one soap dispenser or tray.
- * **7.2.1.12. Drinking Facilities.** An easily accessible drinking fountain or a paper cup dispenser and a receptacle for used paper cups shall be provided in a day care facility or child care institution.
- * **7.2.1.13. Protruding Hazards.** All ancillary items in a washroom, including towel dispensers and hand dryers, shall be installed so that they do not create a hazard for a visually impaired person.
- * **7.2.1.14. Wastes.** Wastes from every plumbing fixture shall be piped to the *plumbing system*.
- * **7.2.1.15. Sewer Hookup.** *Building* sewers shall discharge into a public sewage system where such a system is available at the time of construction.
- * **7.2.1.16. Private Disposal.** Where a public sewage system is not available, the *building* sewer shall discharge into a *private sewage disposal system*.
- 7.2.1.17. Clothes Washer Provisions**
 - * **(1)** Where the *plumbing system* of a *building* is connected to a municipal sewer system, roughed-in plumbing for automatic clothes washer drains shall be provided in every single family *dwelling unit*.
 - * **(2)** Sentence (1) does not apply to a *building* containing more than one *dwelling unit* if a central clothes washing and drying facility is available to all occupants of the *building*.

7.2.2. Water Closets and Lavatories

7.2.2.1. Water Closets

(1) Except for water closets in day care facilities for children under 6 years of age, 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; when such a determination cannot be made with reasonable accuracy, it shall be assumed that the *occupancy* is equally divided between the sexes. *

(2) If the *occupant load* in an *occupancy* does not exceed 10 persons, or the total area in a Group E *occupancy* does not exceed 100 m², then both sexes may be served by one water closet. e *

7.2.2.2. Privacy

(1) Except for washrooms serving children under 6 years of age in a day care *occupancy*, a room containing sanitary facilities serving one sex only shall be enclosed and have a full height door that shall be clearly marked to show the sex served. *

(2) A room providing separate water closets or urinals for more than one male or female shall be designed so that the water closets or urinals are not visible when the door to the room opens onto a place where persons of the other sex work or pass. *

7.2.2.3. Urinals. Urinals may be substituted for two-thirds of the required number of water closets and may be counted as water closets, except that when only 2 water closets are required, one urinal may be substituted for one of the water closets. *

7.2.2.4. Number of Water Closets. The minimum number of water closets shall be determined in accordance with Subsection 7.2.2. for the *occupant load* of the *occupancy* calculated from Table 3.1.16.A., except that for Group D *occupancies* the *occupant load* shall be calculated by assuming a net area of 14 m² for each person. e *

7.2.2.5. Employee Facilities. Facilities provided for employees may be counted as part of those required for the *occupancy* where those facilities are made accessible to the public. *

7.2.2.6. Water Closet Cubicle

* (1) Except for facilities provided in accordance with Section 3.7, every cubicle containing a water closet shall have a minimum depth of 1 400 mm and a minimum width of 800 mm.

* (2) Water closet cubicles shall be constructed of smooth, easily cleanable material.

* **7.2.2.7. Finishes around Urinals.** Wall and floor finishes within 900 mm of a urinal shall be of an impervious material such as ceramic tile or other equally hard, glasslike and durable finish.

7.2.2.8. Installation Conditions

* (1) No water closet or urinal shall be installed in a room used for sleeping unless accepted by the authority having jurisdiction.

* (2) No water closet or urinal shall be installed in a basement unless light and ventilation are provided for the space in which it is located.

7.2.2.9. Location and Number of Fixtures for Eating Areas and Establishments Serving Alcoholic Beverages

* (1) Except as described in Sentence (4), the number of water closets required for dining rooms, restaurants, banquet rooms, lounges, taverns and clubs shall be

- (a) one fixture to serve groups of 25 females or less, and
- (b) one fixture to serve groups of 35 males or less except that not less than one urinal shall be provided in washrooms for males if there are more than 20 males and the urinal shall be in addition to the water closet required when there are not more than 35 males.

* (2) A washroom for patrons use in a restaurant shall be located so that patrons are not required to pass through kitchens, storage rooms or other food areas.

* (3) In the case of the type of food establishment commonly located in a shopping mall, where one or more independently operated food establishments sell food for consumption adjacent to the point of service

or out of the food establishment but inside the mall, the facilities required by Sentence (1) may instead be provided and maintained by the owner of the mall outside the food establishment but in the mall.

(4) A restaurant that has sufficient water closets for the staff and patrons of all indoor areas need not have facilities for seasonally used outdoor seating areas operated as an integral part of the restaurant, provided the number of seats in the outdoor seating area is not more than 50.

7.2.2.10. Food Handlers' Facilities and Dishwashing

(1) A food establishment must have available during all hours when the establishment is operating at least one water closet and one lavatory for the use of food handlers.

(2) Notwithstanding Sentence (1), a food establishment in which food is prepared or processed shall have a lavatory for the use of food handlers readily accessible to every area where food is prepared or processed.

(3) If the lavatories required by Sentences (1) and (2) are not readily accessible to areas where food is served, an additional lavatory shall be located adjacent to those areas.

(4) If a water supply is not available in accordance with Sentence 7.2.1.2.(1), provision shall be made for a supply of hot and cold potable water for the lavatories required by Sentences (1) to (3).

(5) Sentences (1) to (3) do not apply to a food establishment in which the only food kept and served is food in sealed containers.

(6) A food establishment in which utensils are washed shall be provided with a double compartment sink when an automatic dishwasher is provided and a triple compartment sink when an automatic dishwasher is not provided.

7.2.2.11. Water Closets for A1, A3, A4, Some A2 and Other Occupancies. The number of water closets required for Group A, Division 1, 3, and 4 occupancies and for auditoria, gymnasia, lecture halls, secondary schools, nonresidential colleges, day use areas, man-made beaches and commer-

7.2.2.11.

cial bathing places and similar *occupancies* shall conform to Table 7.2.2.A.

Table 7.2.2.A.
Forming Part of Article 7.2.2.11.

Number of Persons of Each Sex	Minimum Number of Water Closets	
	Male	Female
1 – 25	1	1
26 – 50	1	2
51 – 75	2	3
76 – 100	2	4
101 – 150	3	5
151 – 200	4	6
201 – 300	5	7
301 – 400	6	8
Over 400	7 plus 1 for each additional increment of 200 males	9 plus 1 for each additional increment of 150 females
Column 1	2	3

* **7.2.2.12. Water Closets for Some A2 and Similar Occupancies.** Except as provided in Sentence 7.2.2.1.(2), the number of water closets required for 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 7.2.2.B.

* **7.2.2.13. Water Closets for Primary Schools and Places of Worship**

* **(1)** The number of water closets required for primary schools shall be at least one fixture for each 30 males and one fixture for each 25 females.

* **(2)** 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.

Table 7.2.2.B.
Forming Part of Article 7.2.2.12.

Number of Persons of Each Sex	Minimum Number of Water Closets for Each Sex
1 – 25	1
26 – 50	2
Over 50	3 plus 1 for each additional increment of 50 persons of each sex
Column 1	2

* **7.2.2.14. Water Closets for B1 Occupancies.** The number of water closets required for Group B, Division 1 *occupancies* shall be determined on the basis of the special needs of such *occupancies*.

* **7.2.2.15. Water Closets for E Occupancies.** Except as provided in Sentence 7.2.2.1.(2), 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.

* **7.2.2.16. Water Closets for B2, Some C, D and F Occupancies.** Except as provided in Sentence 7.2.2.1.(2), the number of water closets required for Group B, Division 2 *occupancies*, Group C *occupancies* other than *dwelling units* and *suites* conforming to the requirements for *dwelling units*, Group D *occupancies*, and Group F *occupancies* shall conform to Table 7.2.2.C.

* **7.2.2.17. Sanitary Facilities for Recreation Camps**

* **(1)** Where plumbing and sewage disposal facilities are available in a *recreation camp*,

- water closets shall be provided in accordance with Table 7.2.2.C.,
- one shower shall be provided for each 30 persons of each sex, and
- one lavatory shall be provided for each water closet.

* **7.2.2.18. Substitution of Privies.** The facilities required by Article 7.2.2.11. for a *day use area*,

7.2.3.1.

Table 7.2.2.C.
Forming Part of Article 7.2.2.16.

Number of Persons of Each Sex	Minimum Number of Water Closets for Each Sex
1 – 10	1
11 – 25	2
26 – 50	3
51 – 75	4
76 – 100	5
Over 100	6 plus 1 for each additional increment of 30 persons of each sex
Column 1	2

man made beach and commercial bathing place or by Sentence 7.2.2.17.(1) for a *recreation camp* may be omitted where plumbing and sewage disposal facilities are not available but sanitary privies shall be provided and their number shall be the same as the number of water closets required by Table 7.2.2.A. or Table 7.2.2.C. as appropriate.

7.2.2.19. Lavatories

- * (1) Except as provided in Sentence (2), at least one lavatory shall be provided in a room containing one or two water closets or one water closet and one urinal, and at least one additional lavatory shall be provided for each additional 2 such fixtures.
- * (2) A wash fountain in circular form may be provided in lieu of lavatories required in Sentence (1) provided each 500 mm of its circumference is considered to be the equivalent of one lavatory.

7.2.2.20. Service Buildings for Mobile Home Parks and Campgrounds

- * (1) Where a service *building* is required by Sentences (3) and (4), it shall contain lavatories as required in Sentence 7.2.2.17.(1) and at least,
 - (a) one laundry tray or similar facility, and
 - (b) one bathtub or shower for each sex.
- * (2) The requirements of Article 7.2.2.11. and Sentences 7.2.2.17.(1) and 7.2.2.20.(4) for water closets

Table 7.2.2.D.
Forming Part of Sentences 7.2.2.20.(3) and (4)

Number of Mobile Homes or Camping Sites	Minimum Number of Water Closets for Each Sex
1 – 10	1
11 – 22	2
23 – 35	3
36 – 45	4
46 – 55	5
56 – 65	6
66 – 75	7
Over 75	8 plus 1 for each additional increment of 10 sites
Column 1	2

may be satisfied by a combination of water closets and sanitary privies.

(3) If *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 water closets conforming to Table 7.2.2.D.

(4) Except as permitted by Sentence (5) a *campground* shall have a service *building* provided that contains water closets conforming to Table 7.2.2.D.

(5) In computing the number of water closets required by Table 7.2.2.D., allowance may be made for self-contained recreation vehicles or camping sites served by water and sewer connections, provided that the number of camping sites used to calculate water closet requirements is not reduced to less than one third of the total number of camping sites.

7.2.3. Service Water Heating Facilities

7.2.3.1. Hot Water

(1) Where a hot water supply is required by Sentence 7.2.1.2.(4), equipment shall be installed to provide to every *dwelling unit* an adequate supply of service hot water with a temperature range from 45°C to 60°C.

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- * (2) Service hot water may be distributed from a centrally located heater to supply the entire *building* or may be supplied by individual *service water heaters*.

7.2.3.2. Installation

- * (1) Every *service water heater* and its installation shall conform to Part 6 and, as applicable, to the Plumbing and Drainage Act and regulations made pursuant to that Act.
- * **7.2.3.3. Corrosion Resistance.** 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.
- * **7.2.3.4. Chimney Flue.** Fuel-burning *service water heaters* shall be connected to a *chimney flue* conforming to Section 9.21.
- * **7.2.3.5. Prohibition.** Heating coils of *service water heaters* shall not be installed in a *flue* or in the combustion chamber of a *boiler* or *furnace* used to heat a *building*.

7.2.3.6. Burn Prevention

- * (1) Where, in the opinion of the *authority having jurisdiction*, it is necessary to protect children, senior citizens, infirm or disabled persons from burns,
 - (a) piping used to distribute service hot water and other hot water in *assembly, institutional* and *residential occupancies* shall be concealed or insulated, and
 - (b) the temperature of the water from faucets shall be limited to a maximum of 54°C.

Section 7.3 Swimming Pools

7.3.1. General

- * **7.3.1.1. Application.** Except for specific requirements for a *private swimming pool* or a *wading pool*, this Section applies to *public swimming pools* and *semi-public swimming pools*.

7.3.1.2. Plans and Specifications

- * (1) The plans and specifications for a *swimming pool* shall be prepared by a *professional engineer*

or *registered architect* and shall bear the stamp or seal of the *designer*.

- * (2) The set of plans for a *swimming pool* shall show complete construction details and shall include

- (a) a site plan,
- (b) a floor plan,
- (c) structural plans,
- (d) mechanical plans, and
- (e) electrical plans.

- * (3) The plans and specifications required in Sentence (1) shall include the following information

- (a) the deck elevation relative to the surrounding area,
- (b) the location of outlets, drains, overflows, inlets, steps and ladders, diving boards, walk areas, lighting fixtures, equipment, dressing room areas and utility service lines,
- (c) the source of water supply and the method of waste water disposal,
- (d) a statement of
 - (i) *swimming pool* volume,
 - (ii) unit filtration rate,
 - (iii) *maximum design bathing load*,
 - (iv) *bathing load*,
 - (v) total water surface area,
 - (vi) deck area,
 - (vii) design circulation rate in litres per second,
 - (viii) turnover period,
 - (ix) chlorinator capacity
 - (x) filter area and type,
 - (xi) number of inlets,
 - (xii) number of skimmers or gutter drains, and
 - (xiii) gutter capacity or surge tank capacity,
- (e) complete detailed specifications and drawings for the construction of dressing room facilities, the water circulation system, filtration facilities, disinfection equipment and all appurtenances, and
- (f) type of backflow prevention used on the make-up water to avoid cross connection with a public water supply, if applicable.

7.3.1.3. Private Swimming Pools

- * (1) Except for a premanufactured *private swimming pool* that is entirely above ground, plans

and specifications for a *private swimming pool* shall be submitted to the *authority having jurisdiction*, and shall include the following information:

- (a) site plan,
- (b) details of pool construction,
- (c) schematics for the pool mechanical system, including line sizes,
- (d) source of water supply and waste water disposal, and
- (e) pool data giving
 - (i) pool size and surface area,
 - (ii) pool water volume complete with calculations,
 - (iii) pool circulation rate,
 - (iv) pool turnover rate,
 - (v) filter type, size and model,
 - (vi) circulation pump, type, size, model, and flow rate,
 - (vii) number of inlets,
 - (viii) number of skimmers, and
 - (ix) number of main drains.

7.3.2. Pool Location and Layout

* **7.3.2.1. Male, Female Design Criteria.** Any portion of the *swimming pool* construction concerning itself with facilities for its occupants shall be designed on the basis of 50% male and 50% female, or as dictated from experience or proposed use.

* **7.3.2.2. Showers.** Dressing room facilities shall have a shower area at the entrance to a *swimming pool* or adjoining the entrance located so that no *bather* can enter the *swimming pool* area without passing through the shower area.

7.3.2.3. Fence and Gate Design and Construction

* **(1)** The entire area of an outdoor *swimming pool* shall be protected by a fence, *building wall* or enclosure that can prevent access by unauthorized persons and its height above the outside ground level shall not be less than

- (a) 1.8 m for a private swimming pool, and
- (b) 2.0 m for all other swimming pools.

* **(2)** An opening for access through a fence around a *swimming pool* or a *private swimming pool* shall be protected by a gate that is

- (a) the same height as the fence,

- (b) equipped with a self-closing device,
- (c) equipped with a self-latching device on the inside of the gate located not less than 1.5 m above the ground level, and
- (d) capable of being locked.

(3) The fence and gate around a *swimming pool* or a *private swimming pool* shall be constructed so that all horizontal and diagonal members are located on the *swimming pool* side. *

(4) Barbed wire shall not be used on or for a fence or gate around a *swimming pool* or a *private swimming pool*. *

(5) No device shall be installed on or adjacent to a fence or gate around a *swimming pool* or a *private swimming pool* that could cause an electric current to pass through the fence or gate. *

(6) A fence is not required around any portion of an outdoor *private swimming pool* where the top of the outside wall of the *private swimming pool* is not less than 1.8 m above the level of the ground outside the wall and the wall is constructed so that the only means of access to the *private swimming pool* is through a gate or similar facility. *

7.3.2.4. Bathing Load

- (1)** The *bathing load*
 - (a) in a *swimming pool*, other than a *whirlpool*, a *special purpose swimming pool* or a *receiving pool*, shall not exceed one *bather* for each 1.5 m² of *swimming pool* area or the *maximum design bathing load* for the water circulation system, whichever is the lesser, and
 - (b) in *whirlpools* and *special purpose swimming pools*, shall not exceed one *bather* for each square metre of *swimming pool* area or the *maximum design bathing load* for the water circulation system, whichever is the lesser.

7.3.2.5. Spectator Areas

(1) There shall be a physical separation of the space used by spectators and that used by *bathers*, with separate entrances to each. *

(2) The floor and curb of the area used by spectators shall be of tight construction of impervious material and shall be sloped and adequately drained. *

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- * (3) Water drainage from spectator bleachers shall not flow onto a *swimming pool* deck.

7.3.2.6. Food and Beverage Areas

- * (1) Food and beverage consumption shall be provided only in designated areas set aside for the purpose.
- * (2) Areas for concessions, exercise or other special purposes shall not be located within the minimum surrounding deck areas required by this Code.

- * **7.3.2.7. Waste Water Discharge.** Waste water from *private swimming pools* shall be discharged to an existing municipal drainage system as directed by the *authority having jurisdiction*.

7.3.3. Swimming Pool Construction

- * **7.3.3.1. Materials.** *Swimming pools* and all appurtenances thereto shall be constructed of materials which are nontoxic to man, impervious and enduring, which will withstand design stresses, which will provide a watertight structure with a smooth and easily cleaned surface without cracks or joints (excluding structural joints) or to which a smooth easily cleaned surface finish can be applied or attached.
- * **7.3.3.2. Entrapments.** No *swimming pool* shall contain any protrusions, means of entanglement or other obstruction which might cause the submerged entrapment of a *bather*.
- * **7.3.3.3. Colour.** Except for the lane and depth markings, the sides and bottom of a *swimming pool* shall be light in colour.
- * **7.3.3.4. Skimmers and Glazed Surfaces.** Where skimmers are used in a concrete *swimming pool*, the *swimming pool* wall for a distance of 150 mm above the normal water level to 150 mm below the normal water level shall have a glazed surface.
- * **7.3.3.5. Wall and Floor Intersections.** The radius of curvature between the wall and floor of a *swimming pool* shall not exceed 150 mm where the water depth is less than 1.5 m.
- * **7.3.3.6. Slopes to Drain.** All bottom slopes of a *swimming pool* shall be directed to the main drains.

7.3.3.7. Vertical Wall Slopes. Side and end walls of a *swimming pool* shall not be sloped more than 11° to the vertical.

7.3.3.8. Bottom Slopes

(1) The slope of the bottom of a *swimming pool* where the water is less than 1.5 m deep, shall be a uniform slope not more than 1:12 for a *public swimming pool* and 1:10 for a *semi-public swimming pool*.

(2) Except for stand-alone diving tanks, the slope of the bottom of a *swimming pool* where the water is greater than 1.5 m deep shall be not more than 1:3.

7.3.3.9. Slopes for Wave Pools: Deviations. The Director may approve deviations from Articles 7.3.3.6. and 7.3.3.7. and Sentences 7.3.3.8.(1) and (2) for *wave pools*.

7.3.3.10. Wave Shut Down. At least 2 emergency wave shut down switches, one located on each side of the pool, shall be provided at pool side for use by supervisory staff of a *wave pool*.

7.3.3.11. Ledges. Below surface ledges on the sides of a *swimming pool* are prohibited where the depth of water exceeds 1.5 m.

7.3.3.12. Pool Access

(1) Ramps, ladders or recessed stairs shall be provided at the shallow end of a *swimming pool* if the water depth is greater than 600 mm.

(2) Ramps shall comply with the requirements of Sentence 3.7.3.4.(1).

(3) Two ladders shall be provided at the deep end of a *swimming pool*, one at each side of the *swimming pool*.

(4) Stairs or ladders in the deep end of a *swimming pool* shall be placed to direct a *bather* away from diving boards and the diving area.

(5) Recessed steps with grab-rails may be used in lieu of ladders.

(6) In any *swimming pool* where stairs or ramps are used they shall have a nonslip surface sufficiently sloped towards the *swimming pool* to prevent an accumulation of settleable solids.

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- * (7) Stairs and seats or their edges shall be finished in a manner that contrasts with the *swimming pool* colour.
- * (8) Treads of a ladder in a *swimming pool* shall be not less than 75 mm wide over their full length and have nonslip surfaces
- * (9) A ladder shall be corrosion-resistant and shall be rigidly installed.
- * (10) Steps shall be designed with a maximum riser height of 200 mm and a minimum tread width of 250 mm.
- * (11) The Director may accept deviations from the dimensions required by Sentence (10) for a *whirlpool* or a *special purpose swimming pool* in which space considerations prevent compliance with Sentence (10).

7.3.3.13. Diving Boards or Platforms

- * (1) Any diving board or platform that is provided shall have corrosion-resistant anchorage fittings and hardware and be rigidly constructed and properly anchored at the base with sufficient bracing to ensure stability under the heaviest possible anticipated design load.
- * (2) Manufacturer's specifications regarding installation of a diving board or platform shall be adhered to.
- * (3) There shall be not less than 5 m free and unobstructed head room above diving boards and towers and not less than 4 m above deck level diving boards.
- * (4) The clearances required in Sentence (3) shall extend 3 m on either side and in front of all diving boards and towers measured from the tip or end of the board.
- * (5) Adequate guard rails around that portion of a diving board or platform which is not above the water shall be provided if the diving board or platform is more than 1 m above the water surface.
- * (6) Except as required in Sentence (7), the design of a diving board or platform and the corresponding water depths and clearances for a *public swimming pool* shall be in strict accordance with the "FINA Handbook 1988 - 1992; Technical Specifications for Diving Facilities" prepared by the Federation Internationale de Natation Amateur. (See Appendix A.)

(7) The design of deck level diving boards and the corresponding water depths and clearances for a *public swimming pool* shall be in strict accordance with the "Minimum Standards for Public Swimming Pools" prepared by the National Spa and Pool Institute. (See Appendix note A-7.3.4.10.)

(8) The design of a diving board or platform and the corresponding water depths and clearances for a *semi-public swimming pool* shall be in strict accordance with the "Minimum Standards for Public Swimming Pools" prepared by the National Spa and Pool Institute. (See Appendix note A-7.3.4.10.)

7.3.3.14. Design Review. Before a slide or other piece of play equipment is permanently installed or constructed in a *swimming pool*, the design and location shall be reviewed by the Director or person designated by the Director.

7.3.3.15. Anchorage Fittings and Hardware. Anchorage fittings and hardware for play equipment shall be corrosion-resistant.

7.3.3.16. Decks

(1) Except for specific requirements of Article 7.3.4.8., Sentences 7.3.4.13.(9), (10) and (11), Sentence 7.3.4.14.(2) and Sentences 7.3.5.3.(20) and (21), a nonporous, impervious, hard-surfaced area shall be provided around the entire *swimming pool*, solely for the use of *bathers*, not less than 1.8 m in width and providing not less than 0.9 m of unobstructed passage behind a diving board, support column, or a slide or other piece of play equipment and its supporting structure.

(2) The deck area of a deck level *swimming pool* shall have a slope of not less than 1:50 and not more than 1:25 away from the *swimming pool* for a distance of not more than 600 mm with positive drainage to the deck drains.

(3) For a deck level *swimming pool*, the width of deck beyond the edge of the gutter drained to the circulation system of the deck level *swimming pool* shall be not greater than 900 mm.

(4) For the deck area of a *swimming pool* in which recessed gutters or skimmers are used, the deck shall be sloped not less than 1:50 and not more than 1:25 away from the *swimming pool* and drained to waste.

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- * (5) All walks, decks and terraces surrounding a *swimming pool* shall be uniformly sloped not less than 1:50 and not more than 1:25 to drains or points at which the water will have a free unobstructed flow at all times to points of collection.
- * (6) A deck surface must be nonslip when wet, sufficiently smooth to facilitate disinfecting and finished so that there will be no discomfort to bare feet.
- * (7) Where a brushed concrete finish is used on a deck surface, the brushing must be done toward the drains.
- * (8) The deck of an outdoor *swimming pool* shall be not less than 150 mm above the finished ground elevation.

7.3.3.17. Drainage System

- * (1) A drainage opening shall be free from obstruction, including benches and lockers, to allow for ease of cleaning.
- * (2) A drainage system shall be designed in accordance with good engineering practice.
- * (3) The minimum pipe size used for walkway, deck and terrace drainage shall conform to the Plumbing and Drainage Act and regulations made pursuant to that Act.

7.3.3.18. Bibcocks

- * (1) Hose bibcocks that are not less than 19 mm diameter shall be provided so that all parts of a *swimming pool* deck area, dressing rooms, shower and toilet areas are within reach of a 30 m hose.
- * (2) Hot and cold water shall be available from the hose bibcocks for deck cleaning and disinfecting.

7.3.3.19. Pool Markings

- * (1) The depth of water in a *swimming pool* shall be plainly marked at the points of minimum depth, maximum depth, 1.2 m depth, and at the points of break between gentle and steep bottom slopes.
- * (2) The words "DEEP AREA" and "SHALLOW AREA" shall be clearly marked at appropriate locations.

(3) Depth markings for a *swimming pool* to indicate the depth shall be placed on the deck in legible numerals at least 100 mm high in a colour contrasting with the background and be visible both by day and under artificial lighting.

(4) If possible, depth markings shall also be located on the wall of the *swimming pool*, above the operating water level.

(5) Depth markings must be placed on both sides and both ends of a *swimming pool*; the distance between markings shall be not more than 7.6 m.

(6) At the 1.2 m mark and at any point in a *swimming pool* where the slope is greater than 1:12, the *swimming pool* must be equipped with provisions for the installation of a safety line having a minimum diameter of 19 mm and equipped with floats.

(7) Where movable or adjustable water depth or floors are installed in a *swimming pool*, suitable markings shall be incorporated to advise *bathers* of these features.

(8) The words "VARIABLE DEPTH - NO DIVING" shall be clearly marked at appropriate locations.

7.3.3.20. Underwater Lighting

(1) Where underwater lighting is to be used in a *swimming pool*, the total lamp lumens shall be not less than

- (a) 650 multiplied by the area in square metres of the water surface for an outdoor *swimming pool*, or
- (b) 1 100 multiplied by the area in square metres of the water surface for an indoor *swimming pool*.

(2) Where underwater lighting is to be used and night swimming is to be permitted at an outdoor *swimming pool*, area lighting shall be provided for the deck areas and directed towards the deck areas and away from the *swimming pool* surface, to provide a minimum of 215 lx at deck level.

(3) Where underwater lighting is not used and night swimming is permitted at an outdoor *swimming pool*, area lighting shall be designed to provide a minimum of 215 lx at deck level and at the water surface.

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- * (4) Lights shall be located so that bulbs can be replaced even when the *swimming pool* is in full use.

7.3.3.21. Emergency Lighting

- * (1) An emergency lighting system that automatically operates whenever the main lighting system fails shall be provided for
 - (a) an indoor *swimming pool*, or
 - (b) an outdoor *swimming pool* with lighting for night use.

- * (2) The emergency lighting system shall be installed and arranged to ensure that the water surface of the *swimming pool*, the deck, the dressing room facility and the *exit* passages are lit to a minimum average level of 10 lx to facilitate prompt evacuation.

7.3.3.22. General Lighting

- * (1) Lighting with a minimum of 215 lx shall be provided at deck level and at the water surface of an indoor *swimming pool* facility.

- * (2) Lighting with a minimum of 215 lx at floor level shall be provided in *swimming pool* dressing rooms and any other area of the facility used by *bathers*.

7.3.3.23. Electrical Installations

- * (1) Electrical installations for a *swimming pool* shall comply with the Electrical Protection Act and regulations made pursuant to that Act.

- * (2) Structural and reinforcing steel shall be grounded for every class of *swimming pool* at the initial stages of construction, even if electrical equipment or wiring is not involved, in accordance with the Electrical Protection Act and regulations made pursuant to that Act.

- * **7.3.3.24. Heating, Ventilating and Air-Conditioning.** Heating, ventilating and air-conditioning systems shall conform to Part 6. (See Appendix A.)

7.3.3.25. Dressing Rooms

- * (1) Exclusive of washroom and shower areas, 0.5 m² for each male and 0.5 m² for each female is required for dressing room space on the basis of the *bathing load*.

- * (2) No steps or curbs shall be permitted in the interior of a dressing area nor between the dressing room and adjoining *swimming pool* deck areas.

- * (3) Where dressing room facilities are required to be at a different elevation from the *swimming pool* deck, a ramp shall be provided, constructed with a nonslip surface and a slope not exceeding 1:12.

7.3.3.26. Partitions and Walls

- * (1) All *partitions* and walls between portions of the dressing room areas, screen *partitions*, shower, water closet and dressing room booths shall be of durable material not subject to damage by water and shall be so designed that a gap of not less than 150 mm above floor level is provided between the *partitions* and floor.

- * (2) Walls or *partitions* of wood construction shall be mounted on a continuous concrete curb 200 mm in height or otherwise raised 200 mm above the floor level.

7.3.3.27. Dressing Room Floors

- * (1) Floors that are wet traffic areas for *bathers*, including dressing rooms, shall

- (a) be of smooth but nonslip finish,
- (b) be impervious to moisture with no open cracks or joints,
- (c) be drained with no pooling of water,
- (d) have a slope of not less than 1:50 and not more than 1:25 in the direction of the closest drain, and
- (e) have all corners with walls and partitions rounded for ease of cleaning.

7.3.3.28. Dressing Room Bibcock

- * (1) Not less than one 19 mm bibcock shall be provided in each dressing room for flushing down and disinfecting the dressing room interior.

- * (2) Bibcocks required in Sentence (1) shall be installed with a connection to both hot and cold water systems.

7.3.3.29. Showers

- * (1) A water heater and thermostatically controlled mixing valve accessible only to authorized staff shall be installed and shall be capable of provid-

7.3.3.29.

* ing 0.15 L/s of water to each shower head with a temperature range of 35°C to 40°C.

* (2) The number of showers provided in each dressing room shall be one for each 50 *bathers* and not less than 3 showers per dressing room.

* (3) Floor drains shall be so designed that waste water from one shower head shall not pass over the floor area of another shower.

* (4) The lower 2.4 m of walls in a shower area shall be of a smooth and impervious finish.

* **7.3.3.30. Plumbing Fixtures.** The number of water closets, lavatories and urinals serving dressing rooms shall be based on the *bathing load* and Table 7.2.2.A.

7.3.3.31. Accessories

* (1) A mirror shall be provided over each lavatory and it shall be an unbreakable type.

* (2) Sanitary napkin dispensers shall be installed in water closet and shower areas used by females.

* **7.3.3.32. Non-Bather Washroom Facilities.** Plumbing fixtures for persons, other than *bathers*, using a *swimming pool* facility shall be provided outside the dressing room and wet traffic areas and shall be in conformance with Section 7.2.

* **7.3.3.33. Plumbing and Drainage Act.** All plumbing installations shall comply with the Plumbing and Drainage Act and regulations made pursuant to that Act.

* **7.3.3.34. Swimming Pool Inlets and Outlets**

* (1) *Swimming pool* inlets shall be constructed of corrosion-resistant material and shall be designed to minimize the effects of being blocked by *bathers* and to minimize the water stream effect.

* (2) *Swimming pool* inlets and outlets shall be provided and arranged to produce a uniform circulation of water and the maintenance of uniform chlorine or equivalent disinfectant residual throughout the *swimming pool* with provisions to adjust the flow through all inlets.

(3) Provision shall be made for directing water flow to poor circulation areas including recessed ladders, steps, nooks and steep slopes.

(4) The minimum number of inlets shall be calculated on the basis of the maximum flow rate of the filter system divided by the manufacturer's recommended maximum circulation rate for each inlet fitting but in no case shall the velocities exceed the maximum flow allowed by this Code.

(5) Floor inlets shall be provided in *swimming pools* greater than 12.8 m in width.

(6) Where wall inlets are used, they shall be submerged not less than 0.6 m.

(7) In water areas greater than 1.5 m deep, where wall inlets are installed, they shall alternate between one third of the depth from the top of the water and a depth of one third from the bottom.

7.3.3.35. Prefinished Gutter Sections. Nothing in this Subsection shall prohibit the use of prefinished gutter sections which are properly sized and installed to meet other applicable Sections of this Code if the prefinished gutter sections have been listed by the Director in accordance with Article 1.5.7.6.

7.3.3.36. Pool Drains

(1) There shall be at least 2 interconnected drain outlets not less than 300 mm apart at the lowest level of a *swimming pool*.

(2) The total orifice area of all the *swimming pool* drain outlets shall be at least 4 times the cross sectional area of the main *swimming pool* drain line, which shall be sized in accordance with Sentence (5).

(3) A floor outlet shall not permit a flow of water with a velocity greater than 0.5 m/s through the grating.

(4) Slotted openings in a grating shall be not more than 12.5 mm wide.

(5) In a *swimming pool* designed to circulate the overflow water, the main drain piping shall be sized to accommodate at least 50% of the circulated water to the filtration equipment, based on the design flow rate.

* (6) Where it is possible to drain a *swimming pool* by gravity, the drain line shall be no smaller than that required by Sentence (5).

* (7) Anti-vortex drains, consisting of parallel plates, where the water enters from the sides rather than through the top, may be installed provided the distance between the parallel plates does not exceed 12.5 mm.

* (8) The velocity through an anti-vortex drain may be increased to 1.8 m/s.

* (9) The top plate of an anti-vortex drain shall be flush with the *swimming pool* floor.

7.3.3.37. Overflow

* (1) An overflow structure may be either a perimeter overflow gutter or a skimmer system.

* (2) Except where skimmers are provided, a *swimming pool* shall be provided with a level overflow channel around the entire perimeter of the *swimming pool*.

* (3) The design of a perimeter overflow channel shall be such that matter entering it will not be washed back into the *swimming pool*, and so dimensioned as to minimize the dangers of a *bather* catching arms or feet in it.

* (4) A perimeter overflow channel shall be adequately sloped to provide rapid drainage to drains which are not less than 50 mm in diameter and spaced not more than 4.5 m apart.

* (5) The overflow channel drainage and collection system shall have a hydraulic capacity sufficient to carry 125% of the designed flow rate.

* **7.3.3.38. Continuous Skimming.** Depressions in a *swimming pool* lip to provide continuous skimming during off-peak loads are permitted.

7.3.3.39. Surge Capacity

* (1) All deck level systems shall be installed with adequate surge capacity in the gutters, or properly designed surge tank with level controls, based on the displacement of the *bathing load*.

* (2) A surge tank, pipe or channel required in Sentence (1) shall be installed and have a working

capacity of not less than 28 L per *bather*, based on the *bathing load*. e

7.3.3.40. Skimming Devices

(1) A *swimming pool* may be provided with suitable skimming devices which will fulfil the requirements of an overflow channel. *

(2) The minimum number of skimming devices shall be determined by providing one device for each 40 m² of *swimming pool* area, or one device for each 3 L/s based on the flow rate for the *swimming pool*, whichever is greater. *

(3) Collection piping from skimming devices shall be hydraulically designed to carry a minimum of 100% of the design flow rate. *

(4) A skimmer shall *

(a) be constructed of substantial corrosion-resistant materials,

(b) be fully recessed behind the face of the *swimming pool* wall,

(c) have access provided in the deck to each skimmer,

(d) have automatic adjustment of the overflow weir to variations in water level through a vertical distance of at least 100 mm,

(e) have a valve or other device at each skimmer discharge for flow regulation so that uniform skimming action can be achieved,

(f) be designed to take not less than 3 L/s for each unit,

(g) have an equalizer where water is drawn by pump suction, and

(h) have skimmer equalizer inlets covered with a grill or grating at the *swimming pool* wall.

7.3.3.41. Circulation System

(1) The circulation system includes the piping, pumps, hair catchers, filters, flow meters, water heaters, thermometers, pressure and vacuum gauges, suction cleaners and all appurtenances. *

(2) Except as otherwise provided in this Code, * the circulation system shall be installed in accordance with the manufacturer's specification, or, in the absence of a specification, in accordance with the "Uni-

7.3.3.41.

form Swimming Pool, Spa and Hot Tub Code" prepared by the International Association of Plumbing and Mechanical Officials.

- * (3) All circulation system components shall comply with "Standard Number 50 – Circulation System Components for Swimming Pools, Spas, or Hot Tubs" prepared by the National Sanitation Foundation covering this equipment and shall have the approval of an accepted testing laboratory or as required by the Director.

7.3.3.42. Turnover Period

- * (1) The turnover period of a *swimming pool* shall be in accordance with Sentences (2) and (3).
- * (2) A filtration system shall be designed to accommodate the maximum number of *bathers* in any one day on the basis of providing 2 m³ of filtered chemically treated water per *bather* per day.
- * (3) Except as otherwise required, no circulation system shall be designed with a turnover period more than
 - (a) 6 h for a *public swimming pool*,
 - (b) 2 h for a *special purpose swimming pool* for hospital therapy which is not drained for each use.

7.3.3.43. Operation and Maintenance

- * (1) The piping and filtration system shall be designed to minimize friction losses and to
 - (a) circulate the *swimming pool* water through the treatment equipment,
 - (b) permit each filter to be back washed individually where necessary,
 - (c) filter to waste,
 - (d) empty the *swimming pool*,
 - (e) drain or blow out the entire system,
 - (f) measure the circulation rate of flow,
 - (g) permit circulation of water in a closed system between a diatomaceous earth filter and the pump during the precoat operation to avoid diatomaceous earth entering the *swimming pool*, where a diatomaceous earth system is used,
 - (h) vacuum *swimming pool* water to a waste sump or to a filter tank, where a vacuum system is installed,

- (i) provide for chemical treatment, and
- (j) provide for heating.

(2) Adequate, accessible and easily serviceable valves shall be provided in a piping system to permit complete flexible operation of the filtration equipment.

(3) Buried lines in a piping system shall be valved so that sections can be isolated to determine leaks.

(4) The circulating water from a skimmer or overflow system and the circulating water from the main drains shall be separately valved and piped to the mechanical room, but may be joined at that location.

7.3.3.44. Velocities

(1) Velocities in water piping shall not exceed 1.5 m/s in suction piping.

(2) Except for copper pipe, in which the velocity shall be not more than 2.5 m/s, and asbestos cement pipe, in which the velocity shall be not more than 1.8 m/s, the water velocity in a discharge pipe shall be not more than 3 m/s.

7.3.3.45. Materials. The circulation piping and fittings shall be of a nontoxic material, resistant to corrosion, and able to withstand operating pressures.

7.3.3.46. Flanges and Unions. Flange joints or unions shall be inserted at intervals to permit any part of the piping system to be disassembled for cleaning or repairs.

7.3.3.47. Sump or Blow Off Device. A sump or blow off device shall be provided at the lowest part of the piping system to permit cleaning and draining.

7.3.3.48. Flow Indicators and Gauges

(1) A rate of flow indicator shall be provided in a *swimming pool* to show the rate of *swimming pool* water circulation.

(2) A rate of flow indicator shall be installed in strict accordance with manufacturer's recommendations and

- (a) shall be located where practicable near the filters and provide at least a 95% degree of accuracy at all times,

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- (b) shall be provided with a scale calibrated for reading in litres per second or litres per minute, and
- (c) shall have a range of 0 to 150% of the established filtration rate.

- * (3) Where a single treatment plant serves 2 or more separate *swimming pools*, provision shall be made for measuring the flow into or from each *swimming pool*.
- * (4) Gauges shall be installed in all piping systems to measure the pressure drop across pressure type filter systems, suction pressure on vacuum filter systems and on both sides of circulation pumps for checking their operational performance.

7.3.3.49. Heating

- * (1) Discharge of steam into, or placing heating coils directly in a *swimming pool* is prohibited.
- * (2) Valved piping shall be provided for regulating flow through the heater and for by-passing or isolating the heater.
- * (3) One or more thermometers shall be inserted in the piping system.
- * (4) Where a water heater is provided, thermometers shall be installed to measure the temperature of the water leaving the *swimming pool* and the water returning to the *swimming pool*.
- * (5) All thermometers shall be legible in single degrees Celsius with a range of at least 20°C embracing the operating temperature, and shall be so installed that they can be easily read.

7.3.3.50. Equipment and Mechanical Room

- * (1) The equipment and mechanical room shall be reasonably accessible from the *swimming pool* enclosure, utilizing doors locked to unauthorized persons.
- * (2) Additional outside access shall be provided for *public swimming pools* to the equipment and mechanical room for service personnel and supply delivery.
- * (3) The equipment and mechanical room shall be adequately lighted, heated and ventilated.

(4) The floor of an equipment or mechanical room shall have a slope of not less than 1:50 and not more than 1:25 to floor drains.

(5) Adequate space shall be provided for servicing the filtration equipment.

7.3.3.51. Storage Room

(1) A suitable storage room shall be provided to house filter medium and other operating chemicals, testing equipment, operating records, tools and other supplies.

(2) The storage area provided for chemicals shall not be near heating equipment nor have direct access to publicly accessible areas.

(3) Platforms provided for storage of chemicals shall be raised sufficiently off the floor to prevent damage by water.

7.3.3.52. Disinfection Equipment

(1) A *swimming pool* shall be equipped with suitable and efficient disinfecting equipment to provide continuous disinfection when in use and a free chlorine residual level necessary to maintain the *swimming pool* water in a bacteriologically and chemically safe condition at all times.

(2) Disinfection equipment shall be installed and connected so that no feeding can take place unless positive flow through the pool circulation system is assured.

7.3.3.53. Chlorine. All aspects of chlorine storage and handling shall conform to the Occupational Health and Safety Act and regulations made pursuant to that Act.

7.3.3.54. Chemical Feed Equipment

(1) Hypochlorinators or other adjustable output rate chemical feeding equipment shall conform to the requirements of "Standard Number 50 - Circulation System Components for Swimming Pools, Spas, or Hot Tubs" prepared by the National Sanitation Foundation relating to Adjustable Output Rate Chemical Feeding Equipment for Swimming Pools, and shall bear the seal of an approved testing laboratory or as required by the Director, and

- (a) no cross connection with domestic water supply shall be permitted, and

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- (b) the hypochlorinator shall include positive features to prevent siphoning when installed above the *swimming pool*.

7.3.3.55. Water Operated Gas Chlorinator

- * (1) Where elemental chlorine is supplied, a water operated gas chlorinator shall be used which controls and regulates the flow of the gas.
 - * (2) A water operated gas chlorinator shall provide an automatic shutoff of gas when water pressure fails and shall vent leakage to the outside atmosphere.
 - * (3) Capacity of gas chlorinators used for an outdoor *swimming pool* shall be sufficient to feed at a rate of 1.35 kg of chlorine per 24 h per 45 000 L of *swimming pool* capacity.
 - * (4) Gas chlorinators used for an indoor *swimming pool* shall have a capacity that is not less than 0.45 kg of chlorine per 24 h per 45 000 L of *swimming pool* capacity.
- * **7.3.3.56. Disinfection Injection Equipment.** The disinfectant injection equipment shall be on the *swimming pool* supply line and as close to the *swimming pool* inlet as possible.

7.3.3.57. Gaseous Chlorine Equipment

- * (1) Where gaseous chlorine equipment is provided,
 - (a) the mechanical proportioning device and cylinders of chlorine shall be housed in a reasonably gas-tight corrosion-resistant and mechanically vented enclosure having a 1 hr *fire-resistance rating*, of adequate size to house the chlorinator and as many extra tanks as are deemed necessary,
 - (b) only chlorination equipment shall be kept in the chlorine room,
 - (c) the chlorine room shall be at ground level with access to the outside through outwardly opening doors,
 - (d) a separate positive exhaust ventilation system for the chlorinator room shall be provided which will give one complete air change per minute,
 - (e) switches for fans and lights shall be outside the room and located adjacent to the viewing window,

- (f) a signal light located directly adjacent to the switches noted in Clause (e) shall indicate when the ventilation fan is operating,
- (g) the intake for the exhaust fan from the room shall be 150 mm above the floor and the point of discharge shall be located so as not to contaminate air inlets to *buildings* or areas used by people,
- (h) ventilation air shall be supplied through louvred inlets near the ceilings or by a mechanical ventilation system and the air temperature shall be in the range required by Clause (l),
- (i) the vent hose from the chlorine feed machine shall discharge to the outside atmosphere above ground and in a location not used by the public,
- (j) vents shall be of stainless steel and protected to prevent the entry of insects, rain and snow,
- (k) a weigh scale shall be provided in a chlorinator room for weighing all chlorine cylinders in use and the scale platform shall be within 50 mm of the surrounding floor elevation,
- (l) a chlorinator room shall be capable of being heated to a minimum of 15°C but shall be protected against heating to a temperature above 30°C,
- (m) a *swimming pool* shall utilize a monitor alarm system which activates in the event of a chlorine emergency,
- (n) this monitor alarm system shall constantly monitor the air in the chlorine room and activate an audible alarm signal where it can be heard,
- (o) there shall be a steel framed wire reinforced glass window with a minimum glass area of 0.15 m² located so that the chlorinator and its operating parts are visible at all times to the operator from outside the chlorine room,
- (p) wall anchors and chains shall be provided to secure all cylinders housed in the chlorine room,
- (q) a dust tight cabinet for the exclusive purpose of storing breathing apparatus shall be mounted outside, and immediately adjacent to, the chlorine room, and

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- (r) the minimum distance between a chlorine room exhaust and a *building* system air intake shall be 3 m measured between the closest points and the *building* system air intake shall not be below the level of the chlorine room exhaust.

* **7.3.3.58. Ozone Systems.** The design of a water treatment system using ozone shall be submitted for review and acceptance by the Director. (See Appendix A.)

7.3.3.59. pH Control

- * (1) A mechanical device for feeding a regulated adequate dosage of pH buffering chemicals shall be provided for a *swimming pool*.
- * (2) Sentence (1) does not apply to a *semi-public swimming pool* in which chlorine gas is not used.

* 7.3.3.60. Diatomaceous Earth Filter.

A diatomaceous earth filter system shall be equipped with a suitable means of feeding a constant supply of filter aid at an adjustable rate of sufficient capacity relative to the filter system.

7.3.4. Design Standards for Above Ground Pools, Semi-Public Swimming Pools, Special Purpose Swimming Pools, Whirlpools and Wading Pools

7.3.4.1. Above Ground Swimming Pools

- * (1) Except for the changes and additional standards listed in this Section, all above ground *swimming pools* shall be designed in accordance with the requirements of Subsections 7.3.2. and 7.3.3.
- * (2) An above ground *swimming pool* may be installed and operated as a *public swimming pool* adjacent to or near existing dressing rooms if
 - (a) the existing dressing rooms are in satisfactory condition and the layout and number of showers meet the requirements of this Code, and
 - (b) an impervious walkway, not less than 1.2 m in width, is provided between the *swimming pool* and dressing rooms.

(3) Tiling at the water line of an above ground *swimming pool* is not required. *

(4) At least one *swimming pool* ladder with grab rails shall be located adjacent to the platform of an above ground *swimming pool* and one ladder shall be provided at the opposite side or end of the *swimming pool*. *

(5) A minimum horizontal clearance of not less than 1.2 m in width, of which 0.6 m shall be completely free of obstructions, shall be provided around the entire perimeter of an above ground *swimming pool*. *

(6) The normal operating water level of a skimmer for an above ground *swimming pool* shall be not less than 150 mm below the top of the *swimming pool* wall. *

(7) The filtration system for an above ground *swimming pool* shall be designed to circulate the entire volume of the *swimming pool* in not more than 6 h. *

7.3.4.2. Platforms

(1) An above ground *swimming pool* platform shall be supplied for at least 30% of the *swimming pool* perimeter. *

(2) The surface of an above ground *swimming pool* platform shall be flush with the top of the *swimming pool* tank. *

(3) An above ground *swimming pool* platform shall be securely fastened to the *swimming pool* wall or securely supported to withstand anticipated design loads. *

(4) An above ground *swimming pool* platform shall be at least 1.2 m in width and shall have a non-porous, impervious, nonslip surface, properly drained away from the *swimming pool*. *

(5) A barrier or *guard* rail at least 1 070 mm in height shall be provided around the entire outer perimeter of an above ground *swimming pool* platform except at the entry and egress points. *

7.3.4.3. Drainage

(1) The area surrounding an above ground *swimming pool* shall be sloped away from the *swimming pool* and shall be adequately drained away from the *swimming pool*. *

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* (2) Adequate water drainage shall be provided under an above ground *swimming pool* platform.

* **7.3.4.4. Stairs.** Stairs with hand rails shall be provided at entry and egress points of an above ground *swimming pool* and treads shall have a non-skid finish when wet.

* **7.3.4.5. Semi-Public Swimming Pools.** Except for the requirements of Articles 7.3.4.6. through and including 7.3.4.11., a *semi-public swimming pool* shall be designed in accordance with the requirements of Subsections 7.3.2 and 7.3.3.

7.3.4.6. Pool Egress

* (1) Stairs or one ladder shall be provided at the shallow end of a *semi-public swimming pool*.

* (2) One ladder shall be provided at the deep end of a *semi-public swimming pool*.

* **7.3.4.7. Inlets.** An adequate number of directional inlets shall be provided for a *semi-public swimming pool* based on the design circulation rate and pipe velocities.

* **7.3.4.8. Deck Space and Clearances.** A *semi-public swimming pool* that is less than 168 m in area, shall have a minimum of 1.2 m of clear deck space and 0.9 m clearance around equipment.

* **7.3.4.9. Circulation System and Turnover Period.** The circulation system for a *semi-public swimming pool* shall be designed in accordance with Sentence 7.3.3.42.(2) but the turnover period shall be not more than 8 h.

* **7.3.4.10. Diving Tank.** A diving tank for a *semi-public swimming pool* shall be constructed in accordance with the current National Spa and Pool Institute standards. (See Appendix A.)

7.3.4.11. Ancillary Facilities

* (1) Notwithstanding anything in this Code to the contrary, a *semi-public swimming pool* may be installed and operated without providing in conjunction with it a bathhouse, dressing room, lockers, showers, lavatory, urinal, or water closet if

- (a) the hotel, motel, summer camp, apartment building, condominium, private club, multiple housing unit, *mobile home* park, trailer

park, or residential school is equipped with an adequate number of water closets, showers or baths, and lavatories, and the use of the *swimming pool* is restricted entirely to registered guests, tenants, or members and their guests, except that if conditions exist, develop or are anticipated whereby the maintenance of satisfactory water quality is jeopardized, the *authority having jurisdiction* may require the installation of shower and water closet facilities.

(b)

7.3.4.12. Special Purpose Pool. Where a *special purpose pool* is not drained after every use, it shall be designed in accordance with requirements of Subsection 7.3.2. and 7.3.3.

7.3.4.13. Whirlpools

Note: Hot Tubs are included in the definition of "Whirlpool."

(1) Except for the requirements of Sentences (2) to (12), a *whirlpool* shall be constructed in accordance with Subsections 7.3.2. and 7.3.3.

(2) The maximum water depth of a *whirlpool* shall be 1.2 m measured from the *whirlpool* floor to the operating water surface.

(3) The maximum depth of water to a seat or bench in a *whirlpool* shall be 600 mm.

(4) The maximum freeboard for a *whirlpool* shall be 300 mm.

(5) There shall be a minimum of 2 main drains for a *whirlpool*, separated by not less than 300 mm, designed not to exceed the maximum velocities specified by the equipment manufacturer.

(6) In no case shall the circulation system of a *whirlpool* be designed with a turnover period more than

(a) 20 min for a *whirlpool* with a volume more than 4 m³, or

(b) 15 min for a *whirlpool* with a volume not more than 4 m³.

(7) Where cartridge type filters are used for a *whirlpool*, they shall be the surface type designed with a maximum flow rate of 0.27 L/s/m² of effective filter area.

- * (8) Two-speed pumps shall only be allowed on outdoor *whirlpool* applications, and where a two-speed pump is utilized for a *whirlpool*, the filter and heater shall be sized to accommodate the maximum pump output without exceeding the manufacturer's design flow rate of the filter element or heater and without by-passing the filter element.
- * (9) A *whirlpool* shall have a minimum clear deck space not less than 1.8 m at the main entrance point.
- * (10) Except as required by Sentence (9) and permitted by Sentence (11), a *whirlpool* shall have a clear deck space of 900 mm on all sides.
- * (11) A *whirlpool* that has an area less than 6 m² or has no interior dimension more than 2.5 m, may have the clear deck space on 25% of its perimeter less than 900 mm but where the clear deck space is less than 900 mm it shall not be more than 300 mm.
- * (12) The Director may accept deviation from Sentence (11) where a ramp is incorporated within the design of a *whirlpool*.

7.3.4.14. Wading Pools

- * (1) Neither fencing nor a circulation system is required for a *wading pool* that is not operated in conjunction with, or in the same enclosure as, a *swimming pool*.
- * (2) A *wading pool* shall
 - (a) be made of durable material which is impervious to moisture and retains a texture which is non-slip,
 - (b) be completely free of obstructions which may be hazardous,
 - (c) have a floor with a maximum slope of 1:25 and a minimum slope of 1:50,
 - (d) be entirely surrounded by a walkway not less than 1.2 m wide which slopes away from the *wading pool* or basin edge at a uniform slope of not less than 1:50 and not more than 1:25, and
 - (e) have a maximum depth of 600 mm.
- * (3) Where a *wading pool* is operated within the same enclosure as a *swimming pool*, it shall use water chlorinated in accordance with the requirements of Articles 7.3.3.33. and 7.3.3.34. and completely circu-

lated through an approved filter with a turnover period not more than 2 h.

(4) Inlet fittings for a *wading pool* using a circulation system shall be submerged and located to produce uniform distribution of clean water throughout the *wading pool*.

(5) The circulation system for a *wading pool* shall be designed in accordance with Subsections 7.3.2. and 7.3.3.

(6) There shall be no cross connections between a *wading pool* and the water circulation system of a *swimming pool* or between a *wading pool* and a sewer.

(7) The floor of a *wading pool* shall be finished in white or a light colour.

7.3.5. Water Theme Parks

7.3.5.1. **General.** In addition to the requirements of this Subsection, the requirements of Subsections 7.3.2. and 7.3.3. apply to a *water theme park*.

7.3.5.2. Materials

(1) The materials to be used in and around a water slide flume shall ensure that the operational strength of the entire assembly and each of its components is not adversely affected by exposure to rain, snow, ice, sunlight, local normal temperature extremes, local wind pressures, expected local air pollution products and the mechanical, electrical and chemical environment in and around the water slide flume.

(2) Materials selected for components and accessories used in and around a water slide flume shall have all parts with external surfaces and edges that may come into contact with a *slider* assembled, arranged and finished so that they will not constitute a cutting, pinching, puncturing or abrasion hazard in casual contact and in intended use.

7.3.5.3. Flume and Receiving Pool Design and Construction

(1) Structural design of a water slide flume, its supporting structure and ancillary facilities shall conform to Part 4, except that good engineering practice shall be used for items not covered in Part 4.

7.3.5.3.

- * (2) A water slide flume and its *receiving pool* shall be watertight with smooth, inert, nontoxic surfaces that are easy to clean.
- * (3) A water slide flume shall be designed to prevent a hazardous concentration of disinfectant fumes and enclosed sections shall be ventilated if necessary.
- * (4) All curves, turns, and tunnels within the path of a water slide flume shall be designed so that body impact with the walls of the flume or ceiling of a tunnel does not present a hazard.
- * (5) A water slide flume shall be banked to keep a *slider's* body safely inside the flume or curve under all foreseeable circumstances.
- * (6) All slopes within the path of a water slide flume shall be designed so that the *slider's* speed does not exceed a level where a safe equilibrium of dynamic forces can be maintained on any curve or turn within a path, as required by Sentences (4) and (5).
- * (7) In sections of an elevated water slide flume where, contrary to intended use, a *slider* may stop, there shall be safety walls or other provisions to keep a *slider* from falling out of the flume.
- * (8) The construction, dimensions, and mechanical attachments of the components of a water slide flume shall ensure that the surface of the water slide flume is continuous and smooth throughout its length.
- * (9) Wall thickness of a water slide flume shall be designed so that the continuous and combined action of hydrostatic, dynamic and static loads and normal environmental deterioration do not cause structural failure which could result in injury, or continually require repair which would weaken the strength of the original structure.
- * (10) The distance between the side of a water slide flume discharge and a *receiving pool* side wall shall be not less than 1.5 m.
- * (11) The distance between sides of adjacent water slide flume extensions shall be not less than 1.8 m.
- * (12) The slope of the floor of a *receiving pool* shall be not more than 1:7.
- * (13) Special provision shall be made in water slide flume discharge design, *receiving pool* depth, and *receiving pool* width measured from flume discharge, to safely accommodate slides specifically with greater slopes or other special features which allow an unusually rapid descent.
- * (14) Except as required by Sentence (15), multiple-egress water slide flumes shall have parallel discharges or be constructed so that their centrelines do not intersect for a distance of not less than 6 m from the discharge of each flume.
- * (15) Where water slide flumes with nonparallel discharges discharge *sliders* at a high speed, the centrelines shall not intersect for at least 10 m.
- * (16) A water slide flume discharge system shall provide safe entry into the *receiving pool*.
- * (17) Methods to ensure safe entry, in addition to water backup, deceleration distance and attitude control, are acceptable if safe discharge velocities and *slider* attitudes are assured under normal use.
- * (18) Except as required in Sentence (19), a water slide flume shall terminate either at a depth of not less than 150 mm below the *receiving pool* operating water surface level or not more than 75 mm above the water surface if the flume is level for a distance of at least 3 m from the discharge end.
- * (19) If a special discharge system that assures safe discharge from a water slide flume is proposed, then background material must be presented to the Director for review and acceptance of the system.
- * (20) A *receiving pool* shall have a deck area on not less than three sides.
- * (21) A deck along the egress side of a *receiving pool* shall be not less than 3 m wide, have slip-resistant surfaces and be sloped not less than 1:50 and not more than 1:25 away from the *receiving pool* to drainage or to deck drains.
- * (22) Any decks at the entrance to the top of a water slide flume shall be drained as required by Sentence (21).
- * (23) The pump reservoirs shall have sufficient volume to contain at least 2 min of combined flow

from all water treatment and water slide flume pumps and enough water to ensure that the *receiving pool* will maintain a constant water depth.

- * **(24)** A surge-free automatic water level control system shall be installed to ensure that the water in a *receiving pool* is maintained at the proper level.
- * **(25)** Where surface skimmers are used as the sole overflow system, not less than two skimmers shall be used and they shall maintain effective skimming action over the entire surface.

7.3.5.4. Walkways Steps and Stairs

- * **(1)** Walkways, steps and stairs between a *receiving pool* and the top of a water slide flume and between other facilities shall be not less than 1 100 mm in width.
- * **(2)** Walkways, steps and stairs shall be well drained, nonslippery, and separated from any water slide flume by a physical barrier, set back not less than 1 m from the flume so that *sliders* cannot contact it on the way down.
- * **(3)** Steps and stairs shall conform to the requirements of *exit* stairs in Part 3, including dimensions, handrails and *guards*.

7.3.5.5. First Aid

- * **(1)** An area or room shall be incorporated in a *water theme park* for the rendering of first aid.
- * **(2)** The facility required by Sentence (1) shall be capable of being heated to not less than 22°C and shall be equipped with
 - (a) a first aid kit,
 - (b) a stretcher and blankets,
 - (c) a standard plywood backboard or other acceptable splint for treating persons with back or neck injuries, and
 - (d) a non-pay telephone for emergency use.

7.3.5.6. Dispatch Area

- * **(1)** A dispatch area at the top of a water slide flume shall be provided to permit staff to control *sliders* in a safe manner and to provide space for staff to supervise the area at all times when the flume is in operation.

- * **(2)** A means of communication shall be provided between the dispatch area and other areas from which supervision is undertaken or assistance can be obtained.

Section 7.4 Dairy Manufacturing Plants

7.4.1. General

7.4.1.1. General

- * **(1)** Rooms in a *dairy manufacturing plant* used or intended to be used for the processing of milk or cream shall not open directly into any room or space used for any purpose that might unfavourably affect the quality of the milk, cream or manufactured dairy products.
- * **(2)** Dressing rooms for plant staff shall be provided and equipped.
- * **(3)** Refrigerated rooms shall be provided for storage of dairy products.
- * **(4)** A *dairy manufacturing plant* shall have an adequate supply of potable water.
- * **(5)** A *dairy manufacturing plant* shall have adequate facilities for the thorough washing, cleaning and sanitization of all equipment used in the manufacturing, processing, packing or repacking of dairy products.
- * **(6)** Adequate hand washing facilities convenient to all work areas where dairy products are processed shall be provided.

7.4.1.2. Room Finishes

- * **(1)** Walls, ceiling and other structural components of rooms in which milk and milk products are handled or stored shall be
 - (a) smooth,
 - (b) impervious to moisture,
 - (c) light in colour,
 - (d) free of pitting,
 - (e) free of indentations,
 - (f) free of cracks,
 - (g) free of crevices,

7.4.1.2.

- (h) free of ledges, and
- (i) capable of easy cleaning.

7.4.1.3. Floors

- * (1) A *dairy manufacturing plant* shall have
 - (a) water tight floors,
 - (b) floors of nonabsorbent material,
 - (c) floors capable of wet washing,
 - (d) floors capable of easy cleaning,
 - (e) a sufficient number of drains to keep the floors of all rooms well drained and reasonably dry, and
 - (f) floors that slope properly to drains.

- * 7.4.1.4. **Utility Lines.** All utility lines shall be covered and capable of easy cleaning.

7.4.1.5. Ventilation

- * (1) A *dairy manufacturing plant* shall
 - (a) be adequately ventilated to remove odours and moisture, and
 - (b) have all doors, windows and other openings adequately screened or provided with other suitable barriers to prohibit the entrance of insects, rodents and other vermin.

7.4.1.6. Light Fixtures

- * (1) Light fixtures in areas where dairy products are handled or stored or where packaging materials are stored shall
 - (a) have shatterproof bulbs or tubes, or
 - (b) have shatterproof covers to prevent contamination by broken glass in the event of a bulb or tube breakage.

7.4.2. Acceptance

7.4.2.1. Occupancy or Use

- * (1) Upon completion of the construction or alteration of a *dairy manufacturing plant* the occupancy or use of the plant shall not commence until
 - (a) a final inspection by the *authority having jurisdiction* has taken place and he has given permission to occupy and use the *building*, and
 - (b) a copy of the permission to occupy and use the *building* has been filed and ac-

cepted by the Director of the Dairy Division, Alberta Agriculture, as having met all the requirements of the Dairy Industry Act and regulations made pursuant to that Act.

Section 7.5 Interior Finishes

7.5.1. General

7.5.1.1. Lead-Free Paints

(1) The paint used on surfaces in day care facilities, paediatric facilities and similar locations where preschool children gather and in *institutional occupancies* shall be lead free and nontoxic when dry. *

7.5.1.2. Finishes for Hairstyling Shops. *

The material used on the floors, walls and ceilings of a *hairstyling shop* shall provide surfaces that can be easily cleaned.

7.5.1.3. **Change House Finishes.** Interior finish of a change house at a *commercial bathing place* or *man made beach* shall be capable of being thoroughly cleaned and disinfected and the floor shall be impervious and nonabsorbent. *

7.5.1.4. Child Care or Day Care Finishes. *

Wall, ceiling and floor finishes in every room in a child care institution or in day care facilities shall be constructed so as to be easily cleaned.

7.5.1.5. Finishes in Food Establishments

- (1) This Article applies to *
- (a) areas, other than dining and service areas, in which food is prepared or processed,
- (b) areas where utensils are cleaned,
- (c) walk-in refrigerators,
- (d) walk-in freezers,
- (e) rooms containing water closets, lavatories or showers,
- (f) garbage storage areas or rooms, and
- (g) all food or utensil storage areas or rooms except in food warehouses that contain only packaged food in *food establishments*.

- * **(2)** The surface of floors in areas referred to in Sentence (1) shall be smooth, slip-resistant, nonabsorbent, nonpeeling and constructed of durable material that is resistant to acids, alkalis, grease and other substances that are normally constituents of food and cleaning materials.
- * **(3)** The surface of walls in areas referred to in Sentence (1) shall be constructed of durable materials that are smooth, nonabsorbent and capable of wet washing and easy cleaning.
- * **(4)** The surface of ceilings in areas referred to in Sentence (1) shall be constructed of durable materials that are smooth, nonabsorbent and free of ledges and building services not easily accessible for cleaning, on which dust can accumulate.
- * **(5)** In addition to the requirements of Sentence (4), the surface of ceilings in all food storage areas and rooms in a *food establishment* where food is prepared or processed shall be capable of easy cleaning.
- * **(6)** The requirements for floors, walls and ceilings in Sentences (2) to (5) shall also apply to unpackaged *food areas* in a *building* or part of a *building* used for a grocery store.

