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alberta building code 1981



LABOUR

**General Safety Services Division
Building Standards Branch**

TABLE OF CONTENTS

Preface

A Guide to the Use of the Code

Part 1 Administration

Part 2 General Requirements

Part 3 Use and Occupancy

Part 4 Design

Part 5 Wind, Water and Vapour Protection

Part 6 Heating, Ventilating and Air-Conditioning

Part 7 Plumbing Services

Part 8 Construction Safety Measures

Part 9 Housing and Small Buildings

Part 10 Relocatable Industrial Accommodation

Part 11 Climatic Data for Building Design in Alberta

Index

Fire Performance Ratings

Building Design for the Handicapped

The Alberta Uniform Building Standards Act

**Appendix A Explanatory Material for the National
Building Code 1980**

PREFACE

The National Building Code of Canada 1980, that has been adopted as the base document for the Alberta Building Code 1981, is published by the National Research Council through its Associate Committee on the National Building Code. It comprises a model set of technical requirements for ensuring public safety in buildings.

The Code has received wide use in Canada through adoption, either as municipal Bylaws or more recently as the basis of provincial building Codes. Liaison with the provincial Code authorities has been maintained through the Provincial Advisory Committee on the National Building Code which was established by these authorities for that purpose.

The Code has been developed with the voluntary assistance of many experts from coast to coast who contribute to the operation of the Associate Committee on the National Building Code, thus ensuring that the document keeps pace with advances in building technology. The Associate Committee members are appointed by the National Research Council to serve as individuals and not as representatives of any organization. They are broadly representative of all major phases of building in Canada. The Committee has direct responsibility under the National Research Council for the preparation and publication of the Code, thus ensuring the autonomy of this document.

The staff of the Division of Building Research of the National Research Council provides technical and secretarial support, all of which is carried out at the direction of the Associate Committee. The many technical problems revealed through the use of the Code are referred to the Division of Building Research for study in an attempt to make available to the Associate Committee the most up-to-date information on building technology.

The Associate Committee is assisted in the technical aspects of Code writing by a number of Standing Committees, each of which is responsible for one major part of the Code, or for one of the associated documents. Each Standing Committee is made up of experts in the particular field for which it is responsible. Building and fire officials, architects, engineers, contractors and other experts share their experience in the national interest.

All values are now given in metric units. The establishment of common metric pipe sizes has not as yet been attained by all segments of the pipe manufacturing industry. Until the industry reaches such agreement, it is considered appropriate to continue to identify pipe sizes in inches.

Part 5, which formerly dealt with materials, now contains the requirements from Section 4.8 of Part 4 relating to wind, water and vapour protection. The requirements from Part 5 have either been transferred to Part 2 or have been deleted because of duplication elsewhere.

Part 6 of the Code has been completely revised to include the material from the former Canadian Heating, Ventilating and Air-Conditioning Code, which has been discontinued. Certain fire related requirements formerly in Part 6 have been transferred to Part 3 in order that all material of a similar nature is grouped in the same Part.

Part 8 of the Code relating to construction safety measures no longer references the Canadian Construction Safety Code, as this document has been discontinued. The relevant requirements relating to the safety of the public are included in Part 8.

A vertical line in the margin relates to a change or addition in the 1980 edition to the 1977 edition of the National Building Code and may be ignored in the Alberta Building Code 1981.

An asterisk in the margin indicates a change or addition to the 1980 National Building Code at the time it was adopted in Alberta as the Alberta Building Code 1981.

Permission to reprint extracts from the documents issued by the Associate Committee on the National Building Code is gratefully acknowledged.

Comments on the Alberta Building Code 1981 and suggestions for its improvement are welcomed and should be submitted to

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A GUIDE TO THE USE OF THE CODE

The Alberta Building Code 1981 is essentially 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 primary purpose is the promotion of public 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 professional seals on documents, notification, provision of information about equivalent materials, conditions relating to occupancy, correction of unsafe conditions and prohibitions.

Part 2: General

Part 2 contains requirements of a semi-administrative nature such as information to be shown on drawings, provision for equivalents and material of a general nature.

Part 3: Use and Occupancy

This Part contains the requirements with respect to health and fire safety, which depend upon the use to which a building is put and its type of occupancy. The first Section contains the interpretive material relating to occupancy classification and the more general features of fire protection. Sections that follow contain specific requirements relating to building size and occupancy and fire safety within floor areas, exit requirements, requirements for service spaces and health requirements.

Part 4: Design

This Part is made up of seven Sections. The first (4.1) 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. The other Sections (4.3 to 4.7) deal with design in wood, masonry, concrete, steel and aluminum. Sections 4.3 to 4.7 contain 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 that material formerly contained in Section 4.8 of the Code. It includes requirements for the prevention of condensation and cladding requirements.

Part 6: Heating, Ventilating and Air-Conditioning

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

Part 7: Plumbing

This Part contains only basic statements with reference to Scope, Application and Administration. All detailed technical requirements are contained in regulations under The Plumbing and Drainage Act.

Part 8: Construction Safety Measures — Public Safety at Construction Sites

Part 8 regulates the precautions that must be taken to protect the safety of the public in the vicinity of construction 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 three storeys in height, and applies to all occupancies except assembly, institutional and high hazard industrial. Span tables for joists, rafters, trusses and beams are included at the end of Part 9.

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:

This Part sets out climatic data needed for building design, such as temperature, wind forces, rainfall and snowfall. Unless a municipality has specific values assigned in the Table the values should be taken from the Charts.

SUPPLEMENTARY DOCUMENTS

Three documents have been inserted after the Index.

Fire Performance Ratings — Chapter 2 — Supplement to the National Building Code 1980:

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.

Building Standards for the Handicapped 1980:

This provides a guide to requirements to provide accessibility to buildings and water closet facilities for physically disabled persons.

The Alberta Uniform Building Standards Act

PART I

ADMINISTRATION

TABLE OF CONTENTS

Section 1.1	Referencing	3
Section 1.2	Scope	3
Section 1.3	Definitions of Words and Phrases	4
Section 1.4	Abbreviations	12
Section 1.5	Administration	14.1

PART 1 ADMINISTRATION

SECTION 1.1 REFERENCING

SUBSECTION 1.1.1. SHORT TITLE

- * 1.1.1.1. This Code may be cited as the **Alberta Building Code 1981**.

SUBSECTION 1.1.2. NUMBERING SYSTEM

- * 1.1.2.1. 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.
- * 1.1.2.2. 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.
- * 1.1.2.3. 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.
- * 1.1.2.4. 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.

SECTION 1.2 SCOPE

SUBSECTION 1.2.1. APPLICATION

- * 1.2.1.1.(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 not directly involved in *alterations*;
 - (iii) 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;
 - (o) safety during construction of a *project*, including protection of the public and neighbouring properties.
- * (2) In Sentence (1) the term "any *building*" includes *new buildings* and *existing buildings*.
- * 1.2.1.2. The rehabilitation or change in *occupancy* of an *existing building*, that has been designated by an *acceptable* authority as having a significant historic value, shall be permitted if it can be shown that the level of safety is *acceptable* for its intended use.

SUBSECTION 1.2.2. EXCLUSIONS

- 1.2.1.1.(1)** This Code does not apply to *
- (a) a *building* for the housing of livestock or the storage or maintenance of equipment or materials or produce associated with the operation of the farm on which it is located;
 - (b) utility towers and poles, television and radio or other communication antennas or towers, except that loads resulting from those located on or attached to *buildings* shall be included in the *building* design;
 - (c) flood control and hydro-electric dams, except for *buildings* provided for *occupancy*;
 - (d) highway and railway bridges;
 - (e) mechanical and other equipment and *appliances* not required for *building* services and not specifically regulated by this Code;
 - (f) an accessory *building* not greater than 10 m² in *building area* if it is *acceptable* as not creating a hazard.

SECTION 1.3 DEFINITIONS OF WORDS AND PHRASES

SUBSECTION 1.3.1. For definitions of words that are not included in Subsection 1.3.2. reference should be made to Websters Third New International Dictionary. *

SUBSECTION 1.3.2. The words and terms in italics in this Code have the following meanings:

Acceptable means acceptable to the *authority having jurisdiction* or, where specified, to the *fire authority*. *

Accepted means accepted by the *authority having jurisdiction*.

Access to exit (see *Exit, access to*).

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 a signal indicating an emergency requiring immediate action such as an alarm for fire from a manual box, a water flow alarm, an alarm from an automatic fire alarm system or other emergency signal.

Allowable bearing pressure (see *Bearing pressure, allowable*).

Allowable load (see *Load, allowable*).

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. *

Architect means a person who is legally permitted to practise as an architect in Alberta. *

Artesian groundwater (see *Groundwater, artesian*).

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 Alberta Uniform Building Standards Act.

Bachelor dwelling unit means a *dwelling unit* for 1 or 2 adults with or without 1 bedroom.

Barrier free building (as applying to requirements for the design of *buildings* for physically handicapped persons) means a *building* to which the public is admitted, *

but does not include apartment *buildings* less than 4 *storeys* in *building height*, houses, boarding houses, or relocatable industrial accommodation or *buildings* of Group F *major occupancy*.

Bearing pressure, allowable (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.

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

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

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

Breeching means a *flue pipe* or chamber for receiving *flue* gases from 1 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 face, exposing (see *Exposing building face*).

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

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

Caisson (see *Pile*).

Chimney means a primarily vertical shaft enclosing at least 1 *flue* for conducting *flue* gases to the outdoors.

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

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

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

Chimney, metal means a single-wall *chimney* of metal constructed on site.

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

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

Combustible (as applying to an elementary building material) means that such material fails to conform to CAN4-S114-78, "Standard Method of Test for Determination of Non-Combustibility in Building Materials."

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

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 1 person for the work on a project or undertakes the work on a project or any part thereof.

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 (see *Bearing pressure, design*).

Designer means the person responsible for the design.

Design load (see *Load, design*).

Dwelling unit means a *suite* operated as a housekeeping unit, used or intended to be *
used by 1 or more persons and usually containing cooking, eating, living,
sleeping and sanitary facilities.

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

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

Existing building means

- (a) a *building* that was completed on or before May 31, 1981, or *
- (b) a *building* for which an application for a *permit* was *accepted* by the *authority*
having *jurisdiction* on or before May 31, 1981.

Exit means that part of a *means of egress* that leads from the *floor area* it serves, *
including a doorway leading directly from a *floor area*, to an *acceptable* public
thoroughfare or to an *acceptable* open space, both of which are essentially
unobstructed from the ground to the sky throughout their length and breadth.

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

Exit, horizontal means that type of *exit* connecting 2 *floor areas* at substantially the
same level by means of a doorway, vestibule, bridge or balcony, such *floor*
areas being located either in different *buildings* or located in the same *building*
and fully separated from each other by a *firewall*.

Exit level (as applying to Subsection 3.2.6.) means the lowest level in an enclosed
exit stairway from which an exterior door provides access to a public thorough-
fare or to an *acceptable* open space with access to a public thoroughfare at
approximately the same level either directly or through a vestibule or *exit*
corridor.

Exit storey (as applying to Subsection 3.2.6.) means a *storey* from which an exterior
door provides direct access at approximately the same level to a public thor-
oughfare or to an *acceptable* open space with access to a public thoroughfare.

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 and any exterior wall that encloses an *attic* or *roof space*, or where a
building is divided into *fire compartments*, the exterior wall of a *fire compart-*
ment which faces one direction.

Exterior cladding (see *Cladding, exterior*).

Factory-built chimney (see *Chimney, factory-built*).

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 authority means the Fire Commissioner or a local assistant to the Fire Commis- *
sioner authorized by him to act on his behalf with respect to this Code.

Fire compartment means an enclosed space in a *building* that is separated from all
other parts of the *building* by enclosing construction providing a *fire separation*
having a required *fire-resistance rating*.

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

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

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

Fire resistance means the property of a material or assembly to withstand fire or give protection from it; as applied to elements of *buildings*, it is characterized by the ability to confine a fire or to continue to perform a given structural function, or both.

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 and may not be required to have a *fire-resistance rating* or a *fire-protection rating*.

Fire stop means a draft-tight barrier within or between construction assemblies that acts to retard the passage of smoke and flame.

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 (see *Storey, first*).

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.

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* and *vertical service spaces* that pierce the *storey*.

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

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

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

* *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, polyvinylchloride foam and ureaformaldehyde 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.

Forced-air furnace (see *Furnace, forced-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, deep (see *Deep foundation*).

Foundation, shallow (see *Shallow foundation*).

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.

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

Garage, repair means a *building* or part thereof where facilities are provided for the repair or servicing of motor vehicles.

Garage, storage 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.

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 *Storey, first*.)

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

Groundwater, artesian means a confined body of water under pressure in the ground.

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

Groundwater, perched means a free standing body of water in the ground extending to a limited depth.

Guard means a protective barrier around openings in floors or at the open sides of stairs, landings, balconies, *mezzanines*, galleries, raised *walkways* or other locations to prevent accidental falls from one level to another. Such barrier may or may not have openings through it.

Heat detector means a device for sensing an abnormally high air temperature or an abnormal rate of heat rise and automatically initiating a signal indicating this condition.

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 (see *Industrial occupancy, high hazard*).

Horizontal exit (see *Exit, horizontal*).

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.

Independent central station means a continually supervised station under the control of a company independent of the *owners* of the *building* to be protected that conforms with NFPA 71-1977, "Installation, Maintenance and Use of Central Station Signaling Systems."

Indirect service water heater (see *Service water heater, indirect*).

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

Industrial occupancy, high hazard (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.

- Industrial occupancy, medium hazard* (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*.
- * *Industrial occupancy, low hazard* (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*.
- * *Infirm persons* means all institutionalized persons whose age or health is such that they require institutional care or treatment.
- Institutional occupancy* means the *occupancy* or use of a *building* or part thereof by persons who are involuntarily detained, or detained for penal or correctional purposes, or whose liberty is restricted, or require special care or treatment because of age, mental or physical limitations.
- Interconnected floor space* means superimposed *floor areas* or parts of *floor areas* in which floor assemblies that are required to be *fire separations* are penetrated by openings that are not provided with *closures*.
- Limiting distance* means the distance from an *exposing building face* to a property line, the centre line of a *street*, lane, public thoroughfare or an imaginary line between 2 *buildings* 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*.
- Load, allowable* (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.
- 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*.
- Load, design* (as applying to *foundations*) means the load applied to a *foundation unit* and which is not greater than the *allowable load*.
- Load, fire* (see *Fire load*).
- Load, occupant* (see *Occupant load*).
- Low hazard industrial occupancy* (see *Industrial occupancy, low hazard*).
- Masonry or concrete chimney* (see *Chimney, masonry or concrete*).
- Means of egress* means a continuous path of travel provided by a doorway, hallway, corridor, exterior passageway, balcony, lobby, stair, ramp or other egress facility or combination thereof, for the escape of persons from any point in a *building, floor area, room* or contained open space to a public thoroughfare or other acceptable open space. (*Means of egress* includes *exits* and *access to exits*.)
- Medium hazard industrial occupancy* (see *Industrial occupancy, medium hazard*).
- Mercantile occupancy* means the *occupancy* or use of a *building* or part thereof for the displaying or selling of retail goods, wares or merchandise.
- Metal chimney* (see *Chimney, metal*).
- 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* that was not completed on or before May 31, 1981 and for which an application for a *permit*, was not *accepted* by the *authority having jurisdiction* on or before May 31, 1981.
- Noncombustible* (as applying to an elementary building material) means that such material conforms to CAN4-S114-78, "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.

Occupancy, major 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*.

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

Owner means

- (a) a person who is registered under provincial legislation as the owner of a freehold estate in possession of land, *
- (b) a person who has purchased or otherwise acquired land, whether he has purchased or otherwise acquired the land directly from the owner or from another purchaser, and has not become the registered owner thereof,
- (c) a person holding 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, or
- (d) a person controlling the property under consideration.

Partition means an interior wall 1 *storey* or part-*storey* in height that is not loadbearing.

Party wall (see *Wall, party*).

Perched groundwater (see *Groundwater, perched*).

Permit means permission, or authorization in writing, to undertake any activity regulated by this Code and, in the case of an *occupancy permit*, to use or occupy a *building* for the sheltering or support of persons, animals or property. *

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

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

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

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

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

Professional engineer means a person who is legally permitted to practise as a professional engineer in Alberta and is qualified to engage in the appropriate combination of those branches of professional engineering that are applicable to building design and construction. *

Project means any construction, *alteration* or demolition operation. *

Proprietary control centre means a continually supervised station under the control of the *owner* or others interested in the *building* or *buildings* to be protected that conforms with Class A proprietary signalling systems in NFPA 72D-1975, "Installation, Maintenance and Use of Proprietary Protective Signaling Systems for Watchman, Fire Alarm and Supervisory Service." *

Public corridor means a corridor that provides *access to exit* from more than 1 *suite*. *

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 1 or more ovens.

Repair garage (see *Garage, repair*).

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

Return duct means a duct for conveying air from a space being heated, ventilated or air-conditioned back to the heating, ventilating or air-conditioning *appliance*.

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

Sanitary drainage system means a drainage system that conducts sewage.

Separation, fire (see *Fire separation*).

Service room means a room or space provided in a *building* to accommodate building service equipment such as air-conditioning or heating *appliances*, electrical services, pumps, compressors and incinerators.

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 space, horizontal (see *Horizontal service space*).

Service space, vertical (see *Vertical service space*).

Service water heater means a device for heating water for plumbing services.

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

Service water heater, storage type means a *service water heater* with an integral hot water storage tank.

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

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

Smoke detector means a device for sensing the presence of visible or invisible particles produced by combustion, and automatically initiating a signal indicating this condition.

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

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

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

Sprinklered (as applying to a *building* or part thereof) means that the *building* or part thereof is equipped with a system of automatic sprinklers.

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

Storage garage (see *Garage, storage*).

Storage-type service water heater (see *Service water heater, storage type*).

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.

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

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 *business and personal services*, and *medium and low hazard industrial occupancies*. (See Appendix A.)

Supervisory signal means a signal indicating the need for action in connection with the supervision of sprinkler and other extinguishing systems or equipment, or with the maintenance features of other protection systems.

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

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

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 is not *acceptable* and could endanger the life, limb or health of any person authorized or expected to be on or about the premises. *

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

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

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

Wall, party 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.

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*. *

SUBSECTION 1.3.3.

1.3.3.1. Except for the definition of *permit*, definitions in section 1 of The Alberta Uniform Building Standards Act also apply in this Code. *

SECTION 1.4 ABBREVIATIONS

SUBSECTION 1.4.1. ABBREVIATIONS OF NAMES OF ASSOCIATIONS

1.4.1.1. The abbreviations in this Code for the names of associations shall have the meanings assigned to them in this Subsection. The addresses of such associations are shown in brackets following the name of each association.

- ACI American Concrete Institute
(P.O. Box 4754, Redford Station, Detroit,
Michigan 48219 U.S.A.)
- ACNBC Associate Committee on the National Building Code
(National Research Council of Canada, Ottawa,
Ontario K1A 0R6)
- ANSI American National Standards Institute
(1430 Broadway, New York, New York 10018 U.S.A.)
- * 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, Pa. 19103 U.S.A.)
- CAN National Standard of Canada designation
(The number following the CAN designation represents the
agency under whose auspices the standard is issued.
CAN 1 designates CGA,
CAN 2 designates CGSB,
CAN 3 designates CSA, and
CAN 4 designates ULC.)
- CGA Canadian Gas Association
(55 Scarsdale Road, Don Mills, Ontario M3B 2R3)
- * CGSB Canadian General Standards Board
(c/o Department of Supply and Services,
11 Laurier Street, Hull, Quebec K1A 0S5)
- CLA Canadian Lumbermen's Association
(27 Goulburn Avenue, Ottawa, Ontario K1N 8C7)
- CSA Canadian Standards Association
(178 Rexdale Blvd., Rexdale, Ontario M9W 1R3)
- FS Federal Specifications and Standards
(General Services Administration, Washington, D.C.
20405 U.S.A.)
- HI Hydronics Institute (heating)
(35 Rusco Place, Berkeley Heights, New Jersey
07922 U.S.A.)
- HRA Heating, Refrigerating and Air-Conditioning Institute of
Canada
(5468 Dundas Street West, Etobicoke, Ontario M9B 6E3)
- NBC National Building Code of Canada
(National Research Council of Canada, Ottawa,
Ontario K1A 0R6)
- NFPA National Fire Protection Association
(Batterymarch Park, Quincy, Massachusetts 02269 U.S.A.)
- NLGA National Lumber Grades Authority
(1055 West Hastings Street, Vancouver, B.C. V6E 2E9)
- * 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
(1750 S.W. Skyline Blvd., P.O. Box 25406
Portland, Oregon 97225 U.S.A.)

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

SUBSECTION 1.4.2. ABBREVIATIONS OF WORDS AND PHRASES

1.4.2.1. The abbreviations of words and phrases in this Code shall have the meanings assigned to them in this Subsection.

ASWG American Standard Wire Gage
B&SG Brown and Sharpe Gage
CLS Canadian Lumber Standard
cm centimetre(s)
db decibel(s)
° degree(s)
°C degree(s) Celsius
diam diameter
g gram(s)
ga gauge
GSG Galvanized Sheet Gage
h hour(s)
Hz hertz
in. inch(es)
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)
MSG Manufacturers' Standard Gage
N newton
N/A not applicable
ng nanogram(s)
No. number(s)
nom. nominal
o.c. on centre
s second(s)
SWG Standard Wire Gage
temp. temperature
T&G tongue and groove
USSG United States Standard Gage
W watt(s)
wt weight

SECTION 1.5 ADMINISTRATION

SUBSECTION 1.5.1. GENERAL

- * **1.5.1.1.(1)** A *permit* may be required if *work* regulated by this Code is to be done.
- * **(2)** In addition to *permits* that may be required by Sentence (1) for *building* components and services, other permits may be required in connection with the proposed work.
- * **(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.(1)** Except as otherwise allowed by the *authority having jurisdiction*, every applicant for a *permit* shall
 - (a) identify and describe in detail the *project* or *occupancy* to be covered by the *permit* for which application is made,
 - (b) 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*, *architect*, *professional engineer*, or other *designer*, and *constructor*.
- * **(2)** If requested by the *authority having jurisdiction*, the *owner* shall submit an up-to-date plan of survey, 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.
- * **1.5.1.3.(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 an *architect* or *professional engineer*, or both,
 - (b) that the construction or *alteration* be generally reviewed during construction by an *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 1.5.1.6.(2) or 1.5.1.7.(1) shall submit evidence to the *authority having jurisdiction*, before any work begins, that he has retained
 - (a) an *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*.
- * **1.5.1.4.(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 Alberta Uniform Building Standards Act or this Code.
- * **(2)** Notwithstanding anything in any other Act, in a regulation under any 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 Articles 1.5.1.5., 1.5.1.6., or 1.5.1.7. unless the plans, drawings or specifications comply with those Articles.

1.5.1.5.(1) In this Article and in Article 1.5.1.6., 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 4(2) of The Alberta Uniform Building Standards Act, and if the application is for a *building* described in Sentence (3). *

(3) The *buildings* referred to in Sentence (2) are: *

- (a) a *building*, 3 storeys or less in *building 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 *building 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 *building 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* complying with Part 10.

1.5.1.6.(1) No local authority shall issue a *permit* with respect to an application for a *building* described in Sentence (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 an *architect*, or
 - (ii) imprinted with a stamp or seal affixed by or on behalf of one or more *professional engineers*,
- and
- (b) the application complies with this Code and the by-laws of the local authority made pursuant to section 4(2) of The Alberta Uniform Building Standards Act.

(2) The *buildings* referred to in Sentence (1) are *

- (a) a *building* 3 storeys or less in *building height* for *residential occupancy* that is a multiple family dwelling containing 20 *dwelling units* or less, unless another number is prescribed in regulations under The Alberta Uniform Building Standards Act;
- (b) a *building* for *industrial occupancy*, if the *occupant load* is designated to be at a ratio of 28 m² per person or more, unless another number is prescribed in regulations under The Alberta Uniform Building Standards Act;
- (c) a *building* that is classified for more than one type of *occupancy*, if
 - (i) the major use of the *building* is *industrial occupancy* and the *occupant load* is designated to be at a ratio of 28 m² per person or more, unless another ratio is prescribed in regulations under The Alberta Uniform Building Standards Act, and
 - (ii) any type of *occupancy*, other than the major use, does not extend over an area exceeding 400 m², unless another area is prescribed in regulations under The Alberta Uniform Building Standards Act.

1.5.1.7.(1) No local authority shall issue a *permit* for a *building* that is not referred to in Articles 1.5.1.5. or 1.5.1.6. 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 an *architect*,
- (b) in the case of engineering drawings, plans or specifications, imprinted with a stamp or seal affixed by or on behalf of a *professional engineer*, and
- (c) in the case of combined architectural and engineering drawings, imprinted with a stamp or seal affixed by
 - (i) an *architect*, and
 - (ii) one or more *professional engineers*
 or are submitted by an *architect* or *professional engineer* who is authorized by the council of his association to submit those drawings, plans or specifications without the seal of the other professional.
- * 1.5.1.8. 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 Alberta Uniform Building Standards Act.
- * 1.5.1.9.(1) If *permits* are required, the *authority having jurisdiction* shall
 - (a) accept an application for a *permit*, and
 - (b) issue a *permit* when, to the best of his knowledge, the applicable requirements of this Code have been met.
- * 1.5.1.10.(1) The *authority having jurisdiction* may issue a *permit* for an entire *building* conditional upon the submission, before starting *work* thereon, of additional information not available at the time of issuance, if such data are of secondary importance, and are of a nature that the withholding of the *permit* until its availability would unreasonably delay the *building*.
- * (2) When in order to expedite *work*, an initial *permit* for part of a *building* is desired before the issuance of a *permit* for the entire *building*, application shall be made for the entire *building*, and complete plans, specifications and documents covering the part of the *building* for which the initial *permit* is desired shall be submitted to the *authority having jurisdiction*.
- * (3) The *authority having jurisdiction* may issue a *permit*, at the risk of the *owner*, with conditions, if necessary, to ensure compliance with this Code, to excavate or to construct a part of a *building* before the plans of the entire *building* have been submitted.
- * (4) If a *permit* is issued for part of a *building*, the *owner*, if he proceeds, proceeds without assurance that further *permits* will be issued.
- * (5) The *authority having jurisdiction* may issue a *permit*, if in his opinion it is warranted, with respect to a *building* or *occupancy* in which existing related construction is not in complete compliance with this Code, in which case the *permit* may be issued subject to conditions.
- * 1.5.1.11.(1) A *permit* for a temporary *building* may be issued by the *authority having jurisdiction*, notwithstanding anything contained elsewhere in this Code, authorizing, for a limited time only, the erection and existence of a *building* for an *occupancy* which because of its nature will exist for a short time under circumstances which warrant only selective compliance with this Code.
- * (2) A *permit* for a temporary *building* shall state the date after which and the conditions under which the *permit* is no longer valid.
- * (3) A *permit* for a temporary *building* may be extended if permission in writing is given by the *authority having jurisdiction*.
- * (4) A *permit* for a temporary *building* shall be posted on the *building*.
- * 1.5.1.12.(1) The *authority having jurisdiction* may refuse to issue a *permit*
 - (a) if information submitted is inadequate to determine compliance with the provisions of this Code,
 - (b) if incorrect information is submitted, or
 - (c) that would authorize any *building*, *project*, *work* or *occupancy* that would not be permitted by

- (i) this Code, or
- (ii) other legislation.

1.5.1.13.(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.(1) *Permit* fees and application procedures shall be as established by regulation or bylaw. *

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

1.5.1.15. 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 to allow the use of a manufactured product that has not been changed in size during the transition to the International System of Units.

SUBSECTION 1.5.2. NOTIFICATION

1.5.2.1.(1) Before *work* is started, 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 *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*. *

1.5.2.2.(1) The *owner* shall give notice in writing to the *authority having jurisdiction* *

- (a) immediately 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.

1.5.2.3. 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*. *

1.5.2.4. 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*. *

1.5.2.5.(1) The *owner* shall give notice to the *authority having jurisdiction* *

- (a) of 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.

1.5.2.6. 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*. *

1.5.2.7. 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 this Code, a bylaw, or the *permit*, including compliance with any special conditions required by the *authority having jurisdiction*. *

SUBSECTION 1.5.3. SAFETY DURING CONSTRUCTION

- * 1.5.3.1.(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.
- * 1.5.3.2. 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*.
- * 1.5.3.3.(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.