Section 7.6 Lighting

7.6.1. General

7.6.1.1. Scope

- * **(1)** Lighting requirements in this Subsection are additional to requirements in other Parts of this Code.

7.6.1.2. Lighting Levels

- * **(1)** Lighting outlets with fixtures shall be installed to provide illumination of not less than 550 lx in areas of a *food establishment* where food is prepared or utensils are cleaned.
- * **(2)** Lighting outlets with fixtures shall be installed to provide illumination of not less than 330 lx in all areas of a *food establishment* other than those referred to in Sentence (1).

- * **(3)** Lighting outlets with fixtures shall be installed to provide illumination of not less than 500 lx in *hairstyling shops*.

- * **(4)** Except for a family day home, a child care institution or day care facility shall have lighting outlets and fixtures that provide illumination of not less than
 - (a) 215 lx in a sleeping room, hallway, stairway or washroom,
 - (b) 800 lx in a classroom, and
 - (c) 375 lx in all rooms other than those specified in Clauses (a) and (b).

7.6.1.3. Contamination Protection

- * **(1)** Light fixtures serving areas where food is prepared or processed shall be constructed or located to prevent contamination of food by broken glass in the event of a bulb or tube breakage.

Section 7.7 Medical Gas Piping Systems

7.7.1. General

7.7.1.1. Standard

- * **(1)** Except as amended by Sentence (2), a nonflammable medical gas piping system shall be installed in conformance with CSA Z305.1-M, "Nonflammable Medical Gas Piping Systems."

- * **(2)** CSA Z305.1-M, "Nonflammable Medical Gas Piping Systems" is amended
 - (a) in Clause 4.2.2.2(a), by striking out "at least two cylinders" and substituting "provision for at least two cylinders,"
 - (b) by adding the following to the end of Clause 4.2.5.1(g) "This Clause does not apply to existing systems that are being modified,"
 - (c) in Clause 4.2.5.2(e), by adding "except for existing systems", before "the cut-in pressure,"
 - (d) in Clause 4.2.5.9, by striking out "16 m (50 ft)" and substituting "5 m,"
 - (e) in Clause 4.2.7.7, by striking out "16 m (50 ft)" and substituting "5 m,"

7.7.1.1.

- (f) by adding the following to the end of Clause 4.3.2.1 "This Clause does not apply to existing systems that are being modified,"
- (g) in Clause 10.3, by striking out "by the installer" and substituting "by the testing agency,"
- (h) in Clause 11.2, by striking out "or the regulatory authority,"
- (i) by striking out Clause 22.2,
- (j) by adding the following to the end of Clause 1.4 "Installation of medical gas outlets in Biomedical Workshops within health care facilities will be acceptable provided that such workshops are being designated as special areas inaccessible to unauthorized personnel, and to be engaged only in the testing and servicing of medical equipment for use in conjunction with the medical gas system,"
- (k) in Clause 4.2.5.1(e), by replacing "compressor system" with "average calculated demand of the system. Where three or more dryers are used, the system capacity must still be met with the largest unit out of service." and add "Such filters shall be installed upstream of the dryer units." at the end of the Clause,
- (l) in Clauses 4.2.5.9, 4.2.7.7 and 4.3.3.1(c) by adding "openable" ahead of the word "window,"
- (m) by replacing existing Clause 4.3.2.2 with "Both pressure regulators shall be on line at all times, with the operating unit set at the standard main pressure and the standby unit set at 104 kPa lower,"
- (n) by adding the following to the end of Clause 4.3.3.1(c) "Vents from several pressure relief valves serving the same gas system may be connected to a common pipe having an equivalent area to the sum of all outlet ports of the relief valves,"
- (o) by adding the following to the end of Clause 4.3.4.3.9 "The dew point alarm shall be set at +4°C (+/- 2°),"
- (p) by deleting the phrase "below the outlet" from Clause 4.3.4.3.6,

- (q) by replacing the phrase "in close proximity to" in Clause 4.5.1.8(b) with "within 5 metres of,"
- (r) by replacing the phrase in Clause 6.4, "shall be located or protected" with "shall not be installed less than 1 500 mm above the floor unless proper protection is provided,"
- (s) by adding new Clause 10.4 "Perform joint testing program as per the following schedule:

No. of Joints in System	Min. No. to Cut Out
10 – 20	1
21 – 100	2
101 – 500	5
Over 500	10

For the purpose of this Clause, pipe couplings will be counted as 1 joint. For renovation of existing systems, the number of joints in system refers to newly installed joints only,"

- (t) by revising average flow per terminal unit for "Medical Air" in Table 2 from 25 LPM to 10 LPM, and the minimum permissible flow listed under "Medical Air" in Table 4 from 250, 470 and 1250 LPM to 100, 190 and 500 LPM respectively, and
- (u) by revising location of dewpoint alarm sensor shown on Fig. 6 to downstream of the line pressure regulators as per Clause 4.3.4.3.9.

7.7.1.2. Dental Facilities

(1) Compressed air systems and vacuum systems are exempt from the requirements of Article 7.7.1.1. if the system

- (a) is used in a dental facility,
- (b) is directly connected to and designed to serve only dental equipment or dental chairs,
- (c) is not used for respiration, and
- (d) is not connected to a central piping system that serves other uses.

7.7.2. Acceptance

7.7.2.1. Inspection Testing and Reports

- * (1) Upon completion of the installation of, or the *alteration* of, a nonflammable medical gas piping system in a *new building* or existing *building*
 - (a) the nonflammable medical gas piping system shall be inspected and tested in conformance with CSA Standard Z305.1-M, "Nonflammable Medical Gas Piping Systems," and
 - (b) a report shall be prepared by the testing organization indicating the results of the inspection made and testing performed in respect of the nonflammable medical gas piping system.

7.7.2.2. Certification and Review of Report

- * (1) A nonflammable medical gas piping system shall not be used until the report required by Clause 7.7.2.1.(1)(b) has
 - (a) been certified by the person making the report that the nonflammable medical gas piping that is the subject of the report conforms to CSA Standard Z305.1-M, "Nonflammable Medical Gas Piping Systems," and
 - (b) in the case of a hospital, been filed with and accepted by the Director of the Mechanical Engineering Branch, Alberta Public Works, Supply and Services.

7.7.2.3. Alterations to Systems

- * (1) Where an *alteration* is made to an existing nonflammable medical gas piping system, the colour codes of the existing system may be used for the *alteration* if identification labels, lettered, coloured and placed in accordance with CSA Standard Z305.1-M, "Nonflammable Medical Gas Piping Systems," are affixed to both the existing system and the *alteration*.

Section 7.8 Coin Operated Dry Cleaning Establishments

7.8.1. General

7.8.1.1. Scope. This section applies to coin operated dry cleaning establishments in which the process of cleaning wearing apparel, cloth, fabrics or textiles of any kind by immersion and agitation or immersion only, in a nonaqueous solvent is applied by means of a mechanical appliance that may be loaded, activated or unloaded by a customer. (See Appendix A.)

7.8.1.2. Occupancy Restriction. A coin operated dry cleaning establishment shall not be contained in the same *building* as a *residential occupancy*.

7.8.1.3. Location in a Building

- (1) A coin operated dry cleaning establishment shall be located in a *storey* of a *building*
 - (a) closest to grade, and
 - (b) which does not have any part of its floor below ground level.

7.8.1.4. Containing Spills

(1) A coin operated dry cleaning establishment shall have a method of ensuring that any liquid from a leak in the system cannot escape from the maintenance area, including but not limited to diking the floor or machine base of each machine to hold a liquid volume equal to the maximum volume of solvent that can escape from the machine.

(2) Every establishment shall have a method of drawing and storing solvent in the event of a leak in the system into a standby holding tank or its equivalent that is vented to the outside of the *building*.

7.8.2. Separation

7.8.2.1. Separation of Service Room, Maintenance Area and Air Intake

- (1) A *service room* containing a steam boiler, steam generator, *furnace* or open flame burner

7.8.2.1.

- (a) shall not be connected with a space containing a dry cleaning machine, and
- (b) shall obtain combustion air directly from outside the *building*.

7.8.3. Access

7.8.3.1. Access

- * **(1)** Not less than one access door to the maintenance area shall be provided with hardware that permits the door to be readily opened from the inside without requiring keys, special devices or specialized knowledge of the door opening mechanism.
- * **(2)** Only the customer side of a dry cleaning machine shall be accessible from the customer area, and access doors to the maintenance area shall be provided with locks.
- * **(3)** The maintenance area, which is the area in which accessibility is provided to all the working or mechanical portions of the dry cleaning machines, except for parts of machines used by customers, shall be separated from the front of the dry cleaning machine by floor to ceiling *partitions* that will prevent the passage of vapour from the maintenance area to the customer area.

7.8.4. Ventilation

- * **7.8.4.1. Air Concentration of Solvents.**
A coin operated dry cleaning establishment shall have a mechanical exhaust ventilation system than can maintain air concentrations of the solvent in the customer area at not more than 10% of the applicable occupational exposure limit as authorized by the Occupational Health and Safety Act and regulations made pursuant to that Act.

7.8.4.2. Exhaust Systems

- * **(1)** Notwithstanding the requirements of Article 7.8.4.1., every establishment shall have an exhaust ventilation system that shall
 - (a) be capable of operating on a continuous basis while the establishment is open for business,
 - (b) have electrical wiring to ensure that the dry cleaning establishment cannot be op-

- erated unless the exhaust ventilation system is in operation,
- (c) have a minimum air flow
 - (i) for 1 to 3 dry cleaning machines of 120 L/s for each machine,
 - (ii) for 4 to 8 dry cleaning machines of 95 L/s for each machine,
 - (iii) for 9 to 16 dry cleaning machines of 90 L/s for each machine, and
 - (iv) for 17 or more dry cleaning machines of 85 L/s for each machine, and
- (d) have air ducts with grille openings
 - (i) installed to facilitate air movement,
 - (ii) designed on the basis of air movement of not more than 2 500 L/s for each square metre, and
 - (iii) placed as close as possible to each dry cleaning machine, preferably near the base or just above the machine.

(2) In addition to the ventilation system required by Articles 7.8.4.1. and Sentence (1) the establishment shall have one or more general ventilation fans, wired separately, for emergencies, that will exhaust air from the maintenance area to outside of the *building* in the event of accidental solvent vapour dispersion or spills. *

(3) An airflow of not less than 470 L/s for each machine shall be exhausted when the fans required by Sentence (2) and those required by Sentence (1) are operated simultaneously. *

(4) Coin operated dry cleaning equipment shall have an exhaust system which maintains a minimum of 0.5 m/s face velocity through the loading door whenever the door is open. *

(5) The ductwork connections in the system referred to in Sentence (4) shall be sealed. *

(6) The discharge stacks for the ventilating system required by Article 7.8.4.1. and Sentences (1) and (2) shall be not less than

- (a) 1.5 m above the highest roof line,
- (b) 7 m from any air intake, and
- (c) 3 m from the property line or adjacent *buildings*.

 *

7.8.4.3. Make-Up Air

- * **(1)** A coin operated dry cleaning establishment shall have a supply of make-up air, heated to not less than 16°C, not less than the total volume of air exhausted from the establishment and sufficient to eliminate any negative pressure conditions.
- * **(2)** The emergency ventilation capacity required by Sentence 7.8.4.2.(2) need not be considered as part of the total volume of air exhausted from the establishment for the purpose of Sentence (1).

Section 7.9 Abattoirs and Secondary Meat Processing Plants

7.9.1. Abattoirs**7.9.1.1. Facilities**

- * **(1)** Every *abattoir* in which animals are inspected shall have
 - (a) pens for the purpose of holding animals before slaughter which are constructed with a concrete floor and roof capable of providing shade and shelter from precipitation,
 - (b) a killing room for the purpose of slaughtering animals,
 - (c) a storage room for inedible offal, meat that is not food,
 - (d) a hide room for salting hides,
 - (e) a hoist, and
 - (f) a hot water or steam sterilizer capable of maintaining a temperature of not less than 80°C.
- * **(2)** Every *abattoir* in which poultry is slaughtered shall have
 - (a) adequate facilities for receiving and holding live poultry,
 - (b) adequate facilities for slaughtering poultry and scalding carcasses,
 - (c) adequate facilities for plucking carcasses,
 - (d) adequate facilities for eviscerating carcasses and chilling dressed carcasses,
 - (e) adequate facilities for storing inedible offal, meat that is not food, condemned material and refuse,
- (f) adequate facilities for storing dressed carcasses,
- (g) adequate facilities for cleaning and disinfecting live poultry containers,
- (h) sufficient water pressure to operate spray washing equipment to wash carcasses thoroughly, and
- (i) a refrigerated room for the holding of poultry carcasses at a temperature not greater than 4°C.
- * **(3)** Every *abattoir* shall have adequate wash-room facilities provided and every washroom facility shall be:
 - (a) located so that it does not open directly into any room in which poultry or meat is processed or carcasses are cooled or stored,
 - (b) equipped with full length self-closing doors,
 - (c) adequately ventilated, and
 - (d) fully lighted.
- * **(4)** Every *abattoir* shall have or have readily available adequate refrigeration facilities for chilling and storing dressed carcasses immediately after slaughter.
- * **(5)** Every refrigerated room in an *abattoir* shall be equipped with a direct reading thermometer of known accuracy.
- * **(6)** Every *abattoir* shall provide or have available for the use of employees
 - (a) towel and soap dispensers at washing facilities,
 - (b) adequate dressing rooms for all employees to change and store their clothing in clean and sanitary condition, and
 - (c) a lunch room adjacent to adequate dressing and washroom facilities.
- * **(7)** Every *abattoir* shall have
 - (a) adequate accommodation for the use of an inspector appointed pursuant to the Meat Inspection Act,
 - (b) adequate work space on the floor of the killing room for the inspector during his post-mortem inspection, and

7.9.1.1.

- (c) a lockable cupboard for the inspector's equipment.

* **(8)** Where an *abattoir* requires inspection services for three or more days in a week, the Director of Animal Health under the Meat Inspection Act may require the operator to provide the inspector with a furnished office for his exclusive use.

* **7.9.1.2. Construction Materials.** The killing area, cutting area, coolers, offal storage and hide storage areas of an *abattoir* shall be constructed of masonry or metal with the exception of the roof and beams carrying overhead rails, which may be *heavy timber construction* using glued-laminated wood beams where all exposed wood is properly sealed.

* **7.9.1.3. Ramps.** Ramps or inclines used for the movement of animals shall be constructed in such a manner as to provide safe ascent and descent.

7.9.1.4. Floor, Wall and Ceiling Finishes

* **(1)** In killing rooms, rooms in which carcasses of meat are chilled or stored and storage rooms for inedible offal, meat that is not food, condemned material and refuse, floors shall

- (a) be constructed of smooth, nonskid concrete, and
- (b) be sloped to drains that provide adequate drainage.

* **(2)** Floors in hide rooms shall be smooth and impervious to liquids.

* **(3)** All corners in floors and walls in killing rooms, storage rooms for inedible offal and coolers shall be coved smoothly so as to be readily cleanable.

* **(4)** Walls shall be

- (a) of smooth material,
- (b) finished in a light colour, and
- (c) impervious to liquids,

for a height of 2.4 m in killing rooms and rooms in which carcasses of meat are chilled or stored.

* **(5)** Ceilings in refrigerated rooms shall be

- (a) of smooth material, and
- (b) impervious to liquid.

* **7.9.1.5. Pressurized Water Supply.** Every *abattoir* shall have under pressure a supply of potable hot and cold water adequate for the efficient opera-

tion and cleaning of the *abattoir* with a water pressure of not less than 3 450 kPa for cleaning purposes.

7.9.1.6. Sewage Lines and Floor Drains

(1) Sewage lines from washrooms and bathrooms shall not connect directly to sewage lines from floor drains in the *abattoir* but shall go by separate lines to the septic tank or sewage disposal system. *

(2) All floor drains shall be constructed of 100 mm sewage pipes and sloped not less than 1:48 to the main and shall be capped or trapped in accordance with the Plumbing and Draining Act and regulations made pursuant to that Act. * e

7.9.1.7. Prohibition of Catch Basins

- (1)** A catch basin shall not be located in *
- (a) a killing room,
- (b) a room in which carcasses of meat are chilled or stored, or
- (c) any other operating area of the *abattoir*.

* **7.9.1.8. Hand Washing Facilities.** Every *abattoir* shall provide washing facilities with hot and cold water for the use of employees. *

* **7.9.1.9. Storage of Hoses.** Suitable racks or reels shall be provided for the storage of hoses. *

7.9.1.10. Ventilation

* **(1)** Every *abattoir* shall have a minimum ventilation rate of five air changes per hour in the killing and processing areas of the *abattoir*. *

* **(2)** If condensation becomes a problem in the areas mentioned in Sentence (1), the ventilation rate shall be increased to eliminate the condensation problem. *

* **(3)** Holding pens for animals awaiting slaughter shall have adequate ventilation. *

* **(4)** All outside openings capable of being opened, except loading doors, shall be screened sufficiently to prevent the entry of flies or other insects. *

7.9.1.11. Lighting

* **(1)** Operational areas of an *abattoir* shall have a lighting level of 500 lx at a distance of 1 m from the floor. *

- * (2) Inspection stations of an *abattoir* shall have a lighting level of 1 000 lx at a distance of 1 m from the floor.

7.9.1.12. Rails, Racks and Hooks

- * (1) Rails, racks and hooks shall be
 - (a) arranged so as to prevent contact with a wall or floor,
 - (b) unpainted, and
 - (c) of a height of not less than 3.3 m from the floor.

7.9.2. Secondary Meat Processing Plants

- * 7.9.2.1. **Lighting.** Every *secondary meat processing plant* shall have a lighting level of 500 lx at a distance of 1 m in operational areas of the plant.

- * 7.9.2.2. **Ventilation.** Every *secondary meat processing plant* shall have adequate ventilation to prevent the accumulation of condensation in areas where food is prepared, processed and stored.

- * 7.9.2.3. **Sterilizers.** Every *secondary meat processing plant* shall have one or more hot water or steam sterilizers capable of maintaining a temperature of not less than 80°C.

7.9.2.4. Refrigeration

- * (1) Every *secondary meat processing plant* shall have or have readily available adequate refrigeration facilities including facilities for storing dressed carcasses.

- * (2) Every refrigerated room in a *secondary meat processing plant* shall be equipped with a direct reading thermometer with an accuracy of at least + or - 1°C.

- * 7.9.2.5. **Heating System.** Every *secondary meat processing plant* shall have a heating system capable of maintaining a temperature of not less than 10°C and not more than 18°C in areas where food is prepared or processed.

- * 7.9.2.6. **Water Supply and Pressure.** Every *secondary meat processing plant* shall have under pressure a supply of potable hot and cold water adequate for the efficient operation and cleaning of the plant, with water pressure of not less than 3 450 kPa.

7.9.2.7. Sewage Lines and Floor Drains

- (1) Sewage lines from washrooms and bathrooms shall not connect directly to sewage lines from floor drains in the plant but shall go by separate lines equipped with a backflow device to the septic tank or sewage disposal system.

- (2) All floor drains shall be constructed of 10 cm sewage pipes or larger and sloped not less than 1:48 to the main and shall be capped or trapped in accordance with the Plumbing and Drainage Act and regulations made pursuant to that Act.

7.9.2.8. Prohibition of Catch Basins

- (1) A catch basin shall not be located in
 - (a) a processing room,
 - (b) a room in which carcasses of meat are stored, or
 - (c) any operational area of the plant.

7.9.2.9. Floor, Wall and Ceiling Finishes

- (1) In rooms in which carcasses of meat are stored, storage rooms for inedible offal, meat that is not food, and refuse and operational areas of the plant, floors shall be

- (a) constructed of smooth, nonskid concrete, and
- (b) sloped to drains that provide adequate drainage.

- (2) All corners in floors and walls in the inedible offal storage room and cooler shall be coved smoothly so as to be readily cleanable.

- (3) Walls shall be of smooth material, finished in a light colour and impervious to liquids,

- (a) to a height of 3 m in all operational areas of the plant, and
- (b) to the ceiling in refrigerated areas of the plant.

- (4) Ceilings in refrigerated rooms shall be
 - (a) of smooth material, and
 - (b) impervious to liquids.

- (5) The cutting areas, coolers, offal storage and other operational areas shall be constructed of masonry or metal with the exception of the roof and beams carrying overhead rails, which may be *heavy timber construction* using glued-laminated wood beams where all exposed wood is properly sealed.

7.9.2.10.

7.9.2.10. Windows and Openings

* (1) All openings capable of being opened to the outside except loading doors must be screened sufficiently to prevent the entry of flies or other insects.

* (2) All windows must be either installed flush with the inside wall of the plant or window ledges on the inside of the wall must be sloped at not less than 45°.

7.9.2.11. Staff Facilities

* (1) Every *secondary meat processing plant* shall provide

- adequate dressing rooms for all employees to change and store their clothing in clean and sanitary conditions,
- a lunch room adjacent to dressing and washroom facilities, and
- handwashing facilities with hot and cold water for the use of employees while handling meat in the *food area*.

* (2) Washroom facilities shall be provided in every *secondary meat processing plant* and every washroom facility shall be

- located so that it does not open directly into any room in which carcasses are processed or meat is cooled or stored,
- equipped with full length self-closing doors,
- adequately ventilated, and
- fully lighted.

7.9.2.12. Rails, Racks and Hooks

* (1) Rails, racks and hooks shall be

- of metal construction and unpainted,
- arranged so as to prevent the contact of carcass, primal cuts or other portions of meat with a wall or floor, and
- of a height adequate to protect carcasses or food from touching the floor.

* 7.9.2.13. **Hose Storage.** Suitable racks or reels shall be provided for hoses when not in use.

Section 7.10 Laboratories Using Biological Agents

7.10.1. General

* 7.10.1.1. **Laboratories Using Biological Agents.** Laboratories using or intending to use biological agents classified in the Laboratory Biosafety Guidelines proposed by the Medical Research Council of Canada and the Laboratory Centre for Disease Control, Health Protection Branch, Department of National Health and Welfare, shall be designed and constructed in accordance with the containment requirements of these guidelines.

Section 7.11 Cemeteries and Related Buildings

7.11.1. General

* 7.11.1.1. **Application.** This Section applies to the construction of *buildings* or parts thereof used for the storage, burial or disposal of dead human bodies or other human remains.

7.11.1.2. Review by Alberta Consumer and Corporate Affairs

* (1) Plans for the construction of a *crematory* shall be submitted to the Minister, Alberta Consumer and Corporate Affairs, for review prior to application for a *permit*.

* (2) Plans for the establishment of a *cemetery*, showing the location of all *buildings* used for human habitation, shall be submitted to the Director of Licensing of Trades and Businesses, Alberta Consumer and Corporate Affairs, for review prior to application for a *permit*.

* 7.11.1.3. **Columbarium.** A *columbarium* shall only be constructed in a *cemetery* or as part of a church, *crematory* or *mausoleum*.

* 7.11.1.4. **Mausoleum.** A *mausoleum* shall only be constructed in a *cemetery*.

* **7.11.1.5. Fencing.** The entire area of a *cemetery* shall be enclosed by a suitable fence that is provided with adequate entrances.

7.11.2. Design Requirements

7.11.2.1. Materials and Construction

* **(1)** Every *columbarium* and *mausoleum* shall be constructed of *noncombustible construction*, having roof, floor and wall assemblies substantially of masonry or concrete.

* **(2)** A chapel or vault, constructed in a *cemetery* and used as a repository for the dead during the winter months, shall

- (a) be constructed of *noncombustible construction*, having roof, floor and wall assemblies substantially of masonry or concrete,
- (b) have vault doors and frames of iron or wood encased in iron, and
- (c) have windows that are protected by iron sheeted shutters.

* **7.11.2.2. Design.** There shall be no open connections between the vault and chapel except underneath the floor for the reception of coffins.



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 uncompleted or abandoned *building*.

8.1.1.2. Definitions. Words that appear in italics are defined in Part 1.

8.1.1.3. Demolition Procedures. Measures shall be taken during demolition to protect the public in conformance with CSA S350-M, "Code of Practice for Safety in Demolition of Structures" and Subsection 8.2.2.

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 splashboard not less than 300 mm high on the *street* side,

8.2.1.2.

- (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,
- (g) be adequately lighted when the *public way* is lighted, and
- (h) have, at each opening for pedestrian access, a gate not less than 1 200 mm high that can be locked or bolted in a closed position to prevent the entry of pedestrians.

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 the Fire Prevention Act and regulations made pursuant to that Act 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 the requirements of NFPA 10, "Standard for Portable Fire Extinguishers". *

(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 the Fire Prevention Act and regulations made pursuant to that Act.

(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 Electrical Protection Act and regulations made pursuant to that Act.

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) the Gas Protection Act and regulations made pursuant to that Act,
- (b) CAN/CSA-B139-M, "Installation Code for Oil Burning Equipment," or
- (c) the Fire Prevention Act and regulations made pursuant to the Act.

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 the Fire

8.2.2.15.

Prevention Act and regulations made pursuant to that Act.

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 the Fire Prevention Act and regulations made pursuant to that Act 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
 - (a) selected and installed in conformance with the requirements of NFPA 10, "Standard for Portable Fire Extinguishers," and
 - (b) inspected, tested and maintained in conformance with the Fire Prevention Act and regulations made pursuant to that Act.
- (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 the Fire Prevention Act and regulations made pursuant to that Act.

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 the Fire Prevention Act and regulations made pursuant to that Act.

(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 the Fire Prevention Act and regulations made pursuant to that Act.

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.

8.2.3.15. Occupancy While Under Construction

* (1) When a *building* is occupied prior to completion or during extensive alterations, fire safety measures in the occupied portions of the *building* shall be maintained or alternate provisions made.

* (2) Measures shall be taken to cordon off and control access to the work areas.

* (3) Required exits from the occupied area shall be maintained or alternate means of egress shall be provided. (See Appendix A.)

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, 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, walks, 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.

8.2.5.1.

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. Protection from Dangerous Activities

* (1) Operations such as the hoisting of major components onto a tall *building* or other overhead activities that constitute a hazard 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.

* (2) If safety to pedestrians cannot be assured during hoisting or the undertaking of other hazardous operations, then the gates required by Clause 8.2.1.2.(1)(h) and located in the danger zone shall be closed and locked and pedestrians shall be redirected away from the danger.

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

(1) 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

- (1) 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 maintained in a clean and untorn condition when being used.
 - (d)

8.2.6.3. Signs Used for Directing Traffic

- (1) 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" 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" 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

- (1) 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

(1) 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

- (1) 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

- (1) 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

- (1) The chute described in Clause 8.2.7.2.(1)(b) 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.

Part 9

Housing and Small Buildings

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Part 9

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-M, "Concrete Construction for Housing and Small Buildings."

9.3.1.2. **Cement.** Cement shall meet the requirements of CAN3-A5-M, "Portland Cement."

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-M, "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 CAN/CSA-A23.1-M, "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 CAN/CSA-A23.2-M, "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.

Table 9.3.1.A.
Forming Part of Sentence 9.3.1.8.(1)

Concrete Mixes (by volume)			
Concrete Strength, MPa	Cement, parts	Sand, parts	Coarse Aggregate, parts
15	1	2	4
	1	—	6, pit run gravel
20	1	1.75	3, up to 40 mm in size
	1	—	4.75 pit run gravel
Column 1	2	3	4

9.3.1.9. Admixtures. Admixtures shall conform to CAN3-A266.1-M, "Air Entraining Admixtures for Concrete" or CAN3-A266.2-M, "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.

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.)

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 9.23.4.1. for joists, rafters and beams and Article 9.23.13.11. 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-M, "Preservative Treatment of All Timber Products by Pressure Processes,"
- (b) CAN/CSA-O80.2-M, "Preservative Treatment of Lumber, Timber, Bridge Ties and Mine Ties by Pressure Processes,"
- (c) CAN/CSA-O80.9-M, "Preservative Treatment of Plywood by Pressure Processes," or
- (d) CAN/CSA-O80.15-M, "Preservative Treatment of Wood for Building Foundation Systems, Basements and Crawl Spaces by Pressure Processes."

Table 9.3.2.A.
Forming Part of Article 9.3.2.1.

*

USE	Minimum Lumber Grades for Specific End Uses							
	Boards			Framing				
	Paragraph in the NLGA grading rules under which boards are graded			Classification and paragraph in the NLGA rules under which dimension lumber is graded				
	Para 113	Para 114	Para 118	Stud Para 121	Light Framing Para 122	Structural Light Framing Para 123	Structural Joists and Planks Para 124	Posts and Timbers Para 131
Stud wall framing (loadbearing members)	—	—	—	Stud	Standard	No. 2	No. 2	—
Stud wall framing (non-load-bearing members)	—	—	—	Stud	Utility	No. 3	No. 3	—
e Plank frame construction (loadbearing members)	No. 3 Common	—	No. 3 Common	—	—	—	No. 2	—
e Plank frame construction (non-load-bearing members)	No. 5 Common	—	No. 5 Common	—	Economy	No. 3	No. 3	—
Posts and beams less than 114 mm in thickness	—	—	—	—	Standard	No. 2	No. 2	—
Posts and beams 114 mm or more in thickness	—	—	—	—	—	—	—	Standard
e Roof sheathing	No. 3 Common	Standard	No. 4 Common	—	—	—	—	—
e Sub-flooring	No. 3 Common	Standard	No. 3 Common	—	—	—	—	—
e Wall sheathing required as a nailing base	No. 4 Common	Utility	No. 4 Common	—	—	—	—	—
e Wall sheathing not required as a nailing base	No. 5 Common	Economy	No. 5 Common	—	—	—	—	—
Column 1	2	3	4	5	6	7	8	9

Note to Table 9.3.2.A.:

(1) See Appendix A.

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.

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 Table 2.2.1.A. of the Alberta Building Code 1990, and
 S_r = the associated rain load listed in Table 2.2.1.A. of the Alberta Building Code 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.

* **9.4.2.3. Balconies.** Residential balconies and raised decks not used as passageways shall be designed to carry the design roof snow load and the associated rain load in conformance with Article 9.4.2.2., or 1.9 kPa, whichever is greater.

* **9.4.2.4. Roofs at Different Levels.** If roofs are at different levels, or there are projections above the roof level, the design roof snow load shall include

allowance for the effects of drifting snow in accordance with Part 4.

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).

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.

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*.

Table 9.4.3.A.
Forming Part of Sentence 9.4.3.1.(1)

Maximum Deflections		
Structural Members	Type of Ceiling Supported	Maximum Allowable Deflection Expressed as a Ratio of the Clear Span
Roof rafters, roof joists, roof beams and roof decking of plank and beam construction	No ceiling	1/180
	Other than plaster or gypsum board	1/240
	Plaster or gypsum board	1/360
Ceiling joists	Other than plaster or gypsum board	1/240
	Plaster or gypsum board	1/360
Floor beams, floor joists and floor decking of plank and beam construction for floor areas other than bedrooms in <i>dwelling units</i>	No ceiling	1/360
	Other than plaster or gypsum board	1/360
	Plaster or gypsum board	1/360
Floor beams, floor joists and floor decking of plank and beam construction for floor areas of bedrooms in <i>dwelling units</i>	No ceiling	1/240
	Other than plaster or gypsum board	1/240
	Plaster or gypsum board	1/360
Column 1	2	3

Table 9.4.4.A.
Forming Part of Article 9.4.4.1.

Allowable Bearing Pressure for Soil or Rock	
Type and Condition of Soil or Rock	Maximum Allowable Bearing Pressure, kPa
Dense or compact sand or gravel ⁽¹⁾	150
Loose sand or gravel ⁽¹⁾	50
Dense or compact silt ⁽¹⁾	100
Stiff clay ⁽¹⁾	150
Firm clay ⁽¹⁾	75
Soft clay ⁽¹⁾	40
Till	200
Clay shale	300
Sound rock	500
Column 1	2

Note to Table 9.4.4.A.:

⁽¹⁾ See Appendix A.

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 be-

9.5.1.2.

tween 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.

Table 9.5.2.A.
Forming Part of Article 9.5.2.1.

Room Heights	
Room or Space	Minimum Heights
Living room or space, dining room or space, kitchen or kitchen space	2.3 m over not less than 75 per cent of the required floor area with a clear height of 2.1 m at any point over the required area
Bedroom or bedroom space	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.
Unfinished <i>basement</i> including laundry area therein	1.95 m under beams in laundry areas and in any location that would normally be used for passage to laundry and storage areas
Bathroom, water-closet room or laundry area above <i>grade</i>	2.1 m in any area where a person would normally be in a standing position
Passage, hall or main entrance vestibule and finished rooms not specifically mentioned above	2.1 m
Column 1	2

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.

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.**

(1) A door shall be provided at each entrance * to a *dwelling unit*, to each room containing a water closet and to each room containing a boiler or furnace within a *dwelling unit*.

9.6.2.1.

* **(2)** In a building containing more than one *dwelling unit*, doors shall be provided at exterior entrances and *exits*, common laundry and drying rooms, common garbage rooms, public water closet rooms and at other locations where they are needed to satisfy the requirements of Section 9.10.

* **(3)** Notwithstanding the installation of overhead doors for vehicular access, at least one egress door not less than 1 980 mm high and 760 mm wide, swinging on a vertical axis shall be installed in a *storage garage*.

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 2 030 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.

9.6.3.4. Doors to Balconies. Except in a suite * designed in accordance with Section 3.7 and except where balconies are provided to conform with Articles 9.9.2.7. and 3.3.1.5., the door height required by Table 9.6.3.A. from a *dwelling unit* to the exterior balcony shall be measured from the finished floor surface to the top of the door and a sill not more than 300 mm in height above the finished floor surface may be included within the doorway opening.

9.6.4. Exterior Doors

9.6.4.1. Exterior Wood Doors

(1) Exterior wood doors shall conform to CAN/CSA-O132.2-M, "Wood Flush Doors."

(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.

9.6.4.2. Sliding Doors. Sliding doors shall conform to CAN/CGSB- 82.1-M, "Sliding Doors."

Table 9.6.3.A.
Forming Part of Article 9.6.3.1.

Minimum Size of Doors		
At Entrance to:	Width, mm	Height, mm
<i>Dwelling unit</i> (required entrance) Vestibule or entrance hall	810	1 980
Stairs to a floor level that contains a finished space All doors in not less than one line of passage from the exterior to the <i>basement</i> Utility rooms	810	1 980
Walk-in closet	610	1 980
Bathroom, water-closet room, shower room ⁽¹⁾	610	1 980
Rooms located off hallways that are permitted to be 710 mm wide	610	1 980
Rooms not mentioned above, exterior balconies	760	1 980
Column 1	2	3

e Note to Table 9.6.3.A.:

⁽¹⁾ See Article 9.6.3.3.

9.6.5.6.

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-M, "Glass, Safety, Tempered or Laminated," or shall be of wired glass conforming to CAN2-12.11-M, "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-M, "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

Table 9.6.5.A.
Forming Part of Article 9.6.5.1.

Maximum Glass Area for Doors, m ² (1)						
Glass Thickness, mm	Type of Glass					
	Annealed	Annealed Multiple-Glazed Factory-Sealed Units	Laminated	Wired	Heat Strengthened	Fully Tempered
3	0.50	0.70	(2)	(2)	1.00	1.00
4	1.00	1.50	(2)	(2)	1.50	4.00
5	1.50	1.50	(2)	(2)	1.50	No limit
6	1.50	1.50	1.20	1.00	1.50	No limit
Column 1	2	3	4	5	6	7

Note to Table 9.6.5.A.:

(1) See Appendix A.

(2) Not generally available.

9.6.5.6.

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.(1) 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.)

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 9.7.1.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.

Table 9.7.1.A.
Forming Part of Article 9.7.1.2.

Minimum Glass Areas for Rooms of Residential Occupancy		
Location	Unobstructed Glass Area	
	With No Electric Lighting	With Electric Lighting
Laundry, <i>basement</i> recreation room, unfinished <i>basement</i>	4 per cent of area served	Windows not required
Water-closet room	0.37 m ²	Windows not required
Kitchen, kitchen space, kitchen alcove	10 per cent of area served	Windows not required
Living rooms and dining rooms	10 per cent of area served	10 per cent of area served
Bedrooms and other finished rooms not mentioned above	5 per cent of area served ⁽¹⁾	5 per cent of area served ⁽¹⁾
Column 1	2	3

Note to Table 9.7.1.A.:

⁽¹⁾ See Article 9.7.1.3.

9.7.1.4.

(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.)

* **9.7.1.6. Openable Windows into a Garage or Carport.** An openable window shall not be located in that part of a wall separating a *dwelling unit* from an attached garage or carport.

* **9.7.1.7. Non-Openable Windows into a Garage or Carport.** A non-openable window between an attached garage or carport and a *dwelling unit* shall be built to prevent any air infiltration and shall provide an effective barrier to gas and exhaust fumes.

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 CAN/CSA-A440-M, "Windows." (See Appendix A.)

9.7.3. Glass

9.7.3.1. Glass Standards

- (1) Glass shall conform to
- e (a) CAN2-12.1-M, "Glass, Safety, Tempered or Laminated,"
 - e (b) CAN2-12.2-M, "Glass, Sheet, Flat, Clear,"
 - e (c) CAN2-12.3-M, "Glass, Polished Plate or Float, Flat, Clear,"
 - e (d) CAN2-12.4-M, "Glass, Heat-Absorbing,"
 - e (e) CAN2-12.8-M, "Insulating Glass Units,"
 - e (f) CAN2-12.10-M, "Glass, Light and Heat Reflecting," or
 - e (g) CAN2-12.11-M, "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.

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 1 070 mm above the landing shall be protected by barriers or railings located approximately 1 070 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. Where any part of a window in a *dwelling unit* is located within 2 m of adjacent ground level, such window shall conform to the requirements for resistance to forced entry as described in Clause 10.13 of CAN/CSA-A440-M, "Windows." (See Appendix A.)

9.7.7. Skylights

9.7.7.1. Plastic Skylights. Plastic skylights shall conform to CAN/CGSB-63.14-M, "Plastic Skylights."

9.7.7.2. Glass Skylights. Factory-built glass skylights shall meet the performance requirements of CAN/CGSB-63.14-M, "Plastic Skylights."

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, steps, 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 not 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 900 mm, and the length of landing for all other stairs in a straight run need not exceed 1 100 mm. (See also Articles 9.9.6.2. and 9.9.6.6. for landings in *exits*.)

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.

9.8.4.2.

(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.

9.8.5.4. Spiral Stairs

- * (1) A spiral stair not required as part of a *means of egress*, may be used in a *dwelling unit* if
- individual treads turn through an angle not less than 30°,
 - the minimum tread width is 150 mm,
 - the maximum rise is 230 mm,
 - the average run is not less than 200 mm,
 - the length of each tread is at least 660 mm, and
 - handrails are provided on both sides of the stair.

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) Except as provided in Article 9.8.6.1., 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.

(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
- at least one side of stairs less than 1 100 mm in width,
 - two sides of stairs 1 100 mm in width or greater, and
 - 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 raised deck, 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 1 070 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 1 070 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.

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(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 1 070 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.

9.8.8.6. Guards for Ramps. *Guards* for ramps including vehicular ramps shall conform to the requirements for *guards* for stairs in Articles 9.8.8.2. and 9.8.8.4.

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 overall depth of not less than 235 mm,
 - (b) be supported and secured top and bottom,
 - (c) be not less than 25 mm actual thickness if supported along their length and 38 mm actual thickness if unsupported along their length, and
 - (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 1 200 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.

9.9.1.2. Fire Protection. *Flame-spread ratings, fire-resistance ratings and fire-protection ratings* shall conform to Section 9.10.

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 Sentence (3), every *building* shall be designed in conformance with Section 3.7.

(2) Where the *barrier-free* path of travel required in Sentence (1) is provided to any *storey* above the *first storey*, the requirements in Article 3.3.1.7. shall apply.

(3) The *barrier-free* path of travel described in Sentence (1) need not be provided for houses, including boarding houses with fewer than 8 boarders or roomers, semi-detached houses, duplex houses, triplex houses, town houses or row houses which are not used for social programmes such as group homes, halfway houses and shelters. (See Appendix A.)

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 not more

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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 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 1 980 mm.

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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 2 030 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) Doors to an attached storage garage serving only one *dwelling unit* which has a passage door between the garage and the *dwelling unit* it serves 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 with-

out 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 *suite* shall have an exterior *exit* doorway or a doorway 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*, a dead-end corridor is permitted provided it is not more than 3 m in length.

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.

(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*.

Table 9.9.7.A.
Forming Part of Sentence 9.9.7.3.(1)

Maximum Areas and Travel Distances for Rooms and Suites with a Single Egress Door		
Occupancy of Room, Suite or Floor Area	Maximum Area of Room, Suite or Floor Area, m ²	Maximum Distance to Egress Door, m
Group C (except dwelling units)	100	15
Group D	200	25
Group E	150	15
Group F, Division 2	150	10
Group F, Division 3	200	15
Column 1	2	3

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 pro-

vided 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 or below the *first storey* is permitted to lead through a lobby.

(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

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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.

9.9.9.4. Egress from Mobile Homes. *

A *mobile home* shall have at least 2 exterior doors located remote from each other.

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 *

(1) Except where the *authority having jurisdiction* is satisfied that the main entrance to a *building* is readily recognizable as a required *exit* and therefore needs no *exit* sign, an *exit* door installed to satisfy the requirements of Subsection 9.9.8. in a *building* 3 *storeys* in *building height* or a *building* having an *occupant load* greater than 150 shall have an *exit* sign over it.

(2) Sentence (1) does not apply to a main entrance door in other than a *new building*, except when *alterations* are made to the main entrance. *

9.9.10.4. Exit Direction Signs. *Exit* direction signs shall be placed in corridors and passageways 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 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

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 9.9.4.7.(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.

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.

* 9.10.1.13. Welding and Flame Cutting.

Rooms or spaces which contain welding or flame cutting operations are to be in conformance with Article 3.3.5.4.

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.

Table 9.10.2.A.
Forming Part of Article 9.10.2.1.

Occupancy Classifications		
Group	Division	Description of Major Occupancies ⁽¹⁾
C	—	<i>Residential occupancy</i>
D	—	<i>Business and personal services occupancies</i>
E	—	<i>Mercantile occupancies</i>
F	2	<i>Medium hazard industrial occupancies</i>
F	3	<i>Low hazard industrial occupancies</i> (Does not include <i>storage garages</i> serving individual <i>dwelling units</i>)
Col. 1	2	3

Note to Table 9.10.2.A.:

⁽¹⁾ See A-3.1.2.A. in Appendix 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 element of a *building*, such rating shall be determined in conformance with Chapter 2 of the Supplement to the NBC 1990, with the test methods described in Part 3 or with A-9.10.3.1. in Appendix A.

9.10.3.2. 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.

9.10.3.3. 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.

9.10.3.4. 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 Storeys**

(1) *Mezzanines* shall not be considered as *storeys* 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 *storey* in which they are located.

(2) *Mezzanines* shall not be considered as *storeys* 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 *storey* in which they are located provided the space above the *mezzanine* floors and the floor below them have no visual obstructions more than 1 070 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 *storey*, each level additional to the first shall be considered as a *storey*.

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 *storey* 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* and shall be offset by at least one stud in walls and partitions framed with wood or steel studs.

(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.

9.10.6.1.

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 9.10.2. for mixed *occupancies*.)

9.10.8.2. Fire Resistance Ratings in Sprinklered Buildings.

(1) 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).

(2) Where a *building* is *sprinklered* and a *mezzanine* is constructed, the *fire-resistance rating* for the *mezzanine* floor assembly is waived.

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.

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

Table 9.10.8.A.
Forming Part of Article 9.10.8.1.

Minimum Required Fire-Resistance Ratings for Structural Members and Assemblies				
Major Occupancy	Maximum Building Height, storeys	Building Element		
		Floors Except Floors over Crawl Spaces	Mezzanine Floors	Roofs
Residential (Group C)	3	45 min	45 min	—
All other occupancies	2	45 min	—	—
	3	45 min	45 min	45 min
Column 1	2	3	4	5

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).

(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.

9.10.9.6.

(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

e (1) Except as permitted in Sentences (2) to (5), *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-M, "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.

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 occupancies* 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 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*.

9.10.9.14. Separation of Residential Suites

e (1) Except as provided in Sentences (2) and (3), *suites* in *residential occupancies* 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-resistance rating* is required for *fire separations* 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).

(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*.

9.10.9.19.

9.10.9.19. Trunk Rooms and Storage Rooms

- * (1) Except as exempted by Sentence (2), a trunk room or storage room in a *residential occupancy* shall be separated from the remainder of the building by a *fire separation* having a *fire-resistance rating* of not less than 45 min.
- * (2) Sentence (1) does not apply to a trunk room or a storage room that is
 - (a) part of an individual *dwelling unit*,
 - (b) part of a sleeping room occupied separately or not within a *suite*,
 - (c) part of an individually occupied *suite*,
 - (d) less than 1 m² in area, or
 - (e) located in a *sprinklered building*.

- * **9.10.9.20. Janitorial Storage 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 45 min unless the *building* is *sprinklered*.

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 fire-

places 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*.

(2) Except as required in the *appliance* installation standards referenced in Sentence 6.2.1.4.(1) and Article 9.33.1.2., fuel-fired *space-heating appliances*, *space-cooling appliances* and *service water heaters* need not be separated from the remainder of the *building* as required in Sentence (1), where the equipment serves

- (a) not more than one room or *suite*, or
- (b) a *building* with a *building area* of not more than 400 m² and a *building height* of not more than 2 *storeys*.

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. Refuse Room. Rooms for the temporary storage of *combustible refuse* in all *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 or roof assembly above the room or space 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 units* need not be constructed as a *firewall* provided it is constructed as a *fire separation* having not less than a 1 h *fire-resistance rating*.

(2) The wall described in Sentence (1) shall provide continuous protection from the top of the footings to the underside of the roof deck.

(3) Any space between the top of the wall described in Sentence (1) and the roof deck shall be tightly sealed by caulking with mineral wool or *non-combustible material*.

9.10.11.3. 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 *storey* shall be separated from openings in an adjacent *storey* 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 Article 9.9.4.5. and in *sprinklered buildings*, 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*

9.10.13.1.

shall be protected with a *closure* conforming to Table 9.10.13.A. 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.

Fire-Protection Ratings for Closures	
Required Fire-Resistance Rating of Fire Separation	Required Fire-Protection Rating of Closure
30 or 45 min	20 min ⁽¹⁾
1 h	45 min ⁽¹⁾
1.5 h	1 h
2 h	1.5 h
3 h	2 h
4 h	3 h
Column 1	2

Note to Table 9.10.13.A.:

⁽¹⁾ See Article 9.10.13.2.

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-M 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.

9.10.13.3. Unrated Wood Door Frames.

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.

9.10.13.5. 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-M, "Standard Specification for Fire Door Frames Meeting the Performance Required by CAN4-S104-M."

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 provided the glass block is reinforced in accordance with 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*.

- * (3) The size of all other openings required to be protected with a closure shall not exceed 11 m², with no dimension greater than 3.7 m.

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

(1) Where hold-open devices are used on doors in required *fire separations*, they shall be installed in accordance with Article 3.1.8.12.

- * (2) Doors located in *firewalls* in Group C occupancies shall be equipped with acceptable hold-open devices installed in accordance with Sentence (1).

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 *non-combustible* 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 *non-combustible* 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.)

9.10.13.14. Fire Stop Flaps. *Fire stop flaps* in ceiling membranes required in Sentence 9.10.5.1.(4) shall be constructed in conformance with Chapter 2 of the Supplement to the NBC 1990.

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. Spatial Separations between Buildings

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.

Table 9.10.14.A.
Forming Part of Article 9.10.14.1.

Maximum Percentage of Unprotected Openings in Exterior Walls													
Occupancy Classification of Building	Maximum Area of Exposing Building Face, m ²	Limiting distance, m											
		Less than 1.2	1.2	1.5	2.0	4.0	6.0	8.0	10.0	12.0	16.0	20.0	25.0
<i>Residential, business and personal services, and low hazard industrial</i>	30	0	7	9	12	39	88	100	—	—	—	—	—
	40	0	7	8	11	32	69	100	—	—	—	—	—
	50	0	7	8	10	28	57	100	—	—	—	—	—
	100	0	7	8	9	18	34	56	84	100	—	—	—
	Over 100	0	7	7	8	12	19	28	40	55	92	100	—
<i>Mercantile and medium hazard industrial</i>	30	0	4	4	6	20	44	80	100	—	—	—	—
	40	0	4	4	6	16	34	61	97	100	—	—	—
	50	0	4	4	5	14	29	50	79	100	—	—	—
	100	0	4	4	4	9	17	28	42	60	100	—	—
	Over 100	0	4	4	4	6	10	14	20	27	46	70	100
Column 1	2	3	4	5	6	7	8	9	10	11	12	13	14

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 fire fighting facilities and protective wetting facilities are not available within 10 minutes of the alarm being received by the fire department, the *limiting distance* required by Article 9.10.14.1. shall be doubled.

* 9.10.14.4. Alternate Method of Determining Limiting Distance.

Except for *buildings* described in Articles 9.10.14.12. and 9.10.14.14., the *limiting distance* shown in Table 9.10.14.A. may be reduced provided it is not less than the square root of the aggregate area of *unprotected openings* in an *expos-*

ing building face in *residential occupancies, business and personal services occupancies and low hazard industrial occupancies*, and is not less than the square root of twice the aggregate area of *unprotected openings* in *mercantile occupancies and medium hazard industrial occupancies*. (See Appendix A.)

9.10.14.5. Openings in Walls Having a Limiting Distance Less Than 1.2 m.

Openings in a wall having 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. (See Table 9.10.13.A.)

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

9.10.14.11.

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.)

9.10.14.8. Percentage of Unprotected Openings for Irregular-Shaped Buildings.

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.

9.10.14.11. Construction of Exposing Building Face.

Except as permitted in Articles 9.10.14.12. to 9.10.14.16., each *exposing building face* and any exterior wall located above an *exposing building face* that encloses an *attic* or *roof space* shall be constructed in conformance with Table 9.10.14.B. and Subsection 9.10.8.

Table 9.10.14.B.
Forming Part of Article 9.10.14.11.

Minimum Construction Requirements for Exposing Building Faces				
Occupancy Classification of Building	Maximum Percentage of Unprotected Openings Permitted, per cent	Minimum Required Fire-Resistance Rating	Type of Construction Required	Type of Cladding Required
<i>Residential, business and personal services, and low hazard industrial</i>	0	1 h	Masonry or Concrete	<i>Noncombustible</i>
	>0 – 10	1 h	<i>Noncombustible</i>	<i>Noncombustible</i>
	>10 – 25	1 h	<i>Combustible or noncombustible</i>	<i>Noncombustible</i>
	>25 – 100	45 min	<i>Combustible or noncombustible</i>	<i>Combustible or noncombustible</i>
<i>Mercantile, and medium hazard industrial</i>	0	2 h	Masonry or Concrete	<i>Noncombustible</i>
	>0 – 10	2 h	<i>Noncombustible</i>	<i>Noncombustible</i>
	>10 – 25	2 h	<i>Combustible or noncombustible</i>	<i>Noncombustible</i>
	>25 – 100	1 h	<i>Combustible or noncombustible</i>	<i>Combustible or noncombustible</i>
Column 1	2	3	4	5

9.10.14.12.

9.10.14.12. Exposing Building Face of Houses

(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 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.

* (1) Where an *exposing building face* includes projections such as bow windows, bay windows or flue chases of *combustible construction*, the *limiting distance* shall be measured from the face of the projection nearest the line to which the *limiting distance* is measured.

* (2) Except for buildings containing 1 or 2 *dwelling units* and detached garages serving such *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.

9.10.14.14. Detached Garage Serving One Dwelling Unit

(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.

9.10.14.17. Dwelling Unit above another Dwelling Unit. * An *exposing building face* of a building in which one *dwelling unit* is located in whole or in part above another *dwelling unit* may be designed in accordance with the provisions of Sentence 9.10.14.12.(1), if the building contains not more than 2 *dwelling units* and not more than 3 storeys including any *basements*.

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 wall-

board, 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 Sentence (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

9.10.16.4.

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 un-sprinklered *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*.

9.10.16.8. Light Diffusers and Lenses. 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) Except for *foamed plastic* interior trim, *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) a thermal barrier consisting of
 - (i) not less than 12.7 mm thick gypsum board mechanically fastened to a supporting assembly independent of the insulation,

- (ii) lath and plaster, mechanically fastened to a supporting assembly independent of the insulation,
 - (iii) masonry, and
 - (iv) concrete,
- (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 750°C provided the *building* does not contain a Group C *major occupancy*, or
 - (c) any thermal barrier that
 - (i) meets the requirements of classification A when tested in conformance with CAN4-S124-M, "Standard Method of Test for the Evaluation of Protective Coverings for Foamed Plastic," or when tested in conformance with CAN/ULC-S101-M, "Standard Methods for 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.
 - (ii)

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)

Maximum Occupant Load for Buildings without Fire Alarm Systems	
Major Occupancy Classification	Occupant Load Above which Fire Alarm System is Required
Residential	10 (sleeping accommodation)
Business and personal services, Mercantile	150 above or below the first storey
Low or medium hazard industrial	75 above or below the first storey
Column 1	2

(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.

9.10.17.9. Duct-Type Smoke Detectors. A duct-type smoke detector shall be installed in the main supply duct of an air make-up unit serving a public corridor or an exit stairwell and shall shut down fans in the system if the smoke detector is actuated.

9.10.18.1.

9.10.18. Smoke Alarms

9.10.18.1. Required Smoke Alarms. *Smoke alarms* conforming to CAN/ULC-S531-M, "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.

* (1) Except as permitted in Sentence (2), 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.

* (2) A *smoke alarm* required to be installed in an existing *dwelling unit* as a result of developing space for sleeping use need not be interconnected with existing *smoke alarms* in the *dwelling unit*, but if more than one new *smoke alarm* is required, all new *smoke alarms* shall be interconnected.

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 1 100 mm high and 550 mm wide and having a sill height of not more than 900 mm above the floor shall be provided on the second and third *storeys* of every *building* in 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.

(3) Access panels required in Sentence (1) need not be provided in *buildings* containing only *dwelling units* where there is no *dwelling unit* above another *dwelling unit*.

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, the design and location of such roadway or yard shall take into account connection with public thoroughfares, weight of fire fighting equipment, width of roadway, radius of curves, overhead clear-

ance, 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 NFPA 10, "Standard for Portable Fire Extinguishers" and the Alberta Fire Prevention Act and regulations made pursuant to that Act.

Section 9.11 Sound Control

9.11.1. Sound Transmission Class Rating (Airborne Sound)

9.11.1.1. Determination of Sound Transmission Class Ratings. Sound transmission class ratings shall be determined in accordance with ASTM E413, "Classification for Rating Sound Insulation," using results from measurements in accordance with ASTM E90, "Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions" or ASTM E336, "Measurement of Airborne Sound Insulation in Buildings." (See Appendix A.)

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

9.12.1.1. Removal of Topsoil and Organic Matter

(1) The topsoil and vegetable matter in all unexcavated areas under a *building* shall be removed.

(2) In localities where 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

9.12.2.1. Excavation to Undisturbed Soil.

Excavations for *foundations* shall extend to undisturbed *soil*.

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).

(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 by a *professional engineer* for lesser depths. *

(5) The *foundation* depths required in Sentence (1) do not apply to *foundations* for *buildings* whose superstructure will not be damaged by differential *soil* movement caused by *frost action*. *

9.12.3.1.

Table 9.12.2.A.
Forming Part of Sentence 9.12.2.2.(1)

Minimum Depths of Foundation				
Type of Soil	Foundation Containing Heated Basement or Crawl Space		Foundation Containing no Heated Space	
	Good Soil Drainage to not less than the Depth of Frost Penetration	Poor Soil Drainage	Good Soil Drainage to not less than the Depth of Frost Penetration	Poor Soil Drainage
Rock	No limit	No limit	No limit	No limit
Coarse grained soils	No limit	No limit	No limit	Below the depth of frost penetration
Silt	No limit	No limit	Below the depth of frost penetration	Below the depth of frost penetration
Clay or soils not clearly defined ⁽¹⁾	1.2 m	1.2 m	1.2 m but not less than the depth of frost penetration	1.2 m but not less than the depth of frost penetration
Column 1	2	3	4	5

Note to Table 9.12.2.A.:

⁽¹⁾ See Appendix A.

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

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.

9.13.1.3. Standards for Application

(1) The method of application of all bituminous waterproofing and dampproofing materials shall conform to

- (a) CAN/CGSB-37.3M, "Application of Emulsified Asphalts for Dampproofing or Waterproofing,"
- (b) CGSB 37-GP-12Ma, "Application of Unfilled Cutback Asphalt for Dampproofing," or
- (c) CAN/CGSB-37.22M, "Application of Unfilled Cutback Tar Foundation Coating for Dampproofing."

9.13.2. Material**9.13.2.1. Material Standards**

(1) Materials used for dampproofing or waterproofing shall conform to

- (a) CAN/CGSB-37.2-M, "Emulsified Asphalt, Mineral Colloid Type, Unfilled, for Dampproofing and Waterproofing and for Roof Coatings,"
- (b) CGSB 37-GP-6Ma, "Asphalt, Cutback, Unfilled, for Dampproofing,"
- (c) CAN/CGSB-37.16-M, "Filled Cutback Asphalt for Dampproofing and Waterproofing,"
- (d) CGSB 37-GP-18Ma, "Tar, Cutback, Unfilled, for Dampproofing,"
- (e) CSA A123.4-M, "Bitumen for Use in Construction of Built-Up Roof Coverings and Dampproofing and Waterproofing Systems," or
- (f) CAN/CGSB-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 overall 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 covered 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

9.13.5.3.

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 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.

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.

* **9.13.6.5. Seal of Penetrations.** All penetrations of the slab by pipes or other objects shall be sealed against water vapour leakage.

Section 9.14 Drainage

9.14.1. Scope

9.14.1.1. Application. This Section applies to subsurface drainage and to surface drainage.

9.14.1.2. Crawl Spaces. Drainage for crawl spaces shall conform to Section 9.18.

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 exterior of the *foundation* in conformance with Subsection 9.14.3. or by a layer of gravel or crushed *rock* in conformance with Subsection 9.14.4.

(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-29Ma, "Tubing, Plastic, Corrugated, Drainage,"
- (g) CAN/CSA B182.1, "Plastic Drain and Sewer Pipe and Pipe Fittings," or
- (h) CAN3-G401-M, "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 undisturbed 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. Granular Drainage Layer

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 undisturbed 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

(1) A *foundation* drain shall drain to a building drain, storm drain, drainage ditch, dry well, sump pit or to the ground surface. (See Appendix A.) *

(2) Where a *foundation* drain is drained to the ground surface measures shall be taken to prevent soil erosion. *

9.14.5.2. Sump Pits and Pumps

(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. (See Appendix A.)

(3) Electrical connections to the pump required in Sentence (2) shall be in conformance with the Electrical Protection Act and regulations made pursuant to the Act. *

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.

(2) Dry wells shall be not less than 5 m from the *building foundation* and located so that drainage is away from the *building*.

9.14.6. Surface Drainage

9.14.6.1. Surface Drainage. The *building* shall be located or the *building* site graded so that water will not accumulate at or near the *building*. (See Appendix A.)

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.

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-M, "Construction of Preserved Wood Foundations," except as varied by Sentences (5) and (6).

(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.)

(5) Notwithstanding the requirements of CAN3-S406-M, "Construction of Preserved Wood Foundations,"

(a) a preserved wood *foundation* shall be designed and inspected by a *professional engineer* or a *registered architect* and the plans and specifications shall bear the seal of the *professional engineer* or of the *registered architect*,

(b) polyethylene sheet exterior protection is not required if all exterior surfaces are coated with 2 coats of bituminous dampproofing material complying with Section 9.13 applied by brush or spray and all sealants and caulking conform to one of the CGSB 37-GP series of standards for bituminous cements, and

(c) hot dipped galvanized nails may be used below ground level.

(6) CAN3-S406-M, "Construction of Preserved Wood Foundations" is amended

(a) in Clause 3.2.2.(a) by striking out "except for single top plates or the lower of double top plates," and

(b) in Clause 1.1.4. by adding "including unbalanced backfill" after "severe conditions."

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-M, "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.

Table 9.15.3.A.
Forming Part of Article 9.15.3.3.

Minimum Footing Sizes			
No. of Floors Supported	Minimum Width of Strip Footings, mm		Minimum Footing Area for Columns Spaced 3 m o.c., ⁽¹⁾ m ²
	Supporting Exterior Walls	Supporting Interior Walls	
1	250 ⁽²⁾	200 ⁽³⁾	0.4
2	350 ⁽²⁾	350 ⁽³⁾	0.75
3	450 ⁽²⁾	500 ⁽³⁾	1.0
Column 1	2	3	4

Notes to Table 9.15.3.A.:

- ⁽¹⁾ See Sentence 9.15.3.3.(6)
- ⁽²⁾ See Sentence 9.15.3.3.(3) and (4)
- ⁽³⁾ See Sentence 9.15.3.3.(5)

(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.

e 9.15.3.8. Step Footings

(1) When step footings are used, the vertical rise between horizontal portions shall not exceed 600 mm.

(2) 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 pressure shall conform to Table 9.15.4.A. for walls not exceeding 2.5 m in unsupported height.

Table 9.15.4.A.
Forming Part of Article 9.15.4.1.

Thickness of Foundation Walls			
Type of Foundation Wall	Minimum Wall Thickness, mm	Maximum Height of Finish Grade Above Basement Floor or Inside Grade	
		Foundation Wall Laterally Unsupported at the Top, ⁽¹⁾ m	Foundation Wall Laterally Supported at the Top, ⁽¹⁾ m
Solid concrete (15 MPa min. strength)	150	0.80	1.50
	200	1.20	2.15
	250	1.40	2.30
	300	1.50	2.30
Solid concrete (20 MPa min. strength)	150	0.80	1.80
	200	1.20	2.30
	250	1.40	2.30
	300	1.50	2.30
Unit masonry	140	0.60	0.80
	190	0.90	1.20
	240	1.20	1.80
	290	1.40	2.20
Column 1	2	3	4

Note to Table 9.15.4.A.:

⁽¹⁾ See Article 9.15.4.2.

9.15.4.2. Lateral Support

(1) For the purposes of Article 9.15.4.1., foundation walls shall be considered laterally supported at

the top if such walls support solid masonry superstructure or if the floor joists are embedded in the top of the foundation walls.

(2) Foundation walls shall also be considered to be supported at the top if the floor system is anchored to the top of the foundation walls with anchor bolts, in which case the joists may run either parallel or perpendicular to the foundation wall.

(3) When a foundation wall contains an opening more than 1.2 m long or contains openings in more than 25 per cent of its length, that portion of the wall beneath such openings shall be considered laterally 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).

9.15.4.3. Extension above Ground Level.

Exterior foundation walls shall extend not less than 150 mm above finished ground level.

9.15.4.4. Reduction in Thickness

(1) Where the top of a foundation wall is reduced in thickness to permit the installation of floor joists, the reduced section shall be not more than 350 mm high and not less than 90 mm thick.

(2) Where the top of a foundation wall is reduced in thickness to permit the installation of a masonry exterior facing, the reduced section shall be not less than 90 mm thick and tied to the facing material with metal ties conforming to Article 9.20.9.4.(3) spaced not more than 200 mm o.c. vertically and 900 mm o.c. horizontally.

(3) The space between wall and facing described in Sentence (2) shall be filled with mortar.

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 floor joists shall be capped with not less than 50 mm of solid masonry or concrete, or have the top course filled with mortar or concrete.

(2) Capping required in Sentence (1) is permitted to be omitted in localities where termites are not known to occur, when the joists are supported on a wood plate not less than 38 mm by 89 mm where the siding overlaps the *foundation* wall not less than 12 mm.

9.15.5.2. Support of Beams

(1) Not less than 190 mm depth of solid masonry shall be provided beneath beams supported on masonry.

(2) Where the beam referred to in Sentence (1) is supported below the top of the *foundation* walls, the ends of such beams shall be protected from the weather.

9.15.5.3. Pilasters

(1) Pilasters shall be provided under beams that frame into 140 mm unit masonry *foundation* walls.

(2) Pilasters required in Sentence (1) shall be not less than 90 mm by 290 mm and shall be bonded or tied into the wall.

(3) The top 200 mm of pilasters required in Sentence (1) shall be solid.

9.15.6. Parging and Finishing

9.15.6.1. Foundation Walls below Ground. Concrete block *foundation* walls shall be parged on the exterior face below ground level as required in Section 9.13.

9.15.6.2. Foundation Walls above Ground.

Exterior surfaces of concrete block *foundation* walls above ground level shall have tooled joints, or shall be rendered, parged or otherwise suitably finished.