SUBSECTION 1.5.4. TESTS AND EQUIVALENTS

- * 1.5.4.1. 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 test or inspection reports with the *authority having jurisdiction*.
- * 1.5.4.2.(1) 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.
- * (2) 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 the *building*, material, *appliance*, equipment, protection device, construction method, structural assembly or *foundation* condition meets the requirements of this Code.
- * (3) 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 the equivalent, if he is of the opinion that sufficient evidence has been presented to demonstrate that the proposed equivalent will provide the level of performance required by this Code.
- * (4) A copy of the evidence referred to in Sentence (3) shall be forwarded to the Director.
- * (5) 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.
- * (6) After the Director has reviewed the evidence submitted under Sentence (5) he may issue a ruling, that may contain conditions, that in his opinion the performance intended by the Code is or is not met and his ruling shall apply in all municipalities.
- * (7) 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.
- * (8) The Director may issue lists of materials that, in his opinion, satisfy the requirements of this Code and, after listing, may be used to fulfill the requirements of this Code.
- * (9) Every *mobile home* and off-site manufactured house that is constructed after May 31, 1981, shall be certified by the Canadian Standards Association, or by an organization

approved for this purpose by the Director, to confirm that the unit complies with the performance required by this Code.

(10) Every relocatable industrial camp *building*, that is constructed after May 31, * 1981, 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.

(11) The Director may issue lists of third party inspection and certification agencies * that, in his opinion, are qualified to certify products or manufacturers for performance to the requirements of this Code.

(12) 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.

SUBSECTION 1.5.5. CERTIFICATION

1.5.5.1. If requested by the *authority having jurisdiction*, an *owner* shall provide written * certification by a qualified person to certify compliance with this Code and with any *permits* issued.

SUBSECTION 1.5.6. OCCUPANCY

1.5.6.1.(1) An *owner* shall obtain an *occupancy permit*, if required by the *authority* * *having jurisdiction*, or permission in writing to occupy from the *authority having jurisdiction*, before any

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

1.5.6.2. 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* for the accepted use before completion of construction or demolition.

1.5.6.3.(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 *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.

SUBSECTION 1.5.7. UNSAFE CONDITIONS

1.5.7.1. If any *building* is in an *unsafe condition*, the *owner* shall forthwith take all * necessary action to correct the condition.

1.5.7.2. The *authority having jurisdiction* may, by notice in writing, order the *owner* of * any *building* to correct any *unsafe condition*.

1.5.7.3. 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*.

1.5.7.4. The *authority having jurisdiction* shall accept any construction or condition that * lawfully existed before May 31, 1981 if the construction or condition does not constitute an *unsafe condition*.

SUBSECTION 1.5.8. FAILURES

- * **1.5.8.1.(1)** If a failure occurs, with the potential to cause injury or loss of life, the *owner* or the *owner's* agent shall submit a report, if requested by the Director or the *authority having jurisdiction*, to the *authority having jurisdiction*, and a copy 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, and
 - (d) the nature of the failure.

SUBSECTION 1.5.9. ASBESTOS

- * **1.5.9.1.(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*.

SUBSECTION 1.5.10. PROHIBITIONS

- * **1.5.10.1.(1)** No person
 - (a) shall fail to complete, before *occupancy*, construction or demolition required by the examined plans, specifications and documents, 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*.

SUBSECTION 1.5.11. PREVIOUS PERMITS

- * **1.5.11.1.** This Code, or any amendment to it, shall not affect the rights of an *owner* under a *permit* issued before the effective date of this Code, if the *owner* has started *work* within 6 months of the date the *permit* was issued and has actively carried out *work* after starting.

PART 2

GENERAL REQUIREMENTS

TABLE OF CONTENTS

Section 2.1	Application	17
Section 2.2	Referenced Documents	17
Section 2.3	Climatic Data	17
Section 2.4	Plans, Specifications and Calculations	18
Section 2.5	Materials	20
Section 2.6	Equivalents	20
Section 2.7	Review	21

PART 2 GENERAL REQUIREMENTS

SECTION 2.1 APPLICATION

- * **SUBSECTION 2.1.1.** Parts 1, 2, 7, 8 and 11 apply to all *buildings*.
- * **SUBSECTION 2.1.2.** Except as permitted by Subsection 2.1.5., Parts 3, 4, 5 and 6 apply to
 - (a) all *buildings* used for
 - (i) Group A, *assembly occupancies*,
 - (ii) Group B, *institutional occupancies*, and
 - (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
 - (i) Group C, *residential occupancies*,
 - (ii) Group D, *business and personal services occupancies*,
 - (iii) Group E, *mercantile occupancies*, and
 - (iv) Group F, Division 2 and 3, *medium and low hazard industrial occupancies*.
- * **SUBSECTION 2.1.3.** Except as permitted by 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 which are used for
 - (a) Group C, *residential occupancies*,
 - (b) Group D, *business and personal services occupancies*,
 - (c) Group E, *mercantile occupancies*, and
 - (d) Group F, *medium and low hazard industrial occupancies*.

SUBSECTION 2.1.4. This Code applies both to site assembled and factory made *buildings*.

SUBSECTION 2.1.5.

- * **2.1.5.1.(1)** Part 10 applies to *buildings* 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 one *storey buildings*
 - (a) without sleeping accommodation, that do not exceed 1200 m² in *building area*, and
 - (b) with sleeping accommodation, that do not exceed 600 m² in *building area*.

SECTION 2.2 REFERENCED DOCUMENTS

SUBSECTION 2.2.1. The provisions of referenced documents prescribed in this Code apply to this Code only to the extent that they relate to *buildings*.

SUBSECTION 2.2.2. In the case of conflict between the provisions of this Code and those of a referenced document, the provisions of this Code govern.

SUBSECTION 2.2.3. Unless otherwise specified herein, the documents referenced in this Code shall include all amendments, revisions and Supplements effective
 * to 31 October, 1980.

SECTION 2.3 CLIMATIC DATA

SUBSECTION 2.3.1. GENERAL

- * 2.3.1.1. The climatic data for the design of *buildings* in Alberta are given in Part 11.
- 2.3.1.2. Depth of frost penetration shall be established on the basis of *acceptable* local experience.

SECTION 2.4 PLANS, SPECIFICATIONS AND CALCULATIONS

SUBSECTION 2.4.1. GENERAL

- 2.4.1.1. Sufficient information shall be provided to show that the proposed work will conform to this Code.
- 2.4.1.2. 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.

SUBSECTION 2.4.2. SITE PLANS

- 2.4.2.1. When required to prove compliance with this Code, a copy of site plans referenced to an up-to-date survey shall be provided.
- 2.4.2.2.(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, and
 - * (c) existing and finished ground levels to an established datum at or adjacent to the site.

SUBSECTION 2.4.3. FIRE PROTECTION COMPONENTS

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

2.4.3.2. 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.

SUBSECTION 2.4.4. STRUCTURAL AND FOUNDATION DRAWINGS AND CALCULATIONS

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

2.4.4.2. 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).

- 2.4.4.3.(1) Structural drawings and related documents submitted with the application to build shall indicate in addition to those items specified in Subsection 2.4.5. and Part 4 applicable to the specific material
 - (a) the name and address of the person responsible for the structural design,

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

2.4.4.4. 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.

2.4.4.5. 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.

2.4.4.6. 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.

2.4.4.7. 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.

SUBSECTION 2.4.5. HEATING, VENTILATING AND AIR-CONDITIONING DRAWINGS AND SPECIFICATIONS

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

2.4.5.2.(1) The information shown on architectural plans and plans for heating, ventilating and air-conditioning systems shall be clear and legible and such plans shall contain all details necessary for checking the installation, including

- (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 on the plans,
- (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) details or description of the windows and outside doors, including the size, weather-stripping, 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 grade of required *fire separations*.

SECTION 2.5 MATERIALS

SUBSECTION 2.5.1. Unless otherwise specified, used materials may be reused when they meet the requirements of this Code for new materials and are otherwise satisfactory for the intended use.

SUBSECTION 2.5.2. All *building* materials on the *building* site shall be stored in such a way as to prevent deterioration or loss or impairment of their structural and other essential properties.

SECTION 2.6 EQUIVALENTS

SUBSECTION 2.6.1. GENERAL

2.6.1.1. The provisions of this Code are not intended to limit the appropriate use of materials, *appliances*, equipment or methods of design or construction not specifically authorized herein.

2.6.1.2. Any person desirous of providing an equivalent to satisfy 1 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.

2.6.1.3. Materials, systems, equipment and procedures not specifically described herein, or which vary from the specific requirements in this Code, or for which no recognized test procedure has been established, may be used if it can be shown that the material, system or equipment is suitable on the basis of past performance, or on the basis of *acceptable* tests or evaluation.

SUBSECTION 2.6.2. STRUCTURAL EQUIVALENTS

2.6.2.1.(1) *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 one of the following methods:

- (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,

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.

SUBSECTION 2.6.3. MATERIALS EQUIVALENTS

2.6.3.1. Any material may be used provided it is shown to be satisfactory for the purpose intended and to be at least the equivalent of the quality, strength, effectiveness, *fire resistance*, durability and safety required by this Code.

SUBSECTION 2.6.4. EQUIVALENT TEST STANDARDS

2.6.4.1. 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 2.7 REVIEW

SUBSECTION 2.7.1. GENERAL

2.7.1.1. Requirements of this Section apply only to *buildings* falling within the scope of Part 4, except that Subsection 2.7.5. applies to all *buildings*.

SUBSECTION 2.7.2. REVIEW OF CONSTRUCTION

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

SUBSECTION 2.7.3. REVIEW OF SHOP DRAWINGS

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

SUBSECTION 2.7.4. WORKMANSHIP AND MATERIALS

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

SUBSECTION 2.7.5. OFF-SITE REVIEW

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

PART 3

USE AND OCCUPANCY

TABLE OF CONTENTS

SECTION 3.1 GENERAL

Subsection 3.1.1.	Scope	27
Subsection 3.1.2.	Classification of Buildings or Parts of Buildings by Major Occupancy ...	27
Subsection 3.1.3.	Multiple Occupancy Requirements ..	30
Subsection 3.1.4.	Construction Types	32
Subsection 3.1.5.	Fire-Resistance Rating	37
Subsection 3.1.6.	Fire Separations and Closures	38
Subsection 3.1.7.	Building Services in Fire Separations and Fire Rated Assemblies	42
Subsection 3.1.8.	Firewalls	43
Subsection 3.1.9.	Fire Stopping	44

Subsection 3.1.10.	Flame-Spread Rating and Smoke Developed Classification	45
Subsection 3.1.11.	Interior Finish	45
Subsection 3.1.12.	Fire Retardant Treated Wood Roof Systems	46
Subsection 3.1.13.	Roof Covering	46
Subsection 3.1.14.	Occupant Load	47

SECTION 3.2 SIZE AND OCCUPANCY REQUIREMENTS FOR FIRE SAFETY

Subsection 3.2.1.	Building Size Determination	48
Subsection 3.2.2.	Building Size and Construction Relative to Occupancy	49
Subsection 3.2.3.	Spatial Separation and Exposure Protection of Buildings	76
Subsection 3.2.4.	Fire Alarm and Detection Systems ..	83
Subsection 3.2.5.	Provisions for Fire Fighting	88
Subsection 3.2.6.	Additional Requirements for High Buildings	91
Subsection 3.2.7.	Provisions for Physically Handicapped Persons	97
Subsection 3.2.8.	Lighting and Emergency Power Systems	97
Subsection 3.2.9.	Mezzanines and Openings Through Floor Assemblies	98

SECTION 3.3 SAFETY REQUIREMENTS WITHIN FLOOR AREAS

Subsection 3.3.1.	Requirements Applying to All Floor Areas	101
Subsection 3.3.2.	Assembly Occupancy	105
Subsection 3.3.3.	Institutional Occupancy	110
Subsection 3.3.4.	Residential Occupancy	111
Subsection 3.3.5.	Business and Personal Services Occupancy	112
Subsection 3.3.6.	Mercantile Occupancy	113

Subsection 3.3.7.	Industrial Occupancy	114

SECTION 3.4 REQUIREMENTS FOR EXITS

Subsection 3.4.1.	General Requirements	116
Subsection 3.4.2.	Number and Location of Exits from Floor Areas	116
Subsection 3.4.3.	Width and Height of Exits	118
Subsection 3.4.4.	Flame-Spread Rating for Exits	120
Subsection 3.4.5.	Required Fire Separation for Exits	120
Subsection 3.4.6.	Exit Signs	121
Subsection 3.4.7.	Lighting for Exits	122
Subsection 3.4.8.	Types of Exit Facility	122

SECTION 3.5 SERVICE SPACES

Subsection 3.5.1.	General	126
Subsection 3.5.2.	Service Rooms	126
Subsection 3.5.3.	Vertical Service Spaces and Service Facilities	128
Subsection 3.5.4.	Horizontal Service Spaces and Service Facilities	129
Subsection 3.5.5.	Elevators, Dumbwaiters and Escalators	130

SECTION 3.6 HEALTH REQUIREMENTS

Subsection 3.6.1.	Height and Area of Rooms	130
Subsection 3.6.2.	Windows	130
Subsection 3.6.3.	Ventilation	130
Subsection 3.6.4.	Plumbing Facilities	131
Subsection 3.6.5.	Medical Gas Piping Systems	133

PART 3 USE AND OCCUPANCY

(See Appendix A.)

SECTION 3.1 GENERAL

SUBSECTION 3.1.1. SCOPE

3.1.1.1. The scope of this Part shall be as described in Subsection 2.1.2.

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

3.1.1.3. Information to be submitted regarding major components of fire protection shall conform to the requirements in Article 2.4.3.1.

SUBSECTION 3.1.2 CLASSIFICATION OF BUILDINGS OR PARTS OF BUILDINGS BY MAJOR OCCUPANCY

(See Appendix A.)

3.1.2.1.(1) Every *building* or part thereof shall be classified as belonging to one of the Groups or Divisions listed in the following Clauses according to its *major occupancy* as described and exemplified in Table 3.1.2.A. and Sentences (4) to (7):

Classification of buildings or parts thereof

- (a) Group A, *assembly occupancy*,
 - (i) Division 1,
 - (ii) Division 2,
 - (iii) Division 3, or
 - (iv) Division 4,
- (b) Group B, *institutional occupancy*,
 - (i) Division 1, or
 - (ii) Division 2,
- (c) Group C, *residential occupancy*,
- (d) Group D, *business and personal services occupancy*,
- (e) Group E, *mercantile occupancy*, or
- (f) Group F, *industrial occupancy*,
 - (i) Division 1,
 - (ii) Division 2, or
 - (iii) Division 3.

(2) When it is intended to use a *building* for more than 1 *major occupancy*, the *building* shall be classified according to all *major occupancies* for which it is used or intended to be used.

(3) Any *building* may be deemed to be occupied by a single *major occupancy*, notwithstanding its use for more than 1 *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.

Buildings containing occupancies of same classification

(4) 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*.

Other uses of arena-type buildings

(5) Police stations with detention quarters may 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*.

Police stations

(6) Convalescent homes and children's custodial homes may be classified as * Group C *major occupancies* provided that occupants are ambulatory and 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.

Convalescent and children's custodial homes

(7) Facilities for pre-school programmes, involving not more than 3 h attendance per day, in which no child is less than 3.5 years old, may be classified as Group A, Division 2 occupancy. *

Table 3.1.2.A.
Forming Part of Article 3.1.2.1.

CLASSIFICATION BY GROUP OR DIVISION OF TYPICAL OCCUPANCIES			
Group	Division	Description of Occupancies	Examples
A	1	<i>Assembly occupancies</i> intended for the production and viewing of the performing arts, including:	Motion pictures <i>theatres</i> Opera houses Television studios admitting a viewing audience <i>Theatres</i> , including experimental <i>theatres</i>
A	2	<i>Assembly occupancies</i> not elsewhere classified in Group A, including:	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) Gymnasias Lecture halls Libraries Licensed beverage establishments Lodge rooms Museums Passenger stations and depots Recreational piers Restaurants Schools and colleges, nonresidential Undertaking premises
A	3	Arena-type occupancies ⁽¹⁾ , including:	Arenas Armouries Ice rinks Indoor swimming pools with or without spectator seating
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, including:	Amusement park structures (not elsewhere classified) Bleachers Grandstands Reviewing stands Stadia
B	1	<i>Occupancies</i> in which persons are detained for penal or correctional purposes, or for involuntary detention, or whose liberties are restricted, including:	Jails Penitentiaries Police stations with detention quarters ⁽²⁾ Prisons Psychiatric hospitals with detention quarters Reformatories with detention quarters
Col. 1	2	3	4

*

Table 3.1.2.A. (Cont'd)

CLASSIFICATION BY GROUP OR DIVISION OF TYPICAL OCCUPANCIES				
Group	Division	Description of Occupancies	Examples	
B	2	<i>Occupancies in which persons because of age, mental or physical limitations require special care or treatment, including:</i>	Children's custodial home ⁽³⁾ Convalescent homes ⁽³⁾ Day-care centres ⁽⁵⁾ Homes for the aged Hospitals Infirmaries Orphanages	Psychiatric hospitals without detention quarters Reformatories without detention quarters Sanatoria without detention quarters
C	—	<i>Occupancies used for sleeping accommodations excluding those covered in Group B, institutional occupancies, including:</i>	Apartments Boarding houses Clubs, residential Colleges, residential Convents Dormitories	Hotels Houses Lodging houses Monasteries Motels Schools, residential
D	—	<i>Occupancies for conducting business and the rendering of professional and personal services, including:</i>	Banks Barber and hair-dressing shops Beauty parlours Dental offices Dry cleaning, self-service not employing flammable or explosive solvents or cleaners Laundry, self-service	Medical offices Offices Police stations without detention quarters Radio stations Small tool and appliance rental and service Telephone exchanges
E	—	<i>Occupancies for the displaying, or selling of retail goods, wares or merchandise, including:</i>	Department stores Exhibition halls Markets	Shops Stores Supermarkets
F	1	<i>Occupancies involving sufficient quantities of highly combustible and flammable or explosive materials which because of their inherent characteristics constitute a special fire hazard, including:</i>	Bulk plants for flammable liquids Bulk storage warehouses for hazardous substances Cereal mills ⁽⁴⁾ Chemical manufacturing or processing plants ⁽⁴⁾ Distilleries ⁽⁴⁾ Dry cleaning plants Feed mills ⁽⁴⁾	Flour mills ⁽⁴⁾ Grain elevators ⁽⁴⁾ Lacquer factories Mattress factories Paint, varnish and pyroxylin product factories Rubber processing plants Spray painting operations Waste paper processing plants
Col. 1	2	3	4	

*

Table 3.1.2.A. (Cont'd)

CLASSIFICATION BY GROUP OR DIVISION OF TYPICAL OCCUPANCIES			
Group	Division	Description of Occupancies	Examples
F	2	Occupancies in which the <i>combustible</i> content is more than 50 kg/m ² or 1 200 MJ/m ² of floor surface and not classified in Division 1 of this Group, including:	Aircraft hangars Box factories Candy plants Cold storage plants Dry cleaning plants not using flammable or explosive solvents or cleaners Electrical substations Factories Freight depots Helicopter landing areas on roofs Laboratories Laundries except self-service Mattress factories Planing mills Printing plants Repair garages Salesrooms Service stations Storage rooms Television studios not admitting a viewing audience Warehouses Wholesale rooms Woodworking factories Workshops
F	3	Occupancies in which the <i>combustible</i> content is not more than 50 kg/m ² or 1 200 MJ/m ² of floor surface, including:	Creameries Factories Laboratories Power plants Sales rooms Sample display rooms Storage garages including open air parking garages Storage rooms Warehouses Workshops
Col. 1	2	3	4

Notes to Table 3.1.2.A.:

- (1) See Sentence 3.1.2.1.(4).
(2) See Sentence 3.1.2.1.(5).
(3) See Sentence 3.1.2.1.(6).
(4) See Sentence 3.2.2.1.(2).
(5) See Sentence 3.1.2.1.(7)

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SUBSECTION 3.1.3. MULTIPLE OCCUPANCY REQUIREMENTS

Buildings containing multiple occupancies

3.1.3.1.(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*. Where any *building* contains more than 1 *major occupancy* (classified in more than 1 Group or Division), the requirements of Subsection 3.2.2. concerning *building* size and construction relative to *occupancy* shall be applied according to Sentences (2) to (4).

Applicable building height and area

(2) 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.

Construction requirements for multiple occupancies

(3) Except as provided in Sentences (4) and (6), in any *building* containing more than 1 *major occupancy*, the requirements of Subsection 3.2.2. for the most restricted *major occupancy* contained shall apply to the whole *building*.

- (4) Except as permitted in Sentence (6), in any *building* containing more than 1 *major occupancy* in which 1 *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 be applied to that portion as if the entire *building* was of that *major occupancy*. Major occupancies above other major occupancies
- * (5) If a *major occupancy* is supported above another *major occupancy* the *fire-resistance rating* of the structural assemblies supporting the assembly separating the two *major occupancies* shall be not less than the *fire-resistance rating* required by Article 3.1.3.3. for the *fire separation* between the *major occupancies*. Support of major occupancies
- (6) In a *building* containing more than 1 *major occupancy*, where the aggregate area of all *major occupancies* in that 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 Subsection 3.2.2. provided they are not classified as Group F, Division 1 or 2 *occupancies*. Exception for major occupancy
- 3.1.3.2.(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. Prohibition of occupancy combinations
- (2) Not more than 1 *dwelling unit* shall be contained within a *building* classified as Group F, Division 2 *major occupancy*. Dwelling units in industrial buildings
- 3.1.3.3.(1) Except as provided in Sentence (2), different divisions of Group A *major occupancies* shall be separated from each other and from all other *major occupancies* by a *fire separation* having a *fire-resistance rating* of at least 1 h. Separation of assembly occupancies
- (2) Different divisions of Group A *major occupancies* shall be separated from Group E and Group F, Division 2 *major occupancies* by a *fire separation* having a *fire-resistance rating* of at least 2 h.
- (3) Except as provided in Sentence (4), Group C *major occupancies* shall be separated from all other *major occupancies* by a *fire separation* having a *fire-resistance rating* of at least 1 h. Separation of residential occupancies
- (4) Group C *major occupancies* shall be separated from Group E and Group F, Division 2 *major occupancies* by a *fire separation* having a *fire-resistance rating* of at least 2 h, except that where not more than 2 *dwelling units* are contained in a *building* with a Group E *major occupancy* not over 3 *storeys* in *building height*, the grade of *fire separation* between the 2 *major occupancies* need not exceed 1 h.
- (5) Different divisions of Group B *major occupancies* shall be separated from each other and from all other *major occupancies* by a *fire separation* having a *fire-resistance rating* of at least 2 h. Separation of institutional occupancies
- (6) Group F, Division 1 *major occupancies* shall be separated from Group D and Group E *major occupancies* by a *fire separation* having a *fire-resistance rating* of at least 3 h, and from Group F, Division 2 and 3 *major occupancies* by a *fire separation* having a *fire-resistance rating* of at least 2 h. Separation of industrial occupancies
- (7) Where the separation of one *major occupancy* from another can be regulated by more than one requirement in Sentences (1) to (6), the more restrictive requirement shall govern.
- (8) The *fire separations* required between *major occupancies* in this Article may be penetrated by floor openings protected in conformance with Subsection 3.2.9., except for *mezzanines* described in Sentence 3.2.9.1.(4) and openings described in Sentence 3.2.9.1.(8). Exemption for interconnected floor spaces
- * (9) Group D *major occupancies* shall be separated from Group E and Group F, Division 2 and 3 *major occupancies* by a *fire separation* having a *fire-resistance rating* not less than 1 h.
- * (10) Group E *major occupancies* shall be separated from Group F, Division 2 and 3 *major occupancies* by a *fire separation* having a *fire-resistance rating* not less than 1 h.

(11) Group F, Division 2 *major occupancies* shall be separated from Group F, Division * 3 *major occupancies* by a *fire separation* having a *fire-resistance rating* not less than 1 h.

(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*.)

SUBSECTION 3.1.4. CONSTRUCTION TYPES

Combustible
Construction

3.1.4.1.(1) Where a *building* is permitted to be of *combustible construction*, it may be constructed of *combustible* materials described in Part 9, with or without *noncombustible* components.

Protection of
foamed plastic

(2) *Foamed plastics* which form part of a wall or ceiling assembly in *combustible ** construction shall be protected on the room side by one of the finishes described in Clause 3.1.4.5.(2)(e).

(3) Subject to Sentences (4) and (5), *foamed plastic* within an exterior metal panel * wall assembly, or above a metal roof deck, in a *building* classified as Group F, Division 3 *occupancy*, is exempt from the requirement for protection from the *building* interior if

- (a) the *building* is not more than 1 *storey* in *building height*,
- (b) the *building area* is not greater than the area permitted in this Code for unsprinklered *combustible construction*, and
- (c) the exterior metal panel wall assembly or the metal roof deck is exposed to a space that is
 - (i) used for cold storage at temperatures below 5°C,
 - (ii) unoccupied, except for occasional maintenance, and used as a compressor station or a pumphouse,
 - (iii) *sprinklered* and used as a *storage garage*, or
 - (iv) *sprinklered* and used as a warehouse and contains no production, sales or display facilities.

(4) All surfaces of *foamed plastic* within an exterior metal panel wall assembly shall be * protected by sheet metal not less than 0.48 mm thick with a melting point not less than 750°C.

(5) *Foamed plastic* above a metal roof deck shall be protected from the *building ** interior by sheet metal not less than 0.48 mm thick with a melting point not less than 750°C.

(6) *Foamed plastic interior trim* may be used without *thermal barrier* protection in * *buildings* permitted to be of *combustible construction* if it covers not more than 5% of the wall or ceiling area to which it is attached and the *flame-spread rating* is not more than 150.

3.1.4.2.(1) Where *fire-retardant treated wood* is specified in this Part, such wood shall

Fire-retardant
treated wood

- (a) be impregnated with fire-retardant chemicals in conformance with CSA O80-1974, "Wood Preservation," and
- (b) be tested to determine its *flame-spread rating* and bear identification showing compliance with this provision.

3.1.4.3. Where *combustible construction* is permitted and is required to have a $\frac{3}{4}$ h *fire-resistance rating*, *heavy timber construction* may be used provided the construction conforms to Article 3.1.4.4.

Heavy timber
alternative to
 $\frac{3}{4}$ h combust-
ible fire rating

3.1.4.4.(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 dimensions given in this Article for solid sawn lumber used in *heavy timber construction* shall conform to CSA O141-1970, "Softwood Lumber".
- * **(3)** Except as provided in Sentences (4) to (6), the minimum dimensions of wood elements in *heavy timber construction* shall conform to Table 3.1.4.A.

Table 3.1.4.A.
Forming Part of Sentence 3.1.4.4.(3)

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

- * **(4)** Roof arches supported on the top 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 that is 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 not less than 19 mm thick tongued and grooved flooring laid cross-wise or diagonally, or not less than 12.5 mm thick tongued and grooved phenolic-bonded plywood or 12.5 mm thick tongued and grooved phenolic-bonded waferboard, and

(b) laid not closer than 15 mm to walls to provide for expansion, and the gap covered at the top or bottom.

- * (6) Roofs shall be

(a) not less than 28 mm thick, tongued and grooved phenolic-bonded plywood, or

(b) glued-laminated or solid sawn plank that is

(i) not less than 38 mm thick, splined or tongued and grooved, or

(ii) 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 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.

Construction
detail

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

(10) Wood girders and beams shall be closely fitted around columns, and adjoining ends shall be connected by ties or *acceptable* 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 *acceptable* metal hangers into which the ends of the beams are closely fitted.

(12) Except as provided in Sentence (13), where floors and roofs are constructed with concealed spaces, such as ceiling or *attic spaces*, such spaces shall be *sprinklered*.

Concealed
spaces

(13) Sprinkler protection as required in Sentence (12) may be omitted when the suspended ceiling is constructed of material having a *flame-spread rating* of 25 or less on any exposed surface or any surface that would be exposed by cutting through the material in any direction.

(See also Sentence 3.1.9.1.(5).)

3.1.4.5.(1) Where a *building* or part of a *building* is required to be of *noncombustible construction*, the construction shall be made from *noncombustible* materials, except as permitted in Sentences (2) to (11), Articles 3.3.4.6., 3.3.5.2., 3.3.6.2. and Sentences 3.1.11.1.(2) and 3.3.7.7.(7).

(See Subsection 3.1.7. for *combustible* elements penetrating a *fire separation*.)