9.15.6.3. Form Ties. All form ties shall be removed at least flush with the concrete surface.

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 fill which do not provide structural support for 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.

9.16.1.3. Dampproofing and Waterproofing. Dampproofing and waterproofing shall conform to Section 9.13.

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*.

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 *groundwater levels* may cause hydrostatic pressure beneath the slab, the slab shall be designed to resist such pressures.

9.16.3.3.

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.

(2) 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.

9.18.1.2. Foundations. *Foundations* enclosing crawl spaces shall conform to Section 9.15.

9.18.1.3. Insulation. Insulation shall conform to Section 9.25.

9.18.1.4. Heating. Heating of crawl spaces shall conform to Section 9.33.

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 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

9.18.4.1.

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 CAN/CGSB-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.

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-M, "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 900 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.

9.20.1.2. 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-M, "Burned Clay Brick (Solid Masonry Units Made from Clay or Shale),"
 - (b) CSA A82.3-M, "Calcium Silicate (Sand-Lime) Building Brick,"
 - (c) CSA A82.4-M, "Structural Clay Load-Bearing Wall Tile,"
 - (d) CSA A82.5-M, "Structural Clay Non-Load-Bearing Tile,"
 - (e) CAN3-A165.1-M, "Concrete Masonry Units,"
 - (f) CAN3-A165.2-M, "Concrete Brick Masonry Units,"
 - (g) CAN3-A165.3-M, "Prefaced Concrete Masonry Units,"
 - (h) CAN3-A165.4-M, "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.

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.

Compressive Strength of Masonry		
Type of Unit	Minimum Compressive Strength over Net Area, MPa	
	Exposed to Weather	Not Exposed to Weather
Solid or hollow concrete block	15	10
Solid <i>loadbearing</i> cellular units	Not permitted	5
Solid non- <i>loadbearing</i> cellular units	Not permitted	2
Column 1	2	3

9.20.3. Mortar

9.20.3.1. Mortar Materials

(1) Cementitious materials and aggregates for mortar shall comply with

- (a) CAN3-A5-M, "Portland Cement," e
- (b) CAN3-A8-M, "Masonry Cement," e
- (c) CSA A82.22-M, "Gypsum Plasters,"
- (d) CSA A82.56-M, "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 with 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)				
Permissible Use of Mortar	Portland Cement	Masonry Cement	Lime	Aggregate
All locations but not for use with sand-lime or concrete brick	1/2 to 1 1	1 —	— 1/4 to 1/2	Not less than 2 1/4 and not more than 3 times the sum of the volumes of the cement and the lime
All locations except <i>foundation</i> walls and piers, but not for use with sand-lime or concrete brick	— 1	1 —	— 1/2 to 1 1/4	
All locations except <i>loadbearing</i> walls of hollow units, parapet walls and <i>chimneys</i>	1	—	1 1/4 to 2 1/2	
All non- <i>loadbearing</i> interior walls and all <i>loadbearing</i> walls of solid units, except <i>foundation</i> walls, parapet walls and <i>chimneys</i>	1 —	— —	2 1/4 to 4 1	
Column 1	2	3	4	5

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.

Table 9.20.5.A.
Forming Part of Sentence 9.20.5.2.(2)

Maximum Allowable Spans for Steel Lintels Supporting Masonry Veneer, m					
Minimum Angle Size, mm			75 mm Brick	90 mm Brick	100 mm Stone
Vertical Leg	Horizontal Leg	Thickness			
90	75	6	2.55	—	—
90	90	6	2.59	2.47	2.30
100	90	6	2.79	2.66	2.48
125	90	8	3.47	3.31	3.08
125	90	10	3.64	3.48	3.24
Column 1	2	3	4	5	6

9.20.6.1.

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 be not 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. Nonconforming 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.

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.

(3) Metal ties of the individual rod type shall be corrosion-resistant and shall have

- (a) a minimum cross-sectional area of not less than 17.8 mm^2 , and
- (b) not less than a 50 mm portion bent at right angles at each end.

(4) Metal ties of the individual rod type shall

- (a) extend from within 25 mm of the outer face of the wall to within 25 mm of the inner face of the wall,
- (b) be completely embedded in mortar except for the portion exposed in cavity walls, and
- (c) be staggered from course to course.

(5) Where 2 or more wythes in walls other than cavity walls are bonded together with metal ties of the individual rod type, the space between wythes shall be completely filled with mortar.

(6) Ties described in Sentence (5) shall be

- (a) located within 300 mm of openings and spaced not more than 900 mm apart around openings, and
- (b) spaced not more than 900 mm apart horizontally and 460 mm apart vertically at other locations.

(7) Where the inner and outer wythes of cavity walls are connected with individual wire ties, the ties shall be

- (a) spaced not more than 600 mm apart horizontally within 100 mm of the bottom of each floor or roof assembly where the cavity extends below the assemblies,
- (b) spaced not more than 900 mm apart within 300 mm of any openings, and
- (c) spaced not more than 900 mm apart horizontally and 400 mm apart vertically at other locations.

9.20.9.5. Ties for Masonry Veneer

(1) Masonry veneer 75 mm or more in thickness and resting on a bearing support shall be tied to masonry back-up or to wood framing members with not less than 0.76 mm thick, 22 mm wide corrosion-resistant straps spaced in accordance with Table 9.20.9.A. and shaped to provide a key with the mortar.

Table 9.20.9.A.

Forming Part of Sentence 9.20.9.5.(1)

Veneer Tie Spacing	
Maximum Vertical Spacing, mm	Maximum Horizontal Spacing, mm
400	800
500	600
600	400
Column 1	2

(2) Masonry veneer individually supported by masonry or wood-frame back-up shall be secured to the back-up in conformance with Subsection 4.3.2.

9.20.9.6. Reinforcing for Glass Block

(1) Glass block shall have horizontal joint reinforcement of 2 corrosion-resistant bars of not less than 3.76 mm diam or expanded metal strips not less than 75 mm wide spaced at vertical intervals of not more than 600 mm for units 190 mm or less in height and in every horizontal joint for units higher than 190 mm.

(2) Reinforcement required in Sentence (1) shall be lapped not less than 150 mm.

9.20.10. Lateral Support

9.20.10.1. Lateral Support Required

(1) Masonry walls shall be 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.

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

9.20.12.2.

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.

9.20.13.8. Flashing Joints. Joints in flashing shall be made watertight.

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 Droppings. 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.

Minimum Requirements for Galvanizing		
Connector Material	ASTM Standard	Coating Class
Wire ties and continous reinforcing (hot-dipped galvanizing)	A153	Class B2 458 g/m ²
Hardware and bolts	A153	See A153
Strip, plate, bars and rolled sections (not less than 3.18 mm thick)	A123	610 g/m ²
Sheet (less than 3.18 mm thick)	A123	305 g/m ² on material 0.76 mm thick ⁽¹⁾
Column 1	2	3

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.

9.21.1.1.

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.

9.21.1.2. Factory-Built Chimneys. *Factory-built chimneys* serving solid fuel-burning *appliances*, and their installation, shall conform to CAN/ULC-S629-M, "Standard for 650°C Factory-Built Chimneys." (See Appendix A.)

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, incinerator or a *slow burning solid fuel fired appliance* 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 *storey*.

(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.

Diameter of Round Flues for Fireplace Chimneys, mm				
Maximum Fireplace Opening, m ²	Chimney Height, m			
	3.0	4.6	6.0	9.0
0.15	140	128	124	116
0.25	181	164	156	145
0.35	212	193	184	171
0.50	253	229	218	202
0.65	287	260	247	227
0.80	318	290	273	251
1.0	356	321	303	279
1.2	388	352	331	304
1.4	419	380	358	328
1.6	448	405	382	349
1.8	—	430	404	371
2.0	—	—	425	390
2.2	—	—	—	407
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.

Table 9.21.2.B.
Forming Part of Article 9.21.2.5.

Nominal Rectangular Flue Sizes for Fireplace Chimneys, mm				
Maximum Fireplace Opening, m ²	Chimney Height, m			
	3.0	4.6	6.0	9.0
0.15	200 × 200	200 × 200	200 × 200	200 × 200
0.25	200 × 300	200 × 200	200 × 200	200 × 200
0.35	200 × 300	200 × 300	200 × 300	200 × 200
0.50	300 × 300	300 × 300	300 × 300	200 × 300
0.65	300 × 400	300 × 300	300 × 300	300 × 300
0.80	400 × 400	300 × 400	300 × 400	300 × 300
1.0	400 × 400	400 × 400	300 × 400	300 × 400
1.2	—	400 × 400	400 × 400	300 × 400
1.4	—	—	400 × 400	400 × 400
1.6	—	—	—	400 × 400
1.8	—	—	—	—
2.0	—	—	—	—
2.2	—	—	—	—
Column 1	2	3	4	5

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 1 100°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-M, "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.)

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.

9.21.3.8.

(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.

9.21.3.10. Extension of Chimney Liners.

Chimney liners shall extend from a point not less than 200 mm below the lowest *flue pipe* connection to a point not less than 50 mm or more than 100 mm above the *chimney cap*.

9.21.4. Masonry and Concrete Chimney Construction

9.21.4.1. Unit Masonry. 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*.

(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 for Fireplaces.** Combustion air for a fireplace shall be provided and shall be introduced by an air intake other than a door or window. (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-S639-M, "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

9.22.5.2.

the requirements of Clauses 5.3.6.5. to 5.3.6.7. of CAN/CSA-A405-M, "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

9.22.8.1. Factory-Built Fireplaces

(1) Factory-built fireplaces and their installation shall conform to CAN/ULC-S610-M, "Standard for Factory-Built Fireplaces."

(2) Heat exchanger inserts for use in a particular model of a factory-built fireplace shall be specifically tested and listed as suitable for use with that fireplace model. (See Appendix A.)

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

9.22.10.1. The installation of fireplace inserts shall conform to CAN3-B365, "Installation Code for Solid-Fuel Burning Appliances and Equipment."

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 fastenings 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 conformance with Table 9.23.3.A., the exterior wall may be fastened to the floor framing by

- (a) having plywood, waferboard or strand-board 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 fibre-board or gypsum sheathing shall not be less than 3.2 mm in diameter with a minimum head diameter of 11.1 mm.

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. (Tables A-1 to A-9 are found at the end of Part 9.) (See Appendix A.)

9.23.3.A.

Table 9.23.3.A.
Forming Part of Article 9.23.3.4.

Nailing for Framing		
Construction Detail	Minimum Length of Nails, mm	Minimum Number or Maximum Spacing of Nails
Floor joist to plate — toe nail	82	2
Wood or metal strapping to underside of floor joists	57	2
Cross bridging to joists	57	2 each end
Double header or trimmer joists	76	300 mm (o.c.)
Floor joist to stud (balloon construction)	76	2
Ledger strip to wood beam	82	2 per joist
Joist to joist splice (see also Table 9.23.13.A)	76	2 at each end
Tail joist to adjacent header joist	82	5
(end nailed) around openings	101	3
Each header joist to adjacent trimmer joist	82	5
(end nailed) around openings	101	3
Stud to wall plate (each end) toe nail	63	4
or end nail	82	2
Doubled studs at openings, or studs at walls or wall intersections and corners	76	750 mm (o.c.)
Doubled top wall plates	76	600 mm (o.c.)
Bottom wall plate or sole plate to joists or blocking (exterior walls) ⁽¹⁾	82	400 mm (o.c.)
Interior walls to framing or subflooring	82	600 mm (o.c.)
Horizontal member over openings in non-loadbearing walls — each end	82	2
Lintels to studs	82	2 at each end
Ceiling joist to plate — toe nail each end	82	2
Roof rafter, roof truss or roof joist to plate — toe nail	82	3
Rafter plate to each ceiling joist	101	2
Rafter to joist (with ridge supported)	76	3
Rafter to joist (with ridge unsupported)	76	see Table 9.23.13.A.
Gusset plate to each rafter at peak	57	4
Rafter to ridge board — toe nail	57	4
— end nail	82	3
Collar tie to rafter — each end	76	3
Collar tie lateral support to each collar tie	57	2
Jack rafter to hip or valley rafter	82	2
Roof strut to rafter	76	3
Roof strut to loadbearing wall — toe nail	82	2
38 mm × 140 mm or less plank decking to support	82	2
Plank decking wider than 38 mm × 140 mm to support	82	3
38 mm edge laid plank decking to support (toe nail)	76	1
38 mm edge laid plank to each other	76	450 mm (o.c.)
Column 1	2	3

Note to Table 9.23.3.A.:

⁽¹⁾ See Sentence 9.23.3.4.(2)

Table 9.23.3.B.
Forming Part of Article 9.23.3.5.

Fasteners for Sheathing and Subflooring						
Element	Minimum Length of Fasteners for Sheathing and Subfloor Attachment, mm				Minimum Number or Maximum Spacing of Fastener	
	Common or Spiral Nails	Ring Thread Nails	Roofing Nails	Staples		
Plywood, waferboard or strandboard up to 10 mm thick	51	45	N/A	38	150 mm (o.c.) along edges and 300 mm (o.c.) along intermediate supports	
Plywood, waferboard or strandboard from 10 mm to 20 mm thick	51	45	N/A	51		
Plywood, waferboard or strandboard over 20 mm thick	57	51	N/A	N/A		
Fibreboard sheathing up to 13 mm thick	N/A	N/A	44	28		
Gypsum sheathing up to 13 mm thick	N/A	N/A	44	N/A		
Board lumber 184 mm or less wide	51	45	N/A	51		2 per support
Board lumber more than 184 mm wide	51	45	N/A	51		3 per support
Column 1	2	3	4	5		6

(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.)

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-M, "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.

9.23.4.3.

Table 9.23.4.A.⁽¹⁾
Forming Part of Sentence 9.23.4.2.(1)

Maximum Spans for Steel Beams Supporting Floors in Dwelling Units, m							
One Storey Supported							
Section	Supported Joist Length, m (Half the sum of joist spans on both sides of the beam)						
	2.4	3.0	3.6	4.2	4.8	5.4	6.0
W150 × 22	5.5	5.2	4.9	4.8	4.5	4.3	4.1
W200 × 21	6.5	6.2	5.7	5.3	5.0	4.7	4.5
W200 × 27	7.3	6.9	6.6	6.3	6.1	5.8	5.5
W200 × 31	7.8	7.4	7.1	6.8	6.6	6.4	6.1
W250 × 24	8.1	7.5	6.9	6.4	6.0	5.7	5.4
W250 × 33	9.2	8.7	8.3	8.0	7.6	7.2	6.9
W250 × 39	10.0	9.4	9.0	8.6	8.3	8.0	7.6
W310 × 31	10.4	9.6	8.8	8.2	7.7	7.3	7.0
W310 × 39	11.3	10.7	10.2	9.8	9.2	8.7	8.3
Two Storeys Supported							
W150 × 22	4.7	4.2	3.9	3.6	3.4	3.2	3.0
W200 × 21	5.2	4.7	4.3	4.0	3.7	3.5	3.4
W200 × 27	6.3	5.7	5.2	4.8	4.5	4.3	4.1
W200 × 31	6.9	6.2	5.7	5.3	5.0	4.7	4.5
W250 × 24	6.2	5.6	5.1	4.8	4.5	4.2	4.0
W250 × 33	7.9	7.1	6.5	6.0	5.7	5.4	5.1
W250 × 39	8.7	7.8	7.2	6.7	6.3	5.9	5.6
W310 × 31	8.0	7.2	6.6	6.1	5.8	5.4	5.2
W310 × 39	9.5	8.6	7.9	7.3	6.9	6.5	6.2
Column 1	2	3	4	5	6	7	8

Note to Table 9.23.4.A.:

⁽¹⁾ See Appendix A.

(2) Beams described in Sentence (1) shall conform to 20 f-E stress grade in CAN/CSA-O122-M, "Glued-Laminated Timber" and to Article 4.3.1.2.

(3) A structural glued-laminated timber beam shall be fabricated in a plant certified in accordance with CAN/CSA-O177-M, "Qualification Code for Manufacturers of Structural Glued-Laminated Timber."

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-1 and A-2 or the spacing of the members shall be reduced to allow for the loads due to the topping. (See Appendix A.)

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-4 to A-7,

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)									
Number of Storeys Supported	Beam Width, mm	Supported Length, ⁽¹⁾ m	Beam Depth, mm						
			228	266	304	342	380	418	456
1	80	2.4	4.32	5.04	5.76	6.48	7.20	7.92	8.64
		3.0	3.87	4.51	5.15	5.80	6.44	7.09	7.73
		3.6	3.53	4.12	4.70	5.29	5.88	6.47	7.06
		4.2	3.27	3.81	4.36	4.90	5.44	5.99	6.53
		4.8	3.06	3.57	4.07	4.58	5.09	5.60	6.11
1	130	2.4	5.51	6.43	7.35	8.26	9.18	10.10	11.02
		3.0	4.93	5.75	6.57	7.39	8.21	9.03	9.86
		3.6	4.50	5.25	6.00	6.75	7.50	8.25	9.00
		4.2	4.16	4.86	5.55	6.25	6.94	7.64	8.33
		4.8	3.90	4.54	5.19	5.84	6.49	7.14	7.79
2	80	2.4	3.28	3.83	4.37	4.92	5.47	6.01	6.56
		3.0	2.93	3.42	3.91	4.40	4.89	5.38	5.87
		3.6	2.68	3.12	3.57	4.02	4.46	4.91	5.36
		4.2	2.48	2.89	3.31	3.72	4.13	4.54	4.96
		4.8	2.32	2.71	3.09	3.48	3.86	4.25	4.64
2	130	2.4	4.18	4.88	5.57	6.27	6.97	7.66	8.36
		3.0	3.74	4.36	4.99	5.61	6.23	6.85	7.48
		3.6	3.41	3.98	4.55	5.12	5.69	6.26	6.83
		4.2	3.16	3.69	4.21	4.74	5.27	5.79	6.32
		4.8	2.96	3.45	3.94	4.43	4.93	5.42	5.91
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.

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

9.23.5.2.

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*.

* (4) *Buildings* not more than 4.3 m in width shall be anchored to the ground where wind loads exceed 0.4 kPa (1 chance in 30 of being exceeded in any one year).

* (5) *Buildings* more than 4.3 m in width but not more than 4.9 m in width shall be anchored to the ground where wind loads exceed 0.6 kPa (1 chance in 30 of being exceeded in any one year).

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 4.9 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.

9.23.9.4.

(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.

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.

Table 9.23.10.A.
Forming Part of Article 9.23.10.1.

Size and Spacing of Studs				
Type of Wall	Supported Loads (including <i>dead loads</i>)	Minimum Stud Size, mm	Maximum Stud Spacing, mm	Maximum Unsupported Height, m
Interior	No load	38 × 38 38 × 89 flat ⁽¹⁾	400 400	2.4 3.6
	Attic not accessible by a stairway	38 × 64 38 × 64 flat ⁽¹⁾	600 400	3.0 2.4
		38 × 89 38 × 89 flat ⁽¹⁾	600 400	3.6 2.4
	Attic accessible by a stairway plus one floor Roof load plus one floor Attic not accessible by stairway plus 2 floors	38 × 89	400	3.6
	Roof load Attic accessible by a stairway Attic not accessible by a stairway plus one floor	38 × 89 38 × 64	600 400	3.6 2.4
	Attic accessible by a stairway plus 2 floors, or roof load plus 2 floors	38 × 89 64 × 89 38 × 140	300 400 400	3.6 3.6 4.2
		Attic accessible by a stairway plus 3 floors, or roof load plus 3 floors	38 × 140	300
Exterior	Roof with or without attic storage	38 × 64 38 × 89	400 600	2.4 3.0
		38 × 89 38 × 140	400 600	3.0 3.0
	Roof with or without attic storage plus 2 floors	38 × 89 64 × 89 38 × 140	300 400 400	3.0 3.0 3.6
		Roof with or without attic storage plus 3 floors	38 × 140	300
Column 1	2	3	4	5

Note to Table 9.23.10.A.:

⁽¹⁾ See Article 9.23.10.2.

9.23.10.3.

(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.

9.23.10.6. Studs at Sides of Openings

(1) Except as provided in Sentence (2), studs shall be doubled on each side of openings so that the inner studs extend from the lintel to the bottom wall plate and the outer studs extend from the top wall plates to the bottom wall plate.

(2) Single studs may be used on either side of openings in non-loadbearing interior walls not required to have fire-resistance ratings provided the studs extend from the top wall plate to the bottom wall plate.

9.23.11. Wall Plates

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 separations with a fire-resistance rating shall be framed with the equivalent of not less than two 38 mm thick members that are 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.

9.23.12.A.

Table 9.23.12.A.
Forming Part of Sentences 9.23.12.3.(1) and (4)

Wood Lintel Spans			
Location of Lintels	Supported Loads including <i>Dead Loads</i> and Ceiling	Depth of Lintels, mm	Maximum Allowable Spans, m
Interior walls	Limited attic storage	89	1.22
		140	1.83
		184	2.44
		235	3.05
		286	3.81
	Full attic storage or roof load or limited attic storage plus one floor	89	0.61
		140	0.91
		184	1.22
		235	1.52
	Full attic storage plus one floor or roof load plus one floor or limited attic storage plus 2 or 3 floors	286	1.83
		89	—
		140	0.76
		184	0.91
	Full attic storage plus 2 or 3 floors or roof load plus 2 or 3 floors	235	1.22
		286	1.52
		89	—
140		0.61	
Exterior walls	Roof with or without attic storage	184	0.91
		235	1.22
		286	1.52
		89	—
		140	0.61
	Roof with or without attic storage plus one floor	184	0.91
		235	1.22
		286	1.52
		89	—
	Roof with or without attic storage plus 2 or 3 floors	140	0.61
		184	0.91
		235	1.07
286		1.22	
Roof with or without attic storage	89	1.12	
	140	1.68	
	184	2.24	
	235	2.79	
	286	3.35	
Roof with or without attic storage plus one floor	89	0.56	
	140	1.40	
	184	1.96	
	235	2.24	
	286	2.51	
Roof with or without attic storage plus 2 or 3 floors	89	0.56	
	140	1.12	
	184	1.68	
	235	1.96	
	286	2.24	
Column 1	2	3	4

9.23.12.B.

Table 9.23.12.B.
Forming Part of Sentence 9.23.12.3.(5)

Built-Up Wood Lintels Supporting Roof and Ceiling Loads over Large Openings ^(4,5)														
Supported Length, m ⁽¹⁾	No. 1 and No.2 Lintel Span, m ^(2,3)							Select Structural Lintel Span, m ^(2,3)						
	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
Live Load – 1.0 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	B	D	F	F	A	A	A	B	C	D	F
3.0	A	A	B	D	F	G*	G*	A	A	A	B	D	E	G*
3.6	A	B	C	D	F	G*	G*	A	A	A	C	D	F	G*
4.2	A	B	D	F	G*	G*	G*	A	A	B	C	E	F	G*
4.8	A	C	D	F	G*	G*	I*	A	A	B	D	F	G*	I*
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	B	D	F	G*	I*	A	A	A	C	D	F	I*
3.0	A	B	D	F	G*	I*	J*	A	A	B	C	E	I*	J*
3.6	A	C	D	F	G*	I*	K*	A	A	B	D	F	I*	K*
4.2	B	D	F	G*	G*	I*	M*	A	A	C	D	F	I*	M*
4.8	B	D	F	G*	I*	K*	M*	A	B	D	F	I*	K*	M*
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	C	D	F	I*	K*	A	A	B	C	E	I*	K*
3.0	A	B	D	F	G*	I*	M*	A	A	C	D	F	I*	M*
3.6	B	D	F	G*	I*	K*	M*	A	B	D	F	I*	K*	M*
4.2	B	D	G*	G*	I*	K*	P*	A	B	D	F	I*	K*	P*
4.8	C	F	G*	G*	I*	M*	P*	A	D	F	G*	I*	M*	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	C	E	G*	G*	I*	M*	A	A	C	D	F	I*	M*
3.0	B	D	F	G*	I*	K*	M*	A	B	D	F	I*	K*	M*
3.6	B	E	G*	G*	I*	M*	P*	A	B	D	F	I*	M*	P*
4.2	D	F	G*	G*	I*	M*	R*	B	D	F	G*	I*	M*	R*
4.8	D	G*	G*	I*	K*	P*	R*	B	D	F	I*	K*	P*	R*
Column 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15

Addendum to Table 9.23.12.B.:

- ⁽¹⁾ Supported length means half the span of trusses, roof joists or rafters supported by the lintel 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 - Lintel Sizes

A = 3 – 38 × 184
 B = 4 – 38 × 184
 C = 3 – 38 × 235
 D = 4 – 38 × 235
 E = 3 – 38 × 286
 F = 4 – 38 × 286

G* = 80 × 380
 H* = 130 × 304
 I* = 80 × 418
 J* = 130 × 342
 K* = 80 × 456
 L* = 130 × 380
 M* = 80 × 494

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.

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 *loadbearing* 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 *loadbearing* 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 *loadbearing* 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) Member 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 9.23.9.3.

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). (Tables A-10 and A-11 are found at the end of 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)

Rafter-to-Joist Nailing (Minimum Number of Nails not less than 76 mm Long) (Unsupported Ridge)													
Roof Slope	Spacing, mm	Rafter Tied to Every Joist						Rafter Tied to Joist every 1.2 m					
		Building Width up to 8 m			Building Width up to 9.8 m			Building Width up to 8 m			Building Width up to 9.8 m		
		Roof Snow Load, kPa											
		1.0 or less	1.5	2.0 or more	1.0 or less	1.5	2.0 or more	1.0 or less	1.5	2.0 or more	1.0 or less	1.5	2.0 or more
1 in 3	400	4	5	6	5	7	8	11	—	—	—	—	—
	600	6	8	9	8	—	—	11	—	—	—	—	—
1 in 2.4	400	4	4	5	5	6	7	7	10	—	9	—	—
	600	5	7	8	7	9	11	7	10	—	—	—	—
1 in 2	400	4	4	4	4	4	5	6	8	9	8	—	—
	600	4	5	6	5	7	8	6	8	9	8	—	—
1 in 1.71	400	4	4	4	4	4	4	5	7	8	7	9	11
	600	4	4	5	5	6	7	5	7	8	7	9	11
1 in 1.33	400	4	4	4	4	4	4	4	5	6	5	6	7
	600	4	4	4	4	4	5	4	5	6	5	6	7
1 in 1	400	4	4	4	4	4	4	4	4	4	4	4	5
	600	4	4	4	4	4	4	4	4	4	4	4	5
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-M, "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.

9.23.13.11.

Table 9.23.13.B.
Forming Part of Sentence 9.23.13.11.(8)

Maximum Roof Truss Deflections		
Truss Span	Type of Ceiling	Maximum Deflection
4.3 m or less	Plaster or gypsum board	$1/360$ of the span
	Other than plaster or gypsum board	$1/180$ of the span
Over 4.3 m	Plaster or gypsum board	$1/360$ of the span
	Other than plaster or gypsum board	$1/240$ of the span
Column 1	2	3

9.23.14. Subflooring

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.).

9.23.14.2. Material Standards

- (1) Wood-based panels for subfloors shall conform to
- CSA O121-M, "Douglas Fir Plywood,"
 - CSA O151-M, "Canadian Softwood Plywood,"
 - CSA O153-M, "Poplar Plywood,"
 - CAN3-O437.0-M, "Waferboard and Strandboard," or
 - CAN/CSA-O325.0, "Construction Sheathing."
- (2) Wood-based panels for subfloors conforming to Clause (1)(e) shall be produced at mills operating a quality assurance programme conforming to CSA-O325.2-M, "Quality Assurance for Construction Sheathing."

(3) 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.

(4) Subflooring described in Sentence (3) shall conform to grade N-1 or N-2 in CAN3-O188.1-M, "Interior Mat-Formed Wood Particleboard."

(5) Subflooring described in Sentence (3) 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-M 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.

Table 9.23.14.A.
Forming Part of Sentences 9.23.14.5.(1) and 9.23.15.6.(1)

Thickness of Subflooring, mm				
Maximum Spacing of Supports, mm	Plywood and O-2 Grade Waferboard and Strandboard	Waferboard and Strandboard, R-1 and O-1 Grades	Particleboard	Lumber
400	15.5	15.9	15.9	17.0
500	15.5	15.9	19.0	19.0
600	18.5	19.0	25.4	19.0
Column 1	2	3	4	5

(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

Table 9.23.14.B

Forming Part of Sentences 9.23.14.5.(1) and 9.23.15.6.(1)

Rating for Subfloor When Applying CSA O325.0		
Maximum Spacing of Supports, mm	Panel Mark	
	Subfloor	Used with Panel-Type Underlay
400	1F16	2F16
500	1F20	2F20
600	1F24	2F24
Column 1	2	3

- (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.

(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-M, "Douglas Fir Plywood,"
- (b) CSA O151-M, "Canadian Softwood Plywood,"
- (c) CSA O153-M, "Poplar Plywood,"
- (d) CAN3-O437.0-M, "Waferboard and Strandboard," or
- (e) CAN/CSA-O325.0, "Construction Sheathing."

(2) Wood-based panels used for roof sheathing conforming to Clause (1)(e) shall be produced at mills operating a quality assurance programme conforming to CSA-0325.2-M, "Quality Assurance for 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.

9.23.15.6.

Table 9.23.15.A.
Forming Part of Sentence 9.23.15.6.(2)

Minimum Thickness of Roof Sheathing, mm					
Maximum Spacing of Supports, mm	Plywood and O-2 Grade Waferboard and Strandboard		Waferboard and Strandboard, R-1 and O-1 Grades		Lumber
	Edges Supported	Edges Unsupported	Edges Supported	Edges Unsupported	
300	7.5	7.5	9.5	9.5	17.0
400	7.5	9.5	9.5	11.1	17.0
600	9.5	12.5	11.1	12.7	19.0
Column 1	2	3	4	5	6

(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.

Table 9.23.15.B
Forming Part of Sentence 9.23.15.6.(2)

Rating for Roof Sheathing When Applying CSA O325.0		
Maximum Spacing of Supports, mm	Panel Mark	
	Edges Supported	Edges Unsupported
400	2R16	1R16
500	2R20	1R20
600	2R24	1R24
Column 1	2	3

(3) Asphalt-coated or asphalt-impregnated fibreboard not less than 11.1 mm thick conforming to CAN/CSA-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.

(4) All edges of sheathing described in Sentence (3) shall be supported by blocking or framing.

9.23.16. Wall Sheathing

9.23.16.1. Required Sheathing. Exterior walls and gable ends shall be sheathed when the *exterior cladding* requires intermediate fastening between supports or if the *exterior cladding* requires solid backing.

9.23.16.2. Thickness, Rating and Material Standards

(1) Where wall sheathing is required, it shall conform to either Table 9.23.16.A. or Table 9.23.16.B.

(2) Wood-based panels used for wall sheathing conforming to Table 9.23.16.B. shall be produced at mills operating a quality assurance programme conforming to CSA-O325.2-M, "Quality Assurance for Construction Sheathing."

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.

Table 9.23.16.A.
Forming Part of Article 9.23.16.2.

Wall Sheathing Thickness and Specifications			
Type of Sheathing	Minimum Thickness, mm ⁽¹⁾		Material Standards
	With Supports 400 mm o.c.	With Supports 600 mm o.c.	
Lumber	17.0	17.0	See Table 9.3.2.A.
Fibreboard (insulating)	9.5	11.1	CAN/CSA-A247-M
Gypsum sheathing	9.5	12.7	CSA A82.27-M
Plywood (exterior type)	6.0	7.5	CSA O121-M CSA O151-M CSA O153-M
Waferboard and Strandboard Grade O-2	6.0	7.5	CAN3-O437.0-M
Waferboard and Strandboard Grades R-1 and O-1	6.35	7.9	CAN3-O437.0-M
Expanded polystyrene Types 1 and 2	38	38	CAN/CGSB-51.20-M
Expanded polystyrene Types 3 and 4	25	25	CAN/CGSB-51.20-M
Urethane and Isocyanurate Types 1, 2 and 4	38	38	CGSB 51-GP-21M
Urethane and Isocyanurate Type 3	25	25	CGSB 51-GP-21M
Urethane and Isocyanurate Types 1 and 2, faced	25	25	CAN/CGSB-51.26-M
Phenolic, faced	25	25	CAN/CGSB 51.25-M
Rigid Board Mineral Fibre, Type 2	25	25	CSA A101-M
Column 1	2	3	4

Note to Table 9.23.16.A.:

⁽¹⁾ See also Sentences 9.27.5.1.(2) to (4).

(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.

9.23.16.6.

Table 9.23.16.B.
Forming Part of Article 9.23.16.2

Rating for Wall Sheathing When Applying CSA O325.0	
Maximum Spacing of Supports, mm	Panel Mark
400	W16
500	W20
600	W24
Column 1	2

9.23.17. Wall Sheathing Paper

9.23.17.1. Material Standard. Sheathing paper shall conform to CAN2-51.32-M, "Sheathing, Membrane, Breather Type."

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) Wall sheathing may be used in lieu of one layer of sheathing paper required in Sentence (3), and the thickness need not conform to Table 9.23.16.A.

(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.)

9.23.18.1. Required Bracing

(1) Except as provided in Sentence (2), each exterior wall in each storey shall be braced with not less than one diagonal brace conforming to Article 9.23.18.2.

(2) Bracing is not required where walls have an interior finish conforming to the requirements of Section 9.29, or if the walls are clad with panel type siding, diagonal lumber or plywood, waferboard, strandboard, gypsum or fibreboard sheathing.

9.23.18.2. Material and Installation

(1) 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.

(2) Bracing described in Sentence (1) shall be nailed to each stud and wall plate by not less than two 63 mm nails.

Section 9.24 Sheet Steel Stud Wall Framing

9.24.1. General

9.24.1.1. Application

(1) This Section applies to sheet steel studs for use in non-loadbearing exterior and interior walls.

(2) Where *loadbearing* steel studs are used, they shall be designed in conformance with Part 4.

9.24.1.2. 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 9.24.2.A.
Forming Part of Article 9.24.2.1.

Steel Studs for Non-Loadbearing Interior Walls		
Minimum Stud Size, mm	Maximum Stud Spacing, mm	Maximum Wall Height, m
30 × 40	400 600	3.0 2.7
30 × 63	400 600	4.0 3.6
30 × 91	400 600	5.2 4.9
Column 1	2	3

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

9.24.3.1.

Table 9.24.2.B.
Forming Part of Article 9.24.2.5.

Steel Studs for Non-Loadbearing Exterior Walls				
Minimum Stud Size, mm	Minimum Metal Thickness, mm	Maximum Stud Length, m		
		Spacing of Studs		
		300 mm (o.c.)	400 mm (o.c.)	600 mm (o.c.)
30 × 91	0.53	3.0	2.4	—
30 × 91	0.69	3.3	2.7	2.4
30 × 91	0.85	3.6	3.0	2.7
30 × 91	1.0	4.0	3.3	3.0
Column 1	2	3	4	5

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 m 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 than 12.7 mm thick fastened to stud and runner webs.

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*.

9.25.2.4. Thermal Insulation Requirements

(1) Except as permitted by Sentence (2), thermal insulation conforming with Table 9.25.2.A. shall be included in exterior assemblies of a *building of residential occupancy* and of a garage serving a *building of residential occupancy*, where they are heated.

Table 9.25.2.A.
Forming Part of Article 9.25.2.4.

Thermal Insulation Requirements		
Location of Assembly in Which Insulation is Placed		Minimum Thermal Resistance m ² · °C/W
Wall assembly (except basements)	Building exterior	2.1
	Between building and attached garage	2.1
	Exterior of heated garage	2.1
Basement and crawl space	Perimeter walls – top to 600 mm below grade	1.4
Floor assembly	Perimeter	2.1
	Exposed cantilevers	3.5
Roof – ceiling assembly	Building – general	6.0
	Heated garage	6.0
Column 1	2	3

(2) Where alternative measures, including solar heating, are provided to meet the intent of the thermal insulation requirements of Sentence (1), the *building* need not conform to Sentence (1).

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

- CSA A101-M, "Thermal Insulation, Mineral Fibre, for Buildings,"
- CAN/CSA-A247-M, "Insulating Fibre-board,"

9.25.3.1.

- (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) CAN/CGSB 51.60M, "Cellulose Fibre Loose Fill Thermal Insulation."
- (b) CAN/CGSB-51.33-M, "Vapour Barrier Sheet, Excluding Polyethylene, 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.

(5) Blown-in cellulose fibre attic insulation may be used as attic insulation on slopes up to 2.5 in 12, except in cathedral type ceilings.

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

(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-51.20-M "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

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.

9.25.4.9. Insulation Shields

(1) Insulation shields shall be installed around *chimneys* and gas vents to ensure that appropriate clearances are maintained when insulation is used in attics.

(2) Insulation shields required in Sentence (1) shall be constructed of *noncombustible* material of sufficient thickness so that it will not be deformed during installation and shall be designed so that the appropriate clearance is maintained automatically.

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 1 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

(a) capping with masonry units without voids, or

9.25.5.8.

- (b) 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

(1) Except as provided in Sentence (2), vapour barrier protection shall be installed on the warm side of insulation. (See Appendix A.)

(2) When a vapour barrier is placed within a wall assembly, the location where the vapour barrier is installed shall be above the dew point.

9.25.6.3. Low Permeance Insulation

(1) Additional vapour barrier protection is not required with insulation when

- (a) 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
- (b) the insulation is foamed plastic insulation with a permeance rating of not more than $230 \text{ ng/Pa} \cdot \text{s} \cdot \text{m}^2$ 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.

- e Methods described in CAN3-A123.51-M, "Asphalt Shingle Application on Roof Slopes 1:3 and Steeper,"
- e or CAN3-A123.52-M, "Asphalt Shingle Application on Roof Slopes 1:6 to less than 1:3" are permitted to be used for asphalt shingle applications not described in this Section.

9.26.2. Roofing Materials

9.26.2.1. Material Standards

- (1)** Roofing materials shall conform to
 - (a) CAN/CGSB-37.4-M, "Fibrated, Cutback, Lap Cement for Asphalt Roofing,"
 - (b) CAN/CGSB-37.5-M, "Cutback Asphalt Plastic Cement,"
 - (c) CAN/CGSB-37.8-M, "Asphalt, Cutback, Filled, for Roof Coating,"
 - (d) CGSB 37-GP-9Ma, "Primer, Asphalt for Asphalt Roofing, Dampproofing and Waterproofing,"
 - (e) CGSB 37-GP-21M, "Tar, Cutback, Fibrated, for Roof Coating,"
 - (f) CAN/CGSB-37.50M, "Hot Applied Rubberized Asphalt for Roofing and Waterproofing,"
 - (g) CGSB 37-GP-52M, "Roofing and Waterproofing Membrane, Sheet Applied, Elastomeric,"
 - (h) CGSB 37-GP-54M, "Roofing and Waterproofing Membrane, Sheet Applied, Flexible, Polyvinyl Chloride,"
 - (i) CGSB 37-GP-56M, "Membrane, Modified, Bituminous, Prefabricated, and Reinforced for Roofing,"
 - (j) CGSB 41-GP-6M, "Sheets, Thermosetting Polyester Plastics, Glass Fibre Reinforced,"
 - (k) CAN2-51.32-M, "Sheathing, Membrane, Breather Type,"
 - (l) CSA A123.1-M, "Asphalt Shingles Surfaced with Mineral Granules,"
 - (m) CSA A123.2-M, "Asphalt Coated Roofing Sheets,"
 - (n) CSA A123.3-M, "Asphalt or Tar Saturated Roofing Felt,"
 - (o) CSA A123.4-M, "Bitumen for Use in Construction of Built-Up Roof Coverings and Dampproofing and Waterproofing Systems,"
 - (p) CSA A123.17, "Asphalt-Saturated Felted Glass-Fibre Mat for Use in Construction of Built-Up Roofs," or
 - (q) CSA O118.1-M, "Western Red Cedar Shingles, and Shakes."

9.26.2.2. Nails

(1) Nails used for roofing shall be corrosion-resistant roofing or shingle nails conforming to CSA B111, "Wire Nails, Spikes and Staples."

(2) Nails shall have sufficient length to penetrate through, or 12 mm into, roof sheathing.

(3) Nails used with asphalt roofing shall have a head diameter of not less than 9.5 mm and a shank thickness of not less than 2.95 mm.

(4) Nails used with wood shingles or shakes shall have a head diameter of not less than 4.8 mm and a shank thickness of not less than 2.0 mm and shall be stainless steel, aluminum or hot-dipped galvanized. (See Appendix A.)

9.26.2.3. 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 A-9.26.2.2.(4) in 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.

(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

9.26.4.3.

Table 9.26.3.A.
Forming Part of Sentence 9.26.3.1.(1)

Roofing Types and Slope Limits of Roofs		
Type of Roofing	Minimum Slope	Maximum Slope
Built-up Roofing		
Asphalt base (gravelled)	1 in 50 ⁽¹⁾	1 in 4
Asphalt base (without gravel)	1 in 25	1 in 2
Coal-tar base (gravelled)	1 in 50 ⁽¹⁾	1 in 25
Cold process	1 in 25	1 in 1.33
Asphalt Shingles		
Normal application	1 in 3	no limit
Low slope application	1 in 6	no limit
Roll Roofing		
Smooth and mineral surfaced	1 in 4	no limit
480 mm wide selvage asphalt roofing	1 in 6	no limit
Cold application felt	1 in 50	1 in 1.33
Wood Shingles	1 in 4	no limit
Handsplit Shakes	1 in 3	no limit
Asbestos-Cement Corrugated Sheets	1 in 4	no limit
Corrugated Metal Roofing	1 in 4	no limit
Sheet Metal Shingles	1 in 4	no limit
Slate Shingles	1 in 2	no limit
Clay Tile	1 in 2	no limit
Glass Fibre Reinforced Polyester Roofing Panels	1 in 4	no limit
Column 1	2	3

Note to Table 9.26.3.A.:

⁽¹⁾ See Sentences 9.26.3.1.(2) and (3).

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.

9.26.4.8. Roof Penetrations

(1) Where a pipe or duct penetrates a roof, the joint between the pipe or duct and the roof shall be flashed and be made watertight. *

(2) Except as required by Sentence (3), flashing for a pipe or duct shall be rectangular and shall be not less than 500 mm in length by 500 mm in width; if sleeve flashing is used, the sleeve shall extend not less than 150 mm above the roof at every point of the pipe or duct.

(3) For a pipe or duct penetrating *

- (a) a sloping roof, the flashing flange shall extend not less than 125 mm beyond the pipe or duct,
- (b) a flat roof, the flashing flange shall extend not less than 250 mm beyond the pipe or duct.

(4) Flashing for a pipe or duct penetrating a roof shall be *

- (a) lead sheet with a mass of not less than 25 kg/m²,
- (b) copper sheet with a mass of not less than 3 kg/m²,
- (c) aluminum sheet with a mass of not less than 1.5 kg/m²,
- (d) alloyed zinc sheet with a mass of not less than 2.5 kg/m², or
- (e) other flashing acceptable to the *authority having jurisdiction*.

(5) If lead sheet is used as a flashing for a *plumbing system* pipe, it shall be worked over and into a hub of the increaser, which shall then be fitted with a 100 mm diameter or larger roof ring caulked into the hub of the increaser. *

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.

9.26.5.1.

- (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 3 500 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,
 - (d) self-sealing composite membranes consisting of modified bituminous coated material, or
 - (e) 0.15 mm polyethylene laid as a continuous sheet without the use of cement.

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.

9.26.7.7. Eave Protection. Eave protection shall conform to Subsection 9.26.5.

9.26.7.8. Flashing. Flashing shall conform to Subsection 9.26.4.

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.

9.26.8.6. Flashing. Flashing shall conform to Subsection 9.26.4.

9.26.8.7. Fastening. Shingles shall be fastened in accordance with Article 9.26.7.4.

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.

9.26.9.6. Exposure. The exposure of wood roof shingles shall conform to Table 9.26.9.A.

9.26.9.6.

Table 9.26.9.A.
Forming Part of Article 9.26.9.6.

Maximum Exposure of Wood Roof Shingles, mm						
Roof Slope	No. 1 Grade Length of Shingle			No. 2 Grade Length of Shingle		
	400 mm	450 mm	600 mm	400 mm	450 mm	600 mm
Less than 1 in 3	100	115	165	90	100	140
1 in 3	125	140	190	90	100	140
Over 1 in 3	125	140	190	100	115	165
Column 1	2	3	4	5	6	7

9.26.9.7. Flashing. Flashing shall conform to Subsection 9.26.4.

9.26.9.8. Eave Protection. Eave protection shall conform to Subsection 9.26.5.

9.26.10. Handsplit Roof Shakes

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.

9.26.10.6. Flashing. Flashing shall conform to Subsection 9.26.4.

9.26.10.7. Eave Protection. Eave protection shall conform to Subsection 9.26.5.

9.26.11. Built-Up Roofs

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.

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.

Table 9.26.11.A.
Forming Part of Article 9.26.11.1.

Quantities of Bitumen for Built-Up Roofs		
Type of Roof	Amount of Bitumen per Square Metre of Roof Surface	
	Mopping Coats between Layers	Flood Coat
Asphalt and aggregate	1 kg	3 kg
Coal-tar and aggregate	1.2 kg	3.6 kg
Cold process roofing	0.75 L cold process cement	2 L cold process top coating
Column 1	2	3

(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.

9.26.11.5. Flashing. Flashing shall conform to Subsection 9.26.4.

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 insulation.

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.

9.26.14. Glass Reinforced Polyester Roofing

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

9.26.15.1. Hot applied rubberized asphalt roofing shall be installed in accordance with CGSB 37-GP-51M, "Application of Rubberized Asphalt, Hot Applied, for Roofing and Waterproofing."

9.26.16. Polyvinyl Chloride Sheet Roofing

9.26.16.1. Polyvinyl chloride sheet applied roofing membrane shall be installed in accordance with CGSB 37-GP-55M, "Application of Sheet Applied Flexible Polyvinyl Chloride Roofing Membrane."

9.26.17. Downspouts and Roof Drains

9.26.17.1. Downspouts

(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. (See Appendix A.)

* (2) Where a downspout is provided and is directly connected to a sewer, the connection to the sewer shall conform to the Plumbing and Drainage Act and regulations made pursuant to that Act.

* **9.26.17.2. Eave Troughs.** Where eave troughs are installed, eave troughs and downspouts shall conform to Article 9.26.17.3.

9.26.17.3. Hydraulic Loads

* (1) Except as provided in Sentence (2), the hydraulic load in litres from a roof or paved surface is
e the maximum 15 min. rainfall determined from Sub-section 2.2.1., multiplied by the sum of

- (a) the area in square metres of the horizontal projection of the surface that is drained, and
- (b) one half the area in square metres of the vertical projection of the largest adjacent wall surface.

(2) A flow control drain may be installed if *

- (a) the maximum drain-down time is not more than 24 h,
- (b) the roof structure has been designed to carry the load of the stored water,
- (c) one or more scuppers are installed so that the maximum depth of water on the roof is not more than 150 mm,
- (d) it is located not more than 15 m from the edge of the roof and not more than 30 m from an adjacent drain, and
- (e) it does not drain more than 900 m² of roof area.

(3) The hydraulic load that drains to an eave trough shall conform to Table 9.26.17.A. *

(4) The hydraulic load that drains to a downspout shall conform to Table 9.26.17.B. *

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

Table 9.26.17.A.
Forming Part of Sentence 9.26.17.3.(3)

Size of Eave Trough, mm	Area of Eave Trough, mm ²	Maximum Hydraulic Load on Eave Trough, L			
		Slope			
		1:200	1:100	1:50	1:25
75	2 300	400	560	800	1 000
100	4 000	840	1 200	1 700	2 400
125	6 300	1 500	2 200	3 000	4 200
150	9 100	2 300	3 200	4 500	6 500
175	12 400	3 300	4 600	6 500	9 200
200	16 200	4 700	6 600	9 400	13 200
250	25 300	8 500	12 000	17 000	23 600
Column 1	2	3	4	5	6

Table 9.26.17.B.
Forming Part of Sentence 9.26.17.3.(4)

Circular Downspout		Non-Circular Downspout	
Diameter, mm	Maximum Hydraulic Load, L	Area, mm ²	Maximum Hydraulic Load, L
50	1 700	2 000	1 500
63	3 100	3 100	2 700
75	5 000	4 500	4 500
100	10 800	8 100	9 700
125	19 500	12 600	17 600
150	32 000	18 200	28 700
200	68 000	32 400	61 500
Column 1	2	3	4

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))

9.27.3.1.

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 nonhardening 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 nonhardening 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-M, "Sealing Compound, One Component, Elastomeric, Chemical Curing," e
 - (c) CGSB 19-GP-14M, "Sealing Compound, One Component, Butyl-Polyisobutylene Polymer Base, Solvent Curing," or
 - (d) CAN/CGSB-19.24-M, "Multi-Component, Chemical Curing Sealing Compound." e

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, 12.5 mm waferboard or 12.5 mm 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, 7.5 mm waferboard or 7.5 mm 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, 9.5 mm waferboard or 9.5 mm 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.

9.27.5.5.

(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.

Table 9.27.5.A.
Forming Part of Article 9.27.5.4.

Attachment of Siding			
Type of Siding	Minimum Nail or Staple Length, mm	Minimum Number of Nails or Staples	Maximum Nail or Staple Spacing
Wood trim	51	—	600 mm (o.c.)
Lumber siding or horizontal siding made from sheet material	51	—	600 mm (o.c.)
Metal siding	38	—	600 mm (o.c.) (nailed to framing) 400 mm (o.c.) (nailed to sheathing only)
Handsplit wood shakes up to 200 mm in width	51	2	—
Handsplit wood shakes over 200 mm in width	51	3	—
Wood shingles and machine grooved shakes up to 200 mm in width	32	2	—
Wood shingles and machine grooved shakes over 200 mm in width	32	3	—
Asbestos-cement shingles	32	2	—
Panel or sheet type siding up to 7 mm thick	38	—	150 mm (o.c.) along edges
Panel or sheet type siding more than 7 mm thick	51	—	300 mm (o.c.) along intermediate supports
Column 1	2	3	4

9.27.5.6.

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-M, "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.

Exposure and Thickness of Wood Shingles and Machine Grooved Shakes			
Shake or Shingle Length, mm	Maximum Exposure		Minimum Butt Thickness, mm
	Single Coursing, mm	Double Coursing, mm	
400	190	305	10
450	216	356	11
600	292	406	13
Column 1	2	3	4

9.27.8. Asbestos-Cement Shingles and Sheets

9.27.8.1. Material Standards

- (1) Asbestos-cement shingles and sheets shall conform to
- CAN/CGSB-34.4-M, "Siding, Asbestos Cement, Shingles and Clapboards,"
 - CAN/CGSB-34.5-M, "Sheets, Asbestos Cement, Corrugated,"
 - CAN/CGSB-34.14-M, "Sheets, Asbestos Cement, Decorative,"
 - CAN/CGSB-34.16-M, "Sheets, Asbestos Cement, Flat, Fully Compressed,"
 - CAN/CGSB-34.17-M, "Sheets, Asbestos Cement, Flat, Semi-compressed," or
 - CAN/CGSB-34.21-M, "Panels, Sandwich, Asbestos Cement with Insulating Cores."

9.27.8.2. Weight and Thickness

- (1) Asbestos-cement shingles shall weigh not less than 8.06 kg/m^2 .
- (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

9.27.9.1. Material Standards. Plywood siding shall be exterior type conforming to CSA O115-M, "Hardwood and Decorative Plywood," CSA O121-M, "Douglas Fir Plywood," CSA O151-M, "Canadian Softwood Plywood" or CSA O153-M, "Poplar 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.

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.

9.27.9.4.

Table 9.27.9.A.
Forming Part of Sentence 9.27.9.2.(2)

Minimum Plywood Thickness, Exterior Wall Finish		
Spacing of Supports, mm	Face Grain Parallel to Supports, mm	Face Grain Right Angles to Supports, mm
400	8	6
600	11	8
Column 1	2	3

(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.

(3) 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-11.5-M, "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 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 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 mouldings.

(2) The horizontal joints of siding described in Sentence (1) shall overlap not less than 1 mm per 16 mm width of siding board but not less than 9.5 mm for matched joint siding or 25 mm for lapped siding.

9.27.10.5. 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

9.27.13.1. Material Standard. Vinyl siding, including flashing and trim accessories, shall conform to CGSB 41-GP-24Ma, "Siding, Soffits and Fascia, Rigid Vinyl."

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.

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

9.28.2.1. Portland Cement. Portland cement shall conform to CAN3-A5-M, "Portland Cement."

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.

Table 9.28.2.A
Forming Part of Sentence 9.28.2.2.(2)

Aggregate Grading for Stucco		
Sieve Sizes, mm	Per Cent Passing	
	Maximum	Minimum
4	—	100
2	—	90
1	90	60
0.5	60	45
0.25	30	10
0.125	5	—
Column 1	2	3

9.28.2.3. Water. 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.

(3) External corners of stucco lath shall be reinforced with a vertical strip of lath or reinforcing extending not less than 150 mm on both sides of the

Table 9.28.4.A.
Forming Part of Article 9.28.4.3.

Stucco Lath				
Location	Type of Lath	Minimum Diam of Wire, mm	Maximum Mesh Opening	Minimum Mass, kg/m ²
Vertical surfaces	Welded or woven wire	1.19	25 mm	—
		1.35	38 mm	—
1.60		51 mm	—	
	Stucco mesh reinforcing (expanded metal)	—	25.8 cm ²	0.98
Horizontal surfaces ⁽¹⁾	9.5 mm rib lath	—	—	1.84
	Cedar lath	—	—	—
Column 1	2	3	4	5

Note to Table 9.28.4.A.:

⁽¹⁾ See Appendix A.

corner, or the lath or reinforcing shall extend around corners not less than 150 mm.

9.28.4.6. Fastening

(1) Stucco lath shall be fastened in conformance with Subsection 9.27.5.

(2) Fasteners on vertical surfaces shall be spaced not more than 150 mm o.c. vertically and 400 mm o.c. horizontally, or 100 mm o.c. vertically and 600 mm o.c. horizontally.

(3) Nailing patterns other than those required in Sentence (2) are permitted to be used provided there are not fewer than 20 fasteners per square metre of wall surface.

(4) Fasteners on horizontal surfaces shall be spaced not more than 150 mm o.c. along the framing members when members are spaced not more than 400 mm o.c., and 100 mm o.c. along members when members are spaced not more than 600 mm o.c.

9.28.5. Stucco Mixes

9.28.5.1. Mixes. Stucco mixes shall conform to Table 9.28.5.A.

Table 9.28.5.A.
Forming Part of Article 9.28.5.1.

Stucco Mixes (by volume)			
Portland Cement	Masonry Cement	Lime	Aggregate
1	—	0.25 to 1	3.25 to 4 parts per part of cementitious material
1	1	—	
Column 1	2	3	4

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.

9.28.6.1.

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.

Table 9.29.3.A.
Forming Part of Article 9.29.3.1.

Minimum Size and Maximum Spacing of Furring, mm			
Maximum Spacing of Furring, mm	Maximum Spacing of Furring Supports		
	Continuous Support	400 mm (o.c.)	600 mm (o.c.)
300	19 × 38	19 × 38	19 × 64
400	19 × 38	19 × 38	19 × 64
600	19 × 38	19 × 64	19 × 89
Column 1	2	3	4

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-M, "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-M, "Gypsum Board Application."

9.29.5.2. Materials. Gypsum board shall conform to CSA A82.27-M, "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 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.

9.29.5.6. Nails. Nails for fastening gypsum board to wood supports shall conform to CSA Standard B111, "Wire Nails, Spikes and Staples."

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.

Table 9.29.5.A:
Forming Part of Article 9.29.5.3.

Maximum Spacing of Supports for Gypsum Board				
Thickness, mm	Orientation of Board to Framing	Maximum Spacing of Supports o.c., mm		
		Walls	Ceilings Painted Finish	Ceilings Water-Based Texture Finish
9.5	parallel perpendicular	— 400	— 400	— —
12.7	parallel perpendicular	600 600	400 600	— 400
15.9	parallel perpendicular	600 600	400 600	— 600
Column 1	2	3	4	5

9.29.5.8.

Table 9.29.5.B.
Forming Part of Article 9.29.5.5.

Minimum Fastener Penetration into Wood Supports, mm				
Required Fire-Resistance Rating of Assembly	Walls		Ceilings	
	Nails	Screws	Nails	Screws
Fire-resistance rating not required	20	15	20	15
45 min	20	20	30	30
1 h	20	20	45	45
1.5 h	20	20	60	60
Column 1	2	3	4	5

(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.

(3) The uppermost wall nails shall be not more than 200 mm below the ceiling.

(4) Nails shall be located not less than 10 mm from the side or edge of the board.

(5) Nails shall be driven so that the heads are below the plane of the board surface but do not puncture the paper.

9.29.5.9. 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.

9.29.5.10. 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.

9.29.6. Plywood Finish

9.29.6.1. Thickness

(1) The minimum thickness of plywood interior finish shall conform to Table 9.29.6.A., except that no minimum thickness is required when the plywood is applied over solid backing.

(2) Thicknesses listed in Table 9.29.6.A. shall permit a manufacturing tolerance of ± 0.4 mm.

Table 9.29.6.A.
Forming Part of Articles 9.29.6.1. and 9.29.6.2.

Minimum Thickness of Plywood Interior Finish		
Maximum Spacing of Supports, mm (o.c.)	On Supports with no Horizontal Blocking, mm	On Supports with Blocking at Vertical Intervals not Exceeding 1.2 m, mm
400	4.7	4.0
600	8.0	4.7
Column 1	2	3

9.29.6.2. Grooved Plywood

(1) 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.

(2) 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.

9.29.6.3. Nails and Staples. 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.

9.29.6.4. Edge Support. All plywood edges shall be supported by furring, blocking or framing.

9.29.7. Hardboard Finish

9.29.7.1. Material Standard. Hardboard shall conform to CAN/CGSB-11.3-M, "Hardboard."

9.29.7.2. 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.

9.29.7.3. 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.

9.29.7.4. Edge Support. All hardboard edges shall be supported by furring, blocking or framing where the back-up is not continuous.

9.29.8. Insulating Fibreboard Finish

9.29.8.1. Material Standard. 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-M, "Interior Mat-Formed Wood Particleboard."

(2) Waferboard and strandboard finish shall conform to CAN3-O437.0-M "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 9.29.6.A., except that no minimum thickness is required when applied over solid backing.

(2) Thicknesses listed in Table 9.29.6.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

- not less than 6.35 mm thick on supports not more than 400 mm o.c.,
- not less than 9.5 mm thick on supports not more than 600 mm o.c., and
- 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.

9.29.10.1.

(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 CAN/CGSB-19.22-M, "Mildew Resistant Sealing Compound for Tubs and Tile."

Section 9.30 Flooring

9.30.1. General

9.30.1.1. Required 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-M, "Hardwood and Decorative Plywood,"
- (b) CSA O121-M, "Douglas Fir Plywood,"
- (c) CSA O151-M, "Canadian Softwood Plywood,"
- (d) CSA O153-M, "Poplar Plywood,"
- (e) CAN3-O188.1-M, "Interior Mat-Formed Wood Particleboard,"
- (f) CAN3-O437.0-M, "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 on the surface

patched so that the defects will not be transmitted to the finished surface.

9.30.3. Wood Strip Flooring

9.30.3.1. Thickness. 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.

Table 9.30.3.A.
Forming Part of Article 9.30.3.1.

Wood Strip Flooring			
Type of Flooring	Maximum Joist Spacing, mm	Minimum Thickness of Flooring, mm	
		With Subfloor	No Subfloor
Matched hardwood (interior use only)	400	7.9	19.0
	600	7.9	33.3
Matched softwood (interior or exterior use)	400	19.0	19.0
	600	19.0	31.7
Square edge softwood (exterior use only)	400	—	25.4
	600	—	38.1
Column 1	2	3	4

9.30.3.3.

Table 9.30.3.B.
Forming Part of Sentence 9.30.3.3.(1)

Nailing of Wood Strip Flooring		
Finish Floor Thickness, mm	Minimum Length of Flooring Nails, mm	Maximum Spacing of Flooring Nails, mm
7.9	38 ⁽¹⁾	200
11.1	51	300
19.0	57	400
25.4	63	400
31.7	70	600
38.1	83	600
Column 1	2	3

Note to Table 9.30.3.B.:

⁽¹⁾ See Article 9.30.3.4.

(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.

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. General

9.31.1.1. Plumbing systems and plumbing facilities shall conform to Part 7. *

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.

(5) A space that contains a fuel-fired heating appliance shall be provided with combustion air in accordance with Article 9.32.3.4. *

(6) Combustion air intake inlets shall be located on the outside of the *building* and not within an *attic* or *roof space* or a *crawl space*. *

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.

9.32.1.3. Roughed-In Plumbing. Where roughed-in plumbing is installed for the future installa- *

tion of a water closet or urinal, provision shall be made for the future installation of the required ventilation.

* **9.32.1.4. Fireplaces.** On-site constructed fireplaces or factory-built fireplaces shall be considered fuel-fired *appliances*. (See Section 9.22 for combustion air.)

* **9.32.1.5. Supply Air.** A supply of fresh air shall be provided for a *residential occupancy* and, if the *building* is heated by a forced air system, may be introduced at the return air duct upstream from the *furnace* fan.

9.32.1.6. Outdoor Air Intakes

* (1) An outdoor air intake opening 0.008 m² or less in area into a return air system shall not be dampered.

* (2) An outdoor air intake opening more than 0.008 m² in area but less than 0.033 m² in area into a return air system shall be equipped with a manually operated 50% damper.

* (3) An outdoor air intake opening not less than 0.033 m² in area into a return air system shall be equipped with an automatic damper.

* **9.32.1.7. Make-Up Air.** Where a ventilating system exhausts air to the outdoors, provision shall be made for the admission of a supply of make-up air in sufficient quantity so that the efficiency of the exhaust system is not adversely affected.

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) Except as provided in Sentence (2), every *dwelling unit* shall be provided with a mechanical ventilation system having a capacity to exhaust inside air and to introduce outside air at the rate of not less than 0.5 air changes per hour.

(2) Mechanical ventilation systems designed to operate on a continuous basis shall be capable of providing an air change rate of not less than 0.3 air changes per hour.

(3) The rate of air change required in Sentences (1) and (2) 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 and 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. Mechanical ventilation shall conform to the requirements in Part 6.

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.

9.32.3.5.

Table 9.32.2.A.
Forming Part of Sentence 9.32.2.1.(1)

Natural Ventilation Area		
	Location	Minimum Unobstructed Area
Within dwelling unit	Bathrooms or water-closet rooms	0.09 m ²
	Unfinished <i>basement</i> space	0.2 per cent of the <i>floor area</i>
	Dining rooms, living rooms, bedrooms, kitchens, combined rooms, dens, recreation rooms and all other finished rooms	0.28 m ² per room or combination of rooms
Other than within dwelling unit	Bathrooms or water-closet rooms	0.09 m ² per water closet
	Sleeping areas	0.14 m ² per occupant
	Laundry rooms, kitchens, recreation rooms	4 per cent of the <i>floor area</i>
	Corridors, storage rooms and other similar public rooms or spaces	2 per cent of the <i>floor area</i>
	Unfinished <i>basement</i> space not used on a shared basis	0.2 per cent of the <i>floor area</i>
Column 1	2	3

(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.

9.32.3.9. Enclosed Exit Stairways. An enclosed *exit* stairway that serves more than one *storey* shall not be heated, ventilated or air-conditioned using an air system that serves other parts of the *building*.

9.32.3.10. Clothes Dryer Vents

(1) In a *residential occupancy* all clothes dryer vents shall be ducted to the outside, and if clothes

dryers are collectively vented, a sheet metal duct shall be provided and a continuously operating fan shall be positioned downstream from all dryer-vent outlets to positively exhaust all moisture and lint.

- * (2) A screen is not permitted on a clothes dryer vent.
- * (3) Except in single family *dwelling units*, suitable access doors shall be installed in a clothes dryer vent for cleaning purposes.
- * (4) A clothes dryer vent shall not be connected to any other exhaust system, *gas vent* or *chimney*.

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.

9.33.1.2. Stoves, Ranges and Space Heaters

* (1) Except for *stoves* and *space heaters* accepted for use by the *authority having jurisdiction*, *stoves* and *space heaters* shall conform to CSA-B366.1-M, "Solid Fuel-Fired Central Heating Appliances," or ULC-S627-M, "Standard for Space Heaters for Use with Solid Fuels."

* (2) The installation of solid-fuel burning *stoves*, *ranges* and *space heaters*, including the requirements for combustion air, shall conform to CAN/CSA-B365-M, "Installation Code for Solid-Fuel Burning Appliances and Equipment."

* (3) A solid-fuel burning *appliance* shall not be installed in a location where there is a corrosive or an explosive atmosphere.

9.33.1.3. Design Temperatures

(1) A *building* of *residential occupancy* that is 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 Article 9.33.1.4.

(2) A *building* other than a *building* used for *residential occupancy* 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 temperature shall be determined in conformance with Subsection 2.2.1.

(4) Thermostatic control of the heat supply shall be provided in a *dwelling unit*.

9.33.1.4. Basement and Crawl Space Design Temperatures

(1) In an unfinished *basement* in a *building* used for *residential occupancy* heating facilities shall be provided which shall be capable of maintaining a temperature of not less than 18°C.

(2) Where a crawl space is required to be heated, the heating facilities shall be capable of maintaining a temperature of not less than 15°C.

* 9.33.1.5. **Crawl Space - Mobile Homes.** A crawl space beneath a *mobile home* need not be heated if the floor assembly of the *mobile home* has been designed and insulated for the outside winter design temperature and if the *building* services and *foundation* are protected against frost damage.

* 9.33.1.6. **Roof Access.** Provisions for access to roof-mounted heating, ventilating and air-conditioning equipment shall conform to the requirements of Article 3.5.4.7.

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 pro-

9.33.2.1.

vided 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 6 mm acceptable resilient ceramic fibre thermal insulation, 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.

Section 9.34 Electrical Facilities

9.34.1. General

- * **9.34.1.1. Standard for Electrical Installations.** An electrical installation shall conform to the Electrical Protection Act and regulations made pursuant to that Act.

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).

9.34.1.6. Public Corridors and Stairs. *Public corridors* and public stairs shall have at least one duplex receptacle for each 10 m length or fraction thereof.

9.34.1.7. Electrical Wiring and Cables. Electrical wiring and cables shall conform to Sentences 3.1.4.3.(1), 3.1.5.17.(1) and 3.5.4.3.(1), where appropriate.

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*.

(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)

Minimum Lighting for Public Areas		
Room or Space	lx	W/m ² of Floor Area (Incandescent Lighting)
Storage rooms	50	5
Service rooms and laundry areas	200	20
Garages	50	5
Public water-closet rooms	100	10
Service hallways and stairways	50	5
Recreation rooms	100	10
Column 1	2	3

(3) When other types of lighting are used, illumination equivalent to that shown in Table 9.34.2.A. shall be provided.

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

9.35.3.2.

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 m² 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.

Section 9.36 Log Construction

9.36.1. General

* **9.36.1.1. Soundness of Logs.** Logs which are sound and free of fractures may be used for *founda-*

tion, beams, posts and similar members if the strength and stability of the *building* is confirmed by a structural analysis, or accepted tests, or previous experience.

9.36.1.2. Preservative Treatment. The portion of any log coming into contact with masonry or concrete at or below ground level, or with *soil*, shall be treated with preservative. *

9.36.1.3. Exterior Joints Watertight. All exterior joints between logs shall be made watertight. *

9.36.1.4. Moisture Content. Logs shall be seasoned to a moisture content not exceeding 19% before installation. *

9.36.2. Walls

9.36.2.1. Horizontal Log Walls *

(1) Walls made of logs placed horizontally shall

- (a) have interlocking intersections which will prevent the collection of water in the joints, or
- (b) butt to and be firmly attached to a vertical corner post.

9.36.2.2. Fastening to Bearer. Each horizontal log shall be scribed to fit as closely as possible to its bearer and fastened to the bearer in at least 3 places throughout its length, by dowels, continuous machined joints, vertical framing members or interlocking sections or any combination of these, but the distance between fastenings shall not exceed 1.8 m. *

9.36.2.3. Vertical Log Walls. Each log in a wall built of vertical logs shall be scribed to fit as closely as possible to the adjacent logs. *

9.36.2.4. End Plates. Logs used in a vertical position shall have plates at the top and at the bottom which are at least as wide as the largest end diameter of any of the logs. *

Table A-1
Forming Part of Sentence 9.23.4.1.(1)

Floor Joists – Living Quarters												
Commercial Designation	Grade	Member Size, mm	Strapping Only			Bridging Only			Strapping and Bridging			
			Joist Spacing			Joist Spacing			Joist Spacing			
			300 mm	400 mm	600 mm	300 mm	400 mm	600 mm	300 mm	400 mm	600 mm	
			m	m	m	m	m	m	m	m	m	
Douglas Fir – Larch (includes Douglas Fir and Western Larch)	Select Structural	38 × 89	2.13	1.97	1.73	2.19	1.99	1.73	2.19	1.99	1.73	
		38 × 140	3.23	3.07	2.73	3.44	3.12	2.73	3.44	3.12	2.73	
		38 × 184	3.88	3.69	3.51	4.18	3.92	3.59	4.37	4.07	3.59	
		38 × 235	4.57	4.34	4.13	4.86	4.57	4.29	5.05	4.70	4.39	
		38 × 286	5.21	4.95	4.71	5.49	5.16	4.85	5.66	5.28	4.92	
	No. 1 and No. 2	38 × 89	2.00	1.85	1.66	2.09	1.90	1.66	2.09	1.90	1.66	
		38 × 140	3.09	2.91	2.62	3.29	2.99	2.62	3.29	2.99	2.62	
		38 × 184	3.71	3.53	3.36	4.00	3.76	3.44	4.19	3.90	3.44	
		38 × 235	4.38	4.16	3.96	4.66	4.38	4.11	4.84	4.51	4.20	
		38 × 286	4.99	4.75	4.52	5.26	4.94	4.65	5.43	5.06	4.72	
	No. 3	38 × 89	1.90	1.69	1.38	1.95	1.69	1.38	1.95	1.69	1.38	
		38 × 140	2.78	2.41	1.97	2.78	2.41	1.97	2.78	2.41	1.97	
		38 × 184	3.38	2.93	2.39	3.38	2.93	2.39	3.38	2.93	2.39	
		38 × 235	4.14	3.58	2.93	4.14	3.58	2.93	4.14	3.58	2.93	
		38 × 286	4.80	4.16	3.39	4.80	4.16	3.39	4.80	4.16	3.39	
	Construction	38 × 89	1.90	1.77	1.61	2.03	1.84	1.61	2.03	1.84	1.61	
	Standard	38 × 89	1.81	1.68	1.55	1.96	1.78	1.55	1.96	1.78	1.55	
	Hemlock – Fir (includes Western Hemlock and Amabilis Fir)	Select Structural	38 × 89	2.08	1.93	1.71	2.16	1.96	1.71	2.16	1.96	1.71
			38 × 140	3.18	3.03	2.69	3.39	3.08	2.69	3.39	3.08	2.69
			38 × 184	3.82	3.64	3.46	4.12	3.87	3.54	4.31	4.02	3.54
			38 × 235	4.50	4.28	4.08	4.80	4.51	4.23	4.98	4.64	4.33
38 × 286			5.14	4.89	4.65	5.42	5.09	4.78	5.59	5.21	4.86	
No. 1 and No. 2		38 × 89	2.00	1.85	1.66	2.09	1.90	1.66	2.09	1.90	1.66	
		38 × 140	3.09	2.91	2.62	3.29	2.99	2.62	3.29	2.99	2.62	
		38 × 184	3.71	3.53	3.36	4.00	3.76	3.44	4.19	3.90	3.44	
		38 × 235	4.38	4.16	3.96	4.66	4.38	4.11	4.84	4.51	4.20	
		38 × 286	4.99	4.75	4.52	5.26	4.94	4.65	5.43	5.06	4.72	
No. 3		38 × 89	1.90	1.77	1.61	2.03	1.84	1.61	2.03	1.84	1.61	
		38 × 140	2.99	2.78	2.43	3.19	2.90	2.43	3.19	2.90	2.43	
		38 × 184	3.60	3.42	2.95	3.88	3.61	2.95	4.06	3.61	2.95	
		38 × 235	4.24	4.03	3.61	4.51	4.24	3.61	4.68	4.37	3.61	
		38 × 286	4.84	4.60	4.19	5.10	4.79	4.19	5.26	4.90	4.19	
Construction		38 × 89	1.90	1.77	1.61	2.03	1.84	1.61	2.03	1.84	1.61	
Standard		38 × 89	1.81	1.68	1.55	1.96	1.78	1.55	1.96	1.78	1.55	

Table A-1 (Continued)

Floor Joists – Living Quarters

Commercial Designation	Grade	Member Size, mm	Strapping Only			Bridging Only			Strapping and Bridging			
			Joist Spacing			Joist Spacing			Joist Spacing			
			300 mm	400 mm	600 mm	300 mm	400 mm	600 mm	300 mm	400 mm	600 mm	
			m	m	m	m	m	m	m	m		
Spruce – Pine – Fir (includes Spruce (all species except Coast Sitka Spruce), Jack Pine, Lodgepole Pine, Balsam Fir and Alpine Fir)	Select Structural	38 × 89	1.95	1.81	1.64	2.06	1.87	1.64	2.06	1.87	1.64	
		38 × 140	3.05	2.85	2.57	3.24	2.95	2.57	3.24	2.95	2.57	
		38 × 184	3.66	3.48	3.31	3.94	3.70	3.38	4.12	3.84	3.38	
		38 × 235	4.31	4.10	3.90	4.59	4.31	4.05	4.76	4.44	4.14	
		38 × 286	4.91	4.67	4.45	5.18	4.87	4.57	5.34	4.98	4.64	
	No. 1 and No. 2	38 × 89	1.86	1.72	1.58	1.99	1.81	1.58	1.99	1.81	1.58	
		38 × 140	2.92	2.71	2.49	3.14	2.85	2.49	3.14	2.85	2.49	
		38 × 184	3.54	3.36	3.20	3.81	3.58	3.27	3.99	3.72	3.27	
		38 × 235	4.17	3.96	3.77	4.44	4.17	3.92	4.60	4.29	4.00	
		38 × 286	4.75	4.52	4.30	5.01	4.71	4.42	5.17	4.82	4.49	
	No. 3	38 × 89	1.81	1.68	1.55	1.96	1.78	1.55	1.96	1.78	1.55	
		38 × 140	2.84	2.64	2.43	3.08	2.80	2.43	3.08	2.80	2.43	
		38 × 184	3.47	3.30	2.95	3.74	3.52	2.95	3.92	3.61	2.95	
		38 × 235	4.09	3.89	3.61	4.36	4.09	3.61	4.52	4.22	3.61	
		38 × 286	4.67	4.44	4.19	4.92	4.62	4.19	5.08	4.73	4.19	
	Construction	38 × 89	1.81	1.68	1.55	1.96	1.78	1.55	1.96	1.78	1.55	
	Standard	38 × 89	1.70	1.58	1.47	1.88	1.71	1.50	1.88	1.71	1.50	
	Northern Species (includes any Canadian softwood covered by the NLGA Standard Grading Rules)	Select Structural	38 × 89	1.65	1.53	1.42	1.84	1.68	1.46	1.84	1.68	1.46
			38 × 140	2.59	2.41	2.24	2.90	2.63	2.30	2.90	2.63	2.30
			38 × 184	3.27	3.11	2.94	3.52	3.31	3.03	3.69	3.44	3.03
38 × 235			3.85	3.66	3.48	4.10	3.85	3.62	4.26	3.97	3.70	
38 × 286			4.39	4.18	3.97	4.63	4.35	4.09	4.78	4.45	4.15	
No. 1 and No. 2		38 × 89	1.59	1.48	1.37	1.80	1.64	1.43	1.80	1.64	1.43	
		38 × 140	2.51	2.33	2.16	2.83	2.57	2.25	2.83	2.57	2.25	
		38 × 184	3.19	3.04	2.84	3.44	3.23	2.96	3.60	3.36	2.96	
		38 × 235	3.76	3.58	3.41	4.01	3.77	3.54	4.16	3.88	3.62	
		38 × 286	4.29	4.08	3.88	4.53	4.25	4.00	4.67	4.35	4.06	
No. 3		38 × 89	1.54	1.43	1.32	1.74	1.57	1.36	1.76	1.60	1.36	
		38 × 140	2.42	2.24	1.94	2.74	2.38	1.94	2.75	2.38	1.94	
		38 × 184	3.12	2.90	2.37	3.35	2.90	2.37	3.35	2.90	2.37	
		38 × 235	3.67	3.49	2.89	3.91	3.54	2.89	4.06	3.54	2.89	
		38 × 286	4.19	3.98	3.36	4.42	4.11	3.36	4.55	4.11	3.36	
Construction		38 × 89	1.54	1.43	1.32	1.74	1.57	1.40	1.76	1.60	1.40	
Standard		38 × 89	1.48	1.37	1.27	1.67	1.51	1.36	1.71	1.55	1.36	

Table A-2
Forming Part of Sentence 9.23.4.1.(1)

Floor Joists – Bedrooms and Accessible Attics												
Commercial Designation	Grade	Member Size, mm	Strapping Only			Bridging Only			Strapping and Bridging			
			Joist Spacing			Joist Spacing			Joist Spacing			
			300 mm	400 mm	600 mm	300 mm	400 mm	600 mm	300 mm	400 mm	600 mm	
			m	m	m	m	m	m	m	m	m	
Douglas Fir – Larch (includes Douglas Fir and Western Larch)	Select Structural	38 × 89	2.13	1.97	1.83	2.42	2.20	1.92	2.42	2.20	1.92	
		38 × 140	3.23	3.07	2.88	3.53	3.31	3.02	3.72	3.46	3.02	
		38 × 184	3.88	3.69	3.51	4.18	3.92	3.69	4.37	4.07	3.80	
		38 × 235	4.57	4.34	4.13	4.86	4.57	4.29	5.05	4.70	4.39	
		38 × 286	5.21	4.95	4.71	5.49	5.16	4.85	5.66	5.28	4.92	
	No. 1 and No. 2	38 × 89	2.00	1.85	1.72	2.31	2.09	1.84	2.32	2.11	1.84	
		38 × 140	3.09	2.91	2.70	3.38	3.17	2.90	3.57	3.31	2.90	
		38 × 184	3.71	3.53	3.36	4.00	3.76	3.53	4.19	3.90	3.64	
		38 × 235	4.38	4.16	3.96	4.66	4.38	4.11	4.84	4.51	4.20	
		38 × 286	4.99	4.75	4.52	5.26	4.94	4.65	5.43	5.06	4.72	
	No. 3	38 × 89	1.90	1.77	1.57	2.19	1.93	1.57	2.23	1.93	1.57	
		38 × 140	2.99	2.75	2.25	3.18	2.75	2.25	3.18	2.75	2.25	
		38 × 184	3.60	3.35	2.73	3.86	3.35	2.73	3.86	3.35	2.73	
		38 × 235	4.24	4.03	3.34	4.51	4.09	3.34	4.68	4.09	3.34	
		38 × 286	4.84	4.60	3.88	5.10	4.75	3.88	5.26	4.75	3.88	
	Construction	38 × 89	1.90	1.77	1.64	2.19	1.98	1.78	2.25	2.04	1.78	
	Standard	38 × 89	1.81	1.68	1.56	2.07	1.88	1.70	2.17	1.97	1.72	
	Hemlock – Fir (includes Western Hemlock and Amabilis Fir)	Select Structural	38 × 89	2.08	1.93	1.80	2.39	2.17	1.89	2.39	2.17	1.89
			38 × 140	3.18	3.03	2.82	3.48	3.27	2.98	3.67	3.41	2.98
			38 × 184	3.82	3.64	3.46	4.12	3.87	3.64	4.31	4.02	3.75
			38 × 235	4.50	4.28	4.08	4.80	4.51	4.23	4.98	4.64	4.33
38 × 286			5.14	4.89	4.65	5.42	5.09	4.78	5.59	5.21	4.86	
No. 1 and No. 2		38 × 89	2.00	1.85	1.72	2.31	2.09	1.84	2.32	2.11	1.84	
		38 × 140	3.09	2.91	2.70	3.38	3.17	2.90	3.57	3.31	2.90	
		38 × 184	3.71	3.53	3.36	4.00	3.76	3.53	4.19	3.90	3.64	
		38 × 235	4.38	4.16	3.96	4.66	4.38	4.11	4.84	4.51	4.20	
		38 × 286	4.99	4.75	4.52	5.26	4.94	4.65	5.43	5.06	4.72	
No. 3		38 × 89	1.90	1.77	1.64	2.19	1.98	1.78	2.25	2.04	1.78	
		38 × 140	2.99	2.78	2.58	3.27	3.08	2.77	3.46	3.21	2.77	
		38 × 184	3.60	3.42	3.26	3.88	3.64	3.37	4.06	3.78	3.37	
		38 × 235	4.24	4.03	3.84	4.51	4.24	3.98	4.68	4.37	4.07	
		38 × 286	4.84	4.60	4.37	5.10	4.79	4.50	5.26	4.90	4.57	
Construction		38 × 89	1.90	1.77	1.64	2.19	1.98	1.78	2.25	2.04	1.78	
Standard		38 × 89	1.81	1.68	1.56	2.07	1.88	1.70	2.17	1.97	1.72	

Table A-2 (Continued)

Floor Joists – Bedrooms and Accessible Attics												
Commercial Designation	Grade	Member Size, mm	Strapping Only			Bridging Only			Strapping and Bridging			
			Joist Spacing			Joist Spacing			Joist Spacing			
			300 mm	400 mm	600 mm	300 mm	400 mm	600 mm	300 mm	400 mm	600 mm	
			m	m	m	m	m	m	m	m	m	
Spruce – Pine – Fir (includes Spruce (all species except Coast Sitka Spruce), Jack Pine, Lodgepole Pine, Balsam Fir and Alpine Fir)	Select Structural	38 × 89	1.95	1.81	1.68	2.25	2.04	1.81	2.28	2.07	1.81	
		38 × 140	3.05	2.85	2.64	3.33	3.13	2.85	3.51	3.26	2.85	
		38 × 184	3.66	3.48	3.31	3.94	3.70	3.48	4.12	3.84	3.58	
		38 × 235	4.31	4.10	3.90	4.59	4.31	4.05	4.76	4.44	4.14	
		38 × 286	4.91	4.67	4.45	5.18	4.87	4.57	5.34	4.98	4.64	
	No. 1 and No. 2	38 × 89	1.86	1.72	1.60	2.14	1.93	1.75	2.21	2.01	1.75	
		38 × 140	2.92	2.71	2.51	3.22	3.02	2.75	3.40	3.16	2.76	
		38 × 184	3.54	3.36	3.20	3.81	3.58	3.36	3.99	3.72	3.47	
		38 × 235	4.17	3.96	3.77	4.44	4.17	3.92	4.60	4.29	4.00	
		38 × 286	4.75	4.52	4.30	5.01	4.71	4.42	5.17	4.82	4.49	
	No. 3	38 × 89	1.81	1.68	1.56	2.07	1.88	1.70	2.17	1.97	1.72	
		38 × 140	2.84	2.64	2.45	3.16	2.95	2.67	3.34	3.10	2.71	
		38 × 184	3.47	3.30	3.14	3.74	3.52	3.30	3.92	3.65	3.37	
		38 × 235	4.09	3.89	3.70	4.36	4.09	3.85	4.52	4.22	3.93	
		38 × 286	4.67	4.44	4.22	4.92	4.62	4.34	5.08	4.73	4.41	
	Construction	38 × 89	1.81	1.68	1.56	2.07	1.88	1.70	2.17	1.97	1.72	
	Standard	38 × 89	1.70	1.58	1.47	1.95	1.76	1.59	2.09	1.89	1.66	
	Northern Species (includes any Canadian softwood covered by the NLGA Standard Grading Rules)	Select Structural	38 × 89	1.65	1.53	1.42	1.88	1.70	1.54	2.04	1.83	1.62
			38 × 140	2.59	2.41	2.24	2.96	2.67	2.42	3.14	2.88	2.55
			38 × 184	3.27	3.11	2.94	3.52	3.31	3.11	3.69	3.44	3.20
38 × 235			3.85	3.66	3.48	4.10	3.85	3.62	4.26	3.97	3.70	
38 × 286			4.39	4.18	3.97	4.63	4.35	4.09	4.78	4.45	4.15	
No. 1 and No. 2		38 × 89	1.59	1.48	1.37	1.81	1.64	1.48	1.98	1.76	1.56	
		38 × 140	2.51	2.33	2.16	2.85	2.58	2.33	3.07	2.77	2.46	
		38 × 184	3.19	3.04	2.84	3.44	3.23	3.04	3.60	3.36	3.13	
		38 × 235	3.76	3.58	3.41	4.01	3.77	3.54	4.16	3.88	3.62	
		38 × 286	4.29	4.08	3.88	4.53	4.25	4.00	4.67	4.35	4.06	
No. 3		38 × 89	1.54	1.43	1.32	1.74	1.57	1.42	1.90	1.69	1.50	
		38 × 140	2.42	2.24	2.08	2.74	2.48	2.22	2.99	2.65	2.22	
		38 × 184	3.12	2.95	2.70	3.36	3.16	2.70	3.51	3.28	2.72	
		38 × 235	3.67	3.49	3.31	3.91	3.67	3.31	4.06	3.78	3.31	
		38 × 286	4.19	3.98	3.79	4.42	4.15	3.84	4.55	4.25	3.84	
Construction	38 × 89	1.54	1.43	1.32	1.74	1.57	1.42	1.90	1.69	1.50		
Standard	38 × 89	1.48	1.37	1.27	1.67	1.51	1.36	1.82	1.61	1.43		

Table A-3
Forming Part of Sentence 9.23.4.1.(1)

Ceiling Joists – Attic Not Accessible by a Stairway						
Commercial Designation	Grade	Member Size, mm	All Ceilings			
			Joist Spacing			
			300 mm	400 mm	600 mm	
			m	m	m	
Douglas Fir – Larch (includes Douglas Fir and Western Larch)	Select Structural	38 × 89	3.41	3.10	2.71	
		38 × 140	5.37	4.88	4.26	
		38 × 184	7.05	6.41	5.60	
		38 × 235	9.01	8.18	7.15	
		38 × 286	10.96	9.96	8.70	
	No. 1 and No. 2	38 × 89	3.27	2.97	2.59	
		38 × 140	5.14	4.67	4.08	
		38 × 184	6.76	6.14	5.36	
		38 × 235	8.63	7.84	6.85	
		38 × 286	10.50	9.54	8.34	
	No. 3	38 × 89	3.17	2.88	2.42	
		38 × 140	4.89	4.23	3.46	
		38 × 184	5.95	5.15	4.20	
		38 × 235	7.27	6.30	5.14	
		38 × 286	8.44	7.31	5.97	
		Construction	38 × 89	3.17	2.88	2.51
		Standard	38 × 89	3.06	2.78	2.43
	Hemlock – Fir (includes Western Hemlock and Amabilis Fir)	Select Structural	38 × 89	3.36	3.06	2.67
38 × 140			5.29	4.81	4.20	
38 × 184			6.96	6.32	5.52	
38 × 235			8.88	8.07	7.05	
38 × 286			10.81	9.82	8.58	
No. 1 and No. 2		38 × 89	3.27	2.97	2.59	
		38 × 140	5.14	4.67	4.08	
		38 × 184	6.76	6.14	5.36	
		38 × 235	8.63	7.84	6.85	
		38 × 286	10.50	9.54	8.34	
No. 3		38 × 89	3.17	2.88	2.51	
		38 × 140	4.98	4.53	3.95	
		38 × 184	6.55	5.95	5.19	
		38 × 235	8.36	7.60	6.34	
		38 × 286	10.18	9.01	7.36	
		Construction	38 × 89	3.17	2.88	2.5
		Standard	38 × 89	3.06	2.78	2.43

Table A-3 (Continued)

Ceiling Joists – Attic Not Accessible by a Stairway					
Commercial Designation	Grade	Member Size, mm	All Ceilings		
			Joist Spacing		
			300 mm	400 mm	600 mm
			m	m	m
Spruce – Pine – Fir (includes Spruce (all species except Coast Sitka Spruce), Jack Pine, Lodgepole Pine, Balsam Fir and Alpine Fir)	Select Structural	38 × 89	3.22	2.92	2.55
		38 × 140	5.06	4.60	4.02
		38 × 184	6.65	6.05	5.28
		38 × 235	8.50	7.72	6.74
		38 × 286	10.34	9.40	8.21
	No. 1 and No. 2	38 × 89	3.11	2.83	2.47
		38 × 140	4.90	4.45	3.89
		38 × 184	6.44	5.85	5.11
		38 × 235	8.22	7.47	6.52
		38 × 286	10.00	9.09	7.94
	No. 3	38 × 89	3.06	2.78	2.43
		38 × 140	4.81	4.37	3.82
		38 × 184	6.32	5.74	5.02
		38 × 235	8.07	7.33	6.34
		38 × 286	9.82	8.93	7.36
	Construction	38 × 89	3.06	2.78	2.43
	Standard	38 × 89	2.94	2.67	2.33
	Northern Species (includes any Canadian softwood covered by the NLGA Standard Grading Rules)	Select Structural	38 × 89	2.88	2.61
38 × 140			4.53	4.11	3.59
38 × 184			5.95	5.40	4.72
38 × 235			7.60	6.90	6.03
38 × 286			9.25	8.40	7.34
No. 1 and No. 2		38 × 89	2.81	2.55	2.23
		38 × 140	4.42	4.02	3.51
		38 × 184	5.81	5.28	4.61
		38 × 235	7.42	6.74	5.89
		38 × 286	9.03	8.21	7.17
No. 3		38 × 89	2.74	2.49	2.18
		38 × 140	4.31	3.92	3.42
		38 × 184	5.67	5.09	4.16
		38 × 235	7.19	6.23	5.08
		38 × 286	8.34	7.23	5.90
Construction		38 × 89	2.74	2.49	2.18
Standard		38 × 89	2.67	2.43	2.12

Table A-4
Forming Part of Sentence 9.23.4.1.(1)

Roof Joists – (Design Roof Snow Loads 1.0 and 1.5 kPa)								
Commercial Designation	Grade	Member Size, mm	1.0 kPa			1.5 kPa		
			Joist Spacing			Joist Spacing		
			300 mm	400 mm	600 mm	300 mm	400 mm	600 mm
			m	m	m	m	m	m
Douglas Fir – Larch (includes Douglas Fir and Western Larch)	Select Structural	38 × 89	2.71	2.46	2.15	2.37	2.15	1.88
		38 × 140	4.26	3.87	3.38	3.72	3.38	2.95
		38 × 184	5.60	5.09	4.44	4.89	4.44	3.88
		38 × 235	7.15	6.49	5.67	6.24	5.67	4.96
		38 × 286	8.70	7.90	6.91	7.60	6.91	6.03
	No. 1 and No. 2	38 × 89	2.59	2.36	2.06	2.27	2.06	1.80
		38 × 140	4.08	3.71	3.24	3.57	3.24	2.83
		38 × 184	5.36	4.87	4.26	4.69	4.26	3.72
		38 × 235	6.85	6.22	5.44	5.98	5.44	4.74
		38 × 286	8.34	7.57	6.40	7.28	6.62	5.50
	No. 3	38 × 89	2.49	2.16	1.76	2.14	1.85	1.51
		38 × 140	3.56	3.08	2.51	3.06	2.65	2.16
		38 × 184	4.33	3.75	3.06	3.72	3.22	2.63
		38 × 235	5.29	4.58	3.74	4.55	3.94	3.22
		38 × 286	6.14	5.32	4.34	5.28	4.57	3.73
	Construction	38 × 89	2.51	2.28	1.99	2.20	1.99	1.74
	Standard	38 × 89	2.43	2.20	1.93	2.12	1.93	1.68
	Hemlock – Fir (includes Western Hemlock and Amabilis Fir)	Select Structural	38 × 89	2.67	2.43	2.12	2.33	2.12
38 × 140			4.20	3.82	3.33	3.67	3.33	2.91
38 × 184			5.52	5.02	4.38	4.82	4.38	3.83
38 × 235			7.05	6.41	5.60	6.16	5.60	4.89
38 × 286			8.58	7.80	6.81	7.50	6.81	5.95
No. 1 and No. 2		38 × 89	2.59	2.36	2.06	2.27	2.06	1.80
		38 × 140	4.08	3.71	3.24	3.57	3.24	2.83
		38 × 184	5.36	4.87	4.26	4.69	4.26	3.72
		38 × 235	6.85	6.22	5.44	5.98	5.44	4.75
		38 × 286	8.34	7.57	6.62	7.28	6.62	5.77
No. 3		38 × 89	2.51	2.28	1.99	2.20	1.99	1.74
		38 × 140	3.95	3.59	3.10	3.45	3.14	2.67
		38 × 184	5.20	4.62	3.77	4.54	3.97	3.24
		38 × 235	6.53	5.65	4.61	5.61	4.86	3.97
		38 × 286	7.57	6.56	5.35	6.51	5.64	4.60
Construction		38 × 89	2.51	2.28	1.99	2.20	1.99	1.74
Standard		38 × 89	2.43	2.20	1.93	2.12	1.93	1.68

Table A-4 (Continued)

Roof Joists – (Design Roof Snow Loads 1.0 and 1.5 kPa)								
Commercial Designation	Grade	Member Size, mm	1.0 kPa			1.5 kPa		
			Joist Spacing			Joist Spacing		
			300 mm	400 mm	600 mm	300 mm	400 mm	600 mm
			m	m	m	m	m	m
Spruce – Pine – Fir (includes Spruce (all species except Coast Sitka Spruce), Jack Pine, Lodgepole Pine, Balsam Fir and Alpine Fir)	Select Structural	38 × 89	2.55	2.32	2.03	2.23	2.03	1.77
		38 × 140	4.02	3.65	3.19	3.51	3.19	2.79
		38 × 184	5.28	4.80	4.19	4.61	4.19	3.66
		38 × 235	6.74	6.13	5.35	5.89	5.35	4.68
		38 × 286	8.21	7.46	6.52	7.17	6.52	5.69
	No. 1 and No. 2	38 × 89	2.47	2.24	1.96	2.16	1.96	1.71
		38 × 140	3.89	3.53	3.08	3.40	3.08	2.69
		38 × 184	5.11	4.64	4.05	4.46	4.05	3.54
		38 × 235	6.52	5.93	5.18	5.70	5.18	4.52
		38 × 286	7.94	7.21	6.30	6.94	6.30	5.50
	No. 3	38 × 89	2.43	2.20	1.93	2.12	1.93	1.68
		38 × 140	3.82	3.47	3.03	3.33	3.03	2.65
		38 × 184	5.02	4.56	3.77	4.38	3.97	3.24
		38 × 235	6.41	5.65	4.61	5.60	4.86	3.97
		38 × 286	7.57	6.56	5.35	6.51	5.64	4.60
	Construction	38 × 89	2.43	2.20	1.93	2.12	1.93	1.68
	Standard	38 × 89	2.33	2.12	1.85	2.04	1.85	1.62
	Northern Species (includes any Canadian softwood covered by the NLGA Standard Grading Rules)	Select Structural	38 × 89	2.28	2.07	1.81	1.99	1.81
38 × 140			3.59	3.26	2.85	3.14	2.85	2.49
38 × 184			4.72	4.29	3.75	4.12	3.75	3.27
38 × 235			6.03	5.48	4.79	5.27	4.79	4.18
38 × 286			7.34	6.67	5.82	6.41	5.82	5.09
No. 1 and No. 2		38 × 89	2.23	2.03	1.77	1.95	1.77	1.55
		38 × 140	3.51	3.19	2.79	3.07	2.79	2.43
		38 × 184	4.61	4.19	3.66	4.03	3.66	3.20
		38 × 235	5.89	5.35	4.68	5.15	4.68	4.09
		38 × 286	7.17	6.52	5.58	6.26	5.69	4.80
No. 3		38 × 89	2.18	1.98	1.73	1.90	1.73	1.50
		38 × 140	3.42	3.05	2.49	2.99	2.62	2.14
		38 × 184	4.28	3.71	3.03	3.68	3.19	2.60
		38 × 235	5.23	4.53	3.70	4.50	3.90	3.18
		38 × 286	6.07	5.26	4.29	5.22	4.52	3.69
Construction		38 × 89	2.18	1.98	1.73	1.90	1.73	1.51
Standard		38 × 89	2.12	1.93	1.68	1.85	1.68	1.47

Table A-5
Forming Part of Sentence 9.23.4.1.(1)

Roof Joists – (Design Roof Snow Loads 2.0 and 2.5 kPa)									
Commercial Designation	Grade	Member Size, mm	2.0 kPa			2.5 kPa			
			Joist Spacing			Joist Spacing			
			300 mm	400 mm	600 mm	300 mm	400 mm	600 mm	
			m	m	m	m	m	m	
Douglas Fir – Larch (includes Douglas Fir and Western Larch)	Select Structural	38 × 89	2.15	1.95	1.71	1.99	1.81	1.58	
		38 × 140	3.38	3.07	2.68	3.14	2.85	2.49	
		38 × 184	4.44	4.04	3.53	4.12	3.75	3.27	
		38 × 235	5.67	5.15	4.50	5.27	4.79	4.18	
		38 × 286	6.91	6.27	5.48	6.41	5.82	5.09	
	No. 1 and No. 2	38 × 89	2.06	1.87	1.63	1.91	1.74	1.52	
		38 × 140	3.24	2.94	2.57	3.01	2.73	2.39	
		38 × 184	4.26	3.87	3.38	3.95	3.59	3.14	
		38 × 235	5.44	4.94	4.22	5.05	4.59	3.84	
	No. 3	38 × 89	1.91	1.65	1.35	1.74	1.50	1.23	
		38 × 140	2.72	2.36	1.92	2.48	2.15	1.75	
		38 × 184	3.31	2.87	2.34	3.01	2.61	2.13	
		38 × 235	4.05	3.51	2.86	3.69	3.19	2.61	
	Construction	38 × 89	1.99	1.81	1.58	1.85	1.68	1.47	
		Standard	38 × 89	1.93	1.75	1.53	1.79	1.62	1.42
	Hemlock – Fir (includes Western Hemlock and Amabilis Fir)	Select Structural	38 × 89	2.12	1.93	1.68	1.97	1.79	1.56
			38 × 140	3.33	3.03	2.65	3.10	2.81	2.46
38 × 184			4.38	3.98	3.48	4.07	3.70	3.23	
38 × 235			5.60	5.09	4.44	5.20	4.72	4.12	
38 × 286			6.81	6.19	5.41	6.32	5.75	5.02	
No. 1 and No. 2		38 × 89	2.06	1.87	1.63	1.91	1.74	1.52	
		38 × 140	3.24	2.94	2.57	3.01	2.73	2.39	
		38 × 184	4.26	3.87	3.38	3.95	3.59	3.14	
		38 × 235	5.44	4.94	4.32	5.05	4.59	4.01	
No. 3		38 × 89	1.99	1.81	1.58	1.85	1.68	1.47	
		38 × 140	3.14	2.85	2.37	2.91	2.65	2.16	
		38 × 184	4.09	3.54	2.89	3.72	3.22	2.63	
		38 × 235	5.00	4.33	3.53	4.55	3.94	3.22	
Construction		38 × 89	1.99	1.81	1.58	1.85	1.68	1.47	
		Standard	38 × 89	1.93	1.75	1.53	1.79	1.62	1.42

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Table A-5 (Continued)

Roof Joists – (Design Roof Snow Loads 2.0 and 2.5 kPa)								
Commercial Designation	Grade	Member Size, mm	2.0 kPa			2.5 kPa		
			Joist Spacing			Joist Spacing		
			300 mm	400 mm	600 mm	300 mm	400 mm	600 mm
			m	m	m	m	m	m
Spruce – Pine – Fir (includes Spruce (all species except Coast Sitka Spruce), Jack Pine, Lodgepole Pine, Balsam Fir and Alpine Fir)	Select Structural	38 × 89	2.03	1.84	1.61	1.88	1.71	1.49
		38 × 140	3.19	2.90	2.53	2.96	2.69	2.35
		38 × 184	4.19	3.81	3.33	3.89	3.54	3.09
		38 × 235	5.35	4.86	4.25	4.97	4.52	3.94
		38 × 286	6.52	5.92	5.17	6.05	5.50	4.80
	No. 1 and No. 2	38 × 89	1.96	1.78	1.56	1.82	1.65	1.44
		38 × 140	3.08	2.80	2.45	2.86	2.60	2.27
		38 × 184	4.05	3.68	3.22	3.76	3.42	2.99
		38 × 235	5.18	4.70	4.11	4.81	4.37	3.82
		38 × 286	6.30	5.73	5.00	5.85	5.31	4.64
	No. 3	38 × 89	1.93	1.75	1.53	1.79	1.62	1.42
		38 × 140	3.03	2.75	2.37	2.81	2.56	2.16
		38 × 184	3.98	3.54	2.89	3.70	3.22	2.63
		38 × 235	5.00	4.33	3.53	4.55	3.94	3.22
		38 × 286	5.80	5.02	4.10	5.28	4.57	3.73
	Construction	38 × 89	1.93	1.75	1.53	1.79	1.62	1.42
	Standard	38 × 89	1.85	1.68	1.47	1.72	1.56	1.36
	Northern Species (includes any Canadian softwood covered by the NLGA Standard Grading Rules)	Select Structural	38 × 89	1.81	1.65	1.44	1.68	1.53
38 × 140			2.85	2.59	2.26	2.65	2.40	2.10
38 × 184			3.75	3.40	2.97	3.48	3.16	2.76
38 × 235			4.79	4.35	3.80	4.44	4.04	3.53
38 × 286			5.82	5.29	4.62	5.41	4.91	4.29
No. 1 and No. 2		38 × 89	1.77	1.61	1.41	1.64	1.49	1.31
		38 × 140	2.79	2.53	2.21	2.59	2.35	2.05
		38 × 184	3.66	3.33	2.91	3.40	3.09	2.70
		38 × 235	4.68	4.25	3.68	4.34	3.94	3.35
		38 × 286	5.69	5.17	4.27	5.28	4.76	3.89
No. 3		38 × 89	1.73	1.57	1.33	1.60	1.46	1.21
		38 × 140	2.69	2.33	1.90	2.45	2.12	1.73
		38 × 184	3.28	2.84	2.32	2.98	2.58	2.11
		38 × 235	4.01	3.47	2.83	3.65	3.16	2.58
		38 × 286	4.65	4.03	3.29	4.23	3.66	2.99
Construction		38 × 89	1.73	1.57	1.37	1.60	1.46	1.27
Standard		38 × 89	1.68	1.53	1.34	1.56	1.42	1.24

Table A-6
Forming Part of Sentence 9.23.4.1.(1)

Roof Rafters – (Design Roof Snow Loads 1.0 and 1.5 kPa)									
Commercial Designation	Grade	Member Size, mm	1.0 kPa			1.5 kPa			
			Rafter Spacing			Rafter Spacing			
			300 mm	400 mm	600 mm	300 mm	400 mm	600 mm	
			m	m	m	m	m	m	
Douglas Fir – Larch (includes Douglas Fir and Western Larch)	Select Structural	38 × 89	3.41	3.10	2.71	2.98	2.71	2.37	
		38 × 140	5.37	4.88	4.26	4.69	4.26	3.72	
		38 × 184	7.05	6.41	5.60	6.16	5.60	4.89	
		38 × 235	9.01	8.18	7.15	7.87	7.15	6.24	
		38 × 286	10.96	9.96	8.70	9.58	8.70	7.40	
	No. 1 and No. 2	38 × 89	3.27	2.97	2.59	2.86	2.59	2.27	
		38 × 140	5.14	4.67	3.95	4.49	4.08	3.34	
		38 × 184	6.76	5.88	4.80	5.74	4.97	4.06	
		38 × 235	8.30	7.19	5.87	7.02	6.08	4.96	
		38 × 286	9.63	8.34	6.81	8.14	7.05	5.76	
	No. 3	38 × 89	2.65	2.30	1.87	2.24	1.94	1.58	
		38 × 140	3.78	3.28	2.68	3.20	2.77	2.26	
		38 × 184	4.61	3.99	3.26	3.89	3.37	2.75	
		38 × 235	5.63	4.88	3.98	4.76	4.12	3.37	
		38 × 286	6.53	5.66	4.62	5.52	4.78	3.91	
	Construction	38 × 89	3.17	2.88	2.51	2.77	2.51	2.20	
	Standard	38 × 89	3.06	2.78	2.36	2.67	2.43	2.00	
	Hemlock – Fir (includes Western Hemlock and Amabilis Fir)	Select Structural	38 × 89	3.36	3.06	2.67	2.94	2.67	2.33
			38 × 140	5.29	4.81	4.20	4.62	4.20	3.67
			38 × 184	6.96	6.32	5.52	6.08	5.52	4.82
38 × 235			8.88	8.07	7.05	7.76	7.05	6.16	
38 × 286			10.81	9.82	8.58	9.45	8.58	7.28	
No. 1 and No. 2		38 × 89	3.27	2.97	2.59	2.86	2.59	2.27	
		38 × 140	5.14	4.67	4.08	4.49	4.08	3.50	
		38 × 184	6.76	6.14	5.04	5.90	5.21	4.26	
		38 × 235	8.63	7.54	6.16	7.36	6.37	5.20	
		38 × 286	10.11	8.75	7.15	8.54	7.40	6.04	
No. 3		38 × 89	3.17	2.83	2.31	2.76	2.39	1.95	
		38 × 140	4.67	4.04	3.30	3.95	3.42	2.79	
		38 × 184	5.68	4.92	4.02	4.80	4.16	3.40	
		38 × 235	6.95	6.02	4.91	5.87	5.08	4.15	
		38 × 286	8.06	6.98	5.70	6.81	5.90	4.82	
Construction		38 × 89	3.17	2.88	2.51	2.77	2.51	2.20	
Standard		38 × 89	3.06	2.78	2.43	2.67	2.43	2.09	

Table A-6 (Continued)

Roof Rafters – (Design Roof Snow Loads 1.0 and 1.5 kPa)									
Commercial Designation	Grade	Member Size, mm	1.0 kPa			1.5 kPa			
			Rafter Spacing			Rafter Spacing			
			300 mm	400 mm	600 mm	300 mm	400 mm	600 mm	
			m	m	m	m	m	m	
Spruce – Pine – Fir (includes Spruce (all species except Coast Sitka Spruce), Jack Pine, Lodgepole Pine, Balsam Fir and Alpine Fir)	Select Structural	38 × 89	3.22	2.92	2.55	2.81	2.55	2.23	
		38 × 140	5.06	4.60	4.02	4.42	4.02	3.51	
		38 × 184	6.65	6.05	5.28	5.81	5.28	4.61	
		38 × 235	8.50	7.72	6.74	7.42	6.74	5.89	
		38 × 286	10.34	9.40	8.21	9.03	8.21	7.17	
	No. 1 and No. 2	38 × 89	3.11	2.83	2.47	2.72	2.47	2.16	
		38 × 140	4.90	4.45	3.89	4.28	3.89	3.40	
		38 × 184	6.44	5.85	5.11	5.62	5.11	4.41	
		38 × 235	8.22	7.47	6.38	7.18	6.52	5.39	
		38 × 286	10.00	9.06	7.40	8.74	7.66	6.25	
	No. 3	38 × 89	3.06	2.78	2.31	2.67	2.39	1.95	
		38 × 140	4.67	4.04	3.30	3.95	3.42	2.79	
		38 × 184	5.68	4.92	4.02	4.80	4.16	3.40	
		38 × 235	6.95	6.02	4.91	5.87	5.08	4.15	
		38 × 286	8.06	6.98	5.70	6.81	5.90	4.82	
	Construction	38 × 89	3.06	2.78	2.43	2.67	2.43	2.12	
	Standard	38 × 89	2.94	2.67	2.33	2.57	2.33	2.04	
	Northern Species (includes any Canadian softwood covered by the NLGA Standard Grading Rules)	Select Structural	38 × 89	2.88	2.61	2.28	2.51	2.28	1.99
			38 × 140	4.53	4.11	3.59	3.95	3.59	3.14
			38 × 184	5.95	5.40	4.72	5.20	4.72	4.12
			38 × 235	7.60	6.90	6.03	6.64	6.03	5.11
38 × 286			9.25	8.40	7.01	8.08	7.26	5.93	
No. 1 and No. 2		38 × 89	2.81	2.55	2.23	2.46	2.23	1.95	
		38 × 140	4.42	4.02	3.44	3.86	3.51	2.91	
		38 × 184	5.81	5.13	4.19	5.00	4.33	3.54	
		38 × 235	7.24	6.27	5.12	6.12	5.30	4.33	
		38 × 286	8.40	7.27	5.94	7.10	6.15	5.02	
No. 3		38 × 89	2.62	2.27	1.85	2.22	1.92	1.57	
		38 × 140	3.74	3.24	2.65	3.16	2.74	2.24	
		38 × 184	4.56	3.94	3.22	3.85	3.33	2.72	
		38 × 235	5.57	4.82	3.94	4.71	4.08	3.33	
		38 × 286	6.46	5.60	4.57	5.46	4.73	3.86	
Construction		38 × 89	2.74	2.49	2.18	2.40	2.18	1.90	
Standard		38 × 89	2.67	2.43	2.05	2.33	2.12	1.73	

Table A-7
Forming Part of Sentence 9.23.4.1.(1)

Roof Rafters – (Design Roof Snow Loads 2.0 and 2.5 kPa)								
Commercial Designation	Grade	Member Size, mm	2.0 kPa			2.5 kPa		
			Rafter Spacing			Rafter Spacing		
			300 mm	400 mm	600 mm	300 mm	400 mm	600 mm
			m	m	m	m	m	m
Douglas Fir – Larch (includes Douglas Fir and Western Larch)	Select Structural	38 × 89	2.71	2.46	2.15	2.51	2.28	1.99
		38 × 140	4.26	3.87	3.38	3.95	3.59	3.14
		38 × 184	5.60	5.09	4.44	5.20	4.72	4.12
		38 × 235	7.15	6.49	5.62	6.64	6.03	5.08
		38 × 286	8.70	7.90	6.52	8.08	7.23	5.90
	No. 1 and No. 2	38 × 89	2.59	2.36	2.06	2.41	2.19	1.86
		38 × 140	4.08	3.60	2.94	3.76	3.26	2.66
		38 × 184	5.06	4.38	3.58	4.58	3.96	3.24
		38 × 235	6.19	5.36	4.38	5.60	4.85	3.96
		38 × 286	7.18	6.22	5.08	6.50	5.63	4.59
	No. 3	38 × 89	1.98	1.71	1.40	1.79	1.55	1.26
		38 × 140	2.82	2.44	1.99	2.55	2.21	1.80
		38 × 184	3.43	2.97	2.43	3.10	2.69	2.20
		38 × 235	4.20	3.64	2.97	3.80	3.29	2.68
		38 × 286	4.87	4.22	3.44	4.41	3.82	3.12
Construction	38 × 89	2.51	2.28	1.99	2.33	2.12	1.85	
Standard	38 × 89	2.43	2.16	1.76	2.25	1.95	1.59	
Hemlock – Fir (includes Western Hemlock and Amabilis Fir)	Select Structural	38 × 89	2.67	2.43	2.12	2.48	2.25	1.97
		38 × 140	4.20	3.82	3.33	3.90	3.54	3.10
		38 × 184	5.52	5.02	4.38	5.13	4.66	4.07
		38 × 235	7.05	6.41	5.54	6.55	5.95	5.01
		38 × 286	8.58	7.80	6.42	7.97	7.12	5.81
	No. 1 and No. 2	38 × 89	2.59	2.36	2.06	2.41	2.19	1.91
		38 × 140	4.08	3.71	3.08	3.79	3.42	2.79
		38 × 184	5.31	4.60	3.75	4.80	4.16	3.40
		38 × 235	6.49	5.62	4.59	5.87	5.08	4.15
		38 × 286	7.53	6.52	5.33	6.81	5.90	4.82
	No. 3	38 × 89	2.44	2.11	1.72	2.21	1.91	1.56
		38 × 140	3.48	3.01	2.46	3.15	2.73	2.23
		38 × 184	4.23	3.67	2.99	3.83	3.32	2.71
		38 × 235	5.18	4.48	3.66	4.68	4.06	3.31
		38 × 286	6.01	5.20	4.25	5.43	4.71	3.84
Construction	38 × 89	2.51	2.28	1.99	2.33	2.12	1.85	
Standard	38 × 89	2.43	2.20	1.84	2.25	2.04	1.67	

Table A-7 (Continued)

Roof Rafters – (Design Roof Snow Loads 2.0 and 2.5 kPa)								
Commercial Designation	Grade	Member Size, mm	2.0 kPa			2.5 kPa		
			Rafter Spacing			Rafter Spacing		
			300 mm	400 mm	600 mm	300 mm	400 mm	600 mm
			m	m	m	m	m	m
Spruce – Pine – Fir (includes Spruce (all species except Coast Sitka Spruce), Jack Pine, Lodgepole Pine, Balsam Fir and Alpine Fir)	Select Structural	38 × 89	2.55	2.32	2.03	2.37	2.15	1.88
		38 × 140	4.02	3.65	3.19	3.73	3.39	2.96
		38 × 184	5.28	4.80	4.19	4.90	4.45	3.89
		38 × 235	6.74	6.13	5.35	6.26	5.69	4.97
		38 × 286	8.21	7.46	6.52	7.62	6.92	5.90
	No. 1 and No. 2	38 × 89	2.47	2.24	1.96	2.29	2.08	1.82
		38 × 140	3.89	3.53	3.08	3.61	3.28	2.86
		38 × 184	5.11	4.64	3.89	4.74	4.31	3.52
		38 × 235	6.52	5.82	4.75	6.06	5.27	4.30
		38 × 286	7.80	6.76	5.52	7.06	6.11	4.99
	No. 3	38 × 89	2.43	2.11	1.72	2.21	1.91	1.56
		38 × 140	3.48	3.01	2.46	3.15	2.73	2.23
		38 × 184	4.23	3.67	2.99	3.83	3.32	2.71
		38 × 235	5.18	4.48	3.66	4.68	4.06	3.31
		38 × 286	6.01	5.20	4.25	5.43	4.71	3.84
Construction	38 × 89	2.43	2.20	1.93	2.25	2.05	1.79	
Standard	38 × 89	2.33	2.12	1.85	2.17	1.97	1.72	
Northern Species (includes any Canadian softwood covered by the NLGA Standard Grading Rules)	Select Structural	38 × 89	2.28	2.07	1.81	2.12	1.93	1.68
		38 × 140	3.59	3.26	2.85	3.33	3.03	2.65
		38 × 184	4.72	4.29	3.68	4.38	3.98	3.33
		38 × 235	6.03	5.48	4.51	5.60	4.99	4.08
		38 × 286	7.34	6.40	5.23	6.69	5.79	4.73
	No. 1 and No. 2	38 × 89	2.23	2.03	1.77	2.07	1.88	1.62
		38 × 140	3.51	3.14	2.56	3.26	2.84	2.32
		38 × 184	4.41	3.82	3.12	3.99	3.46	2.82
		38 × 235	5.40	4.67	3.82	4.88	4.23	3.45
		38 × 286	6.26	5.42	4.43	5.66	4.90	4.00
	No. 3	38 × 89	1.95	1.69	1.38	1.77	1.53	1.25
		38 × 140	2.79	2.42	1.97	2.52	2.19	1.78
		38 × 184	3.40	2.94	2.40	3.07	2.66	2.17
		38 × 235	4.15	3.60	2.94	3.76	3.25	2.66
		38 × 286	4.82	4.17	3.41	4.36	3.77	3.08
Construction	38 × 89	2.18	1.98	1.73	2.02	1.84	1.60	
Standard	38 × 89	2.12	1.87	1.53	1.95	1.69	1.38	

Table A-8
Forming Part of Sentence 9.23.4.1.(1)

Maximum Spans (m) for Built-up Floor Beams Supporting not more than One Floor in Houses⁽¹⁾								
Commercial Designation	Grade	Supported Length, m	Size of Built-Up Beam, mm					
			3 – 38 x 184	4 – 38 x 184	3 – 38 x 235	4 – 38 x 235	3 – 38 x 286	4 – 38 x 286
Douglas Fir – Larch (includes Douglas Fir and Western Larch)	Select Structural	2.4	3.84	4.43	4.70	5.42	5.45	6.29
		3.0	3.43	3.97	4.20	4.85	4.87	5.63
		3.6	3.14	3.62	3.83	4.43	4.45	5.14
		4.2	2.90	3.35	3.55	4.10	3.95	4.76
		4.8	2.67	3.14	3.13	3.83	3.46	4.45
	No. 1 and No. 2	2.4	2.99	3.45	3.66	4.22	4.24	4.90
		3.0	2.67	3.09	3.27	3.78	3.79	4.38
		3.6	2.44	2.82	2.98	3.45	3.46	4.00
		4.2	2.26	2.61	2.76	3.19	3.21	3.70
		4.8	2.11	2.44	2.59	2.98	3.00	3.46
Hemlock – Fir (includes Western Hemlock and Amabilis Fir)	Select Structural	2.4	3.78	4.37	4.62	5.34	5.37	6.20
		3.0	3.38	3.91	4.09	4.78	4.53	5.54
		3.6	2.91	3.57	3.41	4.36	3.78	5.03
		4.2	2.50	3.30	2.92	3.90	3.24	4.31
		4.8	2.19	2.91	2.56	3.41	2.83	3.78
	No. 1 and No. 2	2.4	3.14	3.62	3.83	4.43	4.45	5.14
		3.0	2.80	3.24	3.43	3.96	3.98	4.60
		3.6	2.56	2.96	3.13	3.61	3.63	4.19
		4.2	2.37	2.74	2.90	3.35	3.24	3.88
		4.8	2.19	2.56	2.56	3.13	2.83	3.63
Spruce – Pine – Fir (includes Spruce (all species except Coast Sitka Spruce), Jack Pine, Lodgepole Pine, Balsam Fir and Alpine Fir)	Select Structural	2.4	3.84	4.43	4.70	5.42	5.45	6.29
		3.0	3.43	3.97	4.20	4.85	4.87	5.63
		3.6	3.14	3.62	3.79	4.43	4.19	5.14
		4.2	2.78	3.35	3.25	4.10	3.60	4.76
		4.8	2.43	3.14	2.84	3.79	3.15	4.19
	No. 1 and No. 2	2.4	3.25	3.75	3.97	4.59	4.61	5.32
		3.0	2.90	3.35	3.55	4.10	4.12	4.76
		3.6	2.65	3.06	3.24	3.74	3.76	4.34
		4.2	2.45	2.83	3.00	3.47	3.48	4.02
		4.8	2.30	2.65	2.81	3.24	3.15	3.76
Northern Species (includes any Canadian softwood covered by the NLGA Standard Grading Rules)	Select Structural	2.4	3.08	3.55	3.76	4.35	4.37	5.04
		3.0	2.75	3.18	3.37	3.89	3.91	4.51
		3.6	2.51	2.90	3.07	3.55	3.57	4.12
		4.2	2.33	2.69	2.85	3.29	3.24	3.81
		4.8	2.18	2.51	2.56	3.07	2.83	3.57
	No. 1 and No. 2	2.4	2.61	3.01	3.19	3.68	3.70	4.27
		3.0	2.33	2.69	2.85	3.29	3.31	3.82
		3.6	2.13	2.46	2.60	3.00	3.02	3.49
		4.2	1.97	2.27	2.41	2.78	2.80	3.23
		4.8	1.84	2.13	2.25	2.60	2.61	3.02

Note to Table A-8

⁽¹⁾ See A-9.23.4.1.(1) in Appendix A

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⁽¹⁾								
Commercial Designation	Grade	Supported Length, m	Size of Built-Up Beam, mm					
			3 – 38 x 184	4 – 38 x 184	3 – 38 x 235	4 – 38 x 235	3 – 38 x 286	4 – 38 x 286
Douglas Fir – Larch (includes Douglas Fir and Western Larch)	Select Structural	2.4	2.91	3.36	3.56	4.11	3.98	4.77
		3.0	2.46	3.01	2.88	3.68	3.19	4.25
		3.6	2.05	2.73	2.40	3.20	2.66	3.54
		4.2	1.76	2.34	2.06	2.74	2.28	3.04
		4.8	1.54	2.05	1.80	2.40	1.99	2.66
	No. 1 and No. 2	2.4	2.27	2.62	2.77	3.20	3.22	3.72
		3.0	2.03	2.34	2.48	2.86	2.88	3.32
		3.6	1.85	2.14	2.26	2.62	2.63	3.03
		4.2	1.71	1.98	2.06	2.42	2.28	2.81
		4.8	1.54	1.85	1.80	2.26	1.99	2.63
Hemlock – Fir (includes Western Hemlock and Amabilis Fir)	Select Structural	2.4	2.52	3.31	2.95	3.93	3.26	4.35
		3.0	2.01	2.68	2.36	3.14	2.61	3.48
		3.6	1.68	2.24	1.96	2.62	2.17	2.90
		4.2	1.44	1.92	1.68	2.25	1.86	2.48
		4.8	1.26	1.68	1.47	1.96	1.63	2.17
	No. 1 and No. 2	2.4	2.38	2.75	2.91	3.36	3.26	3.90
		3.0	2.01	2.46	2.36	3.00	2.61	3.48
		3.6	1.68	2.24	1.96	2.62	2.17	2.90
		4.2	1.44	1.92	1.68	2.25	1.86	2.48
		4.8	1.26	1.68	1.47	1.96	1.63	2.17
Spruce – Pine – Fir (includes Spruce (all species except Coast Sitka Spruce), Jack Pine, Lodgepole Pine, Balsam Fir and Alpine Fir)	Select Structural	2.4	2.80	3.36	3.27	4.11	3.62	4.77
		3.0	2.24	2.98	2.62	3.49	2.90	3.86
		3.6	1.86	2.49	2.18	2.91	2.42	3.22
		4.2	1.60	2.13	1.87	2.49	2.07	2.76
		4.8	1.40	1.86	1.64	2.18	1.81	2.42
	No. 1 and No. 2	2.4	2.46	2.85	3.01	3.48	3.50	4.04
		3.0	2.20	2.55	2.62	3.11	2.90	3.61
		3.6	1.86	2.32	2.18	2.84	2.42	3.22
		4.2	1.60	2.13	1.87	2.49	2.07	2.76
		4.8	1.40	1.86	1.64	2.18	1.81	2.42
Northern Species (includes any Canadian softwood covered by the NLGA Standard Grading Rules)	Select Structural	2.4	2.34	2.70	2.86	3.30	3.26	3.83
		3.0	2.01	2.41	2.36	2.95	2.61	3.42
		3.6	1.68	2.20	1.96	2.62	2.17	2.90
		4.2	1.44	1.92	1.68	2.25	1.86	2.48
		4.8	1.26	1.68	1.47	1.96	1.63	2.17
	No. 1 and No. 2	2.4	1.98	2.28	2.42	2.79	2.81	3.24
		3.0	1.77	2.04	2.16	2.50	2.51	2.90
		3.6	1.61	1.86	1.96	2.28	2.17	2.65
		4.2	1.44	1.73	1.68	2.11	1.86	2.45
		4.8	1.26	1.61	1.47	1.96	1.63	2.17
Note to Table A-9		4.2	1.44	1.73	1.68	2.11	1.86	2.45
⁽¹⁾ See A-9.23.4.1.(1) in Appendix A		4.8	1.26	1.61	1.47	1.96	1.63	2.17

Table A-10
Forming Part of Article 9.23.13.11.

Maximum Clear Spans (m) between End Supports for Fink Trusses										
Top Member Size, mm	Bottom Member Size, mm	Roof Slope	No. 1 Grade Lumber				No. 2 Grade Lumber			
			Design Roof Snow Load, kPa				Design Roof Snow Load, kPa			
			1.0	1.5	2.0	2.5	1.0	1.5	2.0	2.5
38 × 89	38 × 89	1 in 4.8	6.75	4.87	—	—	5.84	4.01	—	—
		1 in 4	9.57	8.12	6.01	4.54	8.02	7.13	5.18	3.78
		1 in 3	9.60	8.83	7.62	6.75	8.91	7.69	6.60	5.84
		1 in 2.4	9.80	9.04	7.79	6.93	9.11	7.87	6.78	6.01
	38 × 114	1 in 4.8	7.74	5.74	3.78	—	6.75	4.85	—	—
		1 in 4	9.27	8.53	7.06	5.48	8.58	7.36	6.14	4.67
		1 in 3	9.60	8.83	7.62	6.75	8.91	7.69	6.60	5.84
		1 in 2.4	9.80	9.04	7.79	6.93	9.11	7.87	6.78	6.01
	38 × 140	1 in 4.8	8.50	6.35	4.39	—	7.44	5.46	3.47	—
		1 in 4	9.27	8.53	7.28	5.89	8.58	7.36	6.29	5.08
		1 in 3	9.60	8.83	7.62	6.75	8.91	7.69	6.60	5.84
		1 in 2.4	9.80	9.04	7.79	6.93	9.11	7.87	6.78	6.01
38 × 114	38 × 89	1 in 4.8	7.97	5.91	3.96	—	6.95	5.02	—	—
		1 in 4	9.57	8.66	7.18	5.56	8.02	7.16	6.24	4.77
		1 in 3	10.54	9.75	8.81	7.97	8.96	8.20	7.31	6.57
		1 in 2.4	11.20	9.90	9.65	8.89	9.57	8.91	8.10	7.41
	38 × 114	1 in 4.8	9.27	6.98	4.95	3.30	8.12	6.04	4.08	—
		1 in 4	11.91	10.23	8.48	6.68	10.31	9.24	7.44	5.79
		1 in 3	12.19	10.64	9.14	8.66	10.74	9.24	8.48	7.49
		1 in 2.4	12.19	10.89	9.39	8.91	10.99	9.49	8.71	7.74
	38 × 140	1 in 4.8	10.23	7.79	5.63	4.08	9.01	6.78	4.77	—
		1 in 4	11.91	10.23	9.11	7.23	10.31	9.47	8.05	6.29
		1 in 3	12.19	10.64	9.14	8.66	10.74	9.47	8.48	7.49
		1 in 2.4	12.19	10.89	9.39	8.91	10.99	9.49	8.71	7.74
38 × 140	38 × 89	1 in 4.8	8.89	6.73	4.72	—	7.39	5.81	3.86	—
		1 in 4	9.57	8.66	7.62	6.35	8.02	7.16	6.24	5.48
		1 in 3	10.54	9.75	8.81	7.97	8.96	8.20	7.31	6.57
		1 in 2.4	11.20	10.49	9.65	8.89	9.57	8.91	8.10	7.41
	38 × 114	1 in 4.8	10.46	7.97	5.79	4.24	9.22	6.95	4.92	3.27
		1 in 4	12.19	11.12	9.62	7.64	10.33	9.24	8.02	6.68
		1 in 3	12.19	12.19	11.17	9.90	11.50	10.54	9.42	8.45
		1 in 2.4	12.19	12.19	11.48	10.18	12.19	11.45	9.98	9.44
	38 × 140	1 in 4.8	11.68	8.96	6.60	5.00	10.33	7.84	5.68	4.14
		1 in 4	12.19	12.19	10.43	8.33	12.19	10.82	9.22	7.31
		1 in 3	12.19	12.19	11.17	9.90	12.19	11.30	9.67	9.16
		1 in 2.4	12.19	12.19	11.48	10.18	12.19	11.60	9.98	9.44

Table A-11
Forming Part of Article 9.23.13.11.