Noncom-
bustible
Construction

Combustible
elements
permitted in
roofs, floors
and walls

- (2) *Combustible* elements of roofs, floors and walls shall be limited to
- (a) the following minor components:
 - (i) paint,
 - (ii) tightly-adhering paper covering not exceeding 1 mm thickness applied to a *noncombustible* backing provided the assembly has a *flame-spread rating* of 25 or less,
 - (iii) mastics and caulking materials applied to provide flexible seals between the major components of exterior wall construction,
 - (iv) wood furring strips not exceeding 38 mm by 38 mm attached directly to a continuous *noncombustible* backing, or wood nailing strips set into a continuous *noncombustible* backing for the attachment of interior finishes, and
 - (v) similar minor components,
 - (b) roof covering which has an A, B, or C classification determined in conformance with Subsection 3.1.13.,
 - (c) adhesives, vapour barriers and sheathing papers,
 - (d) insulation, other than *foamed plastics*, 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, where the insulation is not protected as described in Clauses (e) or (f),
 - (e) *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 provided the insulation is protected on the room side by a *thermal barrier* consisting of
 - (i) at least 12.7 mm thick gypsum board mechanically fastened to the supporting assembly independent of the insulation,
 - (ii) lath and plaster, mechanically fastened to the supporting assembly independent of the insulation,
 - (iii) masonry,
 - (iv) concrete,
 - (v) any *thermal barrier* that when tested in conformance with ULC S101-1977, "Standard Methods of Fire Endurance Tests of Building Construction and Materials," will not exceed an average temperature rise of 139°C on the unexposed face of the *thermal barrier* after a period of 10 min, (See also Sentence 3.2.3.5.(3).), or
 - (vi) any *thermal barrier* that meets or surpasses classification A when tested in accordance with ULC-S124-1976, "Standard Method of Test for the Evaluation of Protective Coverings for Foamed Plastic"
 - (f) insulation, including *foamed plastics*, having a *flame-spread rating* of greater than 25 but not greater than 500 on any exposed surface or any surface that would be exposed by cutting through the material in any direction provided the insulation is protected on the room side with a *thermal barrier* as described in Clause (e), except that in unsprinklered *buildings* exceeding 18 m in height or in unsprinklered *buildings* regulated by the provisions of Subsection 3.2.6., the insulation is protected on the room side by a *thermal barrier* consisting of
 - (i) at least 2 layers of 15.9 mm thick Type X special fire resistant gypsum board, conforming to CSA A82.27-M1977, "Gypsum Board Products," with at least the first layer mechanically fastened to the supporting assembly independent of the insulation,
 - (ii) at least 75 mm of masonry or concrete, or
 - (iii) any *thermal barrier* that when tested in conformance with ULC S101-1977, "Standard Methods of Fire Endurance Tests of Building Construction and Materials," will not exceed an average temperature rise of 139°C on the unexposed face of the *thermal barrier* after a period of 45 min, (See also Sentence 3.2.3.5.(3).)
 - (g) insulation,
 - (i) including *foamed plastics*, installed above concrete roof decks, outside concrete *foundation* walls below ground level and beneath concrete slabs-on-ground, and
 - (ii) excluding *foamed plastics*, installed above metal roof decks, except as permitted by Sentence 3.1.4.4.(3);

- (h) *combustible* skylight assemblies provided such assemblies
 - (i) do not exceed 9 m² in area with a maximum dimension of 3 m,
 - (ii) are spaced at least 2.5 m apart and 2.5 m from required *fire separations*,
 - (iii) have an aggregate area not exceeding 10 per cent of the ceiling area of the room in which they are located, and
 - (iv) have a *flame-spread rating* not exceeding 250 when tested in conformance with CAN4-S102.2-79, "Standard Method of Test for Surface Burning Characteristics of Flooring, Floor Covering and Miscellaneous Materials,"
- * (i) wood cantstrips and roof curbs provided such roof curbs are not more than 300 mm in height above the top surface of the roof assembly, and
- * (j) wood nailer facings to parapets, not more than 600 mm in height, if the facings and any roof membranes covering the facings are protected by sheet steel, aluminum, or copper flashing.

(3) *Combustible* millwork, interior cladding and finishing materials shall be limited to

Combustible
finishes and
millwork

- (a) millwork such as interior trim, doors and door frames, show windows together with their frames, aprons and backing, handrails, shelves, cabinets and counters,
- (b) window sash and frames provided
 - (i) each window in an exterior wall face is an individual unit separated by *noncombustible* wall construction from every other opening in the wall,
 - (ii) windows in exterior walls in contiguous *storeys* are separated by at least 1 m of *noncombustible construction*, and
 - (iii) the aggregate area of openings in an exterior wall face of a *fire compartment* does not exceed 40 per cent of the area of the wall face,
- (c) finished flooring applied directly to a floor slab in which wood nailing strips may be incorporated or applied to wood sleepers on top of a floor slab provided the space between the flooring is *fire stopped* in conformance with Subsection 3.1.9.,
- (d) *stage* flooring supported on *noncombustible* structural members in conformance with Sentence 3.3.2.15.(1),
- (e) stairs within a *dwelling unit*,
- (f) interior finishes such as paint, wallpaper and other interior finishes not exceeding 1 mm in thickness,
- * (g) interior wall finishes other than *foamed plastics* that
 - (i) are not more than 25 mm in thickness, and
 - (ii) 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,
- * (h) interior ceiling finishes other than *foamed plastics* that
 - (i) are not more than 25 mm in thickness, except for exposed *fire-retardant treated wood* battens, and
 - (ii) have a *flame-spread rating* over at least 90 per cent of the ceiling area within each *fire compartment* 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
- (i) *Combustible* vertical glazing installed at a height of not more than 2 *storeys* above *grade* provided such glazing has a *flame-spread rating* of not more than
 - (i) 100 where the glazing is installed in a *building* of 1 *storey* in *building height* or where 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 3.3.6.3., or
 - (ii) 50 where the glazing in the *first storey* is not separated from the glazing in the second *storey* as described in Subclause (i).

Combustible
services

(4) *Combustible* ducts, including *plenums* and duct connectors may 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 Part 6.

(5) *Combustible* pipe and associated adhesives may be used in a *building* required to be of *noncombustible construction* provided such pipe and adhesives

- (a) have a *flame-spread rating* of not more than 25 except when located in a concealed wall space or in 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 such pipe is located within a concealed space in a wall or in a concrete floor slab.

(6) *Combustible* electrical boxes shall have a *flame-spread rating* of not more than 25.

(7) *Combustible* duct linings, duct coverings, duct insulation, vibration isolation connectors, duct tape, pipe insulation and pipe coverings may be used in *buildings* required to be of *noncombustible construction* provided they conform to the appropriate requirements in Part 6.

(8) *Combustible* travelling cables may be used on elevating devices in *buildings* required to be of *noncombustible construction*.

(9) Wiring with *combustible* insulation and jackets may be used in a *building* required to be of *noncombustible construction* provided

- (a) the wiring is enclosed in *noncombustible* conduit when located in vertical shafts in *buildings* within the scope of Subsection 3.2.6., and
- (b) wiring, including single wires or groups of wires, that has an overall diameter greater than 25 mm is installed in *noncombustible* conduit, unless the wiring is located in
 - (i) a concrete floor slab,
 - (ii) a concealed space in a wall, or
 - (iii) in a *service room* separated from the remainder of the *building* by a *fire separation* having at least a 1 h *fire-resistance rating*.

(10) Where *combustible* conduit is used in a *building* required to be of *noncombustible construction*, it shall be located only in a concealed space in a wall or in a concrete floor slab.

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

Tents and
air-supported
structures

3.1.4.7.(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 may 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 exceeding 120 m² in ground area, located on fair grounds or similar open spaces, need not be separated from one another provided *acceptable* safety precautions are taken.

(5) Every tent and *air-supported structure* and all tarpaulins and decorative materials used in connection with such structures shall conform to ULC-S109-1969, "Standard for Flame Tests of Flame-Resistant Fabrics and Films."

(6) The ground enclosed by a tent or *air-supported structure* and for at least 3 m outside of such structure shall be cleared of all flammable material or vegetation that will carry fire.

(7) Tents and *air-supported structures* shall conform to Sections 3.3 and 3.4.

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

(9) *Air-supported structures* shall be provided with 2 blowers each of which has adequate capacity to maintain full inflation pressure with normal leakage and which are electrically interlocked, so that if one blower fails to operate, the other shall automatically start.

(10) 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 1 blower continuously for 4 h, or a supplementary blower powered by an automatic internal-combustion engine.

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

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

(13) Lighting fixtures or other equipment shall not be suspended from *air-supported structures*.

SUBSECTION 3.1.5. FIRE-RESISTANCE RATING

3.1.5.1.(1) Except as provided in Sentences (2) and (3), 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 ULC-S101-1977, "Standard Methods of Fire Endurance Tests of Building Construction and Materials."

Determination
of fire-
resistance
ratings

(2) A material, assembly of materials or a structural member may be assigned a *fire-resistance rating* on the basis of Chapter 2, "Fire Performance Ratings" of the Supplement to the NBC 1980.

(3) The limitation on the rise of temperature on the unexposed surface of an assembly as required by the tests in Sentence (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 3.2.3.9.

Exception for
exterior walls

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

Lay-in ceiling
panels

3.1.5.2.(1) Floor and roof assemblies shall be rated for exposure to fire on the underside.

Application to
various
assemblies

(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*.

Minimum fire
resistance
rating applies

3.1.5.3. 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.

Fire resistance
of supporting
construction

3.1.5.4.(1) Structural members or assemblies required to have a *fire-resistance rating* shall be supported on construction having at least the same *fire-resistance rating*, except as permitted in Subsection 3.2.2. for mixed types of construction, and in Sentences 3.1.6.3.(2) and 3.5.2.1.(5). *

(2) Where an assembly is required to be of *noncombustible construction* and have a *fire-resistance rating*, it shall be supported by *noncombustible construction*.

SUBSECTION 3.1.6. FIRE SEPARATIONS AND CLOSURES

Requirements
and limitations

3.1.6.1.(1) Any wall, *partition* or floor assembly required to be a *fire separation* shall

- (a) be constructed as a continuous element of a *fire compartment*, and
- (b) where required in this Part have a *fire-resistance rating* as specified.

(2) Openings in *fire separations* shall be protected with *closures*, shafts or other means in conformance with Articles 3.1.6.4. to 3.1.6.9. and with Subsections 3.1.7. and 3.2.9.

Combustible
elements and
construction

3.1.6.2.(1) *Combustible construction* that abuts on or is supported by a *noncombustible fire separation* shall be constructed so that its collapse under fire conditions will not cause the collapse of the *fire separation*.

(2) Where a *fire separation* required to be of *noncombustible construction* terminates at the exterior wall or roof surface, *combustible* material shall not extend across the end of the *fire separation* so that fire could spread from one side of the *fire separation* to the other.

(3) *Foamed plastic* shall not be used in any *fire separation*. *

Continuity of
fire separations

3.1.6.3.(1) Except as provided in Sentences (2) and 3.3.1.1.(4), 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 *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 Sentence (1) 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*. (See Appendix A.)

(3) 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.

Determination
of fire-
protection
ratings

3.1.6.4.(1) Except as provided in Sentences (2) and 3.1.6.8.(2), where an opening in a *fire separation* is required to be protected with a *closure* having a *fire-protection rating*, the *fire-protection rating* shall be determined on the basis of the results of tests conducted in conformance with the appropriate provisions in CAN4-S106-77, "Standard Method for Fire Tests of Window and Glass Block Assemblies," CAN4-S104-77, "Standard Method for Fire Tests of Door Assemblies," or

ULC-S112-1976, "Standard for Fire Dampers."
(See Article 3.1.6.9. for additional requirements for *closures*.)

(2) Except as provided in Sentence 3.1.6.6.(1), the *fire-protection rating* of *closures* shall conform to Table 3.1.6.A. for the required grade of *fire separation*.

Rating of
closures

Table 3.1.6.A.
Forming Part of Sentence 3.1.6.4.(2)

Grade of <i>Fire Separation</i> , h	Required <i>Fire-Protection Rating</i> of <i>Closures</i> , h
¾	¾
1	¾
1½	1
2	1½
3	2
4	3
Column 1	2

(3) Except where *fire dampers*, window assemblies and glass block are used as *closures*, 2 *closures* of the same *fire-protection rating* installed on opposite sides of the same opening may be deemed to have a *fire-protection rating* equal to the sum of the *fire-protection ratings* of the *closures*.

(4) 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 13 of NFPA 80-1979, "Fire Doors and Windows."

Installation of
closures

(5) Every *fire damper* used as a *closure* in a required *fire separation* shall be installed in conformance with Part 6.

(6) 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.

(7) The size of an opening in an interior *fire separation* required to be protected with a *closure* shall not exceed 11 m², with no dimensions greater than 3.7 m, when the *fire compartments* on both sides of the *fire separation* are not *sprinklered*.

Maximum
openings

(8) 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*.

3.1.6.5.(1) Except as provided in Sentences (5) and (6), ducts that connect 2 *fire compartments* shall be equipped with a *fire damper* to prevent the spread of fire from one *fire compartment* to the other.

Fire dampers
as closures

(2) A *fire damper* required in Sentence (1) or other *fire damper* used as a *closure* in a *fire separation* shall have a *fire-protection rating* conforming to Sentence 3.1.6.4.(2).

(3) A *fire damper* referred to in Sentence (2), used in a *fire separation* required to have a *fire-resistance rating* of not more than 2 h and which is not a *firewall*, shall be constructed and rated in conformance with ULC-S112-1976, "Standard for Fire Dampers."

(4) A *fire damper* referred to in Sentence (2), used in a *fire separation* required to have a *fire-resistance rating* of more than 2 h, or used in a *firewall*, shall be rated in conformance with CAN4-S104-77, "Standard Method for Fire Tests of Door Assemblies."

(5) *Fire dampers* need not be provided in *noncombustible* branch ducts that have a melting point above 760°C and 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 provided such ducts 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 3.5.3.3. and such ducts are carried up inside the riser at least 500 mm.

(6) 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*.

20 min door assemblies

3.1.6.6.(1) A door assembly having a 20 min *fire-protection rating* may be used as a *closure* in a *fire separation* not required to exceed a 1 h *fire-resistance rating* in

- (a) a required *fire separation* located between a *public corridor* and a *suite*,
- (b) a required *fire separation* located between a corridor and adjacent sleeping rooms and bedrooms,
- (c) a required *fire separation* located between a corridor and adjacent classrooms, offices and libraries in Group A, Division 2 *major occupancies*, except as required in Article 3.3.2.13., and
- (d) a *fire separation* required to have a $\frac{3}{4}$ h *fire-resistance rating* in buildings not exceeding 3 storeys in building height.

(2) The requirements for *noncombustible* sills and *combustible* floor coverings in NFPA 80-1979, "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.

Self-closing devices

3.1.6.7.(1) Except as provided in Sentences 3.3.2.7.(2) and 3.3.3.3.(3) and Article 3.3.5.4., every door in a *fire separation* other than doors to freight elevators and dumbwaiters shall have an *acceptable* self-closing device, and every swing-type door shall be equipped with a latch.

Hold-open devices

(2) Where the safety of the occupants is not endangered thereby, *acceptable* hold-open devices may be installed on *closures* that are required to be self-closing other than *closures* on vestibules required in Article 3.3.7.7. and on *exit* shafts, except as provided in Sentence (4).

(3) Except as provided in Sentences (4) to (6) and Sentence 3.3.3.3.(2), hold-open devices permitted in Sentence (2) shall be actuated by *smoke detectors* or the *building* fire alarm system.

(4) Except as provided in Sentences (5) and (6) and Sentence 3.3.3.3.(2), hold-open devices on doors may be actuated by a sprinkler system or a heat actuated device designed for this purpose provided the door is not required to function as part of a smoke control system.

(5) Hold-open devices may be installed on *exit* doors in buildings up to 3 storeys in building height provided they are designed to release the door upon a signal from a *smoke detector* located as described in NFPA 80-1979, "Fire Doors and Windows."

(6) Where a fire alarm system is provided, hold-open devices permitted in Sentence (5) shall also be released upon a signal from the *building* fire alarm system.

Wired glass and glass block

3.1.6.8.(1) Except as provided in Article 3.1.6.9. 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 80-1979, "Fire Doors and Windows."

(2) Wired glass assemblies in Sentence (1) need not be tested in conformance with Sentence 3.1.6.4.(1) provided that the wired glass is

- (a) at least 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 at least 0.45 mm diam, or approximately 13 mm across the flats, using wire of at least 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 at least 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 exceeding 1.4 m,
 - (ii) the maximum area unsupported by structural mullions does not exceed 7.5 m², and
 - * (iii) the total area of wired glass in all openings in a *fire separation* between 2 *fire compartments* is not more than 11 m² if either *fire compartment* is not *sprinklered*, or not more than 22 m² if both *fire compartments* are *sprinklered*.

(3) Where glass blocks are permitted in Sentence (1), they shall be installed in accordance with Section 4.4 and reinforced with steel reinforcement in each horizontal joint.

3.1.6.9.(1) Except as provided in Sentence (2), 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 3.1.6.4.(1), and the maximum area of wired glass permitted in such doors, shall conform to Table 3.1.6.B. when used in the locations shown in the Table.

Temperature rise and glass area limits for doors

Table 3.1.6.B.
Forming Part of Sentence 3.1.6.9.(1)

Location	Minimum Required Fire-Protection Rating of Door, h	Maximum Temperature Rise on Unexposed Side of Door, °C	Maximum Area of Glass, 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
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 ¾	No limit	No limit
	¾	250 after ½ h	645
	1½	250 after 1 h	645
	2	250 after 1 h	645
A door in a <i>firewall</i>	1½	250 after ½ h	645
	3	250 after 1 h	0
Column 1	2	3	4

(2) No temperature rise limit and no glass area limit is required on a *closure* located 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 at least $\frac{3}{4}$ h.
- (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*.

Area limits on
wired glass and
glass block

(3) The aggregate area of wired glass panels or glass block used in the locations shown in Column 1 of Table 3.1.6.B. shall not exceed the limits shown in Column 4 of the Table. (See also Article 3.1.6.8.)

SUBSECTION 3.1.7. BUILDING SERVICES IN FIRE SEPARATIONS AND FIRE RATED ASSEMBLIES

3.1.7.1.(1) Except as provided in Sentences (2) to (6), pipes, ducts, electrical outlet boxes, electrical conduit or other similar service equipment that partly or wholly penetrate an assembly required to have a *fire-resistance rating* shall be *non-combustible* unless the assembly has been tested incorporating such equipment.

Wiring in fire
rated
assemblies

(2) Electrical or similar wiring enclosed in *noncombustible* conduit 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 (1).

(3) Wiring, including single wires or groups of wires, with *combustible* insulation or jacketing that is not enclosed in *noncombustible* conduit may partly or wholly penetrate a vertical assembly required to have a *fire-resistance rating* without being incorporated in the assembly at the time of testing as required in Sentence (1) provided the wiring does not exceed 25 mm in overall diameter.

(4) *Combustible* conduit which is embedded in a concrete floor slab shall be 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 (1) where the concrete provides at least 50 mm of cover between the conduit and the bottom of the slab.

(5) *Combustible* outlet boxes shall be 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 (1) provided the opening through the membrane into the box does not exceed 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*.

Piping in fire
rated
assemblies

3.1.7.2.(1) Pipes that penetrate an assembly required to be a *fire separation* shall be

- (a) enclosed in shafts conforming to Section 3.5, or
- (b) tightly fitted or fire stopped to prevent the passage of smoke and flame.

(2) Except as permitted by Sentences (3), (4) and (5), no *combustible* drain, waste or vent piping shall be used in a *plumbing system* within a *building* if any part of the *plumbing system* is located within or passes through a *fire separation* required to have a *fire-resistance rating*.

(3) If drain, waste or vent piping passes through a vertical *fire separation*, the piping * within a *fire compartment* on one side of the *fire separation* may be *combustible*.

(4) If *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*, if no *combustible* piping passes through the wall of or is located within the *fire separation* or the *vertical service space*.

(5) 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 if

- (a) the *combustible* piping is within the basement and is restricted to a single *fire compartment*, and

- (b) the basement is not more than 1 storey in height.

3.1.7.3.(1) Except as provided in Sentences (2) and 3.1.6.5.(6), ducts that penetrate an assembly required to be a *fire separation* shall

Ducts in fire rated assemblies

- (a) be enclosed in shafts conforming to Section 3.5, or
(b) be provided with a *closure* conforming to Article 3.1.6.4. and be tightly fitted or fire stopped to prevent the passage of smoke and flame.

(2) 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 1980 may be pierced by openings leading to ducts within the ceiling space provided such ducts are *noncombustible* and provided

- (a) a single opening does not exceed 930 cm² in area,
(b) the aggregate area of all openings does not exceed 1 per cent of the ceiling area of the *fire compartment*,
(c) the openings are located at least 2 m apart, and
(d) where an opening exceeds 130 cm² in area, it is protected by a *fire stop flap* conforming to Part 6.

- (3) A ceiling assembly used as a *plenum* shall conform to Part 6.

SUBSECTION 3.1.8. FIREWALLS

3.1.8.1.(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*.

Members framing into firewalls

(2) Sentence (1) does not apply when a *firewall* consists of 2 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 $\frac{1}{2}$ the *fire-resistance rating* required for the *firewall* in Sentences (3) and (4) and designed so that the collapse of one wall assembly will not cause collapse of the other.

(3) 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 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* may be reduced to 2 h.

Grade of fire separation

(4) 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 2 h.

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

Fire-resistance rating

(6) 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 used primarily as a *storage garage* separated from the remainder of the *building* by a *fire separation* conforming to Article 3.2.1.3., the *firewall* may terminate at the floor assembly immediately above the *storage garage*. (See also Sentence 3.1.8.1.(10).)

Continuity

(7) Except as provided in Sentences (8) and (9), every *firewall* shall extend above the roof surface to form a parapet not less than

Parapets

- (a) 150 mm in height for a *firewall* required to have a *fire-resistance rating* of 2 h, and
(b) 900 mm in height for a *firewall* required to have a *fire-resistance rating* of 4 h.

(8) A *firewall* may terminate on the underside of a reinforced concrete roof slab provided

- (a) the roof slab on both sides of the *firewall* has a
 - (i) 1 h *fire-resistance rating* if a *firewall* is required to have a 2 h *fire-resistance rating*, or
 - (ii) 2 h *fire-resistance rating* if a *firewall* is required to have a 4 h *fire-resistance rating*, and
- (b) there are no concealed spaces within the roof slab in that portion immediately above the *firewall*.

(9) 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 2 roofs so separated is greater than 3 m.

Support

(10) 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* at least equal to that required for the *firewall*.

Penetrations for service equipment

(11) Piping, ducts and conduit shall be installed so that the collapse of such piping, ducts and conduit will not cause collapse of the *firewall*.

Openings

(12) Opening in *firewalls* shall conform to the size limits described in Sentences 3.1.6.4.(7) and (8), except that the aggregate width of all openings shall not exceed 25 per cent of the length of the *firewall* in a *fire compartment*.

(13) Where the external walls of 2 *buildings* meet at a *firewall* at an angle of 135° or less, the requirements of Article 3.2.3.10. shall apply.

(14) In a *building* of *noncombustible construction* a *firewall* may be offset at any * intermediate floor construction if

- (a) the *fire separation* for the complete *firewall* assembly is continuous, and
- (b) the offset floor construction and all supporting elements have a *fire-resistance rating* not less than that required for the *firewall* and the materials conform to Sentence (5).

SUBSECTION 3.1.9. FIRE STOPPING

Application

3.1.9.1.(1) This Article applies to all types of construction unless otherwise specified.

Location

(2) *Fire stops* shall be provided at floor, ceiling and roof levels to cut off completely all concealed horizontal and vertical spaces, and spaces filled with batts, loose fill or *foamed plastic* insulation, occurring between *storeys* and between top * *storeys* and roof spaces, including

- (a) every stud wall and *partition* at ceiling and floor levels,
- (b) every stud wall and *partition* of *combustible construction* so that the maximum vertical dimension of any concealed space is not greater than 3 m,
- (c) every furred wall and *partition* so that concealed spaces between the furring strips are *fire stopped* at the floor and ceiling levels,
- (d) at the bottom of the cove in every coved ceiling of *combustible construction*,
- (e) the top and bottom of each run of stairs at ceiling and floor levels,
- (f) the top or bottom of every expansion joint between floors and walls in *heavy timber construction*, and
- (g) the opening between the upper and lower portions of a mansard style roof.

Floors

(3) Where *combustible* floors are laid on wood sleepers on top of slabs in *buildings* required to be of *noncombustible construction*, the space between the underside of the flooring and the floor deck shall be filled with *noncombustible* material, or *fire stopping* shall be provided so that there is no open space between the flooring and slab in excess of 10 m² in area.

Ceilings

(4) Where *combustible* ceiling finishes are attached to wood furring strips fastened to a *noncombustible* backing in *buildings* required to be of *noncombustible construction*, *fire stopping* shall be provided in such a manner that there is no open space in excess of 2 m² in area between the ceiling finish and the backing.

(5) A concealed space created by a suspended ceiling, roof space or unoccupied attic space in *buildings of combustible construction* shall, unless *sprinklered*, be separated by *fire stops* into draft-tight compartments not exceeding

Concealed spaces

- (a) 600 m² in area or 60 m in any dimension where materials having a *flame-spread rating* of 25 or less are exposed in the space, and
- (b) 300 m² in area or 20 m in any dimension where materials having a *flame-spread rating* greater than 25 are exposed in the space.

(6) In *combustible construction* the concealed spaces in exterior cornices, mansard style roofs, balconies and canopies shall be *fire stopped* into compartments at the points where such concealed spaces extend across the ends of required *fire separations*, and no compartment shall exceed 20 m in any dimension.

(7) Every *fire stop* shall

Firestopping materials

- (a) be constructed of
 - (i) asbestos-cement board, gypsum board or other *noncombustible* material having a melting point above 760°C such as sheet steel,
 - (ii) solid lumber not less than 38 mm in thickness, or
 - (iii) 12.5 mm thick plywood or 12.7 mm thick waferboard with joints supported, or 2 thicknesses of lumber not less than 19 mm in thickness with joints staggered, where the width or height of the opening or space to be *fire stopped* is such that more than 1 piece of 38 mm thick lumber is necessary, and
- (b) conform to other appropriate requirements in this Part.

(8) Access openings through *fire stops* shall be protected with self-closing draft-tight *closures* of construction equivalent to the *fire stop*.

Openings

(9) Where *fire stops* are pierced by pipes, ducts or other elements or assemblies, the integrity of the *fire stop* shall be maintained.

3.1.9.2.(1) Where insulation having a *flame-spread rating* exceeding 25 is installed in a wall assembly required to be of *noncombustible construction*, *fire stops* shall be installed at

Insulation in concealed spaces

- (a) the locations described in Sentence 3.1.9.1.(2),
- (b) each intersecting wall of a *fire compartment*, and
- (c) intermediate locations so that the distance between *fire stops* does not exceed 20 m.

SUBSECTION 3.1.10. FLAME-SPREAD RATING AND SMOKE DEVELOPED CLASSIFICATION

3.1.10.1.(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 at least 3 tests conducted in conformance * with CAN4-S102-79, "Standard Method of Test for Surface Burning Characteristics of Building Materials."

Determination of flame-spread rating and smoke developed classification

(2) The *flame-spread rating* and smoke developed classification of a material or assembly of materials shall be determined on the basis of at least 3 tests conducted in * conformance with CAN4-S102.2-79, "Standard Method of Test for Surface Burning Characteristics of Flooring, Floor Covering and Miscellaneous Materials," 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 may 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 1980.

SUBSECTION 3.1.11. INTERIOR FINISH

- General** 3.1.11.1.(1) Interior finish material shall include any material that forms part of the interior surface of a floor, wall, *partition* or ceiling, such as
- (a) interior cladding of plaster, wood or tile,
 - (b) surfacing of fabric, paint, plastic, veneer or wallpaper,
 - (c) doors, windows and trim,
 - (d) lighting elements such as light diffusers and lenses forming part of the finished surface of the ceiling, and
 - (e) carpet material that overlies a floor, when such floor is not intended as the finished floor.
- Light diffusers and lenses** (2) Light diffusers and lenses need not meet the *flame-spread ratings* for interior finish provided
- (a) they will fall to the bottom of the test apparatus before the test specimen ignites when tested in conformance with ULC-S102.3-1979, "Standard Method of Fire Test of Light Diffusers and Lenses," *
 - (b) they 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 CAN4-S102.2-79, "Standard Method of Test for Surface Burning Characteristics of Flooring, Floor Covering and Miscellaneous Materials," *
 - (c) they are not prevented from falling from the ceiling by construction located beneath the elements, and
 - (d) they 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 each diffuser or lense does not exceed 1 m² in area and is separated from any adjacent diffuser or lense by at least 1.2 m of ceiling finish material having the required *flame-spread rating*.
- Ceilings below sprinkler systems** (3) Open grid and translucent ceilings located below sprinkler systems shall be installed in conformance with NFPA 13-1978, "Installation of Sprinkler Systems," paragraphs 4-4.15, 4-4.16.