Maximum Clear Spans (m) between End Supports for Howe Trusses										
Top Member Size, mm	Bottom Member Size, mm	Roof Slope	No. 1 Grade Lumber				No. 2 Grade Lumber			
			Design Roof Snow Load, kPa				Design Roof Snow Load, kPa			
			1.0	1.5	2.0	2.5	1.0	1.5	2.0	2.5
38 × 89	38 × 89	1 in 4.8	9.44	7.31	5.48	4.24	8.30	6.45	4.77	3.63
		1 in 4	9.44	8.50	7.28	6.42	8.55	7.36	6.27	5.53
		1 in 3	9.57	8.83	7.59	6.73	8.89	7.67	6.57	5.84
		1 in 2.4	9.77	9.04	7.79	6.93	9.09	7.87	6.78	6.01
	38 × 114	1 in 4.8	9.62	8.15	6.17	4.82	8.30	7.11	5.41	4.19
		1 in 4	9.62	8.50	7.28	6.42	8.55	7.36	6.27	5.53
		1 in 3	9.62	8.83	7.59	6.73	8.89	7.67	6.57	5.84
		1 in 2.4	9.77	9.04	7.79	6.93	9.09	8.87	6.78	6.01
	38 × 140	1 in 4.8	9.62	8.25	7.03	5.63	8.30	7.11	6.04	4.92
		1 in 4	9.62	8.50	7.28	6.42	8.55	7.36	6.27	5.53
		1 in 3	9.62	8.83	7.59	6.73	8.89	7.67	6.57	5.84
		1 in 2.4	9.77	9.04	7.79	6.93	9.09	7.87	6.78	6.01
38 × 114	38 × 89	1 in 4.8	10.18	8.28	6.27	4.92	8.35	7.16	5.48	4.26
		1 in 4	11.20	9.85	8.45	7.34	9.27	8.07	6.83	5.89
		1 in 3	12.19	10.64	9.14	8.66	10.64	9.22	8.28	7.28
		1 in 2.4	12.19	10.89	9.37	8.89	10.97	9.47	8.71	7.72
	38 × 114	1 in 4.8	11.53	9.37	7.13	5.66	9.95	8.30	6.27	4.92
		1 in 4	11.88	10.21	9.37	8.28	10.28	9.44	8.07	7.11
		1 in 3	12.19	10.64	9.37	8.66	10.71	9.44	8.45	7.49
		1 in 2.4	12.19	10.89	9.37	8.89	10.97	9.47	8.71	7.72
	38 × 140	1 in 4.8	11.53	9.90	8.35	6.68	9.95	9.14	7.39	5.86
		1 in 4	11.88	10.21	9.37	8.28	10.28	9.44	8.07	7.11
		1 in 3	12.19	10.64	9.37	8.66	10.71	9.44	8.45	7.49
		1 in 2.4	12.19	10.89	9.37	8.89	10.97	9.47	8.71	7.72
38 × 140	38 × 89	1 in 4.8	10.18	8.73	6.90	5.46	8.35	7.16	5.96	4.74
		1 in 4	11.20	9.85	8.45	7.34	9.27	8.07	6.83	5.89
		1 in 3	12.19	11.48	10.10	8.96	10.64	9.52	8.28	7.28
		1 in 2.4	12.19	12.19	11.35	10.18	11.60	10.59	9.39	8.40
	38 × 114	1 in 4.8	12.19	10.31	7.89	6.29	10.74	9.16	6.95	5.51
		1 in 4	12.19	12.19	10.69	9.42	11.91	10.38	8.78	7.59
		1 in 3	12.19	12.19	11.17	9.90	12.19	11.27	9.67	9.16
		1 in 2.4	12.19	12.19	11.45	10.18	12.19	11.58	9.95	9.44
	38 × 140	1 in 4.8	12.19	12.09	9.34	7.51	12.16	10.41	8.30	6.62
		1 in 4	12.19	12.19	10.69	9.42	12.19	10.79	9.19	8.68
		1 in 3	12.19	12.19	11.17	9.90	12.19	11.27	9.67	9.16
		1 in 2.4	12.19	12.19	11.45	10.18	12.19	11.58	9.95	9.44



Part 10

Relocatable Industrial Accommodation

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Part 10

Relocatable Industrial Accommodation

Section 10.1 Application

10.1.1. General

10.1.1.1. Responsibility for Compliance

- * (1) The *owner* of a *building* regulated by this Part is jointly responsible with any operator or lessor for compliance of the *building* with the Code.
- * (2) During construction of a *building* regulated by this Part, the *constructor* is jointly responsible with the *owner* for compliance with this Code.

10.1.1.2. Application

- * (1) Except as specifically varied in this Part, Parts 1 to 9 apply to a *building* regulated by this Part.
- * (2) Except as provided in Sentence (3), this Part applies to a *building* providing accommodation for an industrial work force living and working in a temporary location, but does not apply to *mobile homes*, prefabricated single family *dwelling units* or other types of prefabricated or manufactured *buildings*.
- * (3) This Part also applies to Group D and Group F Division 3 *occupancies* for a work force working in a temporary location.

10.1.1.3. Scope

- * (1) This Part applies to:
 - (a) a one storey *building*
 - (i) without sleeping accommodation, that is not more than 1 200 m² in *building area* and if *sprinklered*, is not more than 2 400 m² in *building area*, and

- (ii) with sleeping accommodation, that is not more than 600 m² in *building area* and if *sprinklered*, is not more than 1 200 m² in *building area*, or
- (b) a two storey *building*
 - (i) without sleeping accommodation, that is not more than 600 m² in *building area* and if *sprinklered*, is not more than 1 200 m² in *building area*, and
 - (ii) with sleeping accommodation, that is not more than 300 m² in *building area* and if *sprinklered*, is not more than 600 m² in *building area*.

(2) This Part does not apply to a relocatable industrial housing unit if the *building area* is not more than 80 m².

(3) A *building* may consist of one or more transportable modules specifically designed to be readily relocatable and usable without permanent *foundations*.

10.1.1.4. Renovation Requirement of Existing Units

- (1) Sections 10.6 and 10.7 apply to
 - (a) a *building* constructed on or after September 1, 1991, and
 - (b) except as varied by Sentence (2), a *building* constructed before September 1, 1991, at the time of relocation.
- (2) Units built between March 1, 1977 and September 1, 1991 shall comply with the requirements of Part 10 of the Code in effect at the time of construction and to Sections 10.6 and 10.7 of the Alberta Building Code 1990 upon relocation.

10.1.1.4.

- * **(3)** A *building* referred to in Sentences (1) and (2) must be constructed or renovated by a constructor certified by the *authority having jurisdiction* and must carry the appropriate Alberta label.
- * **(4)** A *building* regulated by this Part that is constructed in or relocated into Alberta after September 1, 1991 shall conform in all respects to this Code.
- * **10.1.1.5. Temporary Facilities.** A *building* to which this Part applies shall not stay at one site for more than 5 years, except as permitted by the *authority having jurisdiction*.
- * **10.1.1.6. Combined Activities.** A *building* containing sleeping accommodation may include spaces for other uses not exceeding 100 m² each in area and if more than 50 m² in area, each space shall be separated from the remainder of the *building* by doors and a wall conforming to Sentence 10.4.1.3.(2) and Article 10.4.5.1.

Section 10.2 Structural Requirements

10.2.1. General

10.2.1.1. Structural Design

- * **(1)** Structural design shall be in accordance with Part 4 and, in addition, the design criteria shall allow for the effects of forces due to transportation and frequent relocation.
- * **(2)** Structural design of *loadbearing* assemblies shall be done by a *professional engineer* who is normally engaged in the practice of structural design.
- * **10.2.1.2. Foundations.** A *building* referred to in this Part may have a permanent or temporary *foundation*.

10.2.2. Design Loads

10.2.2.1. Snow Loads

- * **(1)** Roof *live load* shall be ground snow load and associated rain load and may be modified by a coefficient but shall not be less than 2 kPa.

(2) Roof design shall allow for the effects of drifting snow.

10.2.2.2. Wind Loads. Design *live load* due to wind shall be based on a reference velocity wind pressure not less than 0.7 kPa. *

10.2.2.3. Floor loads. Design floor loads in Group D *occupancies* shall be not less than 2.4 kPa. *

10.2.3. Stability

10.2.3.1. Design. If the resistance to overturning, calculated as the sum of the stabilizing moment of *dead load* only, is less than twice the overturning moment due to the *live loads* acting on the *building*, provision for the attachment of tie down devices shall be made in the construction of the modules. *

10.2.3.2. Tie Down Devices *

(1) If tie down devices are required, the manufacturer shall provide tie down instructions with each module specifying the location, required capacity and anchoring of recommended tie down devices.

(2) If special fittings, fixtures or provisions are needed to comply with the tie down instructions, they shall be supplied with the module. *

(3) The tie down instructions shall be provided for a specific site only and shall be printed on a label and affixed to the module in a visible location. *

Section 10.3 Heights and Areas

10.3.1. Size Requirements

10.3.1.1. Heights

(1) Except as permitted by Sentence (2), the clear ceiling height shall be not less than 2.1 m. *

(2) In a module specifically produced to be transported by aircraft, the clear ceiling height shall be not less than 2 m over at least 90% of the *floor area* and shall be not less than 1.9 m over the remaining *floor area*. *

10.3.1.2. Areas

- * (1) The area, calculated wall finish to wall finish, in a sleeping room shall be not less than
 - (a) 7.4 m² for each occupant in a singly occupied room, and
 - (b) 4.7 m² for each occupant in other than a singly occupied room.

Section 10.4 Fire Safety**10.4.1. Fire-Resistance Rating and Fire Separations****10.4.1.1. Fire-Resistance Rating**

- * (1) The *fire-resistance rating* required for a wall by other Parts of this Code is waived if the membranes on the wall have a contribution to the *fire-resistance rating* of the wall not less than the value specified in Articles 10.4.1.3. to 10.4.1.5.
 - (a) when rated in accordance with Chapter 2, "Fire Performance Ratings," of the Supplement to the NBC, or
 - (b) when tested in accordance with Section 15 of CAN/ULC-S101-M, "Standard Methods of Fire Endurance Tests of Building Construction and Materials."

10.4.1.2. Membrane Protection

- * (1) The values of membrane protection in Articles 10.4.1.3. to 10.4.1.5. apply only if the wall or ceiling is framed with wood members not less than 38 × 64 mm spaced not more than 400 mm o.c.
- * (2) If a wall framing system with stud dimensions less than specified in Sentence (1) is used, the membrane values required in Articles 10.4.1.3. to 10.4.1.5. shall be increased by 10 min.
- * (3) Prefinished wall panelling not less than 4.2 mm thick applied over plywood panelling, waferboard or oriented strandboard not less than 7.5 mm thick shall be considered to provide a 5 min membrane protection.

10.4.1.3. Sleeping Rooms

- * (1) Each face of a wall separating a sleeping room from another room shall have not less than a 5 min membrane protection.

(2) Except as permitted by Sentence (3), the face on the sleeping room side of a wall separating a sleeping room from a corridor, or from a space referred to in Article 10.1.1.6. shall not have less than a 10 min membrane protection.

(3) If the wall cavity of a wall separating a sleeping room from a corridor is filled with mineral wool produced from glass, slag or rock

- (a) having a density not less than 14 kg/m³, compressed to 75% of its nominal thickness, and
- (b) completely filling the cavity

 the rating of the membrane protection required by Sentence (1) need not be more than 5 min.

(4) Except as required in Sentence (2), a corridor shall be separated from the remainder of the building by a wall having not less than a 5 min membrane protection on each face.

10.4.1.4. Service Rooms

- (1) Wall faces in a *service room* shall have not less than a 30 min membrane protection.
- (2) The ceiling of a *service room* shall have not less than a 30 min membrane protection.

10.4.1.5. Exterior Wall Requirements

(1) Except as permitted by Sentences (2) and (3), exterior walls shall have not less than a 5 min membrane protection on the inner face and shall have *noncombustible exterior cladding*.

(2) A single module placed more than 15 m from trees, shrubs or other modules may have *combustible cladding*.

(3) The membrane requirements of Sentence (1) do not apply in a single module if the *occupant load* is not more than 10, the *building area* is not more than 80 m², and the module is placed not less than 10 m from any other *building*.

10.4.1.6. Fire Separations

- (1) In a two storey building
 - (a) the floor assembly of the second storey shall have a 45 min *fire-resistance rating*,
 - (b) the *exit* stairways from the second storey shall be separated from the remainder of

10.4.1.6.

- (c) the loadbearing walls supporting the floor assembly of the second floor shall have a *fire-resistance rating* conforming to Articles 10.4.1.1. to 10.4.1.5., and
- (d) the loadbearing columns and arches supporting the floor assembly of the second storey are required to have a 45 min *fire-resistance rating*.

10.4.2. Service Spaces

- * **10.4.2.1. Service Room.** If a fuel-fired *appliance* is placed in a *building* containing sleeping accommodation, the fuel-fired *appliance* shall be placed in a *service room*.
- * **10.4.2.2. Fire Dampers.** An opening through the wall of a *service room* for the passage of a duct shall be protected with a *fire damper* having not less than a 45 min *fire-protection rating*.
- * **10.4.2.3. Fire Stopping**
 - * (1) An opening through the ceiling of a *service room* for the passage of a *chimney flue* shall be protected with fire stopping.
 - * (2) The joist space through which a *chimney flue* penetrates, must have solid blocking not less than 38 mm thick on each side of the *chimney flue* and not less than 25 mm from the *flue* separating the *flue* space from the joist space.

10.4.3. Flame-Spread Rating

10.4.3.1. Flame-Spread Rating

- * (1) Except as otherwise provided in this Sub-section, the *flame-spread rating* of interior wall and ceiling finishes, including 90% of the surface area of cupboards and built-in furniture, shall not exceed 150.
- * (2) *Flame-spread rating* in a corridor and in an *exit stairway* from a second storey shall not exceed 25 on
 - (a) 90% of the ceiling surface area, and
 - (b) 90% of the wall surface area.
- * (3) *Flame-spread rating* on the floor shall not exceed

- (a) 300 in a corridor, and
- (b) 150 in an *exit stairway* from a second storey.

10.4.4. Windows as Means of Egress

10.4.4.1. Windows

- * (1) For each sleeping room a window capable of serving as an emergency *means of egress* shall be provided, with an unobstructed openable area not less than 0.5 m² with no dimension less than 560 mm, and with a sill height not more than 1 150 mm above the inside floor.
- * (2) A window using non-breakable glazing or which is not openable shall not be used in a sleeping area unless the window is designed and permanently marked as being of a knock out type.

10.4.5. Doors

10.4.5.1. Fire-Protection Rating

- * (1) Doors, listed and labelled, having not less than a 20 min *fire-protection rating* or conforming to CAN4-S113, "Standard Specification for Wood Core Doors Meeting the Performance Required by CAN4-S104 for Twenty Minute Fire Rated Closure Assemblies," shall be used
 - (a) as smoke doors, and
 - (b) between any part of a *building*, and
 - (i) a corridor, *exit stair*, or
 - (ii) a *service room*.
- * (2) A door frame that has not been tested and labelled by a testing agency may be used for a door required to have a 20 min *fire-protection rating* if the frame is rabbetted from solid wood stock and the final thickness is not less than 32 mm.
- * (3) A door referred to in Sentence (1) shall be equipped with a latching mechanism.

10.4.5.2. Closers

- * (1) A door equipped with an automatic closer shall be used between any part of a *building* and
 - (a) a *service room*, *exit stair*, or
 - (b) a washroom facility.

* **10.4.5.3. Service Room Doors.** A door to a *service room* may open outward from the *service room*.

10.4.5.4. Smoke Doors

* (1) Every corridor more than 55 m in length shall be subdivided by smoke doors.

* (2) A smoke door shall be equipped with an automatic closer actuated by *smoke detectors*, and shall be designed and installed to retard the passage of smoke.

10.4.6. Exits

* **10.4.6.1. Number of Exits and Travel Distance.** Every *floor area* shall be served by not less than 2 *exits*.

10.4.6.2. Travel Distance

* (1) *Exits* shall be located so that the travel distance from any part of the building to at least one *exit* is not more than

- (a) 25 m if the building is *unsprinklered*, or
- (b) 40 m if the building is *sprinklered*.

10.4.7. Fire Suppression

10.4.7.1. Standpipe and Hose System

* (1) If a *building*, or aggregate of *buildings* containing sleeping accommodation at one site, serves 60 or more persons and is not *sprinklered*, each *building* shall be provided with a standpipe and hose system conforming to Sentences (2) to (7).

* (2) A fire fighting water supply of not less than 13.5 m³ for each *building* shall be supplied, but the total water supply at one site need not be more than 27 m³.

* (3) At least one hose cabinet shall be provided and it shall contain a hose not more than 30 m in length with a minimum inside diameter of 38 mm and adequate to reach all parts of the *building* with a water stream.

* (4) In determining the location of a hose cabinet, allowance for spray shall be made only from the door of a bedroom to the back corner of the bedroom.

* (5) A hose is to be equipped with a nozzle that is adjustable from fog to a straight stream.

(6) The minimum residual pressure at the hydraulically most remote hose station shall be 300 kPa, with a flow rate of not less than 5 L/s.

(7) The fire fighting water system may be combined with the domestic system, however the water storage required for fire fighting shall not be depleted by the domestic system.

(8) Requirements for a *building* that has separate water lines for hose and standpipe systems may be established by the Director.

(9) An aggregate of *buildings* as referred to in Sentence (1) shall be considered as being a Group of *buildings* that

- (a) function as one unit and are not more than 10 m from each other, or
- (b) are physically connected to each other by corridors, *walkways* or other facilities through which fire or smoke could spread.

10.4.7.2. Sprinkler System. Where a *sprinkler* system is required, it shall be designed constructed, installed and tested in conformance with NFPA 13 "Installation of Sprinkler Systems" and shall conform to Sentences 1.5.2.1.(1), 1.5.2.2.(1) and 1.5.2.2.(2), notwithstanding other provisions of this Code. (See Appendix A.)

10.4.7.3. Portable Fire Extinguishers. Portable fire extinguishers shall be provided conforming to NFPA 10, "Standard for Portable Fire Extinguishers."

10.4.8. Electrical

10.4.8.1. Specific Electrical Requirements. Not less than 2 duplex receptacles shall be installed in each sleeping room.

10.4.9. Foamed Plastic

10.4.9.1. Foamed Plastic

(1) *Foamed plastic* shall not be exposed in any part of a *building*.

(2) Sentence (1) applies to the space beneath the module and to a roof space in addition to other parts of the *building*.

10.4.9.1.

- * (3) Where *foamed plastic* is used, the *foamed plastic* shall have a *flame-spread rating* not more than 25.
- * (4) Where *foamed plastic* is used, the surface shall be protected from interior spaces in the *building* by 12.7 mm gypsum board or by a *thermal barrier* complying with CAN4-S124-M, "Standard Method of Test for the Evaluation of Protective Coverings for Foamed Plastic," Classification A.

Section 10.5 Health Requirements

10.5.1. Heating and Ventilation

- * 10.5.1.1. **Design.** Heating equipment shall be capable of maintaining a temperature of 20°C within a *building* when the outside temperature is -45°C and the wind velocity is 25 km/h.

10.5.1.2. Insulation

- * (1) All exterior wall and roof cavities shall be completely filled with insulation having a resistance to heat flow not less than that provided by glass fibre batts but the resistance need not be more than 2.1 m²·°C/W.
- * (2) A floor assembly above an unheated space shall include thermal insulation with a thermal resistance of not less than 2.1 m²·°C/W.
- * (3) Installation and fastening of insulation shall ensure that it cannot be displaced during transportation.

- * 10.5.1.3. **Ventilation.** Ventilation requirements shall be in accordance with ASHRAE Standard 62 "Standards for Natural and Mechanical Ventilation."

10.5.1.4. Circulation

- * (1) In a *building* to which this Part applies, air may be circulated if
 - (a) supply and return air systems are ducted, and
 - (b) 100% of the supply air is exhausted and not returned from
 - (i) washroom facilities,
 - (ii) clothes drying areas, and

- (iii) kitchens and other areas containing cooking facilities.

10.5.1.5. Forced Air System. A forced air heating system shall be provided with air filters. *

10.5.1.6. Ducts

(1) All ducts for a heating system and for a ventilation system shall be constructed of galvanized steel. *

(2) An air duct without a *fire damper* may pass through walls with membrane protection, except for walls of a *service room*. *

10.5.1.7. Vapour Barrier. If a vapour barrier is used for openings for items such as electrical outlet and junction boxes, ducts, windows or doors, the integrity of the vapour barrier around the opening shall be maintained. *

10.5.1.8. Screens. A *building* used for eating, cooking or sleeping shall have screens to prevent the entrance of flies and other insects over all doors, windows and other openings to the exterior. *

10.5.2. Plumbing Facilities

10.5.2.1. Number of Fixtures

(1) The fixtures in each washroom shall be based on the number of persons using that washroom, shall conform to Sentences (2) and (3) and, if persons of each sex are to be accommodated, a separate washroom shall be provided for each sex. *

(2) For a *building* with sleeping accommodation *

- (a) water closets shall be provided on the basis of 1 unit for every 5 persons or part thereof up to 15 persons and 1 unit for every 15 persons or part thereof in excess of 15 persons;
- (b) lavatories shall be provided on the basis of 1 unit for every 5 persons or part thereof;
- (c) showers or tub baths shall be provided on the basis of 1 unit for every 11 persons or part thereof;
- (d) urinals shall be provided in washrooms for males on the basis of 1 unit for every 25 persons or part thereof; and
- (e) laundry facilities shall be provided.

- * (3) In a *building* not covered by Sentence (2) water closets and lavatories shall conform to Part 7.
- * **10.5.2.2. Piping.** Piping in corridor walls and in walls separating sleeping rooms shall be *noncombustible*.
- * **10.5.2.3. Heat Tape.** If heat tape is used on *combustible* drain, waste and vent pipes it shall be provided with devices to ensure that it will not exceed temperatures recommended by the *combustible* pipe manufacturer and it shall be installed in accordance with the manufacturer's recommendations and instructions, except that a heat tape shall be not closer than 50 mm to any other *combustible* material.
- * **10.5.2.4. Sewage Disposal.** Waste water from plumbing fixtures shall be discharged to a public sewage system if a system is available, otherwise it shall be discharged to a *private sewage disposal system* or to a sewage holding tank in accordance with the Plumbing and Drainage Act and regulations made pursuant to that Act.

Section 10.6 General Safety

10.6.1. Spatial Separation

- * **10.6.1.1. Spatial Separation.** Except as permitted by Article 10.6.1.2. and Subsection 3.2.3., the spatial separation between *buildings* shall be not less than 10 m.
- 10.6.1.2. Walkways or Corridors**
 - * (1) The spatial separation between the end walls of modules containing sleeping accommodation may be less than 10 m if the end walls adjoin a *walkway* or corridor
 - (a) whose width is not less than 3 m,
 - (b) that is *sprinklered*,
 - (c) that is separated from any adjoining module or *building* by a *fire separation* with a *fire-resistance rating* not less than 45 min and the *fire separation* extends through any crawl space to the ground and has no *combustible* pipe penetrating it, and
 - (d) that contains no *combustible* piping that is not buried below ground.

10.6.1.3. Proximity to Vegetation. A *building* shall be located not closer than 15 m to any bushes, trees or similar vegetation.

10.6.2. Skirting

10.6.2.1. Skirting

- * (1) Except as permitted in Sentence (2), skirting on a module, if installed, shall be *noncombustible* or have *noncombustible* cladding.
- * (2) Where a single module is 15 m or more from trees or shrubs or similar vegetation, the skirting, if installed, may be *combustible*.
- * (3) Skirting shall be installed if the wall of a module is less than 15 m from the wall of another module or from another wall of the same module that forms an included angle of less than 135°.
- * (4) Skirting shall be installed on that portion of the space beneath the module that is more than 750 mm in height measured at the exterior face of the module and measured between the ground surface and the underside of the module.

10.6.3. Fire Alarm

10.6.3.1. Fire Alarm Systems

- * (1) A fire alarm system shall be installed in accordance with CAN/ULC-S524-M "Standard for the Installation of Fire Alarm Systems," in a *building*
 - (a) providing sleeping accommodation for more than 10 persons,
 - (b) providing dining facilities for more than 100 persons,
 - (c) providing recreational facilities for more than 150 persons, or
 - (d) if required by other Parts of this Code, except as varied by Clauses (a), (b) and (c).
- * (2) The fire alarm system required in Sentence (1) shall be tested to ensure satisfactory operation in conformance with CAN/ULC-S537-M, "Standard for the Verification of Fire Alarm System Installations" except that the verification may be done by an electrician qualified by the Fire Prevention Branch. e

10.6.3.2.

- * **10.6.3.2. Pull Stations.** A manual pull station conforming to ULC-S528, "Standard for Manually Actuated Signalling Boxes for Fire Alarm Systems," shall be located adjacent to each *exit* within a *building* requiring a fire alarm system so that no person can leave the *building* through an *exit* without passing a manual pull station.
- * **10.6.3.3. Heat Detectors.** Heat actuated *fire detectors* conforming to ULC-S530, "Standard for Heat Actuated Fire Detectors for Fire Alarm Systems," shall be placed in each *service room*, storage room, kitchen and clothes drying area in a *building* requiring a fire alarm system.
- * **10.6.3.4. Smoke Detectors.** If a fire alarm system is required by Sentence 10.6.3.1.(1), *smoke detectors* conforming to CAN/ULC-S529, "Standard for Smoke Detectors for Fire Alarm Systems," shall be installed in every corridor serving rooms containing sleeping accommodation.

10.6.3.5. Smoke Alarms

- * (1) A *smoke alarm*
 - (a) conforming to CAN/ULC-S531, "Standard for Smoke Alarms," and
 - (b) equipped to show that it is in operating conditionshall be installed on the ceiling of every room providing sleeping accommodation and may be tied into the *building* fire alarm system.
- * (2) A *smoke alarm* shall be installed by permanent connection to an electrical circuit and shall have no disconnect switches between the overcurrent device and the *smoke alarm*.

10.6.4. Kitchen Ventilation

- * **10.6.4.1. Cooking Equipment Ventilation System.** Except as provided in Article 10.6.4.2., every kitchen containing commercial cooking equipment used in processes producing smoke or grease-laden vapours, shall be equipped with a mechanical exhaust system conforming to NFPA 96, "Standard for the Installation of Equipment for the Removal of Smoke and Grease-Laden Vapours from Commercial Cooking Equipment."

10.6.4.2. Kitchen Hoods, Canopies and Exposed Exhaust Ducts

- (1) Ducts for a kitchen exhaust system shall be constructed of 0.84 mm minimum thickness stainless steel.
- (2) A demountable exhaust extension may be used if the connection is exposed and is grease-tight.
- (3) The air flow in and around a canopy or hood shall be in accordance with good engineering practice and each design shall be submitted for review to the *authority having jurisdiction*.
- (4) The required clearance from the exhaust duct to *combustible* material may be waived if a 25 mm air space, having no materials in it, separates the exhaust duct from a *noncombustible* material backed by not less than 25 mm of mineral wool insulation which protects the *combustible* material.
- (5) The required clearance from the hood or canopy to *combustible* material may be waived if a 50 mm air space, having no materials in it, separates the hood from a *noncombustible* material backed by not less than 25 mm of mineral wool insulation which protects the *combustible* material.
- (6) A sidewall fan may be used.
- (7) A fan shall be rated for continuous use as a commercial exhaust fan.

10.6.4.3. Exception for Existing Modules

- (1) A canopy or hood installed before June 30, 1985, is permitted to have other than welded joints and seams.
- (2) In modules constructed prior to June 30, 1985, the kitchen mechanical exhaust and fire suppression system is considered acceptable providing:
 - (a) the canopy completely covers all commercial cooking *appliances* and is complete with filters;
 - (b) an automatic fire suppression system is located in the canopy; and
 - (c) the system provides mechanical exhaust sufficient to remove grease-laden vapours.

10.6.5. Lighting

- * **10.6.5.1. Emergency Lighting.** Emergency lighting shall be provided to average levels of not less than 10 lx at floor or tread level in all corridors and in areas serving as *access to exit* from *buildings* having an *occupant load* of more than 20 persons.
- * **10.6.5.2. Exit Signs.** An illuminated *exit* sign shall be installed at each *exit* location serving a *building* having an *occupant load* of more than 20 persons.

10.6.6. Doors

- * **10.6.6.1. Exit Door Hardware.** Every *exit* door from a *building* containing sleeping, dining or recreational facilities shall be equipped with plunger type hardware or hardware listed and labelled by a testing agency, that will release and allow the door to swing open if a force not exceeding 90 N is applied to the hardware in the direction of *exit* travel.

Section 10.7 Identification

10.7.1. Labelling

10.7.1.1. Identification Plate

- * **(1)** Each *building* module conforming to this Part shall be clearly and permanently identified with a plate showing
 - (a) the date of construction,
 - (b) the name of the *constructor*,
 - (c) the address of the *constructor*,
 - (d) the Model Number and Serial Number, and
 - (e) the structural and mechanical design parameters.
- * **(2)** The identification plate shall be fixed to the module in a location that shall be visible when the unit is complexed or standing alone.
- * **(3)** In the case of a *building* module constructed after September 1, 1991, the identification plate required by Sentence (1) shall be affixed at the time of construction.

(4) In the case of a *building* module constructed before September 1, 1991, the identification plate required by Sentence (1) shall be affixed before relocation to a new site. *



Part 11

Exterior Acoustic Insulation

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Part 11

Exterior Acoustic Insulation

Section 11.1 Application

11.1.1. Scope

- * **11.1.1.1. Scope.** This Part applies to *buildings* that are allowed to be constructed subject to acoustic insulation requirements, within an airport vicinity protection area established by an *AVPA regulation*.

Section 11.2 Design

11.2.1. General

- * **11.2.1.1. Design.** In the application of Tables 11.2.1.A to 11.2.1.E each component includes the total of all elements or assemblies of the exterior envelope of the room or space that are of the same type, and the combined area of those elements or assemblies is to be used as the component area.

11.2.1.2. Acoustic Insulation Factor

- * **(1)** The *building* shall be designed and constructed so that the *acoustic insulation factor* for each component of the exterior envelope of every room or space used for sleeping in
 - (a) institutional occupancies, and
 - (b) residential occupanciesshall not be less than the value derived from Table 11.2.1.A.
- * **(2)** The *building* shall be designed and constructed so that the *acoustic insulation factor* for each component of the exterior envelope of
 - (a) every living room, dining room, recreational room, and all other rooms of a

similar nature, in *residential occupancies*, and

- (b) every classroom and all other rooms of a similar nature

shall be not less than the value derived from Table 11.2.1.B.

(3) The *building* shall be designed and constructed so that the *acoustic insulation factor* for each component of the exterior envelope of

- (a) every kitchen, bathroom, laundry room, and all other rooms of a similar nature, in *residential occupancies*, and

- (b) every private office, conference room, meeting room and all other rooms of a similar nature

shall be not less than the value derived from Table 11.2.1.C.

(4) The *building* shall be designed and constructed so that the *acoustic insulation factor* for each component of the exterior envelope of general office areas, reception areas and all other rooms and spaces not included in Sentences (1) to (3) is not less than the value derived from Table 11.2.1.D.

11.2.1.3. Multiple Factors

(1) If one or more components of the exterior envelope of a *building* have an *acoustic insulation factor* that is more than the value required by Sentences 11.2.1.2.(1) to (4) the *acoustic insulation factor* for one or more other components of the exterior envelope of the *building* may be less than the value required by Sentences 11.2.1.2.(1) to (4) if

- (a) the algebraic increase in transmitted sound power is not positive, and
- (b) Table 11.2.1.E. is used to redistribute the *acoustic insulation factor* requirements for

11.2.1.3.

components whose *acoustic insulation factor* deviates from the value required by Sentences 11.2.1.2.(1) to (4).

(2) If the *noise contour* value at a *building* site is more than 30, the mechanical ventilation system required by Sentence (1) shall be designed and installed in such a way that an *owner* or occupant of a *dwelling unit*, or *suite* used for *residential occupancy* need not make changes to the structure or dimensional changes to the ventilation system in order to install an air-conditioning system.

11.2.2. Ventilation

11.2.2.1. Mechanical Ventilation

- * (1) In *buildings* located on a site at which the *noise contour value* is 25 or more, *dwelling units* and *suites* used for *residential occupancy* shall be ventilated with a mechanical ventilation system that shall include a fresh air inlet duct that
- (a) has a minimum diameter of 150 mm,
 - (b) is insulated,
 - (c) has a regulating damper that does not conflict with the requirements of Article 9.33.1.10., and
 - (d) conducts outside air to the *return duct*.

11.2.3. Typical Assemblies

11.2.3.1. Values for Building Components.

* Tables 11.2.3.A. to 11.2.3.D. may be used to determine the *acoustic insulation factor* for some typical construction materials and assemblies, including windows, doors, exterior walls and roofs.

* Table 11.2.1.A.
Forming Part of Sentence 11.2.1.2.(1)

Acoustic Insulation Factor for Each Component of the Exterior Envelope of Rooms and Spaces Used for Sleeping																	
Number of Components Forming Exterior Portion of Room or Space Envelope	Noise Contour at <i>Building Site</i>																
	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	Over 40
1	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	43
2	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	46
3	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	48
4	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	49
5	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	50
6	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	51
Column 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18

11.2.1.B.

Table 11.2.1.B.
Forming Part of Sentence 11.2.1.2.(2)

Acoustic Insulation Factor for the Exterior Envelope of Living Rooms, Dining Rooms, Recreational Rooms, Classrooms, etc.																	
Number of Components Forming Exterior Portion of Room or Space Envelope	Noise Contour at <i>Building Site</i>																
	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	Over 40
1	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	38
2	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	41
3	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	43
4	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	44
5	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	45
6	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	46
Column 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18

Table 11.2.1.C.
Forming Part of Sentence 11.2.1.2.(3)

Acoustic Insulation Factor for the Exterior Envelope of Kitchens, Bathrooms, Laundry Rooms, etc. Private Offices, Conference Rooms, Meeting Rooms, etc.																	
Number of Components Forming Exterior Portion of Room or Space Envelope	Noise Contour at <i>Building Site</i>																
	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	Over 40
1	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	33
2	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	36
3	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	38
4	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	39
5	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	40
6	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	41
Column 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18

11.2.1.D.

*
Table 11.2.1.D.
 Forming Part of Sentence 11.2.1.2.(4)

Acoustic Insulation Factor for the Exterior Envelope of General Offices, Reception Areas and Other Rooms and Spaces not Included under Tables 11.2.1.A. to 11.2.1.C.																	
Number of Components Forming Exterior Portion of Room or Space Envelope	Noise Contour at <i>Building Site</i>																
	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	Over 40
1	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	28
2	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	31
3	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	33
4	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	34
5	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	35
6	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	36
Column 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18

Table 11.2.1.E.
Forming Part of Sentence 11.2.1.3.(1)

Redistribution of Acoustic Insulation Factors					
Component acoustic insulation factor from Tables 11.2.3.A. to 11.2.3.D. minus acoustic insulation factor derived from Tables 11.2.1.A. to 11.2.1.D.	Total Number of Components				
	2	3	4	5	6
	Percentage change in total transmitted sound power				
10 or more	-45	-30	-22	-18	-15
9	-44	-39	-22	-18	-15
8	-42	-28	-21	-17	-14
7	-40	-27	-20	-16	-13
6	-37	-25	-19	-15	-12
5	-34	-23	-17	-14	-10
4	-30	-20	-15	-12	-11
3	-25	-17	-12	-10	-8
2	-18	-12	-9	-7	-6
1	-10	-7	-5	-4	-3
0	0	0	0	0	0
-1	13	0	6	5	4
-2	29	20	15	12	10
-3	50	33	25	20	17
-4	76	50	38	30	25
-5	108	72	54	43	36
Column 1	2	3	4	5	6

11.2.3.A.

Table 11.2.3.A.
Forming Part of Article 11.2.3.1.

Acoustic Insulation Factor for Various Types of Window Glazing									
Acoustic Insulation Factor	Single Glazing Thickness, mm	Interpane spacing, mm							
		Double Glazing				Triple Glazing			
Window area as a percentage of total floor area of room or space 4 5 6 8 10 13 16 20 25 32 40 50 63 80		2 mm and 2 mm glass	3 mm and 3 mm glass	4 mm and 4 mm glass	3 mm and 6 mm glass	6 mm and 6 mm glass	3 mm, 3 mm and 3 mm glass	3 mm, 3 mm and 6 mm glass	
35 34 33 32 31 30 29 28 27 26 25 24 23 22	2	6							
36 35 34 33 32 31 30 29 28 27 26 25 24 23		13							
37 36 35 34 33 32 31 30 29 28 27 26 25 24	3	15	6						
38 37 36 35 34 33 32 31 30 29 28 27 26 25	4, 6	18	13	6					
39 38 37 36 35 34 33 32 31 30 29 28 27 26		22	16	13	6	6	6, 6		
40 39 38 37 36 35 34 33 32 31 30 29 28 27	9	28	20	16	13	13	6, 10	6, 6	
41 40 39 38 37 36 35 34 33 32 31 30 29 28		35	25	20	16	16	6, 15	6, 10	
42 41 40 39 38 37 36 35 34 33 32 31 30 29	12	42	32	25	20	20	6, 20	6, 15	
43 42 41 40 39 38 37 36 35 34 33 32 31 30		50	40	32	25	24	6, 30	6, 20	
44 43 42 41 40 39 38 37 36 35 34 33 32 31		63	50	40	32	30	6, 40	6, 30	
45 44 43 42 41 40 39 38 37 36 35 34 33 32		80	63	50	40	37	6, 50	6, 40	
46 45 44 43 42 41 40 39 38 37 36 35 34 33		100	80	63	55	50	6, 65	6, 50	
47 46 45 44 43 42 41 40 39 38 37 36 35 34		125	100	80	75	70	6, 80	6, 65	
48 47 46 45 44 43 42 41 40 39 38 37 36 35		150	125	100	95	90	6, 100	6, 80	
49 48 47 46 45 44 43 42 41 40 39 38 37 36			150	125	110	100		6, 100	
50 49 48 47 46 45 44 43 42 41 40 39 38 37				150	135	125			
Column 1	2	3	4	5	6	7	8	9	

Notes to Table 11.2.3.A.:

- (1) If the calculated percentage window area is not presented as a column heading, the nearest higher percentage column in the table values should be used.
- (2) *Acoustic insulation factor* data listed in the table are for well-fitted weather stripped units that can be opened. The *acoustic insulation factor* values apply only when the windows are closed. For windows fixed and sealed to the frame, add 3 to the *acoustic insulation factor* given in the table.
- (3) If the interpane spacing or glass thickness for a specific double-glazed window is not listed in the table, the nearest listed values should be used.
- (4) The *acoustic insulation factor* ratings for 9 mm and 12 mm glass are for laminated glass only; for solid glass subtract 2 from the *acoustic insulation factor* values listed in the table.
- (5) If the interpane spacings for a specific triple-glazed window are not listed in the table, use the listed case whose combined spacings are nearest the actual combined spacing.
- (6) The *acoustic insulation factor* data listed in the tables are for typical windows, but details of glass mounting, window seals, etc. may result in slightly different performance for some manufacturers' products. If laboratory sound transmission loss data (conforming to ASTM test method E-90) are available, these may be used to calculate the *acoustic insulation factor*.
- (7) For easy reference, glazing dimensions may be written in the form 2(100) to denote 2 mm glass (100 mm space) 2 mm glass.

Table 11.2.3.B.
Forming Part of Article 11.2.3.1.

Acoustic Insulation Factor for Exterior Wall Assemblies											
Type of Exterior Wall	Percentage of exterior wall area to total floor area of room or space										
	16	20	25	32	40	50	63	80	100	125	160
EW1	39	38	37	36	35	34	33	32	31	30	29
EW2	41	40	39	38	37	36	35	34	33	32	31
EW3	44	43	42	41	40	39	38	37	36	35	34
EW4	47	46	45	44	43	42	41	40	39	38	37
EW1R	48	47	46	45	44	43	42	41	40	39	38
EW2R	49	48	47	46	45	44	43	42	41	40	39
EW3R	50	49	48	47	46	45	44	43	42	41	40
EW5	55	54	53	52	51	50	49	48	47	46	45
EW4R	56	55	54	53	52	51	50	49	48	47	46
EW6	58	57	56	55	54	53	52	51	50	49	48
EW7 or EW5R	59	58	57	56	55	54	53	52	51	50	49
EW8	63	62	61	60	59	58	57	56	55	54	53
Column 1	2	3	4	5	6	7	8	9	10	11	12

Notes to Table 11.2.3.B.:

- (1) If the calculated percentage of wall area is not presented as a column heading, the nearest higher percentage column in the table should be used.
- (2) The common structure of walls EW1 to EW5 is composed of 12.7 mm gypsum board, vapour barrier, and 38 x 89 mm studs with 50 mm (or thicker) mineral wool or glass fibre batts in the inter-stud cavities.
- (3) EW1 denotes exterior wall as in Note (2), plus sheathing, plus wood siding or metal siding and fibre backer board.
EW2 denotes exterior wall as in Note (2), plus rigid insulation (25-50 mm), and wood siding or metal siding and fibre backer board.
EW3 denotes simulated mansard with structure as in Note (2), plus sheathing, 38 x 89 mm framing, sheathing, and asphalt roofing material.
EW4 denotes exterior wall as in Note (2), plus sheathing and 20 mm stucco.
EW5 denotes exterior wall as in Note (2), plus sheathing, 25 mm air space, 100 mm brick veneer.
EW6 denotes exterior wall composed of 12.7 mm gypsum board, rigid insulation (25-50 mm), 100 mm back-up block, 100 mm face brick.
EW7 denotes exterior wall composed of 12.7 mm gypsum board, rigid insulation (25-50 mm), 140 mm back-up block, 100 mm face brick.
EW8 denotes exterior wall composed of 12.7 mm gypsum board, rigid insulation (25-50 mm), 200 mm concrete.
- (4) R signifies the mounting of the interior gypsum board on resilient clips.
- (5) An exterior wall conforming to rainscreen design principles and composed of 12.7 mm gypsum board, 100 mm concrete block, rigid insulation (25-50 mm), 25 mm air space, and 100 mm brick veneer has the same *acoustic insulation factor* as EW6.
- (6) An exterior wall described in EW1 with the addition of rigid insulation (25-50 mm) between the sheathing and the external finish has the same *acoustic insulation factor* as EW2.

11.2.3.C.

Table 11.2.3.C.
Forming Part of Article 11.2.3.1.

Acoustic Insulation Factor for Roof-Ceiling Assemblies	
Roof-Ceiling Combination	Acoustic Insulation Factor
C1	41
C1R or C1D	44
C2 or C1DR	47
C3	49
C2D	50
C2DR	52
Column 1	2

Notes to Table 11.2.3.C.:

- (1) C1 denotes 12.7 mm gypsum board, 75 mm (or thicker) insulation batts, flat roof joist and beam construction, built-up roofing.
C2 denotes, 12.7 mm gypsum board, 75 mm (or thicker) insulation batts, typical wood roof truss with ventilated attic, sheathing and asphalt roofing.
C3 denotes paint finish, 150 mm concrete slab, 50 mm (or thicker) rigid insulation, built-up roofing.
- (2) D signifies the addition of a second layer of 12.7 mm gypsum board.
R signifies mounting the gypsum board on wood strapping or resilient clips.
DR signifies the addition of a second layer of 12.7 mm gypsum board mounted on resilient clips.
- (3) Wherever possible, ventilation openings to attic spaces should be in locations not directly exposed to aircraft noise.

Table 11.2.3.D.
Forming Part of Article 11.2.3.1.

Acoustic Insulation Factor for Exterior Doors									
Type of Exterior Door	Percentage of total exterior door area to total floor area of room or space								
	4	5	6.3	8	10	12.5	16	20	25
D1	30	29	28	27	26	25	24	23	22
D2	34	33	32	31	30	29	28	27	26
D3	36	35	34	33	32	31	30	29	28
D4	37	36	35	34	33	32	31	30	29
D5 or D1 - sd	38	37	36	35	34	33	32	31	30
D2 - sd	41	40	39	38	37	36	35	34	33
D3 - sd	43	42	41	40	39	38	37	36	35
D4 - sd	44	43	42	41	40	39	38	37	36
D5 - sd	45	44	43	42	41	40	39	38	37
D3 - D3	48	47	46	45	44	43	42	41	40
D5 - D5	50	49	48	47	46	45	44	43	42
Column 1	2	3	4	5	6	7	8	9	10

Notes to Table 11.2.3.D.:

- (1) If the calculated percentage door area is not presented as a column heading, the nearest higher percentage column in the table should be used.
- (2) All exterior doors must be fully weatherstripped.
- (3) D1 denotes 44 mm hollow-core wood door (up to 20% of area glazed).
D2 denotes 44 mm glass-fibre reinforced plastic door with foam or glass-fibre insulated core (up to 20% of area glazed).
D3 denotes 35 mm solid slab wood door.
D4 denotes 44 mm steel door with foam or glass-fibre insulated core.
D5 denotes 44 mm solid slab door.
- (4) sd denotes storm door of wood or aluminum with openable glazed sections. The *acoustic insulation factor* values apply when the glazed sections are closed.
- (5) Except as noted specifically above, doors shall not have inset glazing.

Appendix A

Explanatory Material for the Alberta Building Code 1990

A-1.2.2.1. 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 Appendix to this document is included for explanatory purposes only and does not form part of the requirements. The bold face reference numbers that introduce each item apply to the requirements in the Code.

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, Ontario K1A 0R6.

A-1.2.3.1.(1)(a) Farm and Acreage Buildings. Farm and acreage buildings 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,

A-1.2.3.1.

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-1.3.2.1. 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-1.3.2.1. Fire Separation. A fire separation may or may not have a fire-resistance rating.

A-1.3.2.1. 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-1.3.2.1. 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-1.3.2.1. 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.

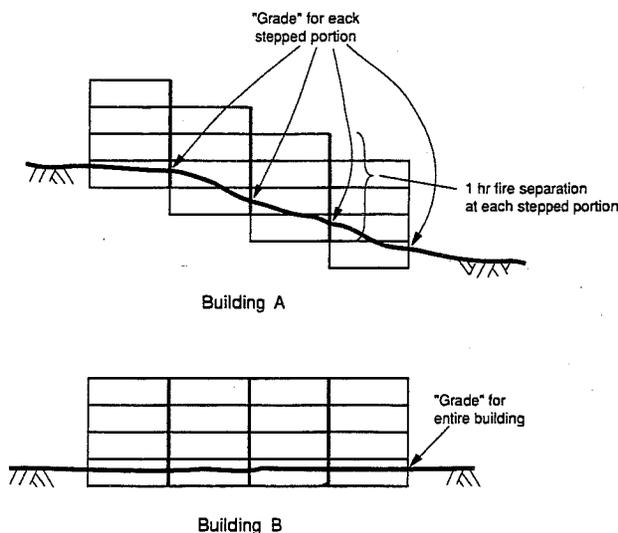
A-1.5.1.11.(1) Temporary Use. An inspector has the discretionary power to allow the temporary use or occupancy of a building even though the building may not comply entirely with all requirements of the ABC. Exceptions to compliance with all requirements are permitted because these buildings are intended for use and/or occupancy for short periods of time. It is a reasonable approach which allows tents or air-supported structures to be erected and occupied at carnivals, circuses, sideshows, auctions, religious outdoor events, etc. It also allows for more permanent structures, although still temporary in nature, to be used as school rooms, trailers on car dealer lots, storage sheds, office accommodation at construction sites or shelters to house plants during the spring season at shopping centres.

Part 10 provides some guidance in the acceptance of temporary structures used for offices. Temporary is usually thought of as being under three years.

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.



A-2.1.6.2.(1)

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 Table 2.2.1.A 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.(5) The 1 per cent values stated in Sentence 2.2.1.1.(5) are the design temperatures that must be used in determining heating and ventilation requirements for Alberta.

A-2.3.5.2. Plans for HVAC Systems. 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-2.3.6.2. Plans for Electrical Systems.

Examples of information that should be shown on architectural plans and plans for electrical 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 dimensions of all rooms,
- (f) the intended use of all rooms,
- (g) the details and descriptions of all windows and doors,
- (h) the details, descriptions and location of fire alarm and detection system components,
- (i) the location of lighting fixtures, switches and average illumination levels in "exits," "public corridors," corridors providing "access to exit" and public spaces,
- (j) the details, descriptions and location of emergency lighting fixtures,
- (k) the emergency electrical power system details,
- (l) details, descriptions and location of exit signs,

A-2.3.6.2.

- (m) the details, descriptions and location of voice communication system components, and
- (n) the details, descriptions and location of electromagnetic door release hardware.

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 in-

surance 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 intended 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

A-3.1.2.A.

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
e Pre-school Facilities (see Article 3.1.2.6.)
Psychiatric hospitals without detention quarters
Reformatories without detention quarters
Sanatoria 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 shops
Beauty parlours
Dental offices
Dry cleaning establishments, self-service, not using flammable or explosive solvents or cleaners
Hairstyling shops

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
Planning 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
 Warehouses
 Workshops

A-3.1.2.3. Arenas. 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 exceeds 1 500 m², the building shall be sprinklered. To be considered as "occasional use," more than two but fewer than ten trade shows or similar type exhibitions are to be held in the arena-type building during one calendar year.

A-3.1.4.2.(1)(b) 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 con-

struction and that is paper faced will not generally comply with the criteria in CAN4-S114-M for non-combustible 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 non-combustible 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 programme 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 assem-

A-3.1.5.5.

bly 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) and (f) Foamed Plastic Insulation Protection. The A classification of CAN4-S124-M, "Standard Method of Test for the Evaluation of Protective Coverings for Foamed Plastics" is more in line with the performance level set by CAN/ULC-S101-M, "Standard Methods of Fire Endurance Tests of Building Construction and Materials" after a period of 10 min.

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 ABC 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 of the ABC.

A-3.1.8.1.(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.(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 con-

A-3.2.3.1.

structed 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.

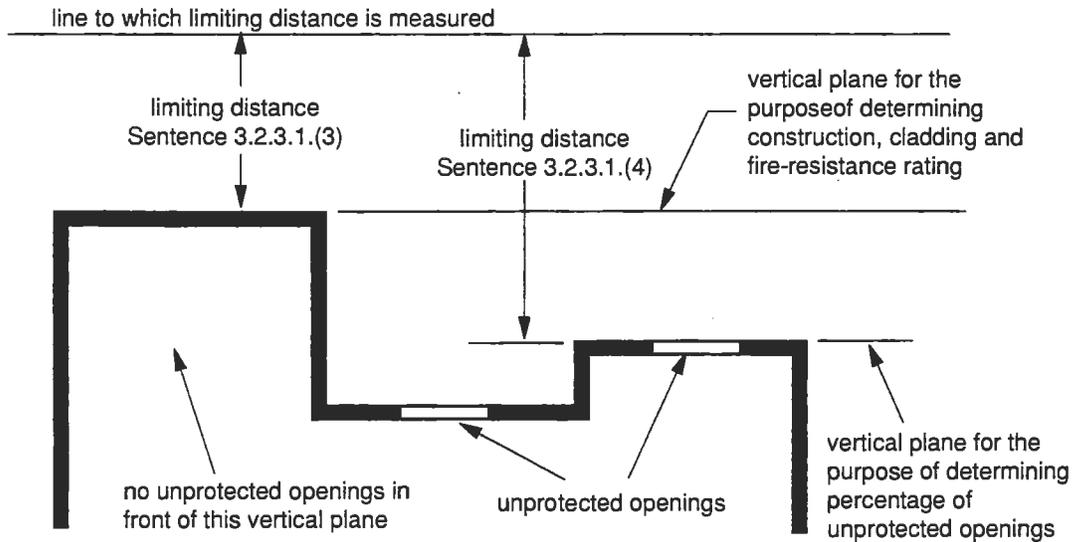
Examples of structures which cannot be identified with the descriptions of buildings in Articles 3.2.2.16. to 3.2.2.62. include grain elevators, refineries and towers.

A-3.2.2.12.(1) 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 for the application of Sentence (3) would be unnecessarily restrictive if the actual unprotected

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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).

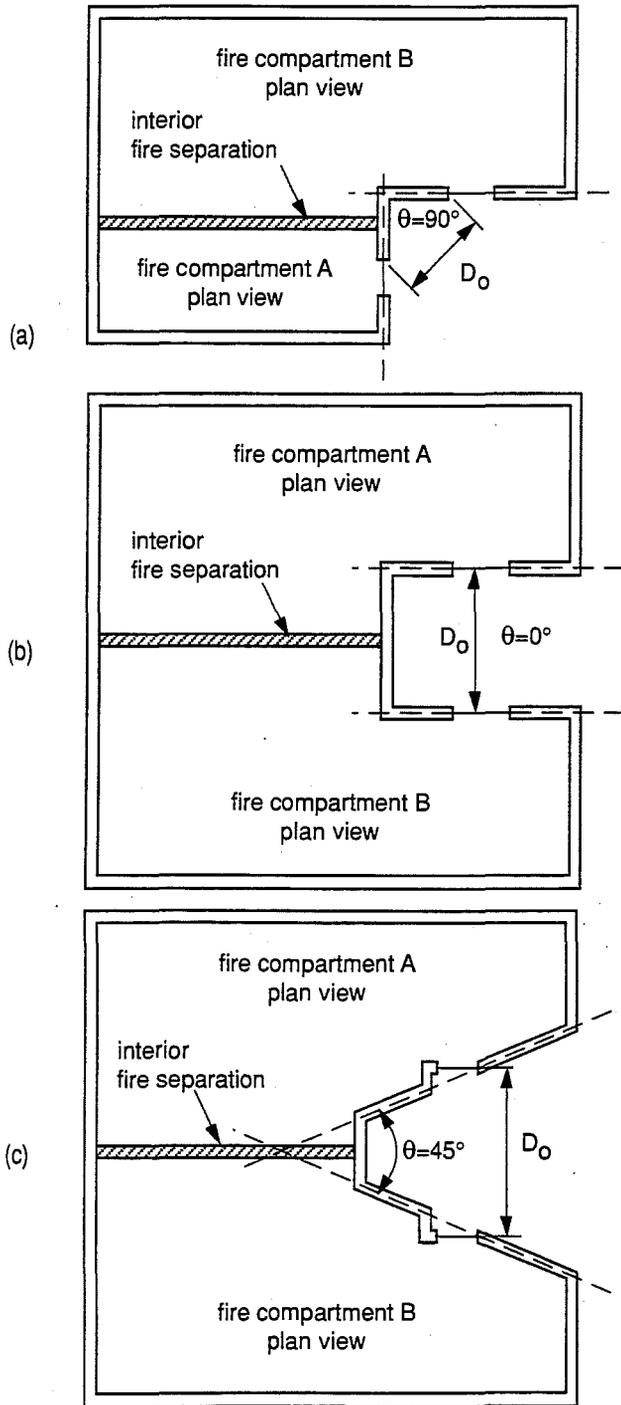
A-3.2.3.11. Increased Openings Permitted.

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 between the intersecting planes of the exposing building faces is 135° or less.

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A-3.2.3.14.(1)

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 two 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 Alberta Fire Code.

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 annunciation of the fire detectors in that room or space. In general, the lowest storey on which access is provided into the room or space should be indicated on the annunciator to 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.

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A-3.2.4.8.(5) Common Zoning. Common zone indication on the annunciator may be provided for the activation of alarm initiating devices and the waterflow 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 simple exit facility.

A-3.2.4.20.(4) Visual Indicator. If staff located in each zone or compartment can see each sleeping room door, visual indicators could be located above each door. If staff cannot see every door, it is intended that the visual indicators 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-3.2.5.8. Water Supply. Sentences (1) and (2) define the minimum water requirements for buildings exceeding 3 storeys in building height or 600 m² in building area. NFPA 1231, "Water Supplies for Suburban and Rural Fire Fighting - 1989," and Fire Underwriters Survey, "Water Supply for Public Fire Protection - A Guide to Recommended Practice 1990," should be consulted to determine optimum values.

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 materials. Therefore, while only NFPA 13 is called up directly in Sentence 3.2.5.13.(1), the additional criteria in the other NFPA standards are included automatically.

In some NFPA standards, certain aspects of sprinkler protection are dependent on the fire-resistance rating of the vertical structural members. In such cases, the sprinkler system design options can be affected by the fire protection provided in these elements. For example, in buildings used for the storage of rubber tires, sprinklers directed at the sides of a column are required if the column does not have the required fire-resistance rating.

Other NFPA standards may require that certain occupancies be sprinklered in conformance with NFPA 13, such as in the case of certain parking garages. These requirements do not supersede the requirements in the Code. An occupancy is required to be sprinklered only when this is specified in the Code, but when it is so required, it must be sprinklered in conformance with NFPA 13 and its referenced standards.

A-3.2.5.14.(1) Hazard Classification for Sprinkler Selection. The reference to light hazard occupancies is based on the descriptions of these occupancies given in NFPA 13, "Installation of Sprinkler Systems" and is intended only for use in the design of sprinkler systems. These descriptions should not be confused with the occupancy classifications in the 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 proscenias; 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 one 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 Alberta Fire Code 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 Alberta Fire Code.

A-3.2.6.2.(2) and (3) Smoke Control Measures. In a sprinklered building, the requirements for control of smoke movement can be handled by the exhaust system for the building.

It is also important that fire fighters are provided with a smoke-free access to below grade fire floors. Sprinklered buildings must include provisions designed to separate the exit stairs serving above grade storeys from those serving below grade storeys, and to limit entry of smoke into these shafts.

A-3.2.6.6. Connected Buildings. The requirement of Article 3.2.6.6. that limits movement of smoke from one building to another may be met by incorporating in the link between the buildings the following requirements.

- (1) Between one building and the other, there should be a firewall as described in Subsection 3.1.10.

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- (2) Any opening in the firewall should be protected against passage of smoke by a vestibule described in Sentence (3) and should have
- (a) a vent to the outdoors that has a net area of $10(0.023d + 0.00045a)m^2$, where d is the number of doors having a perimeter not more than 6 m that open into the vestibule, or if the perimeter of doors exceeds 6 m, the value of d is increased in direct proportion to the increase in the perimeter, and a is the area in m^2 of enclosing walls, floors and ceilings whose outer face is in contact with the outside air, except that where the outer face of a wall is in contact with the ground or fill, it is assumed that there is no leakage through that portion, and the value of a is assumed to be zero, or
 - (b) equipment capable of maintaining a supply of air into the vestibule sufficient to ensure that the air pressure in the vestibule when the doors are closed is higher by at least 12 Pa than that in adjacent floor areas when the outdoor temperature is equal to the winter design temperature on a 2.5 per cent basis.
- (3) Where a vestibule is required by Sentence (2) or by other provisions of this document,
- (a) a fire separation should be provided between a public corridor and the vestibule that has a fire-resistance rating of not less than 45 min,
 - (b) a fire separation should be provided between a floor area, other than the corridor described in (a), and the vestibule that has a fire-resistance rating not less than that required for an exit in Article 3.4.4.1.,
 - (c) a fire separation should be provided between a stair or elevator enclosure and the vestibule that has a fire-resistance rating not less than that required for an exit in Article 3.4.4.1., and
 - (d) a door in the fire separation described in (a), (b) or (c) (except for an elevator door) should be provided with a self-closing device as required by Subsection 3.1.8. of the ABC, and open in the direction of travel from the floor area to the exit stairway.

A-3.2.6.9.(6)(b) Electrical Conductor Protection. Electrical cables that provide continuous operation for 1 h when subjected to the CAN/ULC-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 Alberta Fire Code. 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 activated manually by the responding fire depart-

ment. 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 Areas. 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 Alberta Fire Code. 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 Alberta Fire Code.

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 Article 3.7.2.2., 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 Alberta Fire Code.

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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 1 050 mm minimum clear width of doorways accounts for door stops and, thus, is intended to allow for the use of 1 100 mm doors.

A-3.3.3.6.(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. 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-3.3.5. Industrial Occupancy. Many industrial processes are hazardous and subject to specific requirements under the Occupational Health and Safety Act and regulations made pursuant to that Act. These may have an effect on the design of industrial facilities.

A-3.3.5.2. Fire Extinguishing Systems for Flammable or Combustible Liquid Storage. Options for acceptable fixed fire extinguishing systems for protection of flammable or combustible liquid storage area include: automatic sprinkler, foam sprinkler, waterspray, carbon dioxide, dry chemical or halon systems. Appendix C of NFPA 30, "Flammable and Combustible Liquids Code," represents good engineering practice for design of sprinkler or foam water systems for flammable and combustible liquid storage areas.

A-3.3.5.11.(2) Volume of Tire Storage. The volume of tires in a storage area can be determined by measuring to the nearest 0.1 m the length, width and height of the piles or racks intended to contain the tires. In racks, the top shelf is assumed to be loaded to maximum possible height, while observing required clearances between structural elements and sprinklers.

A-3.3.5.13.(7) Propane Cylinder Storage. Propane cylinders used for fuelling hot air balloons are to be stored outdoors in conformance with CAN/CGA-B149.2 or in Special Cylinder Storage Buildings as described below.

- (1) A Special Cylinder Storage Building is to be a stand-alone building (not separated from other

buildings by firewalls), is to be used for no other purpose (except as provided for in item 9), is to have no other occupancy, and is to be separated from all other buildings by spatial separation in accordance with item 6.

- (2) Storage within such spaces is limited to balloon fabric, balloon baskets and their associated propane cylinders.
- (3) Explosion relief designed in accordance with NFPA 68 "Guide to Explosion Venting" or CAN/CGA-B149.2, and at least 1 m² per 15.25 m³ is to be provided by
 - (a) an open area,
 - (b) an outwardly opening sash (unlockable and unlatchable),
 - (c) explosion relief panels, or
 - (d) single strength glass.
- (4) Each storage room is to be ventilated to the outside by vents located at the top and bottom of opposite walls to provide good circulation patterns. Each vent is to provide an unobstructed opening of at least 1/500 of the floor area in size. Such vents are to be located at least 3 m from any air intake into the building and 7.6 m from a source of ignition outside of the building.
- (5) The floor level of each storage room is to be at, or above, exterior grade. Any space below a Special Cylinder Storage Building is to be ventilated to the outside by vents located on opposite walls to provide good circulation patterns. Each vent is to provide an unobstructed opening of at least 1/500 of the floor area in size. Such vents are to be located at least 3 m from any air intake into the building and 7.6 m from a source of ignition outside of the building. Such spaces are to be free of all combustible material.
- (6) Special Cylinder Storage Buildings are to have spatial separations greater than or equal to the following chart or in accordance with Subsection 3.2.3. of the Alberta Building Code, whichever requires the greater distance:
 - (a) nearest building or group of buildings,
 - (b) line of adjoining property which may be built upon,
 - (c) thoroughfares or sidewalks, and
 - (d) line of adjoining property occupied by

Cylinder Storage Clearances

Quantity of Propane	Distance to	
	(a) & (b)	(c) & (d)
up to and including 225 kg	3 m	3 m
225 to 1 135 kg	4.5 m	7.5 m
1 135 to 2 270 kg	7.5 m	7.5 m
over 2 270 kg	7.5 m	7.5 m

schools, churches, hospitals, athletic fields or other places of public gathering.

- (7) No points of ignition, such as smoking, welding or cutting, or heating appliances, are to be located inside of the building. Signs indicating these restrictions are to be posted throughout the space in accordance with the Alberta Fire Code.
- (8) The Special Cylinder Storage Building is considered by the Canadian Electrical Code to be a "Class 1, Division 2, Group D" hazardous location and all electrical wiring must comply with the requirement of the Canadian Electrical Code as adopted by the Province of Alberta for that hazard.
- (9) If the Special Cylinder Storage Building is also to be used for repair work to balloons, or if it is to be heated, a propane detection system is to be installed and connected to an exterior and an interior alarm, as well as a mechanical ventilation system capable of maintaining the interior atmosphere to maximum 20% of the lower explosion limit of propane.

A-3.3.5.20.(2) NFPA Standards. National Fire Protection Association Standards on dust explosions include

- NFPA 48, "Standard for the Storage, Handling and Processing of Magnesium,"
- NFPA 61A, "Standard for the Manufacturing and Handling of Starch,"
- NFPA 61B, "Standard for Prevention of Fire and Explosions in Grain Elevators and Facilities Handling Bulk Raw Agricultural Commodities,"
- NFPA 61C, "Standard for the Prevention of Fire and Dust Explosions in Feed Mills,"

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- NFPA 61D, "Standard for the Prevention of Fire and Dust Explosions in the Milling of Agricultural Commodities for Human Consumption,"
- NFPA 65, "Standard for the Processing and Finishing of Aluminum,"
- NFPA 650, "Standard for Pneumatic Conveying Systems for Handling Combustible Materials,"
- NFPA 481, "Standard for the Production, Processing, Handling and Storage of Titanium,"
- NFPA 482, "Standard for the Production, Processing, Handling and Storage of Zirconium,"
- NFPA 651, "Standard for the Manufacture of Aluminum or Magnesium Powder,"
- NFPA 120, "Standard for Coal Preparation Plants,"
- NFPA 654, "Standard for the Prevention of Fire and Dust Explosions in the Chemical, Dye, Pharmaceutical and Plastics Industries,"
- NFPA 655, "Standard for the Prevention of Sulfur Fires and Explosions,"
- NFPA 664, "Standard for the Prevention of Fires and Explosions in Wood Processing and Woodworking Facilities," and
- NFPA 91, "Standard for the Installation of Blower and Exhaust Systems for Dust, Stock and Vapor Removal or Conveying."

A-3.4.1.1. 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. Alternate 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 1 100 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. thus 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 in turn 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 the 0.3 m² per person is provided in the stairshaft 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

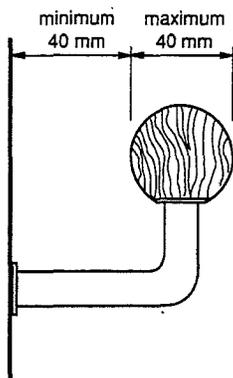
by a fire separation having a fire-resistance rating at least equal to that required for the exit, unless one of the exceptions in this Clause is applied.

A-3.4.6. Application to Means of Egress.