SUBSECTION 3.1.12. FIRE-RETARDANT TREATED WOOD ROOF SYSTEMS

- Roof system** 3.1.12.1.(1) Where a *fire-retardant treated wood* roof system is specified in Subsection 3.2.2., the assembly shall consist of
- (a) wood material which, when tested in conformance with Sentence 3.1.10.1.(1) with the test period extended to 30 min, does not exhibit progressive combustion within that period in excess of 1.52 m from the point of flame impingement, resulting in an equivalent *flame-spread rating* of 25, and bear identification showing compliance with this provision,
 - (b) supports for the roof deck which are
 - (i) *fire-retardant treated wood* exhibiting flame-spread properties as outlined in Clause (a),
 - (ii) *heavy timber construction* as prescribed in Article 3.1.4.4.,
 - (iii) *noncombustible construction*, or
 - (iv) a combination thereof,
 - (c) a deck material of *fire-retardant treated wood* or plywood exhibiting flame-spread properties as outlined in Clause (a) and of not less than 19 mm in actual thickness, and
 - (d) a membrane of metallic material of not less than 0.05 mm thickness applied directly above the wood deck material.

SUBSECTION 3.1.13. ROOF COVERING

- Classification** 3.1.13.1. Where a roof covering is required to be a Class A, B or C roof covering, such classification shall be determined in conformance with ULC-S107-1969, "Standard Test Methods for Fire Resistance of Roof Covering Materials." *
- (See Article 3.2.3.12.)

SUBSECTION 3.1.14. OCCUPANT LOAD

3.1.14.1.(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 bedroom or sleeping area in *dwelling units*, and
- (c) the number of persons for which the area is designed, but not less than that determined from Table 3.1.14.A. for *occupancies* other than those

Table 3.1.14.A.
Forming Part of Article 3.1.14.1.

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
stages 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	
surgical and obstetrical areas	11.60
wards containing more than 2 beds	4.60
detention quarters	11.60
Residential uses	
houses	See Clause (1)(b)
dormitories	4.60
Business and personal services uses	
personal service shops	4.60
offices	9.30
Mercantile uses	
retail sales floors at ground, basement or cellar	2.80
other floors	5.60
Industrial uses	
manufacturing or process rooms	4.60
storage garages	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
Column 1	2

described in Clauses (a) and (b) unless it can be shown that the area will be occupied by fewer persons.

(2) For the purposes of this Article, *mezzanines*, tiers and balconies shall be regarded as part of the *floor area*.

(3) Where a room or group of rooms is intended for 2 or more *occupancies* at different times, the value to be used from Table 3.1.14.A. shall be the value which gives the greatest number of persons for the *occupancies* concerned.

SECTION 3.2 SIZE AND OCCUPANCY REQUIREMENTS FOR FIRE SAFETY

SUBSECTION 3.2.1. BUILDING SIZE DETERMINATION

Dividing
buildings by
firewalls

3.2.1.1. When a *building* is divided by a *firewall* or *firewalls*, each portion of the *building* separated from the remainder in this manner shall be considered as a separate *building* for the purposes of this Section, except that where access is provided through a *firewall*, the requirements of Subsection 3.2.4. shall apply to the *floor areas* on both sides of the *firewall* as if they were in the same *building*.

Exceptions to
building height
in storeys

3.2.1.2.(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 does not exceed 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 3.3.2.13.(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.

(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 *mezzanine* does not exceed 10 per cent of the area of the *storey* in which it is located.

(5) Where more than 1 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 "other floor assemblies" in Articles 3.2.2.9. to 3.2.2.52.

Storage garage
considered as
separate
building

3.2.1.3. Where a basement is used primarily as a *storage garage*, the basement may be considered as a separate *building* for the purposes of Subsection 3.2.2. provided it is separated from the remainder of the *building* by a *fire separation* of reinforced concrete having a *fire-resistance rating* of at least 2 h.

Roofs
considered as
walls

3.2.1.4. 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*.

SUBSECTION 3.2.2. BUILDING SIZE AND CONSTRUCTION RELATIVE TO OCCUPANCY

3.2.2.1.(1) Except as provided in Sentence (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*.)

Application

(2) Structures which, because of unusual proportions, cannot be identified with the descriptions of *buildings* in Articles 3.2.2.9. to 3.2.2.52., such as grain elevators, towers and refineries, or *buildings* which have special *occupancy* hazards, such as warehouses incorporating high piled storage of *combustible* materials, shall be protected against fire spread and collapse in conformance with good fire protection engineering practice such as described in the appropriate NFPA standards.

Special structures

(3) Fire protection is not required for

Exceptions to fire protection requirements

- (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 exceeding 4 storeys in *building height*, and classified as Group A, B, C, D or F, Division 3 *major occupancy* provided such members are
 - (i) at least 3 m from a property line or centre line of a public thoroughfare, and
 - (ii) at least 1 m away from any *unprotected opening* in an exterior wall, or shielded from heat radiation in the event of a fire within a *building* by construction that will provide the same degree of protection that would be necessary if the member was located inside the *building*, with the protection extending on either side of the member a distance equal to the projection of the member from the face of the wall.

3.2.2.2. When the *building height* or the *building area* is such that it could be regulated by more than 1 of Articles 3.2.2.9. to 3.2.2.52. for the same *occupancy* classification of the *building*, the least restrictive Article may be used.

When lesser restrictions apply

3.2.2.3.(1) For the purposes of this Section, a basement or cellar means a *storey* or *storeys* located below the *first storey* in a *building*.

(2) For the purposes of Articles 3.2.2.9. to 3.2.2.52., a crawl space is considered to be a basement or cellar when

Basements, cellars and crawl spaces

- (a) it exceeds 1.8 m in height between the lowest floor assembly and the ground or other surface below,
- (b) it is used for any *occupancy*,
- (c) it is used for the passage of *flue pipes*, *combustible* pipes or ducts, or
- (d) it is used as a *plenum* in *combustible* construction.

3.2.2.4.(1) Every *building* shall face a *street* located in conformance with the requirements for access routes in Sentences 3.2.5.2.(1) to (5).

Streets

(2) For the purposes of this Section an access route conforming to Article 3.2.5.2. may be considered as a *street*.

(3) A *building* is considered to face 2 *streets* when at least 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 at least 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.

Exterior
balconies

3.2.2.5.(1) Exterior balconies shall be constructed in accordance with the type of construction required in Articles 3.2.2.9. to 3.2.2.52., as applicable to the *occupancy* classification of the *building*.

Exterior
passageways

(2) Elevated exterior passageways used as part of a *means of egress* shall conform to the requirements in Articles 3.2.2.9. to 3.2.2.52. for *mezzanines*.

Roof-top
enclosures

3.2.2.6.(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 3.2.2.9. to 3.2.2.52., except that where such enclosure does not exceed 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 3.2.2.9. to 3.2.2.52., except that such enclosures need not have a *fire-resistance rating* or be constructed as a *fire separation*.

Storeys below
ground

3.2.2.7.(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 or cellars 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) the basements and cellars shall be *sprinklered*,
- (b) floor assemblies below such ground level shall be constructed as a
 - (i) 2 h *fire separation* where the basements or cellars are occupied as Group A, D or Group F, Division 3 *occupancies*, and
 - (ii) 3 h *fire separation* where the basements or cellars are occupied by other *occupancies*, and
- (c) all *loadbearing* walls, columns and arches shall have a *fire-resistance rating* at least equal to that required for the construction that they support.

Sprinklers in
lieu of
structural fire
resistance

3.2.2.8.(1) The requirements in Articles 3.2.2.11. to 3.2.2.52. for roof assemblies of *noncombustible construction* to have a *fire-resistance rating* may be waived pro- *
vided

- (a) the *building* is classified as Group A *major occupancy*, or is not more than 1 *storey* in *building height*,
- (b) the required *fire-resistance rating* of the roof assembly does not exceed 1 h,
- (c) the roof assembly is protected by a sprinkler system (See Appendix A.),
- (d) the sprinkler system in Clause (c) is electrically supervised in conformance with Sentence 3.2.4.4.(8), and

- (e) the operation of the sprinkler system in Clause (c) will cause an alarm signal to be transmitted to the fire department in conformance with Sentence 3.2.4.3.(2).

GROUP A—ASSEMBLY BUILDINGS

Group A, Division 1, 1 Storey

(See also Article 3.2.2.10.)

3.2.2.9.(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 does not exceed 300 persons.

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

- (a) basements and cellars shall be sprinklered,
- (b) floor assemblies immediately above basements or cellars shall be a $\frac{3}{4}$ h fire separation (see Article 3.2.2.3.),
- (c) other floor assemblies shall be a $\frac{3}{4}$ h fire separation except for floors above crawl spaces,
- (d) mezzanines shall have, if of combustible construction, a $\frac{3}{4}$ h fire-resistance rating,
- (e) roof assemblies shall have, if of combustible construction, a $\frac{3}{4}$ h fire-resistance rating, and
- (f) all loadbearing walls, columns and arches supporting an assembly required to have a fire-resistance rating shall have a $\frac{3}{4}$ h fire-resistance rating or shall be of noncombustible construction, except that such members and assemblies supporting a fire separation as described in Clause (b) or (c) shall have a $\frac{3}{4}$ h fire-resistance rating.

Group A, Division 1, 1 Storey

(See also Article 3.2.2.9.)

3.2.2.10.(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 does not exceed 600 persons.

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

- (a) basements and cellars shall be sprinklered,
- (b) floor assemblies immediately above basements or cellars shall be a $\frac{3}{4}$ h fire separation (see Article 3.2.2.3.),

- (c) other floor assemblies shall be a $\frac{3}{4}$ h *fire separation*, and
- (d) all *loadbearing* walls, columns and arches supporting an assembly required to have a *fire-resistance rating* shall be of *heavy timber* or *noncombustible construction*, except that such members and assemblies supporting a *fire separation* as described in Clause (b) or (c) shall have a $\frac{3}{4}$ h *fire-resistance rating*.

**Group A, Division 1,
Any Height, Any Area**

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

- (a) is not limited in *building height*, and
 - (b) is not limited in *building area*.
- (2) The *building* shall be of *noncombustible construction*, and
- (a) basements and cellars shall be subdivided by a 2 h *fire separation* into areas not exceeding 500 m², or they shall be *sprinklered*,
 - (b) floor assemblies immediately above basements or cellars shall be a 2 h *fire separation*,
 - (c) floor assemblies immediately above crawl spaces shall have a 1 h *fire-resistance rating*, except that this requirement is waived if the crawl space is subdivided by a 1 h *fire separation* into areas not exceeding 500 m², or they are *sprinklered* (see Article 3.2.2.3.),
 - (d) other floor assemblies shall be a 2 h *fire separation*,
 - (e) *mezzanines* shall have a 1 h *fire-resistance rating*,
 - (f) except as provided in Article 3.2.2.8., roof assemblies shall have a 1 h *fire-resistance rating*, and
 - (g) all *loadbearing* walls, columns and arches shall have a *fire-resistance rating* at least equivalent to that required for the supported assembly but in no case should there be a *fire-resistance rating* of less than 1 hr.

Group A, Division 2, 1 Storey

3.2.2.12.(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*, is not greater in *building area* 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 greater than twice the area limits of Clause (b).
- (2) The *building* shall be of *combustible* or *noncombustible construction* used either singly or in combination, and
- (a) floor assemblies immediately above basements or cellars shall be a $\frac{3}{4}$ h *fire separation* (see Article 3.2.2.3.), and
 - (b) all *loadbearing* walls, columns and arches shall have a *fire-resistance rating* at least equivalent to that required for the supported assembly.
- (3) In *buildings* without basements or cellars the limiting areas may be doubled provided a 1 h *fire separation* 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).

**Group A, Division 2,
1 and 2 Storeys, Sprinklered**

3.2.2.13.(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) is not greater in *building area* than
 - (i) 400 m² if facing 1 *street*,
 - (ii) 500 m² if facing 2 *streets*, or
 - (iii) 600 m² if facing 3 *streets*.

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

- (a) floor assemblies immediately above basements or cellars shall be a $\frac{3}{4}$ h *fire separation* (see Article 3.2.2.3.), and
- (b) all *loadbearing walls*, columns and arches shall have a *fire-resistance rating* at least equivalent to that required for the supported assembly.

Group A, Division 2, 1 and 2 Storeys

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*, is not greater in *building area* than the value in Table 3.2.2.A., and
- (c) if *sprinklered*, is not greater than twice the area limits of Clause (b).

Table 3.2.2.A.
Forming Part of Sentence 3.2.2.14.(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) The *building* shall be of *combustible* or *noncombustible construction* used either singly or in combination, and

- (a) basements and cellars shall be subdivided by a 1 h *fire separation* into areas not exceeding 500 m², or they shall be *sprinklered*,
- (b) floor assemblies immediately above basements or cellars shall be a $\frac{3}{4}$ h *fire separation*,
- (c) floor assemblies immediately above crawl spaces shall have, if of *combustible construction*, a $\frac{3}{4}$ h *fire-resistance rating*, except that this requirement is waived if the crawl spaces are subdivided by a $\frac{3}{4}$ h *fire separation* into areas not exceeding 500 m², or they are *sprinklered* (see Article 3.2.2.3.),
- (d) other floor assemblies shall be a *fire separation* and, if of *combustible construction*, shall have a $\frac{3}{4}$ h *fire-resistance rating*,
- (e) *mezzanines* shall have, if of *combustible construction*, a $\frac{3}{4}$ h *fire-resistance rating*,
- (f) roof assemblies shall have, if of *combustible construction*, a $\frac{3}{4}$ h *fire-resistance rating* or in *buildings* not exceeding 1 *storey* in *building height*, the *fire-resistance rating* may be waived provided that the roof assembly is constructed as a *fire-retardant treated wood roof system* conforming to Sentence 3.1.12.1.(1) and
 - (i) if *unsprinklered*, the *building area* is not greater 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 greater than twice the area limits of Subclause (i), and
- (g) all *loadbearing* walls, columns and arches supporting an assembly required to have a *fire-resistance rating* shall have a $\frac{3}{4}$ h *fire-resistance rating* or shall be of *noncombustible construction*, except that such members and assemblies supporting a *fire separation* as described in Clause (b) shall have a $\frac{3}{4}$ h *fire-resistance rating*.