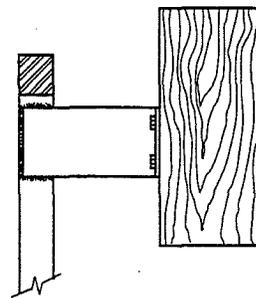
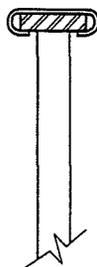
The requirements in Subsection 3.4.6. apply to interior and exterior exits as well as to ramps, stairways and passageways used by the public as access to exit. The treads, risers, landings, handrails and guards for the latter access to exit facilities must thus be provided in conformance with the appropriate 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 limitations 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.



Easy to grasp



Difficult to grasp

A-3.4.6.10.

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-3.4.6.15.(4) Electromagnetic Lock. Electromagnetic locks are intended for use where there is a need for security additional to that provided by traditional exit hardware. They are not intended for indiscriminate use as alternative locking devices. The design of such devices requires evaluation to ensure that their operation will be fail safe in allowing exiting in the event of foreseeable emergencies. Where more than one locking device is used in a building, it is anticipated that one switch is used to release and reset all such devices simultaneously.

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 so as 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-3.5.2.9.(9) Pad Mounted Transformer Clearances from Buildings. Dielectric liquid filled pad-mounted distribution transformers shall be located at least 3 m from any combustible surface or material on a building and at least 6 m from any window, door or ventilation opening on a building.

Where this is not practicable, a lesser distance shall be permitted if a barrier is constructed between the transformer and the building. A solid concrete block barrier at least 200 mm thick, a reinforced concrete barrier at least 150 mm thick or other materials having an equivalent strength and fire-resistance rating must be used.

It is necessary, when a barrier is constructed, to apply the line-of-sight distance to all parts of the trans-

former case and cooling fins. Therefore, the barrier must be of a size that the line-of-sight distance from the building or opening in question, past the barrier to any point of the transformer, is not less than the required distance.

Transformers installed in below grade sidewalk vaults are not considered to present the same hazards because they are not subject to mechanical damage by location. However, adjacent walls must not have combustible surfaces, doors, vents or openings adjacent to the grills in the sidewalk.

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-3.5.4.7.(2) Roof Access. Roof access is provided for two reasons: fire fighting and servicing of service equipment. Article 3.2.5.4. deals with the requirement for fire fighting access.

A-3.5.5.1.(3) Fastening of Elevator Guide Rails. It is essential that the attachment of elevator guide rails be of sufficient strength to withstand the forces imposed. Therefore, provision must be made in the design and construction of all elevator hoistways for adequate supports for guide rail fastenings in the form of reinforced concrete or structural steel. Concrete block, brick, terracotta or similar materials will not be accepted for the anchorage of guide rail brackets.

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-3.7.2.1.(4)(a) 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 unob-

structed 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-3.7.2.2. Fixed Seating. Seating areas for disabled persons should be scattered rather than located in one place, so as to provide a choice of location for the users.

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). Part 7, 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

A-3.7.2.3.

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 impractical or where Part 7 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-3.7.2.4.(3) Parking. Parking stalls for use by disabled persons should be identified with the international symbol of access and should include the words "Permit Required." Requiring disabled persons to pass behind vehicles that would normally back out of a space should be avoided. Asphalt, concrete or firm gravel are acceptable parking surfaces. Curb cuts should be at least 920 mm wide. Parallel parking stalls should be 7 m in length.



A-3.7.2.4.(3)

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-3.7.3.1.

A-3.7.3.1.(4) Accessibility for the Deaf. The international sign indicating accessibility for the deaf and hard of hearing should be used to indicate the availability of variable volume controls on telephones, telecommunication devices for the deaf (TDD) and assistive listening systems. Locations of assistance for blind persons should be identified with the appropriate symbol.



A-3.7.3.1.(4)

A-3.7.3.2. Exterior Walks for a Barrier-Free Building. Where more than one exterior walk leads to a building required to be barrier-free, only one needs to comply with the barrier-free requirement.

Walks must have an even surface and permit a continuous and uninterrupted path of travel. The mini-

A-3.7.3.3.

imum width requirement allows a person in a wheelchair to pass an ambulatory person with ease.

It is important to note that the surface of a walk must be firm and even. Uneven surfaces can be hazardous, not only to a person in a wheelchair but also to an ambulant person with a disability. When precast units such as brick pavers, concrete slabs, or tiles are used, care should be taken to ensure that all joints are as flush as possible, with a tolerance of 6 mm being the preferred upper acceptable limit. In all cases, the selected material must also be slip-resistant, which is of primary concern to an ambulant person with a disability.

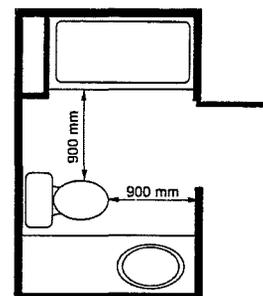
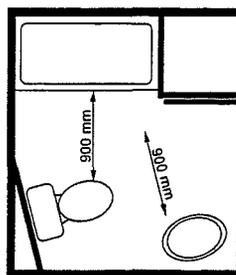
It is recommended that gratings be avoided on walks but if they are used, they should not have spaces greater than 13 mm in one direction. If gratings have elongated openings, they should be placed so that the long dimension is at right angles to the direction of travel.

Having a difference in texture where a walk is level and even with adjacent surfaces serves as a tactile indicator to persons with visual impairments. This would be applicable only to large open areas such as plazas and would not, for example, apply to a wide concrete walk with grass on each side.

The requirement to have an area free from obstructions is primarily to aid persons with visual impairments. Examples of such obstructions are directional signs, tree branches and guy wires. The only projections permitted are handrails. Although a height greater than 1 980 mm is preferred, in order to maintain consistency this minimum height corresponds to the minimum headroom clearance for doorways. A 75 mm curb is required to help guide a sight impaired person using a cane and to prevent the front guide wheels of a wheelchair from accidentally going over the edge.

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.(2)

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.

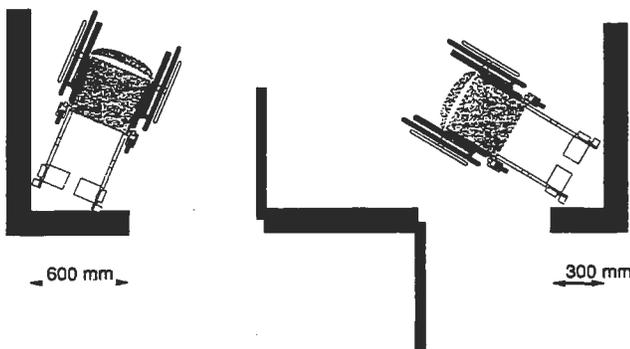
A-3.7.3.3.(8) Air Pressure Differences. Differences in air pressure on opposite sides of a door may be due to the operation of mechanical systems such as

A-3.7.3.3.

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.

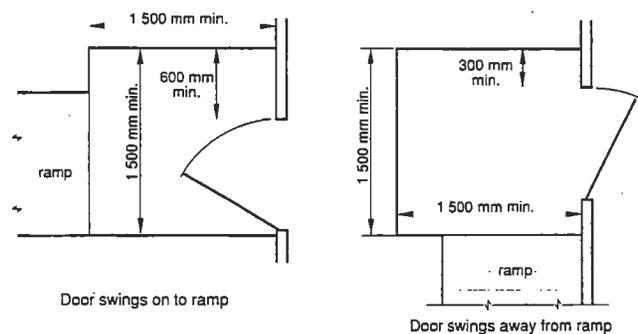


A-3.7.3.3.(10)

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 strip contrasting in colour and texture should be used at the top and bottom of ramps to warn blind and visually impaired persons.

A-3.7.3.4.(1)(c) Level Areas at Doorways on Ramps



A-3.7.3.4.(1)(c)

A-3.7.3.7. Assistive Listening Systems.

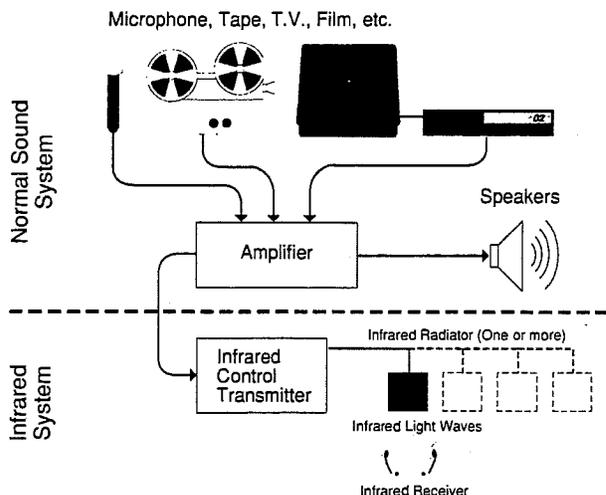
Wireless sound transmission systems, such as FM, infrared or magnetic induction loop, improve sound reception for the hard of hearing by providing amplification which can be adjusted by each user while blocking out unwanted background noise. These systems transmit a signal that is picked up by special 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

A-3.7.3.8.

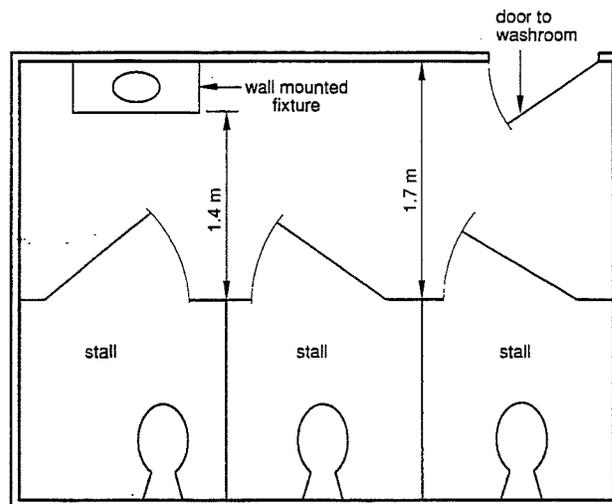
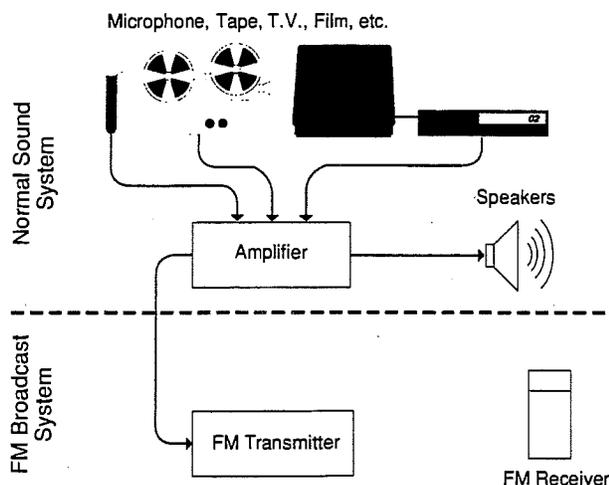
should be knowledgeable about these systems if proper functioning is to be achieved. FM or infrared systems can be designed to broadcast signals which cover the entire room and, thus do not restrict seating to any one area. The diagrams show the general configuration of FM and infrared systems. Although 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.3.7.3.7.

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.

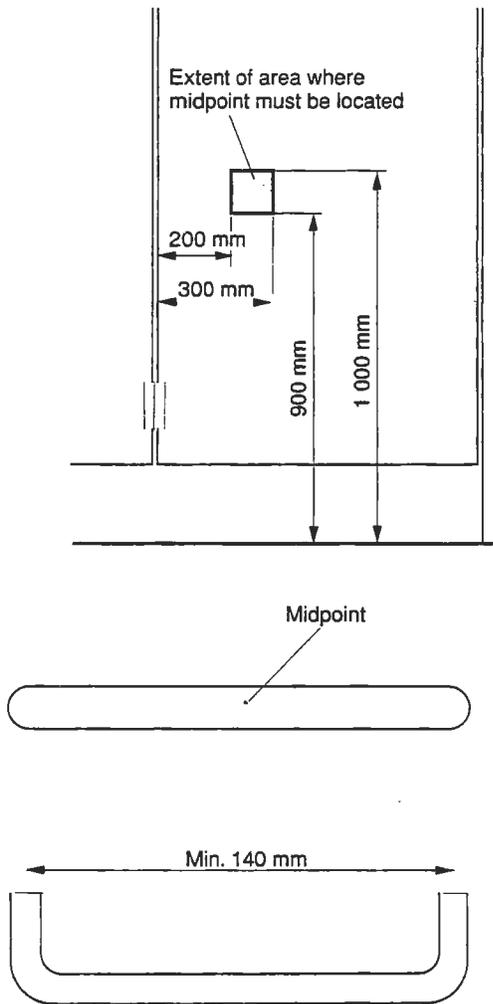


A.3.7.3.8.(1)

A-3.7.3.8.(1)(b)(iv) Door Pulls. The door pull should consist of a D-shaped handle mounted either horizontally or vertically. The centrelines 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

A-3.7.3.8.

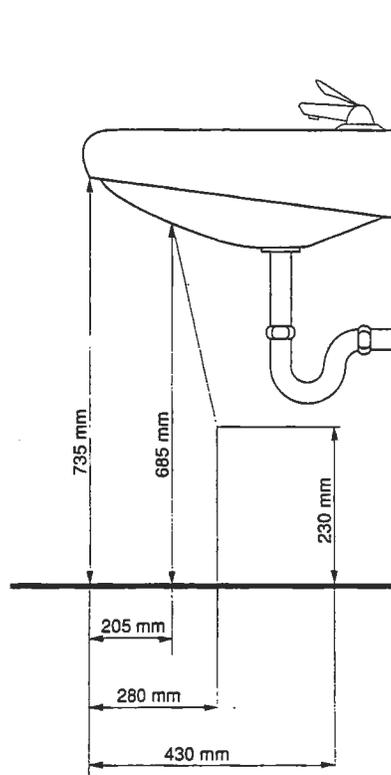
centreline which must be located at between 200 and 300 mm from the hinged side of the door, and the long or longitudinal axis is the one which is located between 900 and 1 000 mm from the floor. If the handle is installed in the vertical position, the distance is measured from the longitudinal axis to the hinged side of the door, while the distance from the floor is measured to the transverse axis.



A.3.7.3.8.(1)(b)(iv)

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.

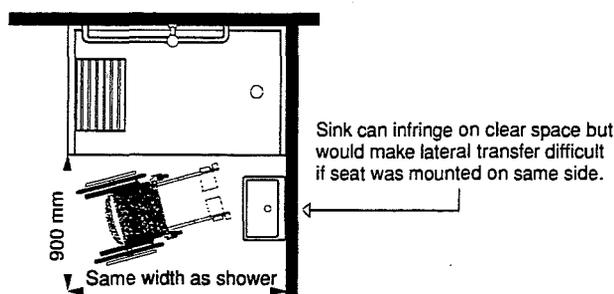
A-3.7.3.10.(1)(c) Clearances Below Lavatories



A.3.7.3.10

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.



A-3.7.3.12.(1)(b)

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 Building Code.

A-4.1.1.3.(1) Structural Integrity. The requirements of Part 4 of the Alberta 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 nonstructural 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.

A-4.1.3.3. Load Combinations. Information on load combinations can be found in the Commentary on Load Combinations for Structural Design in Chapter 4 of the Supplement to the NBC 1990.

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 area-ways and basements. Where appropriate the designer should refer to CAN3-S6, "Design of Highway Bridges."

A-4.1.7.1.(1) to (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) and (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.

A-4.1.8.1.(5)(c) Dynamic Approach for Wind Loads. Information on a dynamic approach can be found in the Commentary on Wind Loads in Chapter 4 of the Supplement to the NBC 1990.

A-4.1.8.1.(6)(a) Gust Factors for Calculation of Internal Pressures. Information on gust factors for the calculation of internal pressures can be found in Commentary on Wind Loads in Chapter 4 of the Supplement to the NBC 1990.

A-4.1.8.1.(6)(d) and 4.1.8.2.(1)(b) Dynamic Approach to the Action of Wind Gusts. Information on a dynamic approach to the action of wind gusts can be found in the Commentary on Wind Loads in Chapter 4 of the Supplement to the NBC 1990.

A-4.1.8.3.(1) Full and Partial Loading under Wind Loads. Information on full and partial loading under wind loads can be found in the Commentary on Wind Loads in Chapter 4 of the Supplement to the NBC 1990.

A-4.1.9.1.(3) Direction of Forces. Information on the direction of earthquake forces 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.(8) and A-4.1.9.B. Force Modification Factor, R. Explanatory notes on the various cases 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.(11) and A-4.1.9.C. Foundation Factor. The foundation factor, F , accounts for the effects of soil conditions on the intensity of shaking of structures. The foundation soils are assumed to maintain their integrity. For all types of foundations, including deep ones, the possibility of ground failure due to excessive settlements in loose sands, liquefaction of saturated sands, fault displacements and loss of strength of sensitive clays should be considered by a person competent in this field of work.

A-4.1.9.1.(13)(b) Dynamic Analysis for Vertical Distribution of Lateral Seismic Forces. Information on a dynamic approach for the vertical distribution of the lateral seismic force, V , 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, S_p .

Lower values of S_p 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.

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-5.3.1. Control of Air Leakage. Moisture movement caused by air leakage is far more extensive than movement by vapour diffusion; it is also more difficult to control because an air barrier is an assembly of materials and must be continuous to be effective (lapping materials or even butting vapour retardant materials are sufficient for vapour diffusion control but not for air leakage control).

The higher the interior moisture conditions, the more critical becomes the control of moisture movement through the enclosure.

For control of air leakage, the materials of the assembly must be air impermeable singly or in combination. Most common building materials are sufficiently air impermeable to function as part of the air barrier assembly.

The air barrier assembly, as the air-tight element, must be designed to structurally resist the peak as well as the sustained air pressure differences across

the assembly. The deflection of an air barrier assembly must be limited to prevent its own rupture. Flexible membranes used as part of an air barrier assembly must be used with caution because of their limited structural properties, difficulty to seal and susceptibility to damage during construction.

The air barrier includes elements constructed by different trades and so requires consideration of the following:

- (1) good access to make connections between the work of different trades, and
- (2) materials sufficiently strong to withstand the rigours of construction.

In all design where air barriers will be inaccessible for repair after construction, provision must be made for inspection of the air barrier before it is covered.

Buildings intended for high humidity should be designed with the air barrier accessible for repair after construction or the air barrier should be tested before being covered.

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 Chapter 4 of the Supplement to the NBC 1990.

A-6.2.2.3.(2) Ventilation of Storage Garages.

Ventilation for storage garages is provided to protect human occupants from exposure to carbon monoxide and other vehicular exhaust fumes. There are many cases, such as small two or three bay storage garages within funeral homes, firehalls, ambulance bays, warehouses used for occasional vehicle storage, etc., where the general public is not present; carbon monoxide or nitrogen dioxide monitoring devices may then be omitted should the owner choose to interlock the ventilation system with the local light switch or other controls to ensure continuous system operation whenever the area is occupied. In any event, the ventilation system capacity must be designed to limit the concentrations of carbon monoxide or nitrogen dioxide below the prescribed values.

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 Explosion 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 66, "Pneumatic Conveying Systems for Handling Feed, Flour, Grain and Other Agricultural Dusts,"
- NFPA 68, "Venting of Deflagrations,"
- NFPA 69, "Explosion Prevention Systems,"
- NFPA 81, "Fur Storage, Fumigation and Cleaning,"
- NFPA 85F, "The Installation and Operation of Pulverized Fuel Systems,"
- NFPA 86, "Ovens and Furnaces, Design, Location and Equipment,"
- NFPA 88A, "Parking Structures,"
- NFPA 88B, "Repair Garages,"
- NFPA 91, "Installation of Blower and Exhaust Systems for Dust, Stock and Vapor Removal or Conveying,"
- NFPA 96, "Installation of Equipment for the Removal of Smoke and Grease-Laden Vapors from Commercial Cooking Equipment,"
- NFPA 204M, "Guide for Smoke and Heat Venting,"
- NFPA 303, "Marinas and Boatyards,"
- NFPA 307, "Construction and Fire Protection of Marine Terminals, Piers and Wharves,"
- NFPA 321, "Basic Classification of Flammable and Combustible Liquids,"
- NFPA 325M, "Fire Hazard Properties of Flammable Liquids, Gases and Volatile Solids,"
- NFPA 395, "Storage of Flammable and Combustible Liquids on Farms and Isolated Construction Projects,"

A-6.2.2.5.

NFPA 409, "Aircraft Hangars,"

NFPA 416, "Construction and Protection of Airport Terminal Buildings,"

NFPA 481, "Production, Processing, Handling and Storage of Titanium,"

NFPA 482, "Production, Processing, Handling and Storage of Zirconium,"

NFPA 490, "Storage of Ammonium Nitrate,"

NFPA 651, "Manufacture of Aluminum or Magnesium Powder,"

NFPA 654, "Prevention of Fire and Dust Explosions in the Chemical, Dye, Pharmaceutical, and Plastics Industries,"

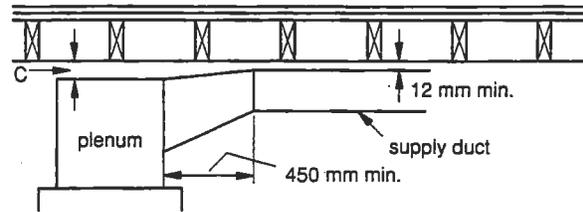
NFPA 655, "Prevention of Sulfur Fires and Explosions," and

NFPA 664, "Prevention of Fires and Explosions in Wood Processing and Woodworking Facilities."

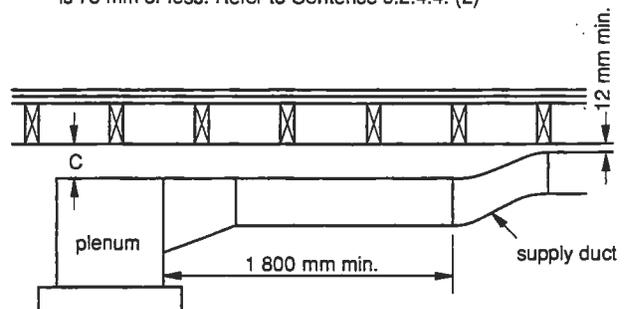
A-6.2.3.12.(1) Make-Up Air for Exhaust Systems. When make-up air is introduced into a building in cold weather, it should be preheated when the comfort of people in the air path is a consideration.

A-6.2.3.13.(3) Minimum Distance for Exhaust Outlets. A minimum distance of 3 m is recommended between exhaust or flue outlets and all intake locations, including existing fresh air intake terminals located in adjacent buildings.

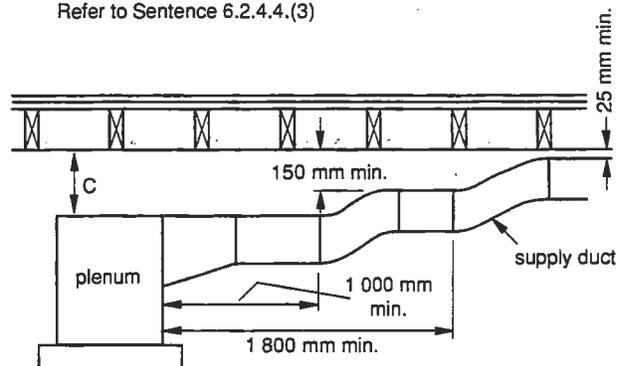
A-6.2.4.4.(2), (3) and (4) Clearances for Warm-Air Supply Ducts



- (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)

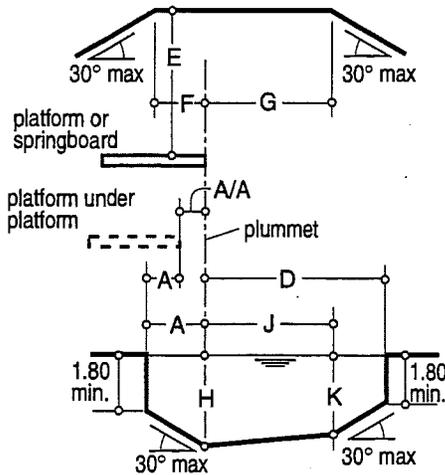
A.6.2.4.4.

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 designed for such applications, may be used.

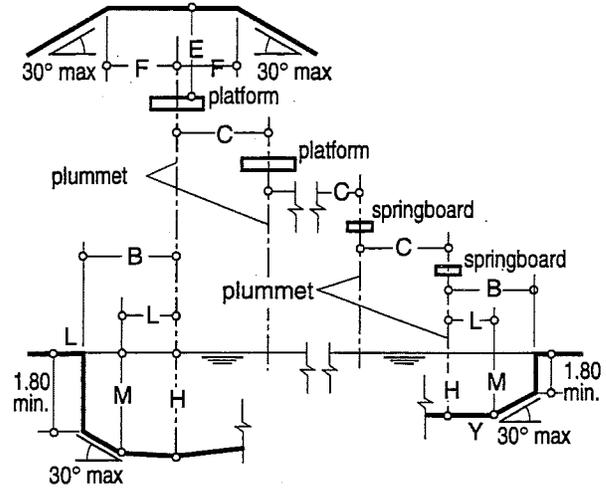
A-6.2.9.2.(6) Temperature of Exposed Piping. Normally piping carrying steam or high-temperature hot water at pressures above atmospheric (corresponding temperature 100°C or above) will be insulated to reduce heat losses as an economy measure. Above a temperature of approximately 70°C, however, a bare 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-7.1.6.3. Protection at Storm Water Retention Ponds. Inlets and outlets to storm water retention ponds are usually associated with sizeable dropoffs in elevation. Water attracts attention and care must be taken to fence off hazardous areas and avoid accidents.

A-7.3.3.13.(6) Diving Board Standards for Public Swimming Pools



Longitudinal section diagrammatic only



Cross section diagrammatic only

A-7.3.3.13.(8) Clearance for Diving Boards.

For deck level diving boards, 4 m of head room provides adequate clearance. Requirement 5.8, Minimum Standards for Public Swimming Pools, published by National Spa and Pool Institute, states: There shall be a completely unobstructed clear vertical distance of 13 ft. (3.96 m) above any diving board measured from the centre of the front end of the board. This area shall extend horizontally at least 8 ft. (2.44 m) behind, 8 ft. (2.44 m) to each side and 16 ft. (4.88 m) ahead of Point A.

A-7.3.3.24. Air Quality at Swimming Pools.

Values used in ASHRAE 62-1989 Standard, "Ventilation for Acceptable Indoor Air Quality" Table 2 are:

Swimming Pools	
pool and deck area	spectator area
70 persons/100 m ²	150 persons/100 m ²
2.5 L/s/ person	8 L/s/ person

These values may not be adequate for wave pools, leisure pools or whirlpools, where more airborne contaminants can be expected. The length of stay in these facilities should also be considered. An ozone system reduces the need to treat water chemically and therefore reduces the amount of airborne contaminants.

A-7.3.3.13.(6) Diving Board Standards for Public Swimming Pools

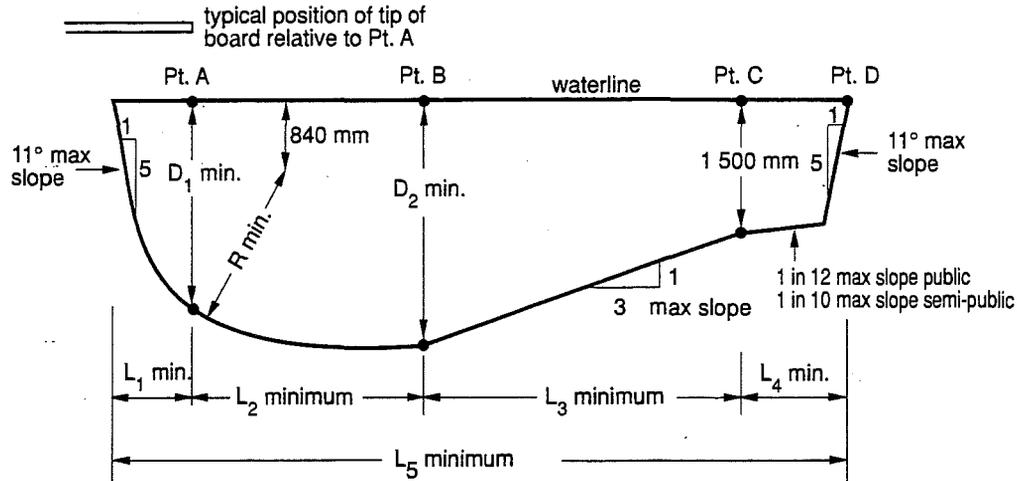
FINA Dimensions for Diving Facilities		Dimensions are In Metres	Springboard				Platform									
			1 Metre		3 Metres		1 Metre		3 Metres		5 Metres		7.5 Metres		10 Metres	
			LENGTH	4.80	4.80	4.50	5.00	6.00	6.00	6.00	2.00					
Revised to 1st Jan 1987		HEIGHT	1.00	3.00	0.60-1.00	2.50-3.00	5.00	7.50	10.00							
			HORIZ	VERT	HORIZ	VERT	HORIZ	VERT	HORIZ	VERT	HORIZ	VERT	HORIZ	VERT		
A	From plumbet BACK TO POOL WALL	DESIGNATION	A-1		A-3		A-1pl		A-3pl		A-5		A-7.5		A-10	
		MINIMUM	1.80		1.80		0.75		1.25		1.25		1.50		1.50	
AA	From plumbet BACK TO PLATFORM plumbet directly below	DESIGNATION									AA5/1		AA7.5/3/1		AA10/5/3/1	
		MINIMUM									1.50		1.50		1.50	
B	From plumbet to POOL WALL AT SIDE	DESIGNATION	B-1		B-3		B-1pl		3.3b-3pl		E-5		B-7.5		B-10	
		MINIMUM	2.50		3.50		2.30		2.90		4.25		4.50		5.25	
C	From plumbet to ADJACENT PLUMBET	DESIGNATION	C-1/1		C-3/3		C-1/1pl		C-3/1pl/3pl		C-5/3/1		C-7.5/5/3/1		C-10/7.5/5/3/1	
		MINIMUM	2.40		2.60		1.65		2.10		2.50		2.50		2.75	
D	From plumbet to POOL WALL AHEAD	DESIGNATION	D-1		D-3		D-1pl		D3pl		D-5		D-7.5		D-10	
		MINIMUM	9.00		10.25		8.00		9.50		10.25		11.00		13.50	
E	On plumbet, from BOARD TO CEILING	DESIGNATION		E-1		E-3		E-1pl		E-3pl		E-5		E-7.5		E-10
		MINIMUM		5.00		5.00		3.50		3.50		3.50		3.50		5.00
F	CLEAR OVERHEAD behind and each side of plumbet	DESIGNATION	F-1	E-1	F-3	E-3	F-1pl	E-1pl	F-3pl	E-3pl	F-5	E-5	F-7.5	E-7.5	F-10	E-10
		MINIMUM	2.50	5.00	2.50	5.00	2.75	3.50	2.75	3.50	2.75	3.50	2.75	3.50	2.75	5.00
G	CLEAR OVERHEAD ahead of plumbet	DESIGNATION	G-1	E-1	G-3	E-3	G-1pl	E-1pl	G-3pl	E-3pl	G-5	E-5	G-7.5	E-7.5	G-10	E-10
		MINIMUM	5.00	5.00	5.00	5.00	5.00	3.50	5.00	3.50	5.00	3.50	5.00	3.50	6.00	5.00
H	DEPTH OF WATER at plumbet	DESIGNATION		H-1		H-3		H-1pl		H-3pl		H-5		H-7.5		H-10
		MINIMUM		3.50		3.80		3.30		3.60		4.00		4.50		5.00
J	DISTANCE AND DEPTH ahead of plumbet	DESIGNATION	J-1	K-1	J-3	K-3	J-1pl	K-1pl	J-3pl	K-3pl	J-5	K-5	J-7.5	K-7.5	J-10	K-10
		MINIMUM	5.00	3.40	6.00	3.70	5.00	3.20	6.00	3.50	6.00	3.90	8.00	4.40	11.00	4.75
M	DISTANCE AND DEPTH each side of plumbet	DESIGNATION	L-1	M-1	L-3	M-2	L-1pl	M-1pl	L-3pl	M-3pl	L-5	M-5	L-7.5	M-7.5	L-10	M-10
		MINIMUM	1.50	3.40	2.00	3.70	1.40	3.20	1.80	3.50	4.25	3.90	4.50	4.40	5.25	4.75
N	MAXIMUM SLOPE TO REDUCED DIMENSIONS beyond full requirements	POOL DEPTH CEILING HT	30 degrees 30 degrees		NOTE: Dimensions C (plumbet to adjacent plumbet) apply for Platforms with widths as detail. For wider Platforms increase C by half the additional width(s).											

A-7.3.4.10.

A-7.3.3.58. Ozone Systems. Ozone systems are relatively new and require the incorporation of a number of safeguards. Designers and manufacturers

of such systems for use in Alberta should contact the Director of Building Standards in the planning stages of such systems.

A-7.3.4.10. Diving Board Standards for Semi-Public Swimming Pools



A.7.3.4.10.

NOTE: L_4 is a minimum dimension to allow sufficient length opposite the board. This may of course be lengthened to form the shallow portion of the pool. The radius shall be at least equal (it may be greater) to the depth of the pool minus the vertical wall depth measured from the water line (or the 11° permissible wall minus 76 mm to allow draining to the main drain).

Pool Type	Related Diving Equipment		Minimum Dimensions								Minimum Width of Pool at:		
	Max. Diving Board Length	Max. Board Hgt. Over Water	D_1	D_2	R	L_1	L_2	L_3	L_4	L_5	PT. A	PT. B	PT. C
VI	3 m	0.66 m	2.13 m	2.59 m	1.66 m	0.76 m	2.44 m	3.20 m	2.13 m	8.53 m	4.88 m	5.49 m	5.49 m
VII	3.7 m	0.75 m	2.29 m	2.74 m	1.83 m	0.91 m	2.74 m	3.66 m	1.22 m	8.53 m	5.49 m	6.10 m	6.10 m
VIII	4.9 m	1 m	2.59 m	3.05 m	2.13 m	1.22 m	3.05 m	4.57 m	0.61 m	9.45 m	6.10 m	6.71 m	6.71 m
IX	4.9 m	3 m	3.35 m	3.66 m	2.59 m	1.83 m	3.20 m	6.40 m	0	11.43 m	6.70 m	7.32 m	7.32 m

L_2 , L_3 and L_4 combined represent the minimum distance from the tip of the board to pool wall opposite diving equipment.

*NOTE: Placement of boards shall observe the following minimum dimensions. With multiple board installations minimum pool widths must be increased accordingly.

1 Meter or Deck Level Board to Pool Side	2.74 m
3 Meter Board to Pool Side	3.35 m
1 Meter or Deck Level Board to 3 Meter Board	3.05 m
1 Meter of Deck Level to another 1 Meter or Deck Level Board	2.44 m
3 Meter to another 3 Meter Board	3.05 m

Pool Type refers to industry standards for equipment.

A-7.8.1.1.

A-7.8.1.1. Non-Coin Operated Drycleaning Plants. For other types of drycleaning plants, the requirements of NFPA 32, "Standard for Drycleaning Plants" are considered good engineering.

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. In a renovation project, only the portion 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) Degree of Application. 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 Tanks. 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 projects 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 project should be determined in advance, as part of

the fire safety plan for the construction project, taking into consideration such issues as the size of the project and site conditions.

A-8.2.3.15.(3) Temporary Exits. Where exits are obstructed by construction while the building is being occupied, an alternative means of exit must be established. Replacing a window with a door and providing the necessary step and walkway could be an acceptable temporary solution.

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 combination.

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 O141, "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.

A-9.3.2.1.

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 un-

der 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-9.3.2.8. Nonstandard Lumber. The NLGA "Standard Grading Rules for Canadian Lumber" permit lumber to be dressed to sizes below the standard sizes (38 × 89, 38 × 140, 38 × 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.

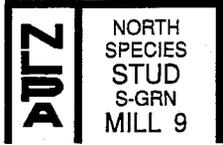
Species Designations and Abbreviations

Commercial Designation of Species or Species Combination	Abbreviation Permitted on Grade Stamps	Species Included
Douglas Fir – Larch	D Fir – L (N)	Douglas Fir, Western Larch
Hemlock – Fir	Hem – Fir (N)	Western Hemlock, Amabilis Fir
Spruce – Pine – Fir	S – P – F or Spruce – Pine – Fir	White Spruce, Engelmann Spruce, Black Spruce, Red Spruce, Lodgepole Pine, Jack Pine, Alpine Fir, Balsam Fir
Northern Species	North Species	Any Canadian softwood covered by the NLGA Standard Grading Rules

A-9.3.2.1.

**Facsimiles of Grade Marks Used by Canadian Lumber
Manufacturing Associations and Agencies Authorized
To Grade Mark Lumber in Canada**

FACSIMILES OF GRADE MARK	ASSOCIATION OR AGENCY
<p>A.F.P.A.[®] 00 S-P-F S-DRY STAND</p>	<p>Alberta Forest Products Assoc. 204 - 11710 Kingsway Avenue Edmonton, Alberta T5G 0X5</p>
<p>CL[®]A S-P-F 100 No. 2 S-GRN.</p>	<p>Canadian Lumbermen's Association 27 Goulburn Avenue Ottawa, Ontario K1N 8C7</p>
<p> 1 S-GRN 1 1 D FIR-N</p>	<p>Cariboo Lumber Mfrs. Association 301, 197 Second Avenue N. Williams Lake, British Columbia V2G 1Z5</p>
<p> W. CEDAR S-GRN.-(N) 100 No 3</p>	<p>Council of Forest Industries of British Columbia 1200 - 555 Burrard Street Vancouver, British Columbia V7X 1S7 Council of Forest Industries of British Columbia Northern Interior Lumber Sector 400 - 1488 Fourth Avenue Prince George, British Columbia V2L 4Y2</p>
<p>CFPA[®] 00 S-P-F S-DRY CONST</p>	<p>Central Forest Products Association P.O. Box 1169 Hudson Bay, Saskatchewan S0E 0Y0</p>
<p></p>	<p>Maritime Lumber Bureau P.O. Box 459 Amherst, Nova Scotia B4H 4A1</p>

Facsimiles of Grade Mark	Association or Agency
<p>NFLD. LUMBER</p> 	<p>Newfoundland Lumber Producers Association P.O. Box 8 Glovertown, Newfoundland A0G 2L0</p>
<p>O.L.M.A.[®] 01-1 CONST. S-DRY SPRUCE - PINE - FIR</p>	<p>Ontario Lumber Manufacturers Association 55 University Avenue, Ste. 325 Toronto, Ontario M5J 2H7</p>
	<p>L'association des manufacturiers des bois de sciage du Québec Quebec Lumber Manufacturers Association 5055, boul. Hamel ouest, bureau 200 Québec, Québec G2E 2G6</p>
<p>P.I.B.[®] NLGA RULE No 1 S-GRN 00 HEM-FIR-N</p>	<p>Pacific Lumber Inspection Bureau 1110 - 355 Burrard Street Vancouver, British Columbia V6C 2G8</p>
<p>ILMA[®] S-DRY 1 00 S-P-F</p>	<p>Interior Lumber Manufacturers Association 203 - 2350 Hunter Road Kelowna, British Columbia V1X 6C1</p>
<p>00  No 1 S-DRY D FIR (N) NLGA RULE</p>	<p>MacDonald Inspection c/o Warnock Hersey Professional Services Ltd. 211 School House Street Coquitlam, British Columbia V3K 4X9</p>
 <p>10 CONST S-P-F S-GRN</p>	<p>Northwest Territories Forest Industries Association 6301 Silverthorne Road P.O. Box 346 Sardis, British Columbia V2R 2N1</p>

A-9.4.4.A.

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 e CAN/CGSB-82.6-M 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.

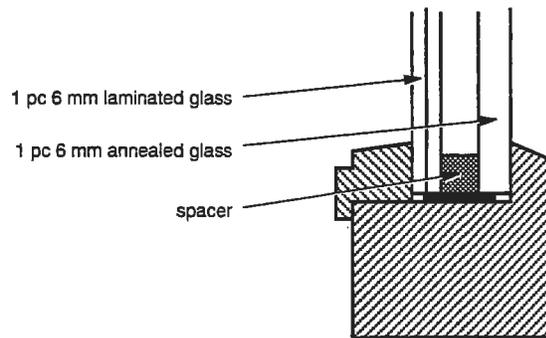
A-9.6.6.1. Glazing in Doors and Sidelights. Dimensions and data may vary slightly with requirements outlined in the "Shield of Confidence" program sponsored by the Alberta Solicitor General. New construction must comply with requirements of the Building Code. Information not covered by the Code and covered by the "Shield of Confidence" program should be considered good advice.

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.



Combined laminated/annealed glazing

A.9.6.6.1.

A-9.6.6.5.(1) Door Fasteners. The purpose of the requirement for 30 mm screw penetration into solid wood is to prevent the door from being dislodged from the jamb due to impact forces. It is not the intent to prohibit other types of hinges or strikeplates that are specially designed to provide equal or greater protection.

A-9.6.6.7. Hinged Doors. Methods of satisfying this Article include either using nonremovable pin hinges or modifying standard hinges by screw fastening a metal pin in a screw hole in one half of the top and bottom hinges. When the door is closed, the projecting portion of the pin engages in the corresponding screw hole in the other half of the hinge and then, even if the hinge pin is taken out, the door cannot be removed.

A-9.6.6.10. Resistance of Doors to Forced Entry. This Article designates ASTM Standard F476, "Standard Test Methods for Security of Swinging Doors" as an alternate to compliance with the prescriptive requirements for doors and hardware. The annex to the standard provides four security classifications, with acceptance criteria, depending on the type of building and the crime rate of the area in which it is located. The ABC 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.

Patio Doors should at least meet the requirements of CAN/CGSB 82.1, "Sliding Doors."

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 CAN/CSA-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.
- A3 — intended for use in high-performance institutional and commercial applications.

Water Leakage

- B1 — moderate climatic conditions
- B2 — severe climatic conditions
- B3 — extreme climatic condition

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 ABC 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.

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.

Table A-9.7.3.2.A.

Maximum Glass Area for Windows, m ² In Areas for Which the "One in Ten" Wind Pressure (Q ₁₀)* Listed in Part 2 of the ABC is less than 0.40 kPa								
Type of Glass	Glass Thickness, mm							
	2.5	3	4	5	6	8	10	12
Annealed	0.66	1.02	1.58	2.17	2.95	4.67	6.40	8.95
Factory-sealed IG Units	1.16	1.82	2.79	3.82	5.24	7.23	8.98	12.40
Heat strengthened or tempered	1.39	1.86	2.51	3.07	3.83	5.22	6.48	8.95
Wired	0.31	0.49	0.76	1.04	1.44	2.26	3.13	5.00

* The maximum hourly wind pressure with one chance in ten of being exceeded in any one year.

Table A-9.7.3.2.B.

Maximum Glass Area for Windows, m ² In Areas for Which the "One in Ten" Wind Pressure (Q ₁₀)* Listed in Part 2 of the ABC is less than 0.60 kPa								
Type of Glass	Glass Thickness, mm							
	2.5	3	4	5	6	8	10	12
Annealed	0.42	0.66	1.02	1.40	1.93	3.05	4.20	6.65
Factory-sealed IG Units	0.75	1.17	1.80	2.47	3.39	5.29	7.29	10.12
Heat strengthened	0.89	1.39	2.05	2.50	3.12	4.25	5.29	7.29
Tempered	1.13	1.52	2.05	2.50	3.12	4.25	5.29	7.29
Wired	0.20	0.32	0.50	0.68	0.95	1.50	2.06	3.32

* The maximum hourly wind pressure with one chance in ten of being exceeded in any one year.

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-9.10.3.1.

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.

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-9.9.2.7.(3) Barrier-Free Access. Except for single family dwellings, duplexes, triplexes, town houses, row houses and boarding houses which are not used for social programmes, barrier-free access must be provided to all entrances of all buildings. Except for buildings of residential occupancy, barrier-free access to other floor areas must be provided to all three storey buildings.

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 Cook-

ing 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. Assemblies 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. (See Appendix B)

Table A-9.10.3.A.

Fire and Sound Resistance of Walls					
Type of Wall	No.	Description	Finish on Each Side ⁽¹⁾	Fire-Resistance Rating	Typical Sound Transmission Class ⁽²⁾
Hollow concrete block (normal weight aggregate)	1	140-mm block	None ⁽³⁾	1 h	48
	2	Same as 1	B	2 h	51
	3	Same as 1, with both surfaces fastened directly, or both on metal resilient channels, or both on metal resilient channels with absorptive material ⁽⁴⁾	A	2 h	47
	4	Same as 1, with metal resilient channels and absorptive material on one side ⁽⁴⁾	A	1.75 h	51
	5	Same as 1, with 38-mm x 38-mm wood strapping and absorptive material on both sides ⁽⁴⁾	A	2 h	57
	6	190-mm block	None ⁽³⁾	1.5 h	50
	7	190-mm block	B	2 h	50

A-9.10.3.A.

Table A-9.10.3.A. (Cont'd)

Fire and Sound Resistance of Walls					
Type of Wall	No.	Description	Finish on Each Side ⁽¹⁾	Fire-Resistance Rating	Typical Sound Transmission Class ⁽²⁾
	8	Same as 6, with both surfaces fastened directly, or both on metal resilient channels, or both on metal resilient channels with absorptive material ⁽⁴⁾	A	2.5 h	49
	9	Same as 6, with metal resilient channels and absorptive material on one side ⁽⁴⁾	A	2.5 h	53
	10	Same as 6, with 38-mm x 38-mm wood strapping on at least one side	A ⁽⁶⁾	2.5 h	53
	11	Same as 6, with 38-mm x 38-mm wood strapping and absorptive material on both sides ⁽⁴⁾	A ⁽⁶⁾	2.5 h	59
	12	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 ⁽⁴⁾	A	2.5 h	64
	13	Same as 6, with studs (65-mm steel or 38-mm x 64-mm wood) and absorptive material on both sides ⁽⁴⁾	A ⁽⁶⁾	2.5 h	70
	14	Same as 6, with metal resilient channels and absorptive material on one side	D (finish one side only)	2.5 h	55
Concrete	15	150 mm	None ⁽³⁾	3 h	55
	16	200 mm	None ⁽³⁾	4 h	58

Table A-9.10.3.A. (Cont'd)

Fire and Sound Resistance of Walls					
Type of Wall	No.	Description	Finish on Each Side ⁽¹⁾	Fire-Resistance Rating	Typical Sound Transmission Class ⁽²⁾
Interior wood stud single row	17	38-mm x 89-mm studs 400 mm o.c.	C	1 h	34
	18	38-mm x 89-mm studs 400 mm o.c., with absorptive material ⁽⁵⁾	A ⁽⁶⁾	45 min	36
	19	Same as 18 ⁽⁴⁾	C	1 h	36
	20	Same as 18, with resilient metal channels on at least one side ⁽⁵⁾	A ⁽⁶⁾	45 min	48
	21	Same as 18, with resilient metal channels on at least one side ⁽⁴⁾	C	1 h	48
	22	Same as 18, with resilient metal channels on at least one side ⁽⁴⁾	D	1 h	54
Interior wood stud two rows staggered on 38-mm x 140-mm plate	23	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⁾	A ⁽⁶⁾	45 min	50
	24	Same as 23, but with absorbtive material on one side ⁽⁴⁾	C	1 h	51
	25	Same as 23, but with absorbtive material on one side ⁽⁴⁾	D	1 h	54
Interior wood stud two rows on separate plates	26	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 ⁽⁴⁾	C	1 h	53
	27	Same as 26, but absorptive material on both sides ⁽⁵⁾	A ⁽⁶⁾	45 min	57

A-9.10.3.A.

Table A-9.10.3.A. (Cont'd)

Fire and Sound Resistance of Walls					
Type of Wall	No.	Description	Finish on Each Side ⁽¹⁾	Fire-Resistance Rating	Typical Sound Transmission Class ⁽²⁾
	28	Same as 26, but absorptive material on both sides ⁽⁴⁾	C	1 h	57
	29	Same as 26, but absorptive material on both sides ⁽⁴⁾	D	1 h	63
Exterior wood stud	30	38-mm x 89-mm or 38-mm x 140-mm studs spaced up to 600 mm o.c., mineral fiber with mass of at least 1.22 kg/m ² , wall sheathing and siding	A ⁽⁶⁾ (interior side)	45 min	N/A
	31	Same as 30	C or D (interior side)	1 h	N/A
Non-loadbearing steel studs	32	90-mm steel studs spaced up to 600 mm o.c.	C	45 min	39
	33	Same as 32, with absorptive material in cavity ⁽⁴⁾	C	1 h	45
	34	Same as 32, with absorptive material in cavity ⁽⁴⁾	D	1 h	53

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, and

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 A-9.10.3.B.

Fire and Sound Resistance of Floors, Ceilings and Roofs					
Type of Assembly	No.	Description	Finish on Ceiling ⁽¹⁾	Fire Resistance Rating	Typical Sound Transmission Class ⁽²⁾
Concrete slabs	1	90-mm reinforced concrete with 20-mm minimum cover over reinforcing steel	None ⁽³⁾	1 h	48
	2	130-mm reinforced concrete with 25-mm minimum cover over reinforcing steel	None ⁽³⁾	2 h	52
Open web steel joists	3	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⁾	C	45 min	53
Wood floor joists spaced not more than 400 mm o.c. or	4	Subfloor of 19-mm T&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⁾	C	45 min	48
	5	Same as 4, with additional layer of 11 mm sanded plywood, waferboard or strandboard on floor	C	45 min	50
Wood floor trusses ⁽⁵⁾ spaced not more than 600 mm o.c.	6	19-mm gypsum-concrete topping (at least 34 kg/m ²) on subfloor of 19-mm T&G lumber or 15.5-mm plywood waferboard or strandboard	D	45 min	52
	7	Same as 6	E	1 h	52
	8	Same as 6, with absorptive material in cavity ⁽⁴⁾ , ceiling finish attached to metal resilient channels spaced at 200 mm o.c.	C	45 min	55

A-9.10.3.B.

Table A-9.10.3.B. (Cont'd)

Fire and Sound Resistance of Floors, Ceilings and Roofs					
Type of Assembly	No.	Description	Finish on Ceiling ⁽¹⁾	Fire Resistance Rating	Typical Sound Transmission Class ⁽²⁾
	9	38-mm lightweight concrete topping (at least 70 kg/m ²) on subfloor of 19-mm T&G lumber or 15.5-mm plywood, waferboard or strandboard	D	45 min	54
	10	Same as 9	E	1 h	56
	11	Same as 9, except ceiling finish attached to metal resilient channels	C	45 min	57
	12	Same as 9, with absorptive material in cavity ⁽⁴⁾ , ceiling finish attached to metal resilient channels spaced at 200 mm o.c.	C	45 min	60
Rating provided by membrane only	13	Supporting members spaced not more than 600 mm o.c.	C	30 min	N/A
	14	Same as 13	E	1 h	N/A
Wood roof trusses spaced not more than 600 mm o.c.	15	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	C	45 min	N/A

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.

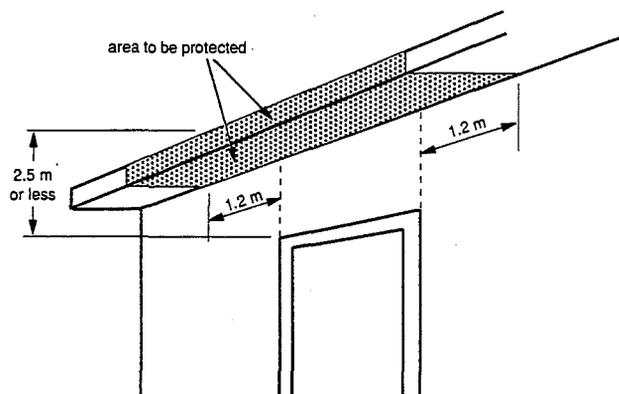
A-9.10.9.6.(1) Penetration of Fire-Rated Assemblies By Service Equipment. This Article, together with Article 3.1.9.1., is intended to ensure that the integrity of fire-rated assemblies is maintained where they are penetrated by various types of service equipment.

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-9.10.12.5. Protection of Overhang of Common Roof Space.



A-9.10.12.5.

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-9.10.14.4. Limiting Distance. Though an alternate method of determining limiting distance is given, the requirements of Article 9.10.14.5. still apply.

A-9.11.1.1. 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 over-

A-9.11.1.1.

looked 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.

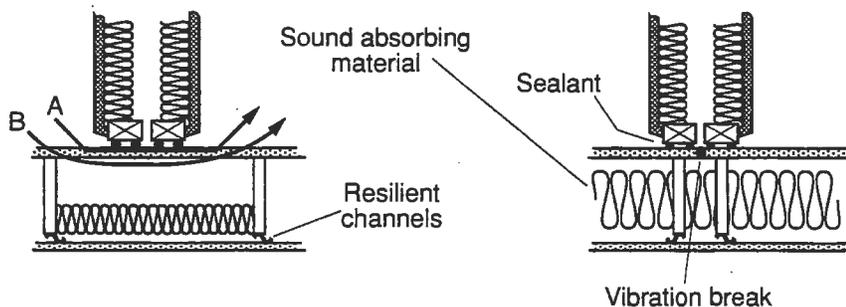
Indirect or flanking transmission arises where the parts of a building are rigidly connected together and where cavities in hollow walls or floors, or continuous lightweight layers connect apartments. Sound travels in cavities, as vibration along surfaces and through walls, ceilings and floors to adjacent 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 resil-

ient 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 fire spread 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.

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.

Impact Noise. Section 9.11 has no requirements for control of impact noise transmission. Footstep and other impacts can cause severe annoyance in multi-family residences. Builders concerned about quality and reducing occupant complaints will ensure that floors are designed to minimize impact transmission. A recommended criterion is that bare floors (tested without a carpet) should achieve an impact insulation class (IIC) of 55. Some lightweight floors that satisfy this requirement may still cause complaints about low frequency impact noise transmission. Adding carpet to a floor will always increase the IIC rating but will not necessarily reduce low frequency noise transmission. Good footstep noise rejection requires fairly heavy floor slabs or floating floors. Impact noise requirements are being considered for inclusion in future versions of the ABC.

Most frequently used methods of test for impact noise are ASTM E492, "Method of Laboratory Measurement of Impact Sound Transmission Through Floor-Ceiling Assemblies Using the Tapping Machine" or ASTM E1007, "Test Method for Field Measurement of Tapping Machine Impact Sound Transmission Through Floor-Ceiling Assemblies and Associated Support Structures."

Machinery Noise. Elevators, garbage chutes, plumbing, fans and heat pumps are common sources of noise in buildings. To reduce annoyance from these, they should be placed as far as possible from sensitive areas. Vibrating parts should be isolated from the building structure using resilient materials such as neoprene or rubber.

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-9.14.2.1.(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 hydro-static 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 dampproofing of walls as specified in Section 9.13.

A-9.14.5.1. Foundation Drainage. Inadequate drainage of foundations is a common problem and must be dealt with at the surface as well as at the footing. Weeping tile and crushed gravel collects water that seeps into the ground from the surface. Sloping the ground around the building must be done periodically to ensure that water will not pond and find its way to the weeping tile too quickly. After the initial settlement, a 10 percent slope for the first 2 m is recommended.

A-9.14.5.2.(2) Sump Pump Discharge. Where an automatic sump pump discharges, provisions must be made to prevent soil erosion and to convey the water away from the building

A-9.14.6.1. Surface Drainage. A surface drainage pattern should be established which will drain the entire lot and direct water away from buildings. Where normal settlement is anticipated, a layer of dense, non-porous material, should be used for the first 2 m around a building to provide a 10% slope away from the building.

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-M, "Engineering Design in Wood (Working Stress Design)" with the following assumptions:

A-9.15.1.3.

- (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-9.20.1.2. Seismic Zones. Information on seismic zones for various localities can be found in Part 2 of the ABC. (See Table 2.2.1.A.)

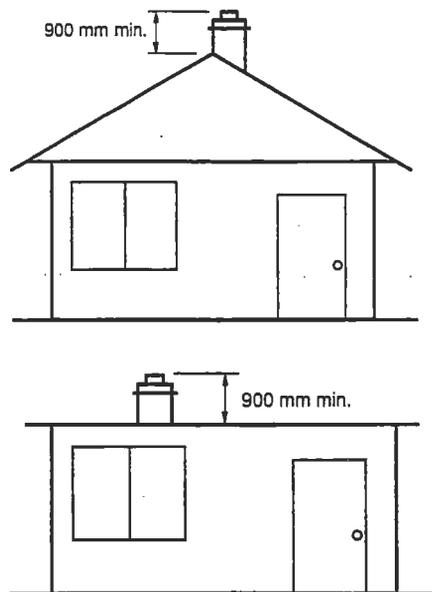
A-9.20.13.10.(3) Dampproofing of Masonry Walls. The reason for installing sheathing paper behind masonry walls is to prevent rainwater from reaching the interior finish if it should leak past the masonry. The sheathing paper intercepts the rainwater and leads it to the bottom of the wall where the flashing directs it to the exterior via weep holes. If the insulation is a type that effectively resists the penetration of water, and is installed so that water will not collect behind it, then there is no need for sheathing paper. If water that runs down between the masonry and the insulation is able to leak out at the joints in the insulation, such insulation will not act as a substitute for sheathing paper. If water cannot leak through the joints in the insulation but collects in cavities between the masonry and insulation, subsequent freezing could damage the wall. Where

sheathing paper is not used, therefore, the adhesive or mortar should be applied to form a continuous bond between the masonry and the insulation. If this is not practicable because of an irregular masonry surface, then sheathing paper is necessary. (See Article 9.25.5.2. for vapour barriers with foamed plastic insulation.)

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.

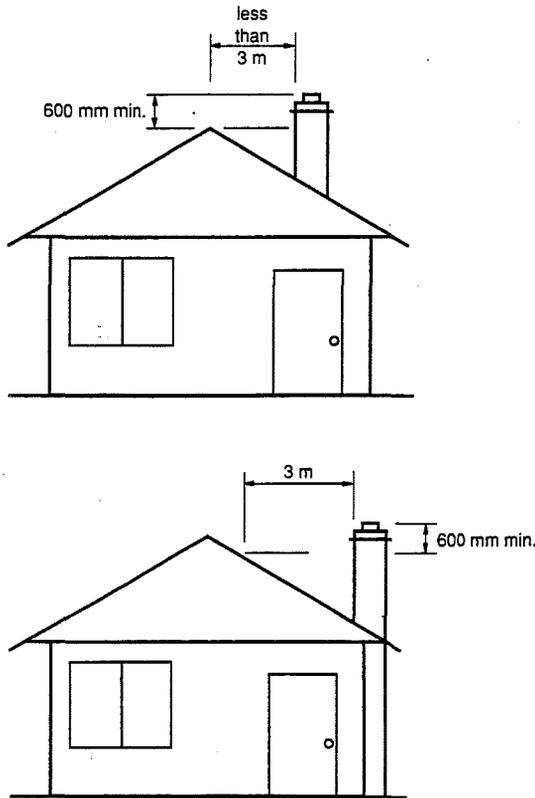
A-9.21.3.6. Metal Chimney Liners. Under the provisions of Section 2.5, masonry chimneys with metal liners may be permitted to serve solid fuel-burning appliances if tests show that such liners will provide an equivalent level of safety.

A-9.21.4.4. Location of Chimney Top



A-9.21.4.4.

A-9.22.1.4.



A-9.21.4.5. Lateral Support for Chimneys.

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.

A-9.22.1.4. Combustion Air for Fireplaces.

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-9.22.8.1.(2) Heat Exchanger Inserts.

Heat exchanger inserts originally designed for use in masonry fireplaces or site-built fireplaces are not acceptable for use in factory-built fireplaces. Factory-built fireplaces are tested as complete systems and therefore components provided by other than the fireplace manufacturer would not be compatible unless listed and tested for that fireplace.

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 roof 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 roof 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 3.3 kPa and 600 mm o.c. spacing but space members 400 mm o.c.
- (2) For a 3.5 kPa design roof 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 roof 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-M, "Engineering Design of Wood (Working Stress Design.)"

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

A-9.23.4.1.

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:

$$\ln(K) = A - B \cdot \ln(S_i/S_{184}) + G$$

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 × 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

Constant A									
Subfloor 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

	Floor Description	Constant B
Basic floor	– 15.5-mm plywood subfloor (or equivalent in Table 9.23.14.A.) – 400-mm joist spacing – no bridging	0.33
Basic floor with bridging		0.38
Basic floor with bridging and strapping		0.41

A-9.23.4.1.

Table G

Floor Description	Constant G
Floors with nailed subfloor	0
Floor with field-glued subfloor, * vibration-controlled span greater than 3 m	0.10
Floor with field-glued subfloor, * vibration-controlled span 3 m or less	0.15

* 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:

- Onysko, D.M. Serviceability Criteria for Residential Floors Based on a Field Study of Consumer Response. Project 03-50-10-008. Forintek Canada Corp., Ottawa, Canada 1985.
- Onysko, D.M. Performance Criteria for Residential Floors Based on Consumer Responses. 1988 International Conference on Timber Engineering, Seattle, September 19-22, Forest Products Research Society, Vol.1, 1988 pp. 736-745.
- Onysko, D.M. Performance and Acceptability of Wood Floors - Forintek Studies. Proceedings of Symposium/Workshop on Serviceability of Buildings, Ottawa, May 16-18, National Research Council of Canada, Ottawa, 1988.

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 shown in the table, straightline interpolation may be used in determining the maximum beam span.

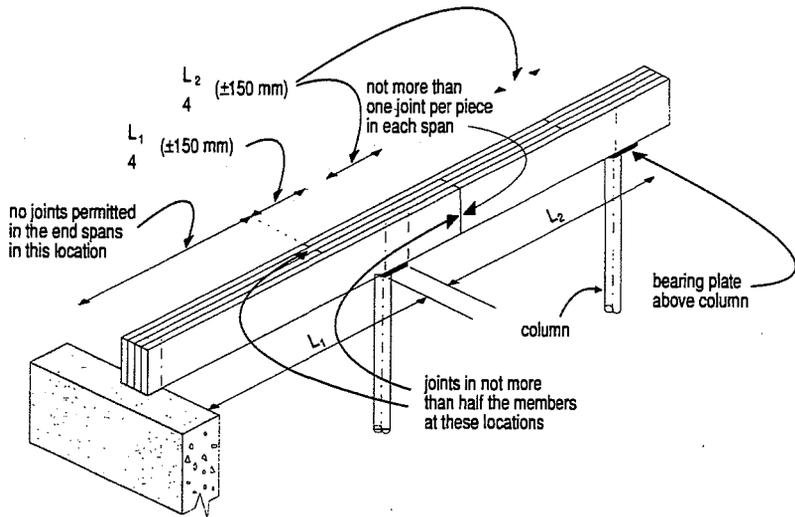
A-9.23.4.A. Spans for Steel Beams. The spans are based on the following assumptions:

- (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-2 and A-3 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.

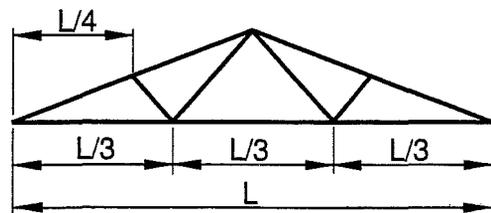
A-9.23.8.3. Joint Location in Built-up Beams



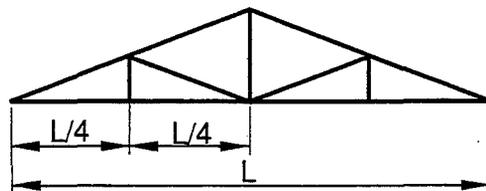
A-9.23.8.3.

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



Fink truss



Howe truss

A-9.23.13.11.(1)

A-9.23.13.11.

shown. 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.(4) 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 × 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.(2) 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.(9) 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.)

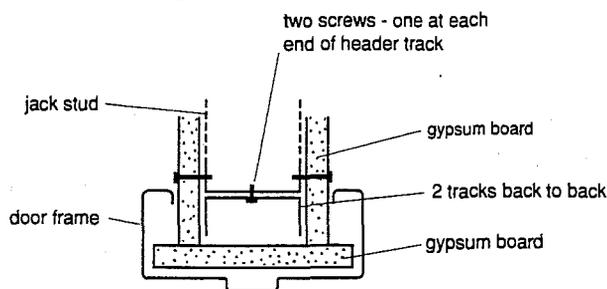
Where the interior is not finished, however, bracing is necessary if the siding itself or the sheathing does not provide the required racking strength. If panel type siding is used, or if the sheathing consists of plywood, waferboard, strandboard, gypsum board, diagonal lumber, or fibreboard sheathing, 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



Header detail

A-9.24.3.2.

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."

Further information is available in "Moisture Problems in Houses," by A.T. Hansen, Canadian Building Digest 231, available from the Institute for Research in Construction, National Research Council of Canada, Ottawa K1A 0R6.

A-9.25.3.1.(2) Flame-Spread Ratings of Insulating Materials. Part 9 has no requirements for flame-spread ratings of insulation materials since these are seldom exposed in parts of buildings where fires are likely to start. Certain of the insulating material standards referenced in 9.25.3.1.(1) do include flame-spread rating criteria. These are included either because the industry producing the product wishes to demonstrate that their product does not constitute a fire hazard or because the product is regulated by authorities other than building authorities (e.g., Hazardous Products Act). However, the Code cannot apply such requirements to some materials and not to others. Hence, these flame-spread rating requirements are excepted in referencing these standards.

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

A-9.23.4.3.

water-repellency 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 bar-

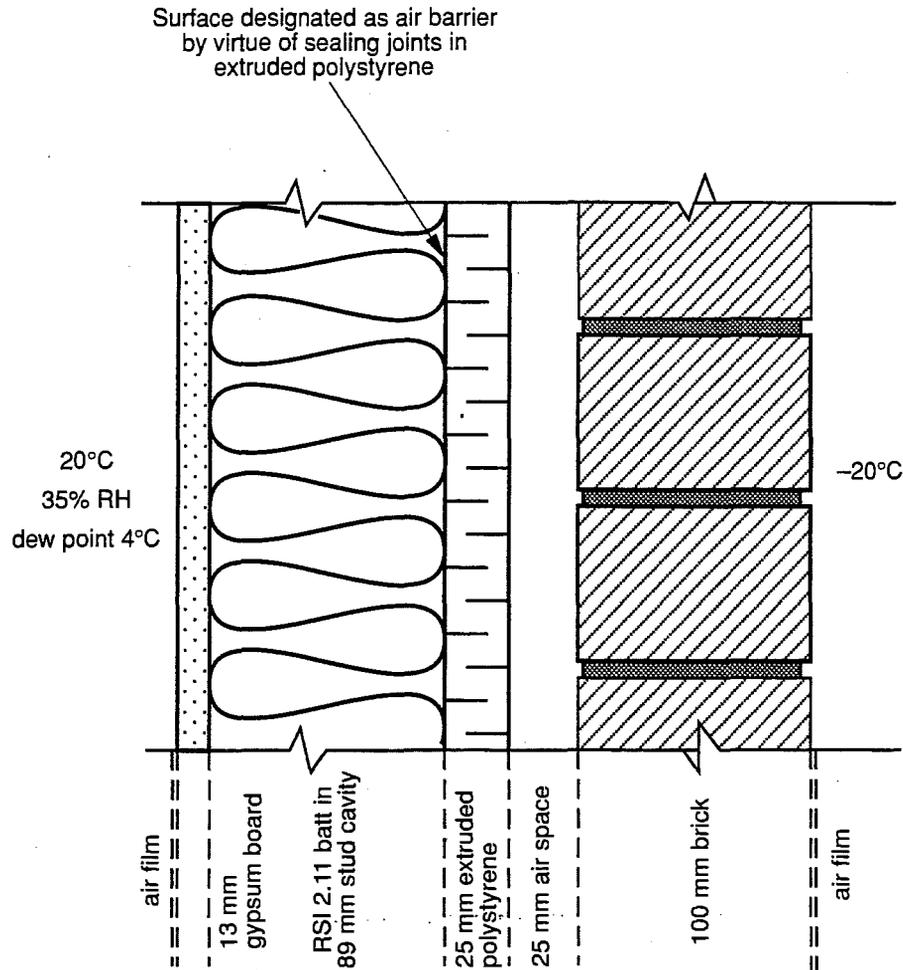
rier is located where the temperature is below the dew point of the indoor air, the trapped water vapour will condense as liquid water or ice. If this temperature remains below the dew point for any length of time, significant moisture could accumulate.

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 1 per cent value is a temperature below which the temperature in an average January can be expected to go only 1 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:

Consider this wall on a house located in an area where the January 1 per cent temperature, as listed in Part 2 of the ABC, 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 1 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.



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

A-9.25.5.2.

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 intercon-

A-9.25.6.3.

nected 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 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.

Insulation should therefore be installed in continuous contact with the masonry to eliminate the space between them. If this is impractical, the adhesive should be applied as a continuous band around the perimeter of the back side of the insulation to prevent spaces behind the insulation from communicating with each other. 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-9.26.2.2.(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 compatible with the chemicals used in the treatment.

A-9.26.17.1 Downspouts. Where a downspout is not connected to a storm sewer, an elbow with extension or a splash block must be used to direct water away from the building.

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 1981 edition of the ABC 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) averaged over any 24 h period. 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.

- (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.

(2) Make-Up Air Provisions

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.

In cold weather, the make-up air shall 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 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.

(3) 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.

A-9.32.3.

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 some ratings of less than 2.0.

(4) 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.

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.

(5) Summer Ventilation

When windows are not openable, the mechanical ventilation system must provide fresh air on a year-round basis. While 0.3 ach averaged over 24 h 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.

(6) Estimating Ventilation Air Requirements

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 finished 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 amount of outdoor air required for winter ventilation.

Volume of house

$$(100 + 100 + 100) \times 2.4 = 720 \text{ m}^3$$

Required rate of ventilation

$$720 \times 0.5 = 360 \text{ m}^3/\text{h}$$

Required total fan capacity

$$(360 \text{ m}^3/\text{h} \times 1000 \text{ L/m}^3) / 3600 \text{ s/h} = 100 \text{ L/s}$$

If the ventilation system is designed to run continuously a ventilation rate of 0.3 air changes per hour may be used for the calculation.

(7) 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,"

Canadian Home Builders Association, "R-2000, Design and Installation Guidelines for Ventilation Systems,"

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-9.33.1.1. Combustion Air and Tight

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

Newer houses are generally more tightly constructed than older ones because of improved construction practices, including tighter windows, weather stripping and caulking. This fact increases the probability that infiltration may not be able to supply enough air to compensate for simultaneous operation of exhaust fans, fireplaces, clothes dryers, furnaces and space heaters. It is necessary, therefore, to introduce outside air to the space containing the fuel-burning appliance. Information regarding combustion air requirements for various types of appliances can be found in the installation standards referenced in Sentence 6.2.1.4.(1). In the case of solid-fuel burning stoves, ranges and space heaters, CAN/CSA-B365-M87 suggests that the minimum size of openings be determined by trial and error to accommodate the flue characteristics, the firing rate, the building characteristics, etc. and that, as a guide, the combustion air opening should be 0.5 times the flue collar area.

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

A-10.4.7.2. Sprinkler System. Sentence 1.5.1.3.(3) requires that sprinkler systems be designed by an engineer. This Sentence overrides Clause 1.5.1.15.(3)(f), which states that professional involvement is not required for Relocatable Industrial Accommodation.



Appendix B

Extract from Supplement to the National Building Code of Canada 1990

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Fire-Performance Ratings

Section 1 General

The contents of this Chapter have been prepared on the recommendations of the Standing Committee on Fire Performance Ratings, which was established by the Associate Committee on the National Building Code (ACNBC) for this purpose.

The fire-performance ratings contained herein are presented in a form closely linked to the performance requirements and the minimum materials specifications of the National Building Code of Canada.

These ratings have been assigned only after careful consideration of all available literature on assemblies of common building materials, where they are adequately identified by description. The assigned values based on this information will, in most instances, be conservative when compared to the ratings determined on the basis of actual tests on individual assemblies.

1.1 Introduction

1.1.1.

(1) The fire-performance ratings set out in this document are for use with the National Building Code of Canada. They apply to materials and assemblies of materials which comply in all essential details with the minimum structural design standards described in Part 4 of the National Building Code of Canada. Additional requirements, where appropriate, are described in other Sections of this Chapter.

(2) Section 2 of this Chapter assigns fire-resistance ratings for walls, floors, roofs, columns and beams related to CAN4-S101-M, "Standard Methods of Fire Endurance Tests of Building Construction and

Materials" and describes methods for determining these ratings.

(3) Section 3 assigns flame-spread ratings and smoke developed classifications for surface materials related to CAN4-S102-M, "Standard Method of Test for Surface Burning Characteristics of Building Materials" and CAN4-S102.2-M, "Standard Method of Test for Surface Burning Characteristics of Flooring, Floor Covering, and Miscellaneous Materials and Assemblies."

(4) Section 4 describes noncombustibility in building materials when tested in accordance with the specification CAN4-S114-M, "Standard Method of Test for Determination of Non-Combustibility in Building Materials."

(5) Section 5 contains requirements for the installation of fire doors and fire dampers in fire-rated stud wall assemblies and the installation of fire stop flaps in fire-rated membrane ceilings.

1.1.2.

(1) Where reference is made in this Chapter to the National Building Code of Canada, such reference shall be to the 1990 edition.

(2) Where documents are referenced in this Chapter, they shall be the editions designated in Table 1.1.A.

1.1.3.

(1) The standard fire tests to which reference is made in the National Building Code of Canada are the basis for compliance with the National Building Code requirements.

(2) The ratings shown in this document apply if more specific test values are not available. The

Table 1.1.A.
Forming Part of Sentence 1.1.2.(2)

Documents Referenced in Chapter 2 of the Supplement to the National Building Code of Canada 1990			
Issuing Agency	Document Number	Title of Document	Reference
ASTM	C330-87	Lightweight Aggregates for Structural Concrete	1.4.3.(2)
CGSB	4-GP-36M-1978	Carpet Underlay, Fibre Type	Table 3.1.B.
CGSB	4-GP-129-1972	Carpets, Commercial	Table 3.1.B.
CGSB	CAN/CGSB-11.3-M87	Hardboard	Table 3.1.A.
CGSB	CAN/CGSB-34.16-M89	Sheets, Asbestos Cement, Flat, Fully Compressed	Table 3.1.A.
CSA	CAN3-A23.1-M90	Concrete Materials and Methods of Concrete Construction	1.4.3.(1)
CSA	CAN3-A23.3-M84	Design of Concrete Structures for Buildings	2.8.2.(1) Table 2.8.A.
CSA	A82.5-M1978	Structural Clay Non-Load-Bearing Tile	Table 2.6.A.
CSA	A82.22-M1977	Gypsum Plasters	Table 3.1.A.
CSA	A82.27-M1977	Gypsum Board Products	1.5.1. 1.5.2. Table 3.1.A.
CSA	A82.30-M1980	Interior Furring, Lathing and Gypsum Plastering	1.7.3.(1) 2.3.12.(1) Table 2.5.A.
CSA	A82.31-M1980	Gypsum Board Application	2.3.12.(1)
CSA	A101-M1983	Thermal Insulation, Mineral Fibre, for Buildings	Table 2.3.F. Table 2.6.E.
CSA	A126.1-M1984	Vinyl Asbestos and Vinyl Composition Floor Tile	Table 3.1.B.
CSA	CAN/CSA-A247-M86	Insulating Fibreboard	Table 3.1.A.
CSA	CAN3-O86-M84	Engineering Design in Wood (Working Stress Design)	2.11.2.(1)
CSA	CAN/CSA-086.1-M88	Engineering Design in Wood (Limit States Design)	2.11.2.(3)
CSA	O115-M1982	Hardwood and Decorative Plywood	Table 3.1.A.
CSA	O121-M1978	Douglas Fir Plywood	Table 3.1.A.
CSA	O141-1970	Softwood Lumber	2.3.10.(2) Table 2.4.A.
CSA	O151-M1978	Canadian Softwood Plywood	Table 3.1.A.
CSA	O153-M1980	Poplar Plywood	Table 3.1.A.
CSA	CAN3-O188.1-M78	Interior Mat-Formed Wood Particleboard	Table 3.1.A.
CSA	CAN3-O188.2-M78	Waferboard	Table 3.1.A.
NFPA	NFPA 80-1990	Fire Doors and Windows	5.2.1. 5.2.2.
Column 1	2	3	4

Table 1.1.A. (Cont'd)
Forming Part of Sentence 1.1.2.(2)

Issuing Agency	Document Number	Title of Document	Reference
ULC	CAN/ULC-S101-M89	Standard Methods of Fire Endurance Tests of Building Construction and Materials	1.1.1.(2) 1.12.2. 1.12.3. 2.3.2.
ULC	CAN/ULC-S102-M88	Standard Method of Test for Surface Burning Characteristics of Building Materials and Assemblies	1.1.1.(3)
ULC	CAN/ULC-S102.2-M88	Standard Method of Test for Surface Burning Characteristics of Flooring, Floor Covering, and Miscellaneous Materials and Assemblies	1.1.1.(3) Table 3.1.B.
ULC	CAN4-S114-M80	Standard Method of Test for Determination of Non-Combustibility in Building Materials	1.1.1.(4) 4.1.1.
ULC	S505-1974	Standard for Fusible Links for Fire Protection Service	4.2.1. 5.3.2.
Column 1	2	3	4

construction of an assembly that is the subject of an individual test report must be followed in all essential details if the fire resistance reported is to be applied as a fire-resistance rating for use in the National Building Code.

1.1.4. The authority having jurisdiction may allow higher fire-resistance ratings than those covered in this Chapter, where supporting evidence justifies a higher rating. Additional information is provided in summaries of published test information and the reports of fire tests carried out by the Institute for Research in Construction, National Research Council of Canada, included in the bibliography listed in Appendix A to this Chapter.

1.1.5. Assemblies containing materials for which there is no nationally recognized standard are not included in this Chapter. Many such assemblies have been rated by Underwriters' Laboratories of Canada. This information is published in their "List of Equipment and Materials," Volume II, Building Construction. Copies of this document may be obtained from Underwriters' Laboratories of Canada, 7 Crouse Road, Scarborough, Ontario M1R 3A9.

1.2 Interpretation of Test Results

1.2.1. The fire-performance ratings set out in this Chapter are based on those that would be obtained from the standard methods of test described in the National Building Code. The test methods are essentially a means of comparing the performance of one building component or assembly with another in relation to its performance in fire.

1.2.2. Since it is not practicable to measure the fire resistance of constructions *in situ*, they must be evaluated under some agreed test conditions. A specified fire-resistance rating is not necessarily the actual time that the assembly would endure *in situ* in a building fire, but is that which the particular construction must meet under the specified methods of test.

1.2.3. Considerations arising from departures in use from the conditions established in the standard test methods may, in some circumstances, have to be taken into account by the designer and the authority having jurisdiction. Some of these conditions are covered at present by the provisions of the National Building Code.

1.3 Aggregates Used in Concrete

1.3.1. Low density aggregate concretes generally exhibit better fire performance than natural stone aggregate concretes. A series of tests on concrete masonry walls, combined with mathematical analysis of the test results, has allowed further distinctions between certain low density aggregates to be made.

1.4 Types of Concrete

1.4.1.

(1) For purposes of this Chapter, concretes are described as Types S, N, L, L₁, L₂, L40S, L₁20S or L₂20S as described in Sentences (2) to (8).

(2) Type S concrete is the type in which the coarse aggregate is granite, quartzite, siliceous gravel or other dense materials containing at least 30 per cent quartz, chert or flint.

(3) Type N concrete is the type in which the coarse aggregate is cinders, broken brick, blast furnace slag, limestone, calcareous gravel, trap rock, sandstone or similar dense material containing not more than 30 per cent of quartz, chert or flint.

(4) Type L concrete is the type in which all the aggregate is expanded slag, expanded clay, expanded shale or pumice.

(5) Type L₁ concrete is the type in which all the aggregate is expanded shale.

(6) Type L₂ concrete is the type in which all the aggregate is expanded slag, expanded clay or pumice.

(7) Type L40S concrete is the type in which the fine portion of the aggregate is sand and low density aggregate in which the sand does not exceed 40 per cent of the total volume of all aggregates in the concrete.

(8) Type L₁20S and Type L₂20S concretes are the types in which the fine portion of the aggregate is sand and low density aggregate in which the sand does not exceed 20 per cent of the total volume of all aggregates in the concrete.

1.4.2. Where concretes are described as being of Type S, N, L, L₁ or L₂, the rating applies to the concrete containing the aggregate in the group that provides the least fire resistance. If the nature of an aggregate cannot be determined accurately enough to

place it in one of the groups, the aggregates shall be considered as being in the group that requires a greater thickness of concrete for the required fire resistance.

1.4.3.

(1) The descriptions of the aggregates in Type S and Type N concretes apply to the coarse aggregates only. Coarse aggregate for this purpose means that retained on a 5 mm sieve using the method of grading aggregates described in CAN3-A23.1-M, "Concrete Materials and Methods of Concrete Construction."

(2) Increasing the proportions of sand as fine aggregate in low density concretes requires increased thicknesses of material to produce equivalent fire-resistance ratings. Low density aggregates for Type L and Types L-S concretes used in loadbearing components shall conform to ASTM C330, "Lightweight Aggregates for Structural Concrete."

1.4.4. Non-loadbearing low density components of vermiculite and perlite concrete, in the absence of other test evidence, shall be rated on the basis of the values shown for Type L concrete.

1.5 Gypsum Wallboard

1.5.1. Where the term gypsum wallboard is used in this Chapter, it is intended to include, in addition to gypsum wallboard, gypsum backing board and gypsum base for veneer plaster as described in CSA A82:27-M; "Gypsum Board Products."

1.5.2. Where the term Type X gypsum wallboard is used in this Chapter, it applies to special fire-resistant board as described in CSA A82:27-M, "Gypsum Board Products."

1.6 Equivalent Thickness

1.6.1. The thickness of solid-unit masonry and concrete described in this Chapter shall be the thickness of solid material in the unit or component thickness. For units that contain cores or voids, the Tables refer to the equivalent thickness determined in conformance with Articles 1.6.2. to 1.6.6.

1.6.2. Where a plaster finish is used, the equivalent thickness of a wall, floor, column or beam protection shall be equal to the sum of the equivalent

thicknesses of the concrete or masonry units and the plaster finish measured at the point that will give the least value of equivalent thickness.

1.6.3.

(1) Except as provided in Sentence (3), the equivalent thickness of a hollow masonry unit shall be calculated as equal to the actual overall thickness of a unit in millimetres multiplied by a factor equal to the net volume of the unit and divided by its gross volume.

(2) Net volume shall be determined using a volume displacement method that is not influenced by the porous nature of the units.

(3) Gross volume of a masonry unit shall be equal to the actual length of the unit multiplied by the actual height of the unit multiplied by the actual thickness of the unit.

(4) Where all the core spaces in a wall of hollow concrete masonry or hollow-core precast concrete units are filled with loose-fill materials such as expanded slag, burned clay or shale (rotary kiln process), vermiculite or perlite, the equivalent thickness rating of the wall shall be considered to be the same as that of a wall of solid units, or a solid wall of the same concrete type and the same overall thickness.

1.6.4. The equivalent thickness of hollow-core concrete slabs and panels having a uniform thickness and cores of constant cross section throughout their length shall be obtained by dividing the net cross-sectional area of the slab or panel by its width.

1.6.5. The equivalent thickness of concrete panels with tapered cross sections shall be the cross section determined at a distance of $2t$ or 150 mm, whichever is less, from the point of minimum thickness, where t is the minimum thickness.

1.6.6.

(1) The equivalent thickness of concrete panels with ribbed or undulating surfaces shall be

- (a) t_a for s less than or equal to $2t$,
- (b) $t + (4t/s - 1)(t_a - t)$ for s less than $4t$ and greater than $2t$, and
- (c) t for s greater than or equal to $4t$ where
 t = minimum thickness of panel,

t_a = average thickness of the panel (unit cross-sectional area divided by the unit width), and

s = centre to centre spacing of ribs or undulations.

(2) Where the total thickness of a panel in Sentence (1) exceeds $2t$, only that portion of the panel which is less than $2t$ from the nonribbed surface shall be considered for the purpose of the calculations in Sentence (1).

1.7 Contribution of Plaster or Gypsum Wallboard Finish to Fire Resistance of Masonry or Concrete

1.7.1.

(1) Except as provided in Sentences (2), (3) and (4) and Article 1.7.2., the contribution of a plaster or gypsum wallboard finish to the fire resistance of masonry or concrete wall, floor or roof assembly shall be determined by multiplying the actual thickness of the finish by the factor shown in Table 1.7.A., depending on the type of masonry or concrete to which it is applied. This corrected thickness shall then be included in the equivalent thickness as described in Subsection 1.6.

(2) Where a plaster or gypsum wallboard finish is applied to a concrete or masonry wall, the calculated fire-resistance rating of the assembly shall not exceed twice the fire-resistance rating provided by the masonry or concrete because structural collapse may occur before the limiting temperature is reached on the surface of the non-fire-exposed side of the assembly.

(3) Where a plaster or gypsum wallboard finish is applied only on the non-fire-exposed side of a hollow clay tile wall, no increase in fire resistance is permitted because structural collapse may occur before the limiting temperature is reached on the surface of the non-fire-exposed side of the assembly.

(4) The contribution to fire resistance of a plaster or gypsum wallboard finish applied to the non-fire-exposed side of a monolithic concrete or unit masonry wall shall be determined in conformance with Sentence (1), but shall not exceed 0.5 times the contribution of the concrete or masonry wall.

Table 1.7.A.
Forming Part of Sentence 1.7.1.(1)

Multiplying Factors for Various Masonry or Concrete Construction				
Type of Surface Protection	Type of Masonry or Concrete			
	Solid Clay Brick, Unit Masonry and Monolithic Concrete, Type N or S	Cored Clay Brick, Clay Tile, Monolithic Concrete, Type L40S and Unit Masonry, Type L ₁ 20S	Concrete Unit Masonry, Type L ₁ or L ₂ 20S and Monolithic Concrete, Type L	Concrete Unit Masonry, Type L ₂
Portland cement-sand plaster, lime sand plaster or portland cement-sand plaster with asbestos fibres	1	0.75	0.75	0.50
Gypsum-sand plaster, wood fibred gypsum plaster or gypsum wallboard	1.25	1	1	1
Vermiculite or perlite aggregate plaster	1.75	1.5	1.25	1.25
Column 1	2	3	4	5

1.7.2. When applied to the fire-exposed side, the contribution of a gypsum lath and plaster or gypsum wallboard finish to the fire resistance of masonry or concrete wall, floor or roof assemblies shall be determined from Table 2.3.A. or 2.3.B.

1.7.3.

(1) Gypsum plastering shall conform to CSA A82.30-M, "Interior Furring, Lathing and Gypsum Plastering."

(2) Portland cement-sand plaster shall be applied in 2 coats; the first coat containing 1 part portland cement to 2 parts sand by volume, and the second coat containing 1 part portland cement to 3 parts sand by volume.

(3) Plaster finish shall be securely bonded to the wall or ceiling.

(4) The thickness of plaster finish applied directly to monolithic concrete without metal lath shall not exceed 10 mm on ceilings and 16 mm on walls.

(5) Where the thickness of plaster finish on masonry or concrete exceeds 38 mm, wire mesh with 1.57 mm diam wire and openings not exceeding 50 mm by 50 mm shall be embedded midway in the plaster.

1.7.4. Gypsum wallboard and gypsum lath finishes applied to masonry or concrete walls shall be secured to wood or steel furring members in conformance with Article 2.3.11.

1.7.5. The following examples are included as a guide to the method of calculating the fire resistance of concrete or hollow masonry walls with plaster or gypsum wallboard protection:

Example (1)

A 3 h fire-resistance rating is required for a monolithic concrete wall of Type S aggregate with a 20 mm gypsum-sand plaster finish on metal lath on each face.

- (a) The minimum equivalent thickness of Type S monolithic concrete needed to give a 3 h fire-resistance rating = 158 mm (Table 2.1.A.).
- (b) Since the gypsum-sand plaster finish is applied on metal lath, Article 1.7.2. does not apply. Therefore, the contribution to the equivalent thickness of the wall of 20 mm gypsum-sand plaster on each face of the concrete is $20 \times 1.25 = 25$ mm (see Article 1.7.1.).
- (c) The total contribution of the plaster finishes is $2 \times 25 = 50$ mm.

- (d) The minimum equivalent thickness of concrete required is $158 \text{ mm} - 50 \text{ mm} = 108 \text{ mm}$.
- (e) From Table 2.1.A., the 108 mm equivalent thickness of monolithic concrete gives a contribution of less than 1.5 h. This is less than half the rating of the assembly so that the conditions in Sentence 1.7.1.(2) are not met. Thus the equivalent thickness of monolithic concrete must be increased to 112 mm to give 1.5 h contribution.
- (f) The total equivalent thickness of the plaster finishes can then be reduced to $158 \text{ mm} - 112 \text{ mm} = 46 \text{ mm}$.
- (g) The total actual thickness of the plaster finishes required is therefore $46 \text{ mm} \div 1.25 = 37 \text{ mm}$ (Article 1.7.1.) or 18.5 mm on each face.
- (h) Since the thickness of the plaster finish on each face exceeds 16 mm, metal lath is still required (Sentence 1.7.3.(4)).
- (i) Since this wall is symmetrical with plaster on both faces, the contribution to fire resistance of the plaster finish on either face is limited to one-quarter of the wall rating by virtue of Sentence 1.7.1.(2). Under these circumstances, the conditions in Sentence 1.7.1.(4) are automatically met.

Example (2)

A 2 h fire-resistance rating is required for a hollow masonry wall of Type N concrete with a 12.7 mm gypsum wallboard finish on each face.

- (a) Since gypsum wallboard is used, Article 1.7.2. applies. The 12.7 mm gypsum wallboard finish on the fire-exposed side is, therefore, assigned 15 min by using Table 2.3.A.
- (b) The fire resistance required of the balance of the assembly is $120 \text{ min} - 15 \text{ min} = 105 \text{ min}$.
- (c) Interpolating between 1.5 h and 2 h in Table 2.1.A. for 105 min fire resistance, the equivalent thickness for hollow masonry units required is $95 \text{ mm} + (18 \text{ mm} \times 15/30) = 104 \text{ mm}$.
- (d) The contribution to the equivalent thickness of the wall of the 12.7 mm gypsum wallboard finish on the non-fire-exposed side using Table 1.7.A. $= 12.7 \times 1.25 = 16 \text{ mm}$.
- (e) Equivalent thickness required of concrete masonry unit $= 104 - 16 = 88 \text{ mm}$.
- (f) The fire-resistance rating of a concrete masonry wall having an equivalent thickness of 88 mm $= 1 \text{ h } 20 \text{ min}$. As this is more than 1 h, the conditions of Sentence 1.7.1.(2) are met and the rating of 2 h is justified.

Example (3)

A 2 h fire-resistance rating is required for a hollow masonry exterior wall of Type L₂20S concrete with a 15.9 mm Type X gypsum wallboard finish on the non-fire-exposed side only.

- (a) According to Table 2.1.A., the minimum equivalent thickness for Type L₂20S concrete masonry units needed to achieve a 2 h rating is 94 mm.
- (b) Since gypsum wallboard is not used on the fire-exposed side, Article 1.7.2. does not apply. The contribution to the equivalent thickness of the wall by the 15.9 mm Type X gypsum wallboard finish applied on the non-fire-exposed side is $15.9 \times 1 = 16 \text{ mm}$ (see Sentence 1.7.1.(1) and Table 1.7.A.).
- (c) Therefore, the equivalent thickness required of the concrete masonry unit is $94 - 16 = 78 \text{ mm}$.
- (d) The contribution to fire resistance of a 78 mm L₂20S concrete hollow masonry unit is 85 min. The contribution of the Type X gypsum wallboard finish is $120 - 85 = 35 \text{ min}$, which does not exceed half the 85 min contribution of the masonry unit or 42.5 min, so that the conditions in Sentence 1.7.1.(4) are met.
- (e) The rating of the wall (120 min) is less than twice the contribution of the masonry unit (170 min) so that the conditions in Sentence 1.7.1.(2) are also met.

1.8 Tests on Floors and Roofs

1.8.1. All tests relate to the performance of a floor assembly or floor-ceiling or roof-ceiling assembly above a fire. It has been assumed on the basis of experience that fire on top will take a longer time to

penetrate the floor than one below, and that the fire resistance in such a situation will be at least equal to that obtained from below in the standard test.

1.9 Moisture Content

1.9.1. The moisture content of building materials at the time of fire test may have a significant influence on the measured fire resistance. In general, an increase in the moisture content should result in an increase in the fire resistance, though in some materials the presence of moisture may produce disruptive effects and early collapse of the assembly.

1.9.2. Moisture content is now controlled in standard fire test methods and is generally recorded in the test reports. In earlier tests, moisture content was not always properly determined.

1.10 Permanence and Durability

1.10.1. The ratings in this Chapter relate to tested assemblies and do not take into account possible changes or deterioration in use of the materials. The standard fire test measures the fire resistance of a sample building assembly erected for the test. No judgment as to the permanence or durability of the assembly is made in the test.

1.11 Steel Structural Members

1.11.1. Since the ability of a steel structural member to sustain the loading for which it was designed may be impaired because of elevated temperatures, measures shall be taken to provide thermal protection. The fire-resistance ratings, as established by the provisions of this Chapter, indicate the time periods during which the effects of heat on protected steel structural members are considered to be within acceptable limits.

1.12 Restraint Effects

1.12.1. In fire tests of floors, roofs and beams, it is necessary to state whether the rating applies to a thermally restrained or thermally unrestrained assembly. Edge restraint of a floor or roof, structural continuity, or end restraint of a beam can significantly extend the time before collapse in a standard test. A restrained condition is one in which expansion or rotation at the supports of a load-carrying ele-

ment resulting from the effects of fire is resisted by forces or moments external to the element. An unrestrained condition is one in which the load-carrying element is free to thermally expand and rotate at its supports.

1.12.2. Whether an assembly or structural member can be considered thermally restrained or thermally unrestrained depends on the type of construction and location in a building. Guidance on this subject can be found in Appendix A1 of CAN/ULC-S101-M, "Standard Methods of Fire Endurance Tests of Building Construction and Materials." Different acceptance criteria also apply to thermally unrestrained and thermally restrained assemblies. These are described in CAN/ULC-S101-M.

1.12.3. The ratings for floors, roofs, and beams in this Chapter meet the conditions of CAN/ULC-S101-M, "Standard Methods of Fire Endurance Tests of Building Construction and Materials" for thermally unrestrained specimens. In a thermally restrained condition, the structural element or assembly would probably have greater fire resistance, but the extent of this increase can be determined only by reference to behavior in a standard test.

Section 2 Fire-Resistance Ratings

2.1 Masonry and Concrete Walls

2.1.1. The minimum thicknesses of unit masonry and monolithic concrete walls are shown in Table 2.1.A. Hollow masonry units and hollow-core concrete panels shall be rated on the basis of equivalent thickness as described in Subsection 1.6.

2.1.2.

(1) Ratings obtained as described in Article 2.1.1. apply to either loadbearing or non-loadbearing walls, except for walls described in Sentences (2) to (6).

(2) Ratings for walls with a thickness less than the minimum thickness prescribed for loadbearing walls in the National Building Code of Canada 1990 apply to non-loadbearing walls only.

Table 2.1.A.
Forming Part of Article 2.1.1.

Minimum Equivalent Thicknesses ⁽¹⁾ of Unit Masonry and Monolithic Concrete Walls Loadbearing and Non-Loadbearing, mm							
Type of Wall	Fire-Resistance Rating						
	30 min	45 min	1 h	1.5 h	2 h	3 h	4 h
Solid brick units (80 per cent solid and over), actual overall thickness	63	76	90	108	128	152	178
Cored brick units and hollow tile units (less than 80 per cent solid), equivalent thickness	50	60	72	86	102	122	142
Solid and hollow concrete masonry units, equivalent thickness							
Type S or N concrete ⁽²⁾	44	59	73	95	113	142	167
Type L ₁ 20S concrete	42	54	66	87	102	129	152
Type L ₁ concrete	42	54	64	82	97	122	143
Type L ₂ 20S concrete	42	54	64	81	94	116	134
Type L ₂ concrete	42	54	63	79	91	111	127
Monolithic concrete and concrete panels, equivalent thickness							
Type S concrete	60	77	90	112	130	158	180
Type N concrete	59	74	87	108	124	150	171
Type L40S or Type L concrete	49	62	72	89	103	124	140
Column 1	2	3	4	5	6	7	8

Notes to Table 2.1.A.:

⁽¹⁾ See definition of equivalent thickness in Subsection 1.6.

⁽²⁾ Hollow concrete masonry units made with Type S or N concrete must have a 28-day compressive strength of at least 7.5 MPa.

(3) Masonry cavity walls (consisting of 2 wythes of masonry with an air space between) that are loaded to a maximum allowable compressive stress of 380 kPa have a fire resistance at least as great as that of a solid wall of a thickness equal to the sum of the equivalent thicknesses of the 2 wythes.

(4) Masonry cavity walls that are loaded to a compressive stress exceeding 380 kPa are not considered to be within the scope of this Chapter.

(5) A masonry wall consisting of 2 types of masonry units, either bonded together or in the form of a cavity wall, shall be considered to have a fire-resistance rating equal to that which would apply if the whole of the wall were of the material that gives the lesser rating.

(6) A non-loadbearing cavity wall made up of 2 precast concrete panels with an air space or insulation in the cavity between them shall be considered to have a fire-resistance rating as great as that of a solid wall of a thickness equal to the sum of the thicknesses of the 2 panels.

2.1.3. If wood joists are built into a masonry wall, the thickness of masonry material between the end of the joist and the fire-exposed side of the wall shall be not less than the equivalent thickness shown in the Tables for the fire resistance required.

2.1.4. On monolithic walls and walls of unit masonry, the full plaster finish on one or both faces multiplied by the factor shown in Table 1.7.A. shall

be included in the wall thickness shown in Table 2.1.A., under the conditions and using the methods described in Subsection 1.7.

2.1.5.

(1) Except as permitted in Sentence (2), portions of loadbearing reinforced concrete walls, which do not form a complete fire separation and thus may be exposed to fire on both sides simultaneously, shall have minimum dimensions and minimum cover to steel reinforcement in conformance with Articles 2.8.2. to 2.8.5.

(2) A concrete wall exposed to fire from both sides as described in Sentence 2.1.5.(1) has a fire-resistance rating of 2 h if the following conditions are met:

- (a) its equivalent thickness is not less than 200 mm,
- (b) its aspect ratio (width/thickness) is not less than 4.0,
- (c) the minimum thickness of concrete cover over the steel reinforcement specified in Clause (d) is not less than 50 mm,
- (d) each face of the wall is reinforced with both vertical and horizontal steel reinforcement in conformance with either Clause 10 or Clause 14 of CAN3-A23.3-M, "Design of Concrete Structures for Buildings,"
- (e) the structural design of the wall is governed by the minimum eccentricity requirements of Clause 10.11.6.3. of CAN3-A23.3-M, "Design of Concrete Structures for Buildings," and

(f) the effective length of the wall, kl_u , is not more than 3.7 m

where

k = effective length factor obtained from CAN3-A23.3-M, "Design of Concrete Structures for Buildings,"

l_u = unsupported length of the wall in metres.

2.2 Reinforced and Prestressed Concrete Floor and Roof Slabs

2.2.1.

(1) Floors and roofs in a fire test are assigned a fire-resistance rating which relates to the time that an average temperature rise of 140°C or a maximum temperature rise of 180°C at any location is recorded on the unexposed side, or the time required for collapse to occur, whichever is the lesser. The thickness of concrete shown in Table 2.2.A. shall be required to resist the transfer of heat during the fire resistance period shown.

(2) The concrete cover over the reinforcement and steel tendons shown in Table 2.2.B. shall be required to maintain the integrity of the structure and prevent collapse during the same period.

2.2.2. The fire resistance of floors containing hollow units may be determined on the basis of equivalent thickness as described in Subsection 1.6.

2.2.3.

(1) For composite concrete floor and roof slabs consisting of one layer of Type S or N concrete and another layer of Type L40S or L concrete in

Table 2.2.A.
Forming Part of Sentence 2.2.1.(1)

Minimum Thickness of Reinforced Concrete Floor or Roof Slabs, mm							
Type of Concrete	Fire-Resistance Rating						
	30 min	45 min	1 h	1.5 h	2 h	3 h	4 h
Type S Concrete	60	77	90	112	130	158	180
Type N concrete	59	74	87	108	124	150	171
Type L40S or Type L concrete	49	62	72	89	103	124	140
Column 1	2	3	4	5	6	7	8

Table 2.2.B.
Forming Part of Sentence 2.2.1.(2)

Minimum Concrete Cover over Reinforcement in Concrete Slabs, mm							
Type of Concrete	Fire-Resistance Rating						
	30 min	45 min	1 h	1.5 h	2 h	3 h	4 h
Type S, N, L40S or L concrete	20	20	20	20	25	32	39
Prestressed concrete slabs Type S, N, L40S or L concrete	20	25	25	32	39	50	64
Column 1	2	3	4	5	6	7	8

which the minimum thickness of both the top and bottom layers is not less than 25 mm, the combined fire-resistance rating may be determined using the following expressions:

- (a) when the base layer consists of Type S or N concrete,

$$R = 0.0002t^2 - 0.0001 d \cdot t + \frac{10}{t}, \text{ and}$$

- (b) when the base layer consists of Type L40S or L concrete,

$$R = 0.00009t^2 + 0.00018d \cdot t - 0.00009 d^2 + \frac{5.8}{t}$$

where

R = fire resistance of slab, h,
t = total thickness of slab, mm, and
d = thickness of base layer, mm.

(2) If the base course described in Sentence (1) is covered by a top layer of material other than Type S, N, L40S or L concrete, the top course thickness may be converted to an equivalent concrete thickness by multiplying the actual thickness by the appropriate factor listed in Table 2.2.C. This equivalent concrete thickness may be added to the thickness of the base course and the fire-resistance rating calculated using Table 2.2.A.

(3) The minimum concrete cover over the main reinforcement for composite concrete floor and roof slabs with base slabs of less than 100 mm thick shall conform to Table 2.2.D. For base slabs of 100 mm or more thick, the minimum cover thickness requirements of Table 2.2.B. shall apply.

(4) Where the top layer of a 2-layer slab is less than 25 mm thick, the fire-resistance rating for the slab shall be calculated as though the entire slab were made up of the type of concrete with the lesser fire resistance.

2.2.4.

(1) The contribution of plaster finish securely fastened to the underside of concrete may be taken into account in floor or roof slabs under the conditions and using the methods described in Subsection 1.7.

(2) Plaster finish on the underside of concrete floors or roofs may be used in lieu of concrete cover

Table 2.2.C.
Forming Part of Sentence 2.2.3.(2)

Top Course Material	Multiplying Factors for Equivalent Thickness	
	Base Slab Normal Density Concrete (Type S or N)	Base Slab Low Density Concrete (Type L40S or L)
Gypsum wallboard	3	2.25
Cellular concrete (mass density 400 – 560 kg/m ³)	2	1.50
Vermiculite and perlite concrete (mass density 560 kg/m ³ or less)	1.75	1.50
Portland cement with sand aggregate	1	0.75
Terrazzo	1	0.75
Column 1	2	3

Table 2.2.D.
Forming Part of Sentence 2.2.3.(3)

Minimum Concrete Cover under Bottom Reinforcement in Composite Concrete Slabs, mm							
Base Slab Concrete Type	Fire-Resistance Rating						
	30 min	45 min	1 h	1.5 h	2 h	3 h	4 h
Reinforced concrete Type S, N, L40S or L	15	15	20	25	30	40	55
Prestressed concrete							
Type S	20	25	30	40	50	65	75
Type N	20	20	25	35	45	60	70
Type L40S or L	20	20	25	30	40	50	60
Column 1	2	3	4	5	6	7	8

referred to in Sentence 2.2.1.(2) under the conditions and using the methods described in Subsection 1.7.

2.2.5.

(1) In prestressed concrete slab construction, the concrete cover over an individual tendon shall be the minimum thickness of concrete between the surface of the tendon and the fire-exposed surface of the slab, except that for ungrouted ducts the assumed cover thickness shall be the minimum thickness of concrete between the surface of the duct and the bottom of the slab. For slabs in which several tendons are used, the cover is assumed to be the average of those of individual tendons, except that the cover for any individual tendon shall be not less than half of the value given in Table 2.2.B. nor less than 20 mm.

(2) Except as provided in Sentence (3), in post-tensioned prestressed concrete slabs, the concrete cover to the tendon at the anchor shall be at least 15 mm greater than the minimum cover required by Sentence (1). The minimum concrete cover to the anchorage bearing plate and to the end of the tendon, if it projects beyond the bearing plate, shall be 20 mm.

(3) The requirements of Sentence (2) do not apply to those portions of slabs not likely to be exposed to fire, such as the ends and tops.

2.2.6. Minimum dimensions and cover to steel tendons of prestressed concrete beams shall conform to Subsection 2.10.

2.3 Wood and Steel Framed Walls, Floors and Roofs

2.3.1. The fire-resistance rating of walls, floors and roofs, incorporating wood, steel, light-gauge steel members and open-web steel joists for ratings up to and including 1.5 h shall be determined by this Subsection.

2.3.2. The ratings in this Subsection apply to both loadbearing and non-loadbearing wood framed walls, to non-loadbearing steel framed walls and to loadbearing floors and roofs. Loadbearing conditions shall be as defined in CAN/ULC-S101-M, "Standard Methods of Fire Endurance Tests of Building Construction and Materials."

2.3.3. The fire-resistance rating of a framed assembly shall be calculated by adding the time assigned in Article 2.3.4. for the membrane on the fire-exposed side plus the time assigned in Article 2.3.5. for the framing members plus the time assigned in Article 2.3.10. for additional protective measures such as the inclusion of insulation or the reinforcement of a membrane. The assigned times in Articles 2.3.4., 2.3.5. and 2.3.10. are not intended to be construed as the fire-resistance ratings of the individual components of an assembly. These assigned times are the individual contributions to the overall fire-resistance rating of the complete assembly.

2.3.4. The fire-resistance rating of a framed assembly depends on the time during which the membrane on the fire-exposed side remains in place. Tables

Table 2.3.A.
Forming Part of Article 2.3.4.

Time Assigned to Wallboard Membranes on Fire Exposed Side	
Description of Finish	Time min
12.5 mm fibreboard	5
8.0 mm Douglas Fir plywood phenolic bonded	5
11.0 mm Douglas Fir plywood phenolic bonded	10
14.0 mm Douglas Fir plywood phenolic bonded	15
9.5 mm gypsum wallboard	10
12.7 mm gypsum wallboard	15
12.7 mm Type X gypsum wallboard	25
15.9 mm gypsum wallboard	20
15.9 mm Type X gypsum wallboard	40
Double 9.5 mm gypsum wallboard	25
12.7 mm and 9.5 mm gypsum wallboard	35
Double 12.7 mm gypsum wallboard	40
Double 12.7 mm gypsum wallboard	50 ⁽¹⁾
Double 12.7 mm Type X gypsum wallboard	80 ⁽²⁾
4.5 mm asbestos cement and 9.5 mm gypsum wallboard	40 ⁽³⁾
4.5 mm asbestos cement and 12.7 mm gypsum wallboard	50 ⁽³⁾
Composite 3 mm asbestos cement on 11 mm fibreboard	20
Column 1	2

Notes to Table 2.3.A.:

- ⁽¹⁾ Wire mesh with 1.57 mm diam wire and 25 mm by 25 mm openings must be fastened between the two sheets of wallboard.
- ⁽²⁾ Applies to non-loadbearing steel framed walls only.
- ⁽³⁾ Values shown apply to walls only.

2.3.A. and 2.3.B. list the times which have been assigned to membranes on the fire-exposed side of the assembly based on their ability to remain in place during fire tests. This is not to be confused with the fire-resistance rating of the membrane, which shall also take into account the rise in temperature on the unexposed side of the membrane.

2.3.5. When the membrane on the fire-exposed side of a framed assembly falls off, there is a brief period of time before structural failure occurs during which the studs or joists are exposed directly to flame. Table 2.3.C. lists the times which have been assigned to the framing members based on the time

involved between failure of the membrane and collapse of the assembly.

2.3.6. Interior vertical fire separations shall be rated for exposure to fire on each side, and it is assumed, therefore, that membrane protection will be provided on both sides of the assembly. In the calculation of the fire-resistance rating of such an assembly, however, no contribution to fire resistance should be assigned for a membrane on the non-fire-exposed side, since this membrane may fail when the structural members fail.

2.3.7. When an exterior wall assembly is required to be rated from the interior side only, such wall assemblies may have an outer membrane consisting of sheathing and exterior cladding combinations listed in Table 2.3.D. or may be any membrane that is assigned a time for contribution to fire resistance of at least 15 min in Table 2.3.A. or 2.3.B.

2.3.8. In the case of a floor or roof, the standard test provides only for testing for fire exposure from below. Floor or roof assemblies of wood, light-gauge steel members or open-web steel joist framing shall have an upper membrane consisting of a subfloor and finish floor conforming to Table 2.3.E. or any other membrane that has a contribution to fire resistance of at least 15 min in Table 2.3.A.

2.3.9.

(1) Insulation used in the cavities of a wood floor assembly will not reduce the assigned fire-resistance rating of the assembly provided:

- (a) the insulation is preformed of rock, slag or glass fibre conforming to CSA A101-M, "Thermal Insulation, Mineral Fibre, for Buildings" having a mass of not more than 1.1 kg/m² and is installed adjacent to the bottom edge of the framing member, directly above steel furring channels,
- (b) the gypsum wallboard ceiling membrane is attached to
 - (i) wood trusses in conformance with Sentence 2.3.11.(2) by way of steel drywall furring channels spaced not more than 400 mm o.c., and the channels are secured to each bottom truss member with a double strand of 1.2 mm galvanized steel wire, or

Table 2.3.B.
Forming Part of Article 2.3.4.

Time Assigned to Lath and Plaster Protection on Fire Exposed Side, min ⁽¹⁾					
Type of Lath	Type of Plaster Finish				
	Plaster Thickness mm	Portland Cement and Sand ⁽²⁾ or Lime and Sand	Portland Cement, Sand and Asbestos Fibre (1.4 kg/bag of cement)	Gypsum and Sand or Gypsum Wood Fibred	Gypsum and Perlite or Gypsum and Vermiculite
Wood lath	13	5	10	20	—
12.5 mm fibreboard	13	—	—	20	—
9.5 mm gypsum lath	13	—	—	35	55
9.5 mm gypsum lath	16	—	—	40	65
9.5 mm gypsum lath	19	—	—	50	80 ⁽¹⁾
Metal lath	19	20	35	50	80 ⁽¹⁾
Metal lath	23	25	40	65	80 ⁽¹⁾
Metal lath	26	30	50	80	80 ⁽¹⁾
Column 1	2	3	4	5	6

Notes to Table 2.3.B.:

⁽¹⁾ Values shown for these membranes have been limited to 80 min because the fire resistance ratings of framed assemblies derived from these Tables shall not exceed 1.5 h.

⁽²⁾ For mixture of portland cement-sand plaster, see Sentence 1.7.3.(2).

Table 2.3.C.
Forming Part of Article 2.3.5.

Time Assigned for Contribution of Wood or Light Steel Frame	
Description of Frame	Time assigned to Frame min
Wood studs 400 mm o.c.	20
Steel studs 400 mm o.c.	10
Wood floor and wood roof joists 400 mm o.c.	10
Open web steel joist floors and roofs with ceiling supports 400 mm o.c.	10
Wood roof and wood floor truss assemblies 600 mm o.c.	5
Column 1	2

Table 2.3.D.
Forming Part of Article 2.3.7.

Membrane on Exterior Face of Wood or Steel Stud Walls	
Sheathing	Exterior Cladding
16 mm T & G lumber	Lumber siding
7.5 mm exterior grade plywood	Wood shingles and shakes
12.7 mm gypsum board	6 mm plywood exterior grade
	6 mm hardboard
	Metal siding
	Stucco on metal lath
	Masonry veneer
None	9.5 mm exterior grade plywood
Column 1	2

Table 2.3.E.
Forming Part of Article 2.3.8.

Flooring or Roofing over Wood, Cold Formed Steel Members or Open-Web Steel Joists			
Type of Assembly	Structural Members	Subfloor or Roof Deck	Finish Flooring or Roofing
Floor	Wood or steel joists and wood trusses	12.5 mm plywood or 17 mm T & G softwood	Hardwood or softwood flooring on building paper Resilient flooring, parquet floor felted synthetic fibre floor coverings, carpeting, or ceramic tile on 8 mm thick panel-type underlay Ceramic tile on 30 mm mortar bed
	Steel joists	50 mm reinforced concrete or 50 mm concrete on metal lath or formed steel sheet, or 40 mm reinforced gypsum-fibre concrete on 12.7 mm gypsum wallboard	Finish flooring
Roof	Wood or steel joists and wood trusses	12.5 mm plywood or 17 mm T & G softwood	Finish roofing material with or without insulation
	Steel joists	50 mm reinforced concrete or 50 mm concrete on metal lath or formed steel sheet or 40 mm reinforced gypsum-fibre concrete on 12.7 mm gypsum wallboard	
Column 1	2	3	4

- (ii) wood joists by way of drywall or resilient steel furring channels spaced not more than 400 mm o.c. in conformance with Sentences 2.3.11.(2) and (3), and
- (c) a steel furring channel is installed midway between each furring channel mentioned in Clause (b) to provide additional support for the insulation.

2.3.10. Preformed rock or slag fibre insulation provides additional protection to wood studs by shielding the studs from exposure to the furnace and thus delaying the time of collapse. The use of rein-

forcement in the membrane exposed to fire also adds to the fire resistance by extending the time to failure. Table 2.3.F. shows the time increments that may be added to the fire resistance if these features are incorporated in the assembly.

2.3.11.

(1) The values shown in Tables 2.3.A., 2.3.B. and 2.3.H. apply to membranes supported on framing members spaced in conformance with Table 2.3.C.

(2) Wood studs and wood roof and floor framing members are assumed to be not less than 38 mm by 89 mm. Wood trusses are assumed to con-

Table 2.3.F.
Forming Part of Article 2.3.10.

Time Assigned for Additional Protection	
Description of Additional Protection	Fire Resistance min
Add to the fire-resistance rating of wood stud walls if the spaces between the studs are filled with preformed insulation of rock or slag fibres conforming to CSA A101, "Thermal Insulation, Mineral Fibre, for Buildings" and with a mass of not less than 1.22 kg/m ² of wall surface ⁽¹⁾	15
Add to the fire-resistance rating of non-loadbearing wood stud walls if the spaces between the studs are filled with preformed insulation of glass fibres conforming to CSA A101, "Thermal Insulation, Mineral Fibre, for Buildings" and having a mass of not less than 0.6 kg/m ² of wall surface	5
Add to the fire-resistance rating of plaster on gypsum lath ceilings if 0.76 mm diam wire mesh with 25 mm by 25 mm openings or 1.57 mm diam diagonal wire reinforcing at 250 mm o.c. is placed between lath and plaster	30
Add to the fire-resistance rating of plaster on gypsum lath ceilings if 76 mm wide metal lath strips are placed over joints between lath and plaster	10
Add to the fire-resistance rating of plaster on 9.5 mm thick gypsum lath ceilings (Table 2.3.B.) if supports for lath are 300 mm o.c.	10
Column 1	2

Note to Table 2.3.F.:

⁽¹⁾ There is no test data to justify the 15 min additional protection for preformed glass fibre insulation.

sist of wood chord and web framing members and connector plates fabricated from at least 1 mm thick galvanized steel with projecting teeth at least 8 mm long. Dimensions for dressed lumber are given in CSA 0141, "Softwood Lumber."

(3) The allowable spans for wood joists listed in Part 9 of the National Building Code of Canada 1990 are provided for floors supporting specific occupancies.

(4) Except as otherwise required in this Chapter, metal studs shall be of galvanized steel not less than 0.5 mm thick.

(5) The thickness of plaster finish shall be measured from the face of gypsum or metal lath.

(6) Gypsum wallboard installed over framing or furring shall be installed so that all edges are supported, except that 15.9 mm thick Type X gypsum wallboard may be installed horizontally with the horizontal joints unsupported.

(7) Except as required in Article 2.3.9., resilient or drywall furring channels may be used to attach a gypsum wallboard ceiling membrane to a floor or roof assembly provided the channels are of galvanized steel not less than 0.5 mm thick and are placed at a spacing of not more than 600 mm o.c. perpendicular to the framing members with an overlap of not less than 100 mm at splices and a minimum end clearance between the channels and walls of 15 mm.

2.3.12.

(1) Except as provided in Sentences (2) to (6), the fastening of lath and plaster or gypsum wallboard finish shall conform to CSA A82.30-M, "Interior Furring, Lathing and Gypsum Plastering" or CSA A82.31-M, "Gypsum Board Application."

(2) Where membrane protection referred to in Tables 2.3.A., 2.3.B. and 2.3.H. is applied to steel framing or furring, fasteners shall penetrate at least 10 mm through the metal.

(3) Except as provided in Sentences (4) and (5), where membrane protection referred to in Tables 2.3.A., 2.3.B. and 2.3.H. is applied to wood framing or furring, minimum fastener penetrations into wood members shall conform to Table 2.3.G. for the time assigned to the membrane.

(4) Where membrane protection is applied in 2 layers, the fastener penetrations described in Table 2.3.G. shall apply to the base layer. Fasteners for the face layer shall penetrate at least 20 mm into wood supports.

Table 2.3.G.
Forming Part of the Article 2.3.12.

Minimum Fastener Penetrations for Membrane Protection on Wood Frame, mm						
Type of Membrane	Assigned Contribution of Membrane to Fire Resistance, ⁽¹⁾ min					
	5-25	30-35	40	50	55-70	80
Single layer	20	29	32	—	—	—
Double layer	20	20	20	29	35	44
Gypsum or fibreboard lath	20	20	23	23	29	29
Column 1	2	3	4	5	6	7

Note to Table 2.3.G.:

⁽¹⁾ Assigned contributions of membranes to fire resistance are determined in Tables 2.3.A., 2.3.B. and 2.3.H.

(5) Where adhesives are used to attach the face layer of gypsum wallboard in a double layer application for walls, the top and bottom of the face layer shall be secured to the supports by mechanical fasteners having lengths as required in Sentences (2) and (4) and spaced not more than 150 mm o.c. for wood supports and not more than 200 mm o.c. for steel supports.

(6) In a double layer application of gypsum wallboard on wood supports, fastener spacing shall conform to Section 9.29 of the National Building Code of Canada 1990.

2.3.13.

(1) Where a beam is included with an open-web steel joist or similar construction and is protected by the same continuous ceiling, the beam is

assumed to have a fire-resistance rating equal to that assigned to the rest of the assembly.

(2) The ratings in this Supplement assume that the construction to which the beam is related is a normal one and does not carry unusual loads from the floor or slab above.

2.3.14. Metal studs in walls required to have a fire-resistance rating shall be installed with not less than 12 mm clearance between the top of the stud and the top of the runner to allow for expansion in the event of fire. Where attachment of the studs is necessary for alignment purposes during erection, such attachment shall be made to the bottom runners only.

2.3.15. Where the fire-resistance rating of a ceiling assembly is to be determined on the basis of the membrane only and not of the complete assembly, the ratings may be determined from Table 2.3.H., provided no openings are located within the ceiling membrane.

Table 2.3.H.
Forming Part of Article 2.3.15.

Fire-Resistance Rating for Ceiling Membranes	
Description of Membrane	Fire-Resistance Rating, min
9.5 mm gypsum wallboard and 12.7 mm gypsum wallboard	30
Double 12.7 mm gypsum wallboard	30
15.9 mm Type X gypsum wallboard with at least 75 mm mineral wool batt insulation above wallboard	30
19 mm gypsum-sand plaster on metal lath	30
Double 14.0 mm Douglas Fir plywood phenolic bonded	30
Double 12.7 mm Type X gypsum wallboard	45
25 mm gypsum-sand plaster on metal lath	45
Double 15.9 mm Type X gypsum wallboard	60
32 mm gypsum-sand plaster on metal lath	60
Column 1	2

2.3.16.

(1) Except as provided in Article 2.3.15., where a floor or roof assembly of combustible construction is assigned a fire-resistance rating on the basis of this Subsection and incorporates a ceiling membrane described in Table 2.3.A. or 2.3.B., the ceiling membrane may be penetrated by openings leading to ducts within concealed spaces above the membrane provided:

- (a) the assembly is not required to have a fire-resistance rating in excess of 1 h,
- (b) the area of any openings does not exceed 930 cm² (see Sentence (2)),
- (c) the aggregate area of openings does not exceed 1 per cent of the ceiling area of the fire compartment,
- (d) the depth of the concealed space above the ceiling is not less than 230 mm,
- (e) the dimension of any opening does not exceed 310 mm,
- (f) supports are provided for openings with any dimension exceeding 150 mm where framing members are spaced greater than 400 mm o.c.,
- (g) individual openings are spaced not less than 2 m apart,
- (h) the ducts above the membrane are sheet steel and are supported by steel strapping firmly attached to the framing members, and
- (i) the clearance between the top surface of the membrane and the bottom surface of the ducts is not less than 100 mm.

(2) Where an individual opening permitted in Sentence (1) exceeds 130 cm² in area, it shall be protected by

- (a) a fire stop flap conforming to Subsection 5.3, or
- (b) thermal protection above the duct consisting of the same materials as used for the ceiling membrane, mechanically fastened to the ductwork and extending 200 mm beyond the opening on all sides (see Figure 2.3.(a)).

2.3.17.

(1) Except as permitted in Article 2.3.15., where a floor or roof assembly of noncombustible construction is assigned a fire-resistance rating on

the basis of this Subsection, and incorporates a ceiling membrane described in Table 2.3.A. or 2.3.B., the ceiling membrane may be penetrated by openings leading to ducts located within concealed spaces above the membrane provided:

- (a) the area of any opening does not exceed 930 cm² (see Sentence (2)),
- (b) the aggregate area of openings does not exceed 2 per cent of the ceiling area of the fire compartment,
- (c) the dimension of any opening does not exceed 400 mm,
- (d) individual openings are spaced at least 2 m apart,
- (e) openings are located at least 200 mm from major structural members such as beams, columns or joists,
- (f) the ducts above the membrane are sheet steel and are supported by steel strapping firmly attached to the framing members, and
- (g) the clearance between the top surface of the membrane and the bottom surface of the duct is at least 100 mm.

(2) Where an individual opening permitted in Sentence (1) exceeds 130 cm² in area, it shall be protected by

- (a) a fire stop flap conforming to Subsection 5.3, or
- (b) thermal protection above the duct consisting of the same materials as used for the ceiling membrane, mechanically fastened to the ductwork and extending 200 mm beyond the opening on all sides (see Figure 2.3.(a)).

2.4 Solid Wood Walls, Floors and Roofs

2.4.1. The minimum thickness of solid wood walls, floors and roofs for fire-resistance ratings from 30 min to 1.5 h is shown in Table 2.4.A.

2.4.2.

(1) The fire-resistance rating of the assemblies described in Table 2.4.A. may be increased by 15 min if one of the finishes described in Clauses (a) to (c) is applied on the fire-exposed side:

- (a) 12.7 mm thick gypsum wallboard,

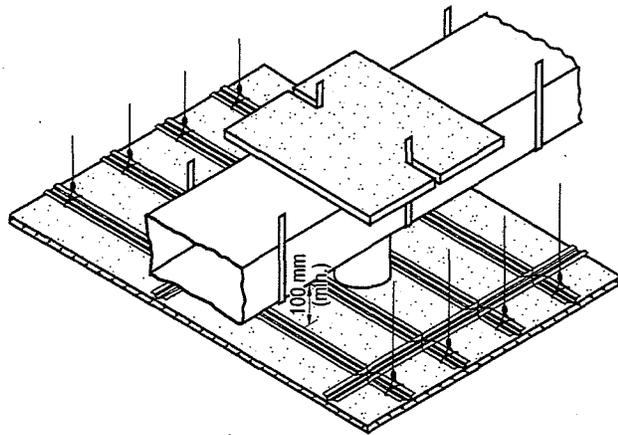


Figure 2.3.(a) Thermal protection above a duct

Table 2.4.A.
Forming Part of Article 2.4.1.

Minimum Thickness of Solid Wood Walls, Roofs and Floors, mm ⁽¹⁾				
Type of Construction	Fire-Resistance Rating			
	30 min	45 min	1 h	1.5 h
Solid wood floor with building paper and finish flooring on top ⁽²⁾	89	114	165	235
Solid wood, splined or tongued and grooved floor with building paper and finish flooring on top ⁽³⁾	64	76	—	—
Solid wood walls of loadbearing vertical plank ⁽²⁾	89	114	140	184
Solid wood walls of non-loadbearing horizontal plank ⁽²⁾	89	89	89	140
Column 1	2	3	4	5

Notes to Table 2.4.A.:

- (1) See CSA O141, "Softwood Lumber" for sizes.
- (2) The assembly shall consist of 38 mm thick members on edge fastened together with 101 mm common wire nails spaced not more than 400 mm o.c. and staggered in the direction of the grain.
- (3) The floor shall consist of nominal 64 mm by 184 mm wide planks either tongued and grooved or with 19 mm by 38 mm splines set in grooves and fastened together with 88 mm common nails spaced not more than 400 mm o.c.

- (b) 20 mm thick gypsum-sand plaster on metal lath, or
 - (c) 13 mm thick gypsum-sand plaster on 9.5 mm gypsum lath.
- (2) Fastening of the plaster to the wood structure shall conform to Subsection 2.3.

2.4.3. Supplementary ratings based on tests are included in Table 2.4.B. The ratings given shall apply to constructions that conform in all details with the descriptions given.

Table 2.4.B.
Forming Part of Article 2.4.3.

Fire-Resistance Rating of Non-Loadbearing Built-up Solid Wood Partitions ⁽¹⁾		
Construction Details	Actual Overall Thickness mm	Fire-Resistance Rating h
Solid panels of wood boards 64 mm to 140 mm wide grooved and joined with wood splines, nailed together, boards placed vertically with staggered joints, 3 boards thick	58	0.5 h
Solid panels with 4 mm plywood facings ⁽²⁾ glued to 46 mm solid wood core of glued, tongued and grooved construction for both sides and ends of core pieces with tongued and grooved rails in the core about 760 mm apart	54	1 h
Column 1	2	3

Notes to Table 2.4.B.:

- (1) The ratings and notes are taken from "Fire Resistance Classifications of Building Constructions," Building Materials and Structures Report BMS 92, National Bureau of Standards, Washington, 1942.
- (2) Ratings for plywood faced panel are based on phenolic resin glue being used for gluing facings to wood frames. If other types of glue are used for this purpose, the ratings apply if the facings are nailed to the frames in addition to being glued.

2.5 Solid Plaster Partitions

2.5.1. The minimum thickness of solid plaster partitions for fire-resistance ratings from 30 min to 4 h is shown in Table 2.5.A.

Table 2.5.A.
Forming Part of Article 2.5.1.

Minimum Thickness of Non-Loadbearing Solid Plaster Partitions, mm							
Type of Plaster on Metal Lath ⁽¹⁾	Fire-Resistance Rating						
	30 min	45 min	1 h	1.5 h	2 h	3 h	4 h
Portland cement-sand ⁽²⁾ or Portland cement-lime-sand	50 ⁽³⁾	—	—	—	—	—	—
Gypsum-sand	50 ⁽³⁾	50 ⁽³⁾	64	—	—	—	—
Gypsum-vermiculite, Gypsum-perlite, Portland cement-vermiculite or Portland cement-perlite	50 ⁽³⁾	50 ⁽³⁾	50 ⁽³⁾	58	64	83	102
Column 1	2	3	4	5	6	7	8

Notes to Table 2.5.A.:

⁽¹⁾ Metal lath shall be expanded metal lath or welded woven wire fabric supported on 19 mm vertical light steel studs spaced not more than 600 mm o.c. Plaster shall be applied to both sides of the lath.

⁽²⁾ For mixture for portland cement-sand plaster, see Sentence 1.7.3.(2).

⁽³⁾ CSA A82.30-M, "Interior Furring, Lathing and Gypsum Plastering" does not permit solid plaster partitions less than 50 mm thick.

Table 2.6.A.
Forming Part of Article 2.6.1.

Minimum Thickness of Concrete or Masonry Protection to Steel Columns, mm							
Description of Cover	Fire-Resistance Rating						
	30 min	45 min	1 h	1.5 h	2 h	3 h	4 h
Monolithic concrete							
Type S concrete ⁽¹⁾ (column spaces filled) ⁽²⁾	25	25	25	25	39	64	89
Type N or L concrete ⁽¹⁾ (column spaces filled) ⁽²⁾	25	25	25	25	32	50	77
Concrete masonry units ⁽³⁾ or precast reinforced concrete units							
Type S concrete (column spaces not filled)	50	50	50	50	64	89	115
Type N or L concrete (column spaces not filled)	50	50	50	50	50	77	102
Clay or shale brick ⁽⁴⁾ (column spaces filled) ⁽²⁾	50	50	50	50	50	64	77
Clay or shale brick ⁽⁴⁾ (column spaces not filled)	50	50	50	50	50	77	102
Hollow clay tile ⁽⁵⁾ (column spaces filled) ⁽²⁾	50 ⁽⁶⁾	50 ⁽⁶⁾	50 ⁽⁶⁾	50 ⁽⁶⁾	— ⁽⁷⁾	— ⁽⁷⁾	— ⁽⁷⁾
Hollow clay tile ⁽⁵⁾ (column spaces not filled)	50 ⁽⁶⁾	50 ⁽⁶⁾	50 ⁽⁶⁾	—	—	—	—
Column 1	2	3	4	5	6	7	8

Notes to Table 2.6.A.:

⁽¹⁾ Applies to cast-in-place concrete reinforced with 5.21 mm diam wire wrapped around column spirally 200 mm o.c., or 1.57 mm diam wire mesh with 100 mm by 100 mm openings.

⁽²⁾ The space between the protective covering and the web or flange of the column shall be filled with concrete, cement mortar or a mixture of cement mortar and broken bricks.

⁽³⁾ Concrete masonry reinforced with 5.21 mm diam wire or wire mesh with 1.19 mm diam wire and 10 mm by 10 mm openings, laid in every second course.

⁽⁴⁾ Brick cover 77 mm thick or less shall be reinforced with 2.34 mm diam wire or 1.19 mm diam wire mesh with 10 mm by 10 mm openings, laid in every second course.

⁽⁵⁾ Hollow clay tiles and masonry mortar reinforced with 1.19 mm diam wire mesh with 10 mm by 10 mm openings, laid in every horizontal joint and lapped at corners.

⁽⁶⁾ Hollow clay tiles shall conform to CSA A82.5-M "Structural Clay Non-Load-Bearing Tile."

⁽⁷⁾ 50 mm nominal hollow clay tile, reinforced with 1.19 mm diam wire mesh with 10 mm by 10 mm openings laid in every horizontal joint and covered with 19 mm gypsum-sand plaster and with limestone concrete fill in column spaces, has a 4 h fire-resistance rating.

Table 2.6.B.
Forming Part of Article 2.6.1.

Minimum Thickness of Plaster Protection to Steel Columns, mm							
Description	Fire-Resistance Rating ^(1,2)						
	30 min	45 min	1 h	1.5 h	2 h	3 h	4 h
Gypsum-sand plaster on 9.5 mm gypsum lath ⁽³⁾	13	13	13	20	—	—	—
Gypsum-perlite or vermiculite plaster on 9.5 mm gypsum lath ⁽³⁾	13	13	13	20	25	—	—
Gypsum perlite or vermiculite plaster on 12.7 mm gypsum lath ⁽³⁾	13	13	13	20	25	32	50
Gypsum perlite or vermiculite plaster on double 12.7 mm gypsum lath ⁽³⁾	13	13	13	20	25	25	32
Portland cement-sand plaster on metal lath ^(4,5)	25	25	25	—	—	—	—
Column 1	2	3	4	5	6	7	8

Notes to Table 2.6.B.:

- (1) Fire-resistance ratings of 30 min and 45 min apply to columns whose M/D ratio is 30 or greater. Fire-resistance ratings greater than 45 min apply to columns whose M/D ratio is greater than 60. Where the M/D ratio is between 30 and 60 and the required fire-resistance rating is greater than 45 min, the total thickness of protection specified in the Table shall be increased by 50 per cent. (To determine M/D, refer to Article 2.6.4.)
- (2) Where the thickness of plaster over gypsum lath is 25 mm or more, wire mesh with 1.57 mm diam wire and openings not exceeding 50 mm by 50 mm shall be placed midway in the plaster.
- (3) Lath held in place by 1.19 mm diam wire wrapped around lath 450 mm o.c.

- (4) Expanded metal lath 1.36 kg/m² fastened to 9.5 mm by 19 mm steel channels held in vertical position around column by 1.19 mm diam wire ties.
- (5) For mixture for portland cement-sand plaster, see Sentence 1.7.3.(2).

2.6 Protected Steel Columns

2.6.1. The minimum thickness of protective covering to steel columns is shown in Tables 2.6.A. to 2.6.F. for fire-resistance ratings from 30 min to 4 h.

Table 2.6.C.
Forming Part of Article 2.6.1.

Minimum Thickness of Gypsum-Sand Plaster on Metal Lath Protection to Steel Columns, mm							
M/D ⁽¹⁾	Fire-Resistance Rating						
	30 min	45 min	1 h	1.5 h	2 h	3 h	4 h
30 to 60	16	16	32	—	—	—	—
over 60 to 90	16	16	16	32	—	—	—
over 90 to 120	16	16	16	25	39	—	—
over 120 to 180	16	16	16	16	25	—	—
over 180	16	16	16	16	25	39	—
Column 1	2	3	4	5	6	7	—

Note to Table 2.6.C.:

- (1) To determine the M/D ratio, refer to Article 2.6.4.

Table 2.6.D.
Forming Part of Article 2.6.1.

Minimum Thickness of Gypsum-Perlite or Gypsum-Vermiculite Plaster on Metal Lath Protection to Steel Columns, mm							
M/D ⁽¹⁾	Fire-Resistance Rating						
	30 min	45 min	1 h	1.5 h	2 h	3 h	4 h
30 to 60	16	16	20	32	35	—	—
over 60 to 90	16	16	16	20	26	35	45
over 90 to 120	16	16	16	16	26	35	45
over 120 to 180	16	16	16	16	20	32	35
over 180	16	16	16	16	16	26	35
Column 1	2	3	4	5	6	7	8

Note to Table 2.6.D.:

- (1) To determine the M/D ratio, refer to Article 2.6.4.

Table 2.6.E.
Forming Part of Article 2.6.1.

Steel Columns with Sheet-Steel Membrane and Insulation as Shown in Figures 2.6(a) and 2.6(b)				
Type of Protection	Steel Thickness ⁽¹⁾ mm	Fastening ⁽²⁾	Insulation	Fire-Resistance Rating
See Figure 2.6.(a)	0.51	No. 8 sheet-metal screws 9.5 mm long, 200 mm o.c.	50 mm mineral, wool batts ⁽³⁾	45 min
See Figure 2.6.(b)	0.64	Self-threading screws or No. 8 sheet-metal screws, 600 mm o.c.	2 layers 12.7 mm gypsum wallboard	1.5 h
See Figure 2.6.(a)	0.64	No. 8 sheet-metal screws, 9.5 mm long 200 mm o.c.	75 mm mineral wool batts ⁽³⁾ 12.7 mm gypsum wallboard	2 h
See Figure 2.6.(b)	0.76	Crimped joint or No. 8 sheet-metal screws, 300 mm o.c.	2 layers 15.9 mm gypsum wallboard	2 h
Column 1	2	3	4	5

Notes to Table 2.6.E.:

- ⁽¹⁾ Minimum thickness, galvanized or wiped-zinc-coated sheet-steel.
- ⁽²⁾ Sheet-steel shall be securely fastened to the floor and super-structure, or where sheet-steel cover does not extend floor to floor,

fire stopping shall be provided at the level where sheet-steel protection ends. In the latter case, an alternate type of fire protection shall be applied between the fire stopping and the super-structure.

- ⁽³⁾ Conforming to CSA A101-M, "Thermal Insulation, Mineral Fibre, for Buildings" Type 1A, minimum density 30 kg/m³: column section and batts wrapped with 25 mm mesh chicken wire.

Table 2.6.F.
Forming Part of Article 2.6.1.

Minimum M/D Ratio for Steel Columns Covered with Type X Gypsum Wallboard Protection ⁽¹⁾				
Minimum Thickness of Type X Gypsum Wallboard Protection, ⁽²⁾ mm	Fire-Resistance Rating			
	1 h	1.5 h	2 h	3 h
12.7	75	—	—	—
15.9	55	—	—	—
25.4	35	60	—	—
28.6	35	50	—	—
31.8	35	40	75	—
38.1	35	35	55	—
41.3	35	35	45	—
44.5	35	35	35	—
47.6	35	35	35	—
50.8	35	35	35	75
63.5	35	35	35	45
Column 1	2	3	4	5

Notes to Table 2.6.F.:

- ⁽¹⁾ To determine the M/D ratio, refer to Article 2.6.4.
- ⁽²⁾ See Article 2.6.5.

2.6.2. For hollow-unit masonry column protection, the thickness shown in Tables 2.6.A. to 2.6.D. is the equivalent thickness as described in Subsection 1.6.

2.6.3. The effect on fire-resistance ratings of the addition of plaster to masonry and monolithic concrete column protection is described in Subsection 1.7.

2.6.4.

(1) The ratio M/D to which reference is made in Tables 2.6.B., 2.6.C., 2.6.D. and 2.6.F. shall be found by dividing "M", the mass of the column in kilograms per metre by "D", the heated perimeter of the steel column section in metres.

(2) The heated perimeter "D" of steel columns, shown as the dashed line in Figure 2.6.(c), shall be equal to 2 (B + H) in Examples (1) and (2), and 3.14B in Example (3). In Figure 2.6.(d), the heated perimeter "D" shall be equal to 2 (B + H).

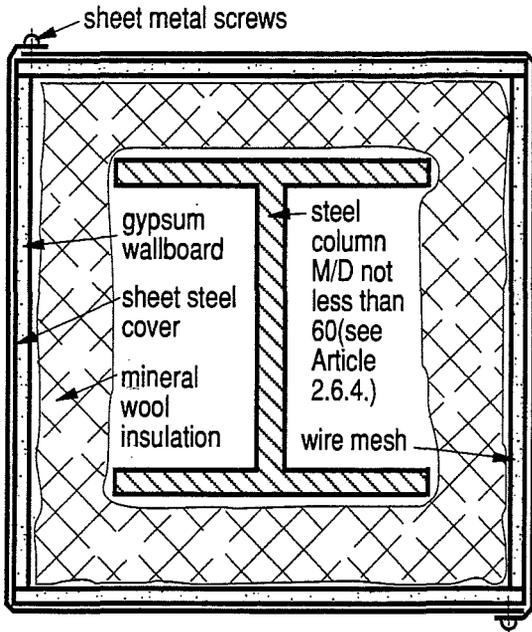


Figure 2.6.(a) Column protected by sheet-steel membrane and mineral-wool insulation

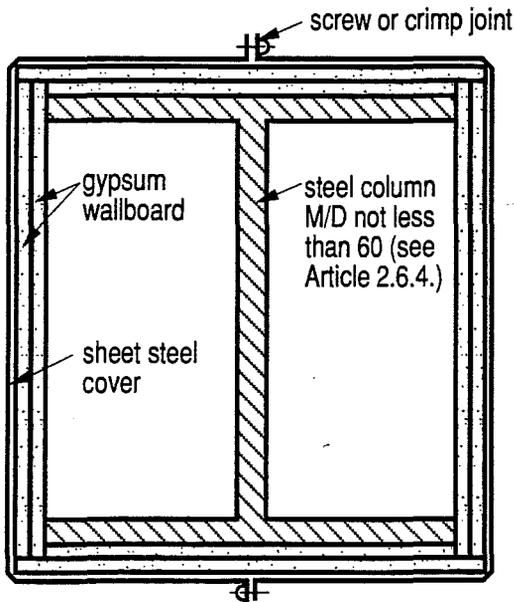
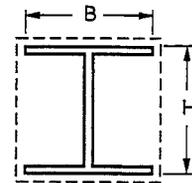
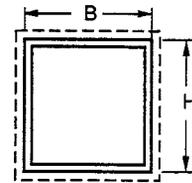


Figure 2.6.(b) Column protected by sheet-steel membrane and gypsum wallboard



example (1)



example (2)



example (3)

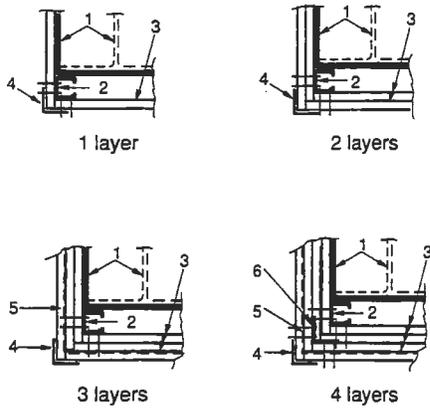
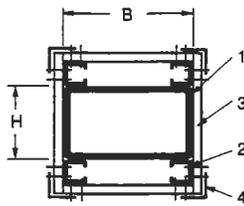
Figure 2.6.(c) Example (1), standard or wide-flange beam, Example (2) hollow structural section (rectangular or square), Example (3), hollow structural section (round)

2.6.5.

(1) Where Type X gypsum wallboard is used to protect a steel column without an outside sheet-steel membrane, the method of wallboard attachment to the column shall be as shown in Figure 2.6.(d) and shall meet the construction details described in Sentences (2) to (7).

(2) The Type X gypsum wallboard shall be applied vertically without horizontal joints.

(3) The first layer of wallboard shall be attached to steel studs with screws spaced not more than 600 mm o.c. and other layers of wallboard shall be attached to steel studs and steel corner beads with screws spaced at a maximum of 300 mm o.c. Where



1. structural member
2. steel studs
3. gypsum wallboard (type X)
4. steel corner bead
5. tie wire
6. sheet metal angle

Figure 2.6.(d) Columns protected by Type X gypsum wallboard without sheet-steel membrane

a single layer of wallboard is used, attachment screws shall be spaced not more than 300 mm o.c.

(4) Steel tie wires spaced at a maximum of 600 mm o.c. shall be used to secure the second last layer of wallboard in 3- and 4-layer systems.

(5) Studs shall be fabricated of galvanized steel, be at least 0.53 mm thick, and at least 41.3 mm wide with legs at least 33.3 mm long and shall be 12.7 mm less than the assembly height.

(6) Corner beads shall be fabricated of galvanized steel, shall be at least 0.41 mm thick and shall have legs at least 38.1 mm long attached to the wall-

board with 25.4 mm screws spaced not more than 300 mm o.c.

(7) In a 4-layer system, metal angles shall be fabricated of galvanized steel and shall be at least 0.46 mm thick with legs at least 51 mm long.

2.7 Individually Protected Steel Beams

2.7.1. The minimum thickness of protective covering on steel beams exposed to fire on 3 sides for fire-resistance ratings from 30 min to 4 h is shown in Table 2.7.A.

2.7.2. Concrete is referred to as Type S, N or L, depending on the nature of the aggregate used. This is described in Subsection 1.4.

2.7.3. The effect on fire-resistance ratings of the addition of plaster finish to concrete or masonry beam protection is described in Subsection 1.7.

2.7.4. The fire resistance of protected steel beams depends on the means used to hold the protection in place. Because of the importance of this factor, no rating has been assigned in Table 2.7.A. to masonry units used as protective cover to steel beams. These ratings, however, may be determined on the basis of comparison with column protection at the discretion of the authority having jurisdiction, if satisfactory means of fastening are provided.

2.7.5. A steel beam or steel joist assembly that is entirely above a horizontal ceiling membrane will be protected from fire below the membrane and will resist structural collapse for a period equal to the fire-resistance rating determined in conformance with Subsection 2.3. The support for this membrane shall be equivalent to that described in Subsection 2.3. The rating on this basis shall not exceed 1.5 h.

2.8 Reinforced Concrete Columns

2.8.1. Minimum dimensions for reinforced concrete columns and minimum concrete cover for vertical steel reinforcement are obtained from Articles 2.8.2. to 2.8.5., taking into account the type of concrete, the effective length of the column and the area of the vertical reinforcement.

Table 2.7.A.
Forming Part of Article 2.7.1.

Minimum Thickness of Cover to Individually Protected Steel Beams, mm ⁽¹⁾							
Description of Cover	Fire-Resistance Rating						
	30 min	45 min	1 h	1.5 h	2 h	3 h	4 h
Type S concrete ⁽²⁾ (beam spaces filled solid)	25	25	25	25	32	50	64
Type N or L concrete ⁽²⁾ (beam spaces filled solid)	25	25	25	25	25	39	50
Gypsum-sand plaster on 9.5 mm gypsum lath ⁽³⁾	13	13	13	20	—	—	—
Gypsum-perlite or vermiculite plaster on 9.5 mm gypsum lath ⁽³⁾	13	13	13	13	25	—	—
Gypsum-perlite or gypsum-vermiculite on 12.7 mm gypsum lath ⁽³⁾	13	13	13	20	25	39	50
Gypsum-perlite or vermiculite plaster on double 12.7 mm gypsum lath ⁽³⁾	13	13	13	20	25	25	39
Portland cement-sand on metal lath ⁽⁴⁾	23	23	23	—	—	—	—
Gypsum-sand on metal lath ⁽⁴⁾ (plaster in contact with lower flange)	16	20	25	39	—	—	—
Gypsum-sand on metal lath with air gap between plaster and lower flange ⁽⁴⁾	16	16	16	25	25	—	—
Gypsum-perlite or gypsum-vermiculite on metal lath ⁽⁴⁾	16	16	16	23	23	35	48 ⁽⁵⁾
Column 1	2	3	4	5	6	7	8

Notes to Table 2.7.A:

- ⁽¹⁾ Where the thickness of plaster finish applied over gypsum lath is 26 mm or more, the plaster shall be reinforced with wire mesh with 1.57 mm diam wire and 50 mm by 50 mm openings placed midway in the plaster.
- ⁽²⁾ Applies to cast-in-place concrete reinforced by 5.21 mm diam wire spaced 200 mm o.c. or 1.57 mm diam wire mesh with 100 mm by 100 mm openings.

- ⁽³⁾ Lath held in place by 1.18 mm diam wire wrapped around the gypsum lath 450 mm o.c.
- ⁽⁴⁾ Expanded metal lath 1.63 kg/m² fastened to 9.5 mm by 19 mm steel channels held in position by 1.19 mm diam wire.
- ⁽⁵⁾ Plaster finish shall be reinforced with wire mesh with 1.57 mm diam wire and 50 mm by 50 mm openings placed midway in the plaster.

2.8.2.

(1) The minimum dimension, *t*, in millimetres of a rectangular reinforced concrete column shall be equal to

- (a) $75 f (R + 1)$ for all Types L and L40S concrete,
- (b) $80 f (R + 1)$ for Type S concrete when the design condition of the concrete column is defined in columns (2) and (4) of Table 2.8.A,
- (c) $80 f (R + 0.75)$ for Type N concrete when the design condition of the concrete column is defined in columns (2) and (4) of Table 2.8.A., and
- (d) $100 f (R + 1)$ for Types S and N concrete when the design condition of the concrete column is defined in column (3) of Table 2.8.A.

where

- f* = the value shown in Table 2.8.A.,
- R* = the required fire-resistance rating in hours,
- k* = the effective length factor obtained from CAN3-A23.3-M, "Design of Concrete Structures for Buildings,"
- h* = the unsupported length of the column in metres, and
- p* = the area of vertical reinforcement in the column as a percentage of the column area.

(2) The diameter of a round column shall be not less than 1.2 times the value "*t*" determined in Sentence 2.8.2.(1) for a rectangular column.

Table 2.8.A. ⁽¹⁾
Forming Part of Article 2.8.2.

Values of Factor "f"			
Overdesign Factor ⁽²⁾	Values of Factor f to be Used in Applying Article 2.8.2. ^(3,4)		
	Where kh is not more than 3.7 m	Where kh is more than 3.7 m but not more than 7.3 m	
		t is not more than 300 mm p is not more than 3 per cent	All other cases
1.00	1.0	1.2	1.0
1.25	0.9	1.1	0.9
1.50	0.83	1.0	0.83
Column 1	2	3	4

Notes to Table 2.8.A.:

- ⁽¹⁾ For conditions that do not fall within the limits described in Table 2.8.A., further information may be obtained from Reference (7) in Appendix A.
- ⁽²⁾ Overdesign factor is the ratio of the calculated load carrying capacity of the column to the column strength required to carry the specified loads determined in conformance with CAN3-A23.3-M, "Design of Concrete Structures for Buildings."
- ⁽³⁾ Where the factor "f" selected from Column 3 results in a "t" greater than 300 mm, the appropriate factor "f" in Column 4 shall be applicable.
- ⁽⁴⁾ Where "p" is equal to or less than 3 per cent and the factor "f" selected from Column 4 results in a "t" less than 300 mm, the minimum thickness shall be 300 mm.

2.8.3

(1) Where the required fire-resistance rating of a concrete column is 3 h or less, the minimum thickness in millimetres of concrete cover over vertical steel reinforcement shall be equal to 25 times the number of hours of fire resistance required or 50 mm, whichever is less.

(2) Where the required fire-resistance rating of a concrete column is greater than 3 h, the minimum thickness in millimetres of concrete cover over vertical steel reinforcement shall be equal to 50 plus 12.5 times the required number of hours of fire resistance in excess of 3 h.

(3) Where the concrete cover over vertical steel in Sentence (2) exceeds 62.5 mm, wire mesh reinforcement with 1.57 mm diameter wire and 100 mm openings shall be incorporated midway in the concrete cover to retain the concrete in position.

2.8.4. The structural design standards may require minimum column dimensions or concrete cover over vertical steel reinforcement differing from those obtained in Sentences 2.8.2.(1) and (2). Where a difference occurs, the greater dimension shall govern.

2.8.5. The addition of plaster finish to the concrete column may be taken into account in determining the cover over vertical steel reinforcement by applying the multiplying factors described in Subsection 1.7. The addition of plaster shall not, however, justify any decrease in the minimum column sizes shown.

2.8.6. The fire-resistance rating of a reinforced concrete column that is built into a masonry or concrete wall so that not more than one face may be exposed to the possibility of fire at one time may be determined on the basis of cover to vertical reinforcing steel alone. In order to meet this condition, the wall shall conform to Subsection 2.1 for the fire-resistance rating required.

2.9 Reinforced Concrete Beams

2.9.1. The minimum thickness of cover over principal steel reinforcement in reinforced concrete beams is shown in Table 2.9.A. for fire-resistance ratings from 30 min to 4 h where the width of the beam or joist is at least 100 mm.

2.9.2. No rating over 2 h may be assigned on the basis of Table 2.9.A. to a beam or joist where the average width of the part that projects below the slab is less than 140 mm, and no rating over 3 h may be

Table 2.9.A.
Forming Part of Article 2.9.1.

Minimum Cover to Principal Steel Reinforcement in Reinforced Concrete Beams, mm							
Type of Concrete	Fire-Resistance Rating						
	30 min	45 min	1 h	1.5 h	2 h	3 h	4 h
Type S, N or L	20	20	20	25	25	39	50
Column 1	2	3	4	5	6	7	8

assigned where the average width of the part that projects below the slab is less than 165 mm.

2.9.3. For the purposes of these ratings, a beam may be either independent of or integral with a floor or roof slab assembly.

2.9.4. Where the upper extension or top flange of a joist or T-beam in a floor assembly contributes wholly or partly to the thickness of the slab above, the total thickness at any point shall be not less than the minimum thickness described in Table 2.2.A. for the fire-resistance rating required.

2.9.5. The addition of plaster finish to a reinforced concrete beam may be taken into account in determining the cover over principal reinforcing steel by applying the multiplying factors described in Subsection 1.7.

2.10 Prestressed Concrete Beams

2.10.1. The minimum cross-sectional area and thickness of concrete cover over steel tendons in prestressed concrete beams for fire-resistance ratings from 30 min to 4 h are shown in Table 2.10.A.

2.10.2. The cover for an individual tendon shall be the minimum thickness of concrete between the surface of the tendon and the fire-exposed surface of the beam, except that for ungrouted ducts the assumed cover thickness shall be the minimum thickness of concrete between the surface of the duct and the sur-

face of the beam. For beams in which several tendons are used, the cover is assumed to be the average of the minimum cover of the individual tendons. The cover for any individual tendon shall be not less than half the value given in Table 2.10.A. nor less than 25 mm.

2.10.3. The ratings in Table 2.10.A. apply to a beam that is either independent of or integral with a floor or roof slab assembly. Minimum thickness of slab and minimum cover to steel tendons in prestressed concrete slabs are contained in Subsection 2.2.

2.10.4. The addition of plaster finish to a prestressed concrete beam may be taken into account in determining the cover over steel tendons by applying the multiplying factors described in Subsection 1.7.

2.10.5.

(1) Except as provided in Sentence (2), in unbonded post-tensioned prestressed concrete beams, the concrete cover to the tendon at the anchor shall be at least 15 mm greater than the minimum required away from the anchor. The concrete cover to the anchorage bearing plate and to the end of the tendon, if it projects beyond the bearing plate, shall be at least 25 mm.

(2) The requirements in Sentence (1) do not apply to those portions of beams not likely to be exposed to fire (such as the ends and the tops of flanges of beams immediately below slabs):

Table 2.10.A.
Forming Part of Article 2.10.1.

Minimum Thickness of Concrete Cover over Steel Tendons in Prestressed Concrete Beams, mm ⁽¹⁾								
Type of Concrete	Area of Beam cm ²	Fire-Resistance Rating						
		30 min	45 min	1 h	1.5 h	2 h	3 h	4 h
Type S or N	260 to 970	25	39	50	64	—	—	—
	Over 970 to 1 940	25	26	39	45	64	—	—
	Over 1 940	25	26	39	39	50	77	102
Type L	Over 970	25	25	25	39	50	77	102
Column 1	2	3	4	5	6	7	8	9

Note to Table 2.10.A.:

⁽¹⁾ Where the thickness of concrete cover over the tendons exceeds 64 mm, a wire mesh reinforcement with 1.57 mm diam wire and 100 mm by 100 mm openings shall be

incorporated in the beams to retain the concrete in position around the tendons. The mesh reinforcement shall be located midway in the cover.

2.11 Glued-Laminated Timber Beams and Columns

2.11.1. This Subsection applies to glued-laminated timber beams and columns required to have fire-resistance ratings greater than those afforded under the provisions of Article 3.1.4.5. of the National Building Code of Canada 1990.

2.11.2.

(1) The fire-resistance rating of glued-laminated timber beams and columns in minutes shall be equal to

- (a) $0.1 fB [4 - 2(B/D)]$ for beams which may be exposed to fire on 4 sides,
- (b) $0.1 fB [4 - (B/D)]$ for beams which may be exposed to fire on 3 sides,
- (c) $0.1 fB [3 - (B/D)]$ for columns which may be exposed to fire on 4 sides, and
- (d) $0.1 fB [3 - (B/2D)]$ for columns which may be exposed to fire on 3 sides,

where

- f = the load factor shown in Figure 2.11.(a),
- B = the full dimension of the smaller side of a beam or column in millimetres before exposure to fire (see Figure 2.11.(b)),
- D = the full dimension of the larger side of a beam or column in millimetres before exposure to fire (see Figure 2.11.(b)),
- k = the effective length factor obtained from CAN3-O86-M, "Engineering Design in Wood," and
- L = the unsupported length of a column in millimetres.

(2) The allowable load on a beam or column shall be determined by using the allowable stresses specified in CAN3-O86-M, "Engineering Design in Wood."

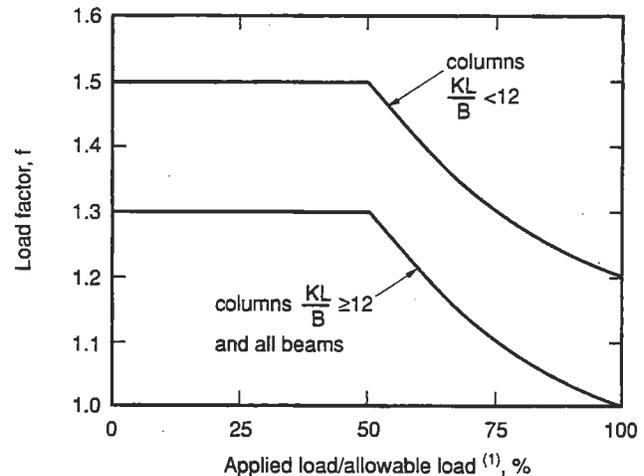


Figure 2.11.(a) Factors to compensate for partially loaded columns and beams

Note to Figure 2.11.(a):

⁽¹⁾ See Sentence 2.11.2.(2)

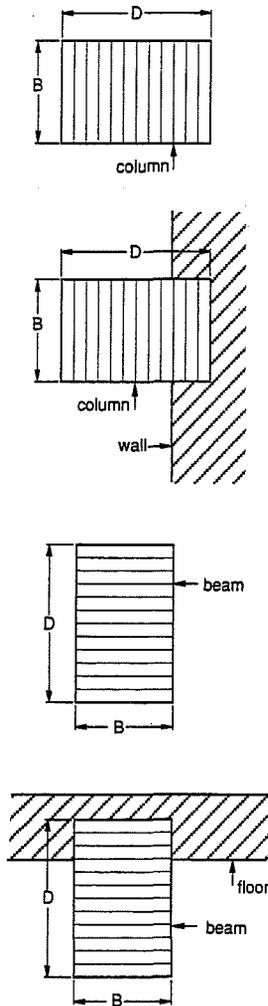


Figure 2.11.(b) Full dimensions of glued-laminated beams and columns

Section 3 Flame-Spread Ratings and Smoke Developed Classifications

3.1 Interior Finish Materials

3.1.1. Tables 3.1.A. and 3.1.B. show flame-spread ratings and smoke developed classifications for combinations of some common interior finish materials. The values are based on all the evidence available at present. Many materials have not been included because of lack of test evidence or because of inability to classify or describe the material in generic terms for the purpose of assigning ratings.

3.1.2. The ratings shown in Tables 3.1.A. and 3.1.B. are arranged in groups corresponding to the provisions of the National Building Code of Canada 1990. The ratings apply to materials falling within the general categories indicated.

3.1.3. In Tables 3.1.A. and 3.1.B., the upper number of each entry relates to flame spread and the lower number to smoke developed limit. For example:

- 25/50 – represents a flame-spread rating of 0 to 25 and a smoke developed classification of 0 to 50.
- 150/300 – represents a flame-spread rating of 75 to 150 and a smoke developed classification of 100 to 300.
- X/X – applied to floors means a flame-spread rating over 300 and a smoke developed classification over 300, and
- X/X – applied to walls and ceilings means a flame-spread rating over 150 and a smoke developed classification over 500.

3.1.4. Thin surface coatings can modify flame-spread characteristics either upward or downward. Table 3.1.A. includes a number of thin coatings that increase the flame-spread rating of the base material, so that these may be considered where more precise control over flame spread hazard is desired.

Table 3.1.A.
Forming Part of Article 3.1.1.

Assigned Flame-Spread Ratings and Smoke Developed Classifications for Combinations of Wall and Ceiling Finish Materials and Surface Coatings				
Materials	Applicable Standard	Minimum Thickness mm	Unfinished	Paint or Varnish not more than 1.3 mm Thick, Cellulosic Wallpaper not more than One Layer
Asbestos cement board	CAN/CGSB-34.16	None		
Brick concrete tile	None	None	0/0	25/50
Steel, copper aluminum	None	0.33		
Gypsum plaster	CSA A82.22	None		
Gypsum wallboard	CSA A82.27	9.5	25/50	25/50
Lumber	None	16	150/300	150/300
Douglas Fir plywood ⁽¹⁾	CSA O121			
Poplar plywood ⁽¹⁾	CSA O153	11	150/100	150/300
Plywood with Spruce face veneer ⁽¹⁾	CSA O151			
Douglas Fir plywood ⁽¹⁾	CSA O121	6	150/100	150/100
Fiberboard low density	CSA A247	11	X/100	150/100
Hardboard Type 1 Standard	CGSB-11.3	9 6	150/X 150/300	(2) 150/300
Particleboard	CAN3-O188.1	12.7	150/300	(2)
Waferboard	CAN3-O188.2	—	(2)	(2)
Column 1	2	3	4	5

Notes to Table 3.1.A.:

⁽¹⁾ The flame-spread ratings and smoke developed classifications shown are for those plywoods without a cellulose resin overlay.

⁽²⁾ Insufficient test information available.

Table 3.1.B.
Forming Part of Article 3.1.1.

Flame-Spread Ratings and Smoke Developed Classifications for Combinations of Common Floor Finish Materials and Surface Coatings ⁽¹⁾		
Materials	Applicable Standard	Finished or Unfinished
Hardwood or softwood flooring either unfinished or finished with a spar or urethane varnish coating	None	<u>300</u> 300
Vinyl-asbestos flooring not more than 4.8 mm thick applied over plywood or lumber subfloor or direct to concrete	CSA A126.1	<u>300</u> 300
Wool carpet (woven), pile weight not less than 1120 g/m ² , applied with or without felt underlay ⁽²⁾	CGSB 4-GP-129	<u>300</u> 300
Nylon carpet, pile weight not less than 610 g/m ² and not more than 800 g/m ² , applied with or without felt underlay ⁽²⁾	CGSB 4-GP-129	<u>300</u> 500
Nylon carpet, pile weight not less than 610 g/m ² and not more than 1355 g/m ² , glued down to concrete	CGSB 4-GP-129	<u>300</u> 500
Wool/nylon blend carpet (woven) with not more than 20 per cent nylon and pile weight not less than 1120 g/m ²	CGSB 4-GP-129	<u>300</u> 500
Nylon/wool blend carpet (woven) with not more than 50 per cent wool, pile weight not less than 610 g/m ² and not more than 800 g/m ²	CGSB 4-GP-129	<u>300</u> 500
Polypropylene carpet, pile weight not less than 500 g/m ² and not more than 1200 g/m ² , glued down to concrete	CGSB 4-GP-129	<u>300</u> 500
Column 1	2	3

Notes to Table 3.1.B.:

⁽¹⁾ Tested on the floor of the tunnel in conformance with provisions of CAN/ULC-S102.2-M, "Standard Method of Test for Surface Burning Characteristics of Flooring, Floor Covering, and Miscellaneous Materials and Assemblies."

⁽²⁾ Type 1 or 2 underlay as described in CGSB 4-GP-36M, "Carpet Underlay, Fiber Type."

3.1.5.

(1) Information on flame-spread rating of proprietary materials and fire-retardant treatments that cannot be described in sufficient detail to ensure reproducibility is available through the listing and labelling service of Underwriters' Laboratories of Canada or other recognized testing laboratory.

(2) A summary of flame spread test results published prior to 1965 has been prepared by the Institute for Research in Construction of the National Research Council of Canada (see Item (1) in Appendix A).

3.1.6.

(1) The propagation of flame along a surface in the standard test involves some finite depth of the

material or materials behind the surface, and this involvement extends to the depth to which temperature variations are to be found during the course of the test; for many commonly used lining materials, such as wood, the depth involved is about 25 mm.

(2) For all the combustible materials described in Table 3.1.A., a minimum dimension is shown, and this represents the thickness of the test samples on which the rating has been based; when used in greater thicknesses than that shown, these materials may have a slightly lower flame-spread rating, and thinner specimens may have higher flame-spread ratings.

(3) No rating has been included for foamed plastic materials because it is not possible at this time to identify these products with sufficient accuracy on

a generic basis. Materials of this type which melt when exposed to the test flame generally show an increase in flame-spread rating as the thickness of the test specimen increases.

3.1.7. In Tables 3.1.A. and 3.1.B., the standards applicable to the materials described are noted because the ratings are dependent on conformance with these specifications.

Section 4 Noncombustibility

4.1 Test Method

4.1.1. Noncombustibility is required of certain components of buildings by the provisions of the National Building Code of Canada 1990, which specifies noncombustibility by reference to CAN4-S114-M, "Standard Method of Test for Determination of Non-Combustibility in Building Materials."

4.1.2. The test to which reference is made in Article 4.1.1. is severe, and it may be assumed that any building material containing even a small proportion of combustibles will itself be classified as combustible. The specimen, 38 mm by 51 mm, is exposed to a temperature of 750°C in a small furnace. The essential criteria for noncombustibility are that the specimen does not flame or contribute to temperature rise.

4.2 Materials Classified as Combustible

4.2.1. Most materials from animal or vegetable sources will be classed as combustible by CAN4-S114-M, "Standard Method of Test for Determination of Non-Combustibility in Building Materials," and wood, wood fibreboard, paper, felt made from animal or vegetable fibres, cork, plastics, asphalt and pitch would therefore be classed as combustible.

4.2.2. Materials that consist of combustible and noncombustible elements in combination will in many cases also be classed as combustible, unless the proportion of combustibles is very small. Some mineral wool insulations with combustible binder, cinder concrete, cement and wood chips and wood-

fired gypsum plaster would also be classed as combustible.

4.2.3. The addition of a fire-retardant chemical is not sufficient to change a combustible product to a noncombustible product.

4.3 Materials Classified as Noncombustible

4.3.1. Noncombustible materials include brick, ceramic tile, concrete made from portland cement with noncombustible aggregate, asbestos cement, plaster made from gypsum with noncombustible aggregate, metals commonly used in buildings, glass, granite, sandstone, slate, limestone and marble.

Section 5 Protection of Openings in Fire-Rated Assemblies

5.1 Scope

5.1.1.

- (1)** This Section specifies requirements for
 - (a) the installation of fire doors and fire dampers in gypsum wallboard-protected stud wall assemblies, and
 - (b) fire stop flaps for installation in fire-rated membrane ceilings.

5.2 Installation of Fire Doors and Fire Dampers

5.2.1. Fire doors and fire dampers in gypsum wallboard-protected steel stud non-loadbearing walls required to have a fire-resistance rating shall be installed in conformance with Section 9.24 of the National Building Code of Canada 1990 and the applicable requirements of NFPA 80, "Fire Doors and Windows."

5.2.2. Fire doors and fire dampers in gypsum wallboard-protected wood stud walls required to have a fire-resistance rating shall be installed in conformance with Section 9.23 of the National Building Code of Canada 1990 and the applicable requirements of NFPA 80, "Fire Doors and Windows."

5.3 Fire Stop Flaps

5.3.1. Fire stop flaps shall be constructed of steel at least 1.5 mm thick, covered on both sides with painted asbestos paper at least 1.6 mm thick and equipped with pins and hinges of corrosion-resistant material (see Figure 5.3.(a)).

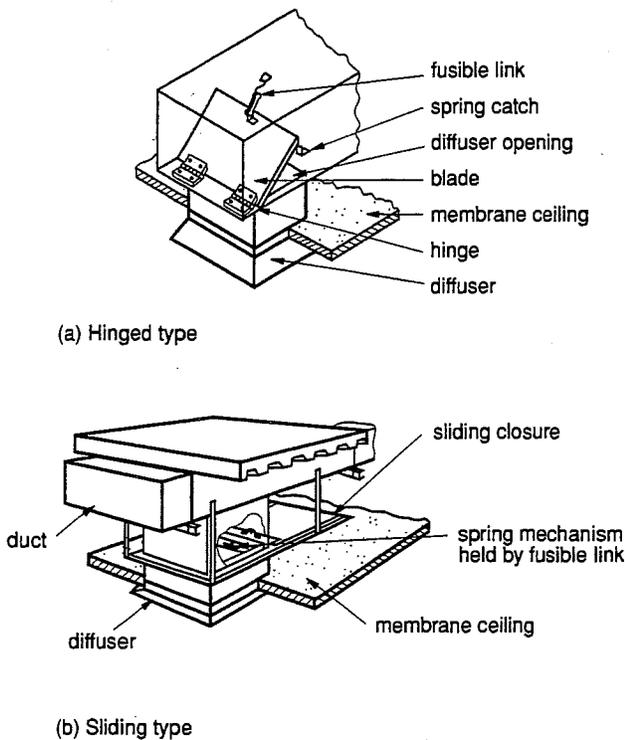


Figure 5.3.(a) Typical fire stop flaps

5.3.2. Fire stop flaps shall be held open with fusible links conforming to ULC-S505, "Standard for Fusible Links for Fire Protection Service" or other heat-activated devices having 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.

Notes

Fire Test Reports

Summaries of available fire-test information have been published by the Institute for Research in Construction (formerly the Division of Building Research) as follows:

- (1) M. Galbreath, Flame Spread Performance of Common Building Materials. Technical Paper No. 170, Division of Building Research, National Research Council Canada, Ottawa, April 1964. NRCC 7820.
- (2) M. Galbreath and W.W. Stanzak, Fire Endurance of Protected Steel Columns and Beams. Technical Paper No. 194, Division of Building Research, National Research Council Canada, Ottawa, April 1965. NRCC 8379.
- (3) T.Z. Harmathy and W.W. Stanzak, Elevated-Temperature Tensile and Creep Properties of Some Structural and Prestressing Steels. American Society for Testing and Materials, Special Technical Publication 464, 1970, p. 186 (DBR Research Paper No. 424). NRCC 11163.
- (4) T.Z. Harmathy, Thermal Performance of Concrete Masonry Walls in Fire. American Society for Testing and Materials, Special Technical Publication 464, 1970, p. 209 (DBR Research Paper No. 423). NRCC 11161.
- (5) L.W. Allen, Fire Endurance of Selected Non-Loadbearing Concrete Masonry Walls. DBR Fire Study No. 25, Division of Building Research, National Research Council Canada, Ottawa, March 1970. NRCC 11275.
- (6) A. Rose, Comparison of Flame Spread Ratings by Radiant Panel, Tunnel Furnace, and Pittsburgh-Corning Apparatus. DBR Fire Study No. 22, Division of Building Research, National Research Council Canada, Ottawa, June 1969. NRCC 10788.
- (7) T.T. Lie and D.E. Allen, Calculation of the Fire Resistance of Reinforced Concrete Columns. DBR Technical Paper No. 378, Division of Building Research, National Research Council Canada, Ottawa, August 1972. NRCC 12797.
- (8) W.W. Stanzak, Column Covers: A Practical Application of Sheet Steel as a Protective Membrane. DBR Fire Study No. 27, Division of

- Building Research, National Research Council Canada, Ottawa, February 1972. NRCC 12483.
- (9) W.W. Stanzak, Sheet Steel as a Protective Membrane for Steel Beams and Columns. DBR Fire Study No. 23, Division of Building Research, National Research Council Canada, Ottawa, November 1969. NRCC 10865.
 - (10) W.W. Stanzak and T.T. Lie, Fire Tests on Protected Steel Columns with Different Cross-Sections. DBR Fire Study No. 30, Division of Building Research, National Research Council Canada, Ottawa, February 1973. NRCC 13072.
 - (11) G. Williams-Leir and L.W. Allen, Prediction of Fire Endurance of Concrete Masonry Walls. DBR Technical Paper No. 399, Division of Building Research, National Research Council Canada, Ottawa, November 1973. NRCC 13560.
 - (12) G. Williams-Leir, Prediction of Fire Endurance of Concrete Slabs. DBR Technical Paper No. 398, Division of Building Research, National Research Council Canada, Ottawa, November 1973. NRCC 13559.
 - (13) A. Rose, Flammability of Fibreboard Interior Finish Materials. Building Research Note No. 68, Division of Building Research, National Research Council Canada, Ottawa, October 1969.
 - (14) L.W. Allen, Effect of Sand Replacement on the Fire Endurance of Lightweight Aggregate Masonry Units. DBR Fire Study No. 26, Division of Building Research, National Research Council Canada, Ottawa, September 1971. NRCC 12112.
 - (15) L.W. Allen, W.W. Stanzak and M. Galbreath, Fire Endurance Tests on Unit Masonry Walls with Gypsum Wallboard. DBR Fire Study No. 32, Division of Building Research, National Research Council Canada, Ottawa, February 1974. NRCC 13901.
 - (16) W.W. Stanzak and T.T. Lie, Fire Resistance of Unprotected Steel Columns. *Journal of Structural Division, Proc., Am. Soc. Civ. Eng.*, Vol. 99, No. ST5 Proc. Paper 9719, May 1973 (DBR Research Paper No. 577) NRCC 13589.
 - (17) T.T. Lie and T.Z. Harmathy, Fire Endurance of Concrete-Protected Steel Columns. *A.C.I. Journal*, January 1974, Title No. 71-4 (DBR Technical Paper No. 597) NRCC 13876.
 - (18) T.T. Lie, A Method for Assessing the Fire Resistance of Laminated Timber Beams and Columns. *Can. J. Civ. Eng.*, Vol. 4, No. 2, June 1977 (DBR Technical Paper No. 718) NRCC 15946.
 - (19) T.T. Lie, Calculation of the Fire Resistance of Composite Concrete Floor and Roof Slabs. *Fire Technology*, Vol. 14, No. 1, February 1978 (DBR Technical Paper No. 772) NRCC 16658.

Obsolete Materials and Assemblies

Building materials, components and structural members and assemblies in buildings constructed before the present edition of the Supplement may have been assigned ratings based on earlier editions of this document or older reports of fire tests. To assist users in determining the ratings of these obsolete assemblies and structural members, the following list of reference documents has been prepared. Although some of these publications are out of print, reference copies are available at the Institute for Research in Construction, National Research Council of Canada, Ottawa, Ont., K1A 0R6.

- (1) M. Galbreath, Fire Endurance of Unit Masonry Walls. Technical Paper No. 207, Division of Building Research, National Research Council Canada, Ottawa, October 1965. NRCC 8740.
- (2) M. Galbreath, Fire Endurance of Light Framed and Miscellaneous Assemblies. Technical Paper No. 222, Division of Building Research, National Research Council Canada, Ottawa, June 1966. NRCC 9085.
- (3) M. Galbreath, Fire Endurance of Concrete Assemblies. Technical Paper No. 235, Division of Building Research, National Research Council Canada, Ottawa, November 1966. NRCC 9279.
- (4) Guideline on Fire Ratings of Archaic Materials and Assemblies. Rehabilitation Guideline #8, U.S. Department of Housing and Urban Development, Germantown, Maryland 20767, October 1980.
- (5) T.Z. Harmathy, Fire Test of a Plank Wall Construction. Fire Study No. 2, Division of Building Research, National Research Council Canada, Ottawa, July 1960. NRCC 5760.
- (6) T.Z. Harmathy, Fire Test of a Wood Partition. Fire Study No. 3, Division of Building Research, National Research Council Canada, Ottawa, October 1960. NRCC 5769.

Appendix C

Uniform Building Standards Act

Chapter U-4

HER MAJESTY, by and with the advice and consent of the Legislative Assembly of Alberta, enacts as follows:

Definitions

- 1** In this Act,
- (a) "building" includes a structure or any part of a building or structure;
 - (b) "clerk" means
 - (i) the city clerk, in the case of a city,
 - (ii) the secretary, in the case of a town, new town, village, summer village, municipal district or county, or
 - (iii) the Deputy Minister of Municipal Affairs, in the case of an improvement district or a special area;
 - (c) "construction" includes alteration or repair;
 - (d) "Council" means the Alberta Building Standards Council;
 - (e) "demolition" includes removal;
 - (f) "Director" means the Director of Building Standards;
 - (g) "inspector" means a person appointed as an inspector pursuant to section 2 and includes the Director;
 - (h) "local authority" means
 - (i) a city, town, new town, village, summer village, municipal district or county, or
 - (ii) the Minister of Municipal Affairs, in the case of an improvement district or a special area;
 - (i) "Minister" means the Minister of Labour;
 - (j) "municipality" means the area of a city, town, new town, village, summer village, county, municipal district, improvement district or special area;
 - (k) "permit" means a permit issued pursuant to this Act or pursuant to a by-law made under this Act;

(l) "regulation" includes any building code or other code of standards that is declared to be in force pursuant to section 3(2).

RSA 1980 cU-4 s1

Staff

2(1) In accordance with the *Public Service Act* there may be appointed a Director of Building Standards, inspectors and any other employees required for the purposes of this Act.

(2) When, pursuant to section 5, a local authority is authorized to enforce this Act, it may appoint inspectors.

RSA 1980 cU-4 s2

Regulations

3(1) The Lieutenant Governor in Council may make regulations

(a) prescribing standards respecting any materials, equipment, protection devices or appliances used or installed in the construction of any building;

(b) prescribing any materials, equipment, protection devices or appliances that must be used or installed in a building or a class of building;

(c) governing the use or installation of any materials, equipment, protection devices or appliances in a building or a class of building;

(d) prohibiting the use or installation of any materials, equipment, protection devices or appliances in a building or a class of building;

(e) classifying buildings according to their use or occupancy;

(f) governing methods used in the construction or demolition of any building or any class of building;

(g) governing the construction standards that must be met in respect to any building or class of building;

(h) governing the use of the property on which a building is located during the period of time that the construction or demolition of the building is taking place;

(i) generally, providing for any other matter in connection with the use, occupancy, relocation, construction or demolition of buildings.

(2) Notwithstanding subsection (1), the Lieutenant Governor in Council may by regulation declare

(a) the *National Building Code of Canada 1970* or any subsequent edition of the National Building Code of Canada, or

(b) any other code of standards respecting any materials, equipment or appliances used or installed in the construction or demolition of any building, to be in force in whole or in part with any revisions variations or modifications that may be specified by the regulations.

(3) The Minister may make regulations

- (a) prohibiting the commencement by any person of the use, occupancy, relocation, construction or demolition of any building unless that person is authorized by a permit to do so;
 - (b) providing for the form and content of permits for use, occupancy, relocation, construction or demolition of a building;
 - (c) providing, subject to section 5.1(1), for the issuance of permits;
 - (d) providing that the granting of a permit does not entitle the permittee, his successors or assigns or anyone on his or their behalf to construct any building that fails to comply with the requirements of any building restriction agreement affecting the site described in the permit;
 - (e) prescribing the fees to be charged for the issuing of permits;
 - (f) exempting
 - (i) any person, class of persons, local authority or class of local authority,
 - (ii) any municipality or class of municipality, or
 - (iii) any building, material, equipment, protection devices, appliances or classes thereof,
 from the operation of any or all of the provisions of this Act or the regulations;
 - (g) prescribing the requirements that must be met by persons appointed as inspectors;
 - (h) generally, for carrying out the purpose and intent of this Act.
- (4) A permit issued in accordance with this Act does not authorize any person to construct a building that does not comply with any other Act or any regulation made under any other Act.

RSA 1980 cU-4 s3; RSA 1980 cA-44.1 s80

Municipal by-laws or codes inoperative

- 4** Any by-law or code
- (a) prescribing standards respecting any materials, equipment, protection devices or appliances used or installed in the construction of any building,
 - (b) prescribing any materials, equipment, protection devices or appliances that must be used or installed in a building or a class of building,
 - (c) governing the use or installation of any materials, equipment, protection devices or appliances in a building or a class of building,
 - (d) prohibiting the use or installation of any materials, equipment, protection devices or appliances in a building or a class of building,
 - (e) classifying buildings according to their use or occupancy.
 - (f) governing methods used in the construction or demolition of any building or any class of building,

- (g) governing the construction standards that must be met in respect to any building or class of building,
- (h) governing the use of the property on which a building is located during the period of time that the construction or demolition of the building is taking place, or
- (i) generally, providing for any other matter in connection with the construction or demolition of buildings, and made or adopted under the *Municipal Government Act* or the *County Act* is inoperative.

RSA 1980 cU-4 s4

Enforcement

- 5(1)** The Minister may, by regulation, authorize any local authority or class of local authority to enforce this Act in its respective municipality.
- (2) When a local authority is authorized to enforce this Act pursuant to the regulations under subsection (1),
- (a) the local authority may make by-laws with respect to the subject matter of section 3(3)(a), (b), (c), (d) and (e), and
 - (b) on by-laws being made under clause (a), the regulations of the Minister made under section 3(3)(a), (b), (c), (d) and (e) do not apply in that municipality.

RSA 1980 cU-4 s5

Issue of permit

- 5.1(1)** Notwithstanding anything in any other Act, in a regulation under any other Act or in a by-law, no permit for
- (a) the use,
 - (b) the occupancy,
 - (d) the construction, or
 - (e) the demolition

of any building shall be issued by a local authority except in accordance with this Act or the regulations.

- (2) Notwithstanding anything in any other Act, in a regulation under any other Act or in a by-law, no person shall submit in support of an application or as an application for a permit under this Act any plans, drawings or specifications for the construction, erection or enlargement of any building that is a category or type of building described in section 5.2, 5.3 or 5.4 unless the plans, drawings or specifications comply with those sections.

RSA 1980 cA-44.1 s80

Permit on plan without architect's or engineer's seal

- 5.2(1)** In this section and in section 5.3, "gross area" means the area of a building that is contained within the outside surface of the exterior walls of the building.
- (2) A local authority may issue a permit to an applicant if the application conforms to this Act and the regulations and the by-laws under section 5(2), and if the application is for a building described in subsection (3).

- (3) The buildings referred to in subsection (2) are:
- (a) a building, 3 storeys or less in height, for assembly occupancy or institutional occupancy that,
 - (i) in the case of a single storey building, has a gross area of 300 square metres or less,
 - (ii) in the case of a 2 storey building, has a gross area of 150 square metres or less on each floor, or
 - (iii) in the case of a 3 storey building, has a gross area of 100 square metres or less on each floor;
 - (b) a building for residential occupancy that
 - (i) is a single family dwelling, or
 - (ii) is multiple family dwelling, containing 4 dwelling units or less;
 - (c) a building, 3 storeys or less in height, for residential occupancy as a hotel, motel or similar use that
 - (i) in the case of a single storey building, has a gross area of 400 square metres or less.
 - (ii) in the case of a 2 storey building, has a gross area of 200 square metres or less on each floor, or
 - (iii) in the case of a 3 storey building, has a gross area of 130 square metres or less on each floor;
 - (d) a building 3 storeys or less in height for warehouse, business and personal services occupancy, for mercantile occupancy or for industrial occupancy that
 - (i) in the case of a single storey building, has a gross area of 500 square metres or less,
 - (ii) in the case of a 2 storey building, has a gross area of 250 square metres or less on each floor, or
 - (iii) in the case of a 3 storey building, has a gross area of 165 square metres or less on each floor;
 - (e) a building that is a farm building not for public use;
 - (f) a relocatable industrial camp building.

RSA 1980 cA-44.1 s80

Permit on plan
with architect's or
engineer's seal

5.3(1) No local authority shall issue a permit with respect to an application for a building described in subsection (2) unless

- (a) the application for the permit is accompanied by plans, drawings or specifications that are
 - (i) imprinted with a stamp or seal affixed by or on behalf of a registered architect or a visiting project architect under the *Architects Act*, or

(ii) imprinted with a seal affixed by or on behalf of one or more professional engineers or licensees registered under the *Engineering, Geological and Geophysical Professions Act* and qualified to engage in the appropriate combination of those branches of professional engineering that are applicable to building design and construction,

and

(b) the application complies with this Act and the regulations and the by-laws of the local authority made pursuant to this Act.

(2) The buildings referred to in subsection (1) are:

(a) a building 3 storeys or less in height for residential occupancy that is a multiple family dwelling containing at least 5 but not more than 20 units on a single site, unless another number is prescribed in regulations under section 5.6;

(b) a building for industrial or warehouse occupancy, or a combination of them, where the occupant load is designed to be a ratio of 28 square metres per person or greater;

(c) a building that is classified for more than 1 type of occupancy, where

(i) the major use of the building is industrial occupancy or warehouse occupancy,

(ii) the occupant load is designed to be at a ratio of 28 square metres per person or greater, and

(iii) any occupancy other than major use does not exceed 400 square metres in area.

Permit on plan
with architect's
and engineer's
seal

5.4 Except as otherwise provided in the regulations, no local authority shall issue a permit for a building that is not referred to in section 5.2 or 5.3 unless the application is accompanied by architectural and engineering drawings, plans or specifications that are

(a) in the case of architectural drawings, plans or specifications, imprinted with a stamp or seal affixed by or on behalf of a registered architect or visiting project architect under the *Architects Act*,

(b) in the case of engineering drawings, plans or specifications, imprinted with a seal affixed by or on behalf of a professional engineer or licensee registered under the *Engineering, Geological and Geophysical Professions Act*, and

(c) in the case of combined architectural and engineering drawings, imprinted with a stamp or seal affixed by

(i) a registered architect or a visiting project architect under the *Architects Act*, and

(ii) one or more professional engineers, or licensees registered under the *Engineering, Geological and Geophysical Professions Act* and qualified to engage in the appropriate combination of those branches of professional engineering that are applicable to building design and construction

or are submitted by a registered architect or professional engineer or licensee who is authorized by the Council under the *Architects Act* or under the *Engineering, Geological and Geophysical Professions Act* to submit those drawings, plans or specifications without the seal of the other professional.

RSA 1980 cA-44.1 s80; 1981 cE-11.1 s94; 1981 c5 s30

Classification of buildings

5.5 The classification of buildings shall be determined in accordance with the regulations.

RSA 1980 cA-44.1 s80

Regulations

5.6 The Lieutenant Governor in Council may, on the recommendation of the Minister of Public Works, Supply and Services, make regulations prescribing

(a) the maximum number of dwelling units in a building referred to in section 5.3(2)(a);

(b) the areas of a building referred to in section 5.3(2)(b) or (c).

RSA 1980 cA-44.1 s80; 1984 c55 s44

Alberta Building Standards Council

6(1) There shall be a council, called the "Alberta Building Standards Council", Standards Council the members of which shall be appointed by the Lieutenant Governor in Council for a term not exceeding 3 years and who are eligible for reappointment.

(2) The Lieutenant Governor in Council may prescribe the remuneration to be paid to those members of the Council who are not employees of the Government and may designate from among the members of the Council a chairman and vice-chairman.

RSA 1980 cU-4 s6

Duties of Council

7 The Council shall

(a) advise the Minister on matters concerning this Act and the regulations and any other matter concerning the use, occupancy, relocation, construction or demolition of buildings;

(b) provide a liaison between the Minister and the Associate Committee on the National Building Code of the National Research Council, or any other persons or bodies interested in construction standards;

(c) perform any duties and functions assigned to it by the Minister.

RSA 1980 cU-4 s7

Powers of inspector

8(1) For the purpose of ensuring compliance with this Act or the regulations or the conditions of a permit, an inspector may

(a) enter into or on any property, construction site or building at any reasonable hour,

(b) demand the production of any register, certificate, plan or document pertaining in any manner to the use, occupancy, relocation, construction or demolition of a building and may examine and make copies thereof, and

(c) inspect and take samples of any material, equipment or appliances being used in the construction or demolition of a building.

(2) If a person refuses to allow an inspector to exercise any powers under subsection (1) or interferes or attempts to interfere with an inspector in the exercise of a power under subsection (1), the Minister or local authority, as the case may be, may apply to the Court of Queen's Bench by way of originating notice for an order restraining any person from preventing or interfering in any manner with an inspector in the exercise of his powers under subsection (1).

(3) A copy of the originating notice and a copy of each affidavit in support shall be served not less than 3 days before the day named in the notice for hearing of the application.

RSA 1980 cU-4 s8

Order of an
inspector

9 When an inspector finds that the use, occupancy, relocation, construction or demolition of a building is not in accordance with the requirements of this Act, the regulations, a by-law made under section 5 or a permit, the inspector, for the purpose of ensuring that those requirements will be complied with, may by notice in writing order the owner of the building or the person responsible for the use, occupancy, relocation, construction or demolition of the building, within the time prescribed in the notice, to do one or more of the following:

- (a) comply with specific conditions prescribed in the notice;
- (b) comply with general conditions prescribed in the notice;
- (c) take the measures prescribed in the notice;
- (d) follow the methods of construction, demolition or relocation prescribed in the notice;
- (e) use or stop using, as the case may be, the materials, equipment, protection devices or appliances described in the notice.
- (f) stop the use, occupancy, relocation, construction or demolition of a building in whole or in part as directed by the notice.

RSA 1980 cU-4 s9

Appeal

10(1) If an owner of a building or the person responsible for the use, occupancy, relocation, construction or demolition of a building is of the opinion that an order of an inspector made under section 9 is not proper, that person may appeal to the Council.

(2) An appeal made under subsection (1) must be commenced by serving notice of the appeal on the Director within 15 days from the date that the owner of the building or the person responsible for the use, occupancy, relocation, construction or demolition of the building is given the order of the inspector.

(3) On considering the matter being appealed the Council may by order confirm, revoke or vary the order of the inspector.

(4) An appeal lies to the Court of Queen's Bench from the order of the Council on a question of law or a question of jurisdiction and on hearing the matter the Court may confirm, revoke or vary the order of the Council.

(5) An appeal under subsection (4) shall be commenced by originating notice within 30 days from the date that the order of the Council is served on the party appealing.

(6) An appeal made pursuant to subsection (1) does not operate as a stay of the order of an inspector except so far as the chairman or a vice-chairman of the Council so directs.

(7) An appeal made pursuant to subsection (4) does not operate as a stay of the order of the Council except so far as a judge of the Court of Queen's Bench so directs.

RSA 1980 cU-4 s10

Hearing of appeal

11(1) When the Council is considering appeals under section 10

(a) it may, at the direction of the chairman, sit in one or more divisions and the divisions may sit simultaneously or at different times;

(b) 3 members constitute a quorum of the Council or of a division of the Council;

(c) the chairman shall designate a member to preside at any sitting of the Council, at which the chairman is not present;

(d) an order of a division is an order of the Council and binds all members of the Council.

(2) The Council may establish rules of procedure respecting the hearing of appeals before it or before a division.

RSA 1980 cU-4 s11

Execution of orders

12(1) When a person does not comply with an order directed to him under section 9 or 10 within the time specified in the order

(a) the Minister or a person appointed by him; or

(b) the local authority or a person appointed by it, as the case may be, may enter on the land and building and do any acts that are necessary to carry out the order.

(2) When the Minister or a person appointed by him carries out an order pursuant to subsection (1), the Minister may certify to the clerk of the local authority for the municipality within which the building is situated the amount of the expenses incurred in carrying out the order and the local authority shall forthwith pay to the Minister the amount of those expenses.

(3) When

(a) the local authority has paid money to the Minister pursuant to subsection (2), or

(b) the local authority or a person appointed by it carries out an order,

the local authority shall place the amount paid to the Minister or the amount of the expenses incurred by itself in carrying out the order on the tax roll as an additional tax against the property concerned and that amount shall be collected in the same manner as taxes on land.

RSA 1980 cU-4 s12

Offence

13(1) A person who

- (a) interferes in any manner with an inspector in the exercise of his duties or powers under this Act or the regulations,
- (b) does not comply with an order made under section 9 or 10,
- (c) refuses to allow or interferes with the execution of an order under section 12,
- (d) contravenes this Act, except sections 5.1, 5.2, 5.3 and 5.4, the regulations or a by-law made under section 5 or any condition of a permit, or
- (e) uses, occupies, relocates, constructs or demolishes a building except in accordance with this Act, the regulations, a by-law made under section 5 or a permit,

is guilty of an offence and liable to a fine of not more the \$1000 and in default to imprisonment for a term not exceeding 90 days, or to both fine and imprisonment.

(2) When, pursuant to section 5, a local authority has been authorized to enforce this Act, any fines resulting from an offence under this Act which took place within the boundaries of the municipality shall accrue to that local authority.

RSA 1980 cU-4 s13; RSA 1980 cA-44.1 s80

Order of the
Court of Queen's
Bench

14(1) When a person

- (a) fails to comply with an order directed to him under section 9 or 10, within the time specified in the order, or
- (b) refuses to allow
 - (i) the Minister or anyone appointed by him, or
 - (ii) a local authority or anyone appointed by it,

to carry out, under section 12, an order made under section 9 or 10 or interferes with or attempts to interfere with the carrying out of that order under section 12,

the Minister or the local authority, as the case may be, may, whether or not that person has been prosecuted under section 13, apply to the Court of Queen's Bench by way of origination notice for an order requiring that person

- (c) to comply with the order made under section 9 or 10, or
- (d) restraining that person from interfering in any manner with the carrying out under section 12 of an order made under section 9 or 10.

(2) A copy of the originating notice and each affidavit in support shall be served not less than 3 days before the day named in the notice for the hearing or such shorter time as the Court may direct.

RSA 1980 cU-4 s14

Costs

15 When an application is made under section 8(2), 10 or 14 the Court may make any direction as to costs that it considers proper.

RSA 1980 cU-4 s15

Proof of
appointment of
inspector

16 A certificate

(a) purporting to be signed by

(i) the Director, in the case of an inspector appointed under section 2(2),
and

(ii) the clerk, in the case of an inspector appointed under section 2(2),
and

(b) stating that the person named in the certificate is an inspector under this
Act,

shall be admitted in evidence as prima facie proof of the appointment of the person named in the certificate as an inspector without proof of the signature of official character of the person appearing to have signed the certificate.

RSA 1980 cU-4 s16



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⁽¹⁾ Items contained in the Index are references 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 this Code" at the front of the document.

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Conversion Factors

To Convert	To	Multiply by
°C	°F	1.8 and add 32
kg	lb	2.205
kPa	lbf/in ² (psi)	0.1450
kPa	lbf/ft ²	20.88
L	gal (imp.)	0.2200
L/s	gal/min (gpm)	13.20
lx	ft-candle	0.09290
m	ft	3.281
m ²	ft ²	10.76
m ³	ft ³	35.31
mm	in.	0.03937
m ³ /h	ft ³ /min (cfm)	0.5886
m/s	ft/min	196.8
MJ	Btu	947.8
N	lbf	0.2248
ng/Pa • sm ²	perms	0.0174
Pa	Inches of water	0.004014
W	Btu/h	3.412