**Group A, Division 2,
up to 5 Storeys, Any Area**

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

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

(2) Except as provided in Sentence (3), the *building* shall be of *noncombustible construction*, and

- (a) basements and cellars shall be subdivided by a 2 h *fire separation* into areas not exceeding 500 m², or they shall be *sprinklered*,
- (b) floor assemblies immediately above basements or cellars shall be a 2 h *fire separation*,
- (c) floor assemblies immediately above crawl spaces shall have a 1 h *fire-resistance rating*, except that this requirement is waived if the crawl spaces are subdivided by a 1 h *fire separation* into areas not exceeding 500 m², or they are *sprinklered* (see Article 3.2.2.3.),
- (d) other floor assemblies shall be a 1 h *fire separation*,
- (e) *mezzanines* shall have a 1 h *fire-resistance rating*,
- (f) except as provided in Sentence (3), and in Article 3.2.2.8., roof assemblies shall have a 1 h *fire-resistance rating*, and
- (g) except as provided in Sentence (3), all *loadbearing* walls, columns and arches shall have a *fire-resistance rating* at least equivalent to the supported assembly, but not less than 1 h.

(3) A building classified as Group A, Division 2 *occupancy* that does not exceed 1 storey in *building height*, and in which the *building area* is not greater than 3 200 m² if *unsprinklered*, or 6 400 m² if *sprinklered*, may be constructed with a roof of *heavy timber construction* and have columns of *heavy timber construction*.

**Group A, Division 2
Any Height, Any Area**

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

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

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

- (a) basements and cellars shall be subdivided by a 2 h *fire separation* into areas not exceeding 500 m², or they shall be *sprinklered*,
- (b) floor assemblies immediately above basements or cellars shall be a 2 h *fire separation*,
- (c) floor assemblies immediately above crawl spaces shall have a 1 h *fire-resistance rating*, except that this requirement is waived if the crawl spaces are subdivided by a 1 h *fire separation* into areas not exceeding 500 m², or they are *sprinklered* (see Article 3.2.2.3.),
- (d) other floor assemblies shall be a 2 h *fire separation*,
- (e) *mezzanines* shall have a 1 h *fire-resistance rating*,
- (f) except as provided in Article 3.2.2.8., roof assemblies shall have a 1 h *fire-resistance rating*, and

- (g) all *loadbearing* walls, columns and arches shall have a *fire-resistance rating* at least equivalent to that required for the supported assembly, but not less than 1 h.

Group A, Division 3, 1 Storey

(See also Article 3.2.2.18.)

3.2.2.17.(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*, is not greater in *building area* 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 greater than twice the area limits of Clause (b).

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

- (a) basements and cellars shall be subdivided by a 1 h *fire separation* into areas not exceeding 500 m², or they shall be *sprinklered*,
- (b) floor assemblies immediately above basements or cellars shall be a $\frac{3}{4}$ h *fire separation*,
- (c) floor assemblies immediately above crawl spaces shall have, if of *combustible construction*, a $\frac{3}{4}$ h *fire-resistance rating*, except that this requirement is waived if the crawl spaces are subdivided by a $\frac{3}{4}$ h *fire separation* into areas not exceeding 500 m², or they are *sprinklered* (see Article 3.2.2.3.), and
- (d) all *loadbearing* walls, columns and arches supporting an assembly required to have a *fire-resistance rating* shall have a $\frac{3}{4}$ h *fire-resistance rating* or shall be of *noncombustible construction*, except that such members and assemblies supporting a *fire separation* as described in Clause (b) shall have a $\frac{3}{4}$ h *fire-resistance rating*.

Group A, Division 3, 1 Storey

(See also Article 3.2.2.17.)

3.2.2.18.(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*, is not greater in *building area* 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 greater than twice the area limits of Clause (b).

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

- (a) basements and cellars shall be subdivided by a 1 h *fire separation* into areas not exceeding 500 m², or they shall be *sprinklered*,
- (b) floor assemblies immediately above basements or cellars shall be a 1 h *fire separation*,
- (c) floor assemblies immediately above crawl spaces shall have, if of *combustible construction*, a $\frac{3}{4}$ h *fire-resistance rating*, except that this requirement is waived if the crawl spaces are subdivided by a $\frac{3}{4}$ h *fire separation* into areas not exceeding 500 m², or they are *sprinklered* (see Article 3.2.2.3.),
- (d) *mezzanines* shall have, if of *combustible construction*, a $\frac{3}{4}$ h *fire-resistance rating*,
- (e) roof assemblies shall have, if of *combustible construction*, a $\frac{3}{4}$ h *fire-resistance rating*, except that the *fire-resistance rating* may be waived provided that the roof assembly is constructed as a *fire-retardant treated wood* roof system conforming to Sentence 3.1.12.1.(1), and

- (i) if unsprinklered, the *building area* is not greater 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 greater than twice the area limits of Subclause (i), and
- (f) all *loadbearing walls*, columns and arches supporting an assembly required to have a *fire-resistance rating* shall have a $\frac{3}{4}$ h *fire-resistance rating* or shall be of *noncombustible construction*, except that such members and assemblies supporting a *fire separation* as described in Clause (b) shall have a 1 h *fire-resistance rating*.

Group A, Division 3, 1 and 2 Storeys

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

Table 3.2.2.B.
Forming Part of Sentence 3.2.2.19.(1)

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

- (2) Except as provided in Clauses (f) and (g), the *building* shall be of *noncombustible construction*, and
- (a) basements and cellars shall be subdivided by a 2 h *fire separation* into areas not exceeding 500 m², or they shall be *sprinklered*,
 - (b) floor assemblies immediately above basements or cellars shall be a 2 h *fire separation*,
 - (c) floor assemblies immediately above crawl spaces shall have a 1 h *fire-resistance rating*, except that this requirement is waived if the crawl spaces are subdivided by a 1 h *fire separation* into areas not exceeding 500 m², or they are *sprinklered* (see Article 3.2.2.3.),
 - (d) other floor assemblies shall be a 1 h *fire separation*,
 - (e) *mezzanines* shall have a 1 h *fire-resistance rating*,
 - (f) roof assemblies shall have a 1 h *fire-resistance rating*, except that *heavy timber* * *construction*, *noncombustible construction* without a *fire-resistance rating*, or combinations thereof may be used if every part of the roof assembly is not less than 6 m above the main floor or balcony and carries no loads other than normal roof loads, including access walks, ventilating and sound or similar equipment, except that the restriction concerning minimum distance shall not apply to
 - (i) an inclined and stepped floor ascending from the main floor and which is used for seating purposes only,
 - (ii) a balcony used for seating purposes only,
 - (iii) a *walkway* used only as a *means of egress*, and
 - (g) all *loadbearing walls*, columns and arches shall have a *fire-resistance rating* at least equivalent to that required for the supported assembly, but not less than 1 h, except that arches may be of *heavy timber construction*.

Group A, Division 3
Any Height, Any Area

3.2.2.20.(1) A building classified as Group A, Division 3 shall conform to Sentence (2) provided the *building*

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

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

- (a) basements and cellars shall be subdivided by a 2 h *fire separation* into areas not exceeding 500 m², or they shall be *sprinklered*,
- (b) floor assemblies immediately above basements or cellars shall be a 2 h *fire separation*,
- (c) floor assemblies immediately above crawl spaces shall have a 1 h *fire-resistance rating*, except that this requirement is waived if the crawl spaces are subdivided by a 1 h *fire separation* into areas not exceeding 500 m², or they are *sprinklered* (see Article 3.2.2.3.),
- (d) other floor assemblies shall be a 2 h *fire separation*,
- (e) *mezzanines* shall have a 1 h *fire-resistance rating*,
- * (f) roof assemblies shall have a 1 h *fire-resistance rating*, except that this requirement is waived if every part of the roof assembly is not less than 6 m above the main floor or balcony and carries no loads other than normal roof loads, including access walks and ventilating and sound or similar equipment, except that the restriction concerning minimum distance shall not apply to
 - (i) an inclined and stepped floor ascending from the main floor and which is used for seating purposes only,
 - (ii) a balcony used for seating purposes only, or
 - (iii) a *walkway* used only as a *means of egress*, and
- (g) all *loadbearing walls*, columns and arches shall have a *fire-resistance rating* at least equivalent to that required for the supported assembly, but not less than 1 h.

Group A, Division 4

3.2.2.21.(1) A building classified as Group A, Division 4 shall conform to Sentence (2).

- (2) The *building* shall be of *noncombustible construction*, except that
 - (a) the roof assemblies may be of *heavy timber construction*, and
 - (b) the *building* may be of *combustible construction* provided
 - (i) the *occupant load* is less than 1 500 persons, and
 - (ii) the *building* has a *limiting distance* of at least 6 m.

GROUP B — INSTITUTIONAL BUILDINGS

Group B, Division 1

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

- (2) The *building* shall be of *noncombustible construction*, and
 - (a) basements and cellars shall be subdivided by a 2 h *fire separation* into areas not exceeding 500 m², or they shall be *sprinklered*,
 - (b) floor assemblies immediately above basements or cellars shall be a 2 h *fire separation*,
 - (c) floor assemblies immediately above crawl spaces shall have a 2 h *fire-resistance rating*, except that this requirement is waived if the crawl spaces are subdivided by a 2 h *fire separation* into areas not exceeding 500 m², or they are *sprinklered* (see Article 3.2.2.3.),
 - (d) other floor assemblies shall be a 2 h *fire separation*,
 - (e) *mezzanines* shall have a 1 h *fire-resistance rating*,
 - (f) except as provided in Article 3.2.2.8., roof assemblies shall have a 1 h *fire-resistance rating*, and

- (g) all *loadbearing* walls, columns and arches shall have a *fire-resistance rating* at least equivalent to that required for the supported assembly.

Group B, Division 2, 1 Storey

3.2.2.23.(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*, is not greater in *building area* than 250 m², and
- (c) if *sprinklered*, is not greater than 500 m².

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

- (a) floor assemblies immediately above basements or cellars shall be a $\frac{3}{4}$ h *fire separation*, and
- (b) all *loadbearing* walls, columns and arches shall have a *fire-resistance rating* at least equivalent to that required for the supported assembly.

Group B, Division 2 1 and 2 Storeys

3.2.2.24.(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) is not greater in *building area* than the value in Table 3.2.2.C.

Table 3.2.2.C.
Forming Part of Sentence 3.2.2.24.(1)

No. of Storeys	Unsprinklered Maximum Area, m ²	<i>Sprinklered</i> Maximum Area, m ²
1	1 000	2 400
2	500	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 immediately above basements or cellars shall be a 1 h *fire separation* (see Article 3.2.2.3.),
- (b) other floor assemblies, except floors over crawl spaces, shall be a $\frac{3}{4}$ h *fire separation*,
- (c) *mezzanines* shall have, if of *combustible construction*, a $\frac{3}{4}$ h *fire-resistance rating*,
- (d) roof assemblies shall have, if of *combustible construction*, a $\frac{3}{4}$ h *fire-resistance rating*, and
- (e) all *loadbearing* walls, columns and arches shall have a *fire-resistance rating* at least equivalent to that required for the supported assembly, but not less than $\frac{3}{4}$ h.

Group B, Division 2 Any Height, Any Area

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

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

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

- (a) basements, cellars and crawl spaces shall be *sprinklered*,

- (b) floor assemblies immediately above basements or cellars shall be a 2 h *fire separation*,
- (c) other floor assemblies shall be a 2 h *fire separation* except for floors above crawl spaces,
- (d) *mezzanines* shall have a 1 h *fire-resistance rating*,
- (e) except as provided in Article 3.2.2.8., roof assemblies shall have a 1 h *fire-resistance rating*, and
- (f) all *loadbearing* walls, columns and arches shall have a *fire-resistance rating* at least equivalent to that required for the supported assembly.

GROUP C — RESIDENTIAL BUILDINGS

Group C, up to 3 Storeys

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

- * (a) is not more than 3 *storeys* in *building height*, except as permitted by Sentence 3.2.2.27.(4),
- (b) if *unsprinklered*, is not greater in *building area* than the value in Table 3.2.2.D., and
- (c) if *sprinklered*, is not greater than twice the area limits of Clause (b).

Table 3.2.2.D.
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	1 200	1 500	1 800
2	900	1 125	1 350
3	600	750	900
Column 1	2	3	4

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

- (a) basements, cellars and crawl spaces shall be subdivided by a $\frac{3}{4}$ h *fire separation* into areas not exceeding 500 m², or they shall be *sprinklered*,
- (b) floor assemblies immediately above basements or cellars shall be a $\frac{3}{4}$ h *fire separation*,
- (c) other floor assemblies, except floors over crawl spaces, shall be a $\frac{3}{4}$ h *fire separation* (see Article 3.2.2.3.),
- (d) *mezzanines* shall have, if of *combustible construction*, a $\frac{3}{4}$ h *fire-resistance rating*, and
- (e) all *loadbearing* walls, columns and arches shall have a *fire-resistance rating* at least equivalent to that required for the supported assembly.

(3) When *buildings* contain *dwelling units* consisting of more than 1 *storey*, as provided in Article 3.3.4.2., the provisions of Sentences (1) and (2) shall apply, except that subject to the provision of Sentence 3.3.4.2.(2), the floor assemblies, including floors over basements or cellars, which are entirely contained within such *dwelling units*, shall have a $\frac{3}{4}$ h *fire-resistance rating* and need not be constructed as a *fire separation*; in *buildings* where there is no *dwelling unit* above another, the *fire-resistance rating* for the floor assemblies within the *dwelling unit* is waived.

Group C, up to 6 Storeys

3.2.2.27.(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) if unsprinklered, is not greater in *building area* than the value in Table 3.2.2.E.,
 - (c) if *sprinklered*, is not greater than twice the area limits of Clause (b).
- (2) The *building* shall be of *noncombustible construction*, and
- (a) basements and cellars shall be subdivided by a 2 h *fire separation* into areas not exceeding 500 m², or they shall be *sprinklered*,
 - (b) floor assemblies immediately above basements or cellars shall be a 2 h *fire separation*,
 - (c) floor assemblies immediately above crawl spaces shall have a 1 h *fire-resistance rating*, except that this requirement is waived if the crawl spaces are subdivided by a 1 h *fire separation* into areas not exceeding 500 m², or they are *sprinklered* (see Article 3.2.2.3.),
 - (d) other floor assemblies shall be a 1 h *fire separation*,
 - (e) *mezzanines* shall have a 1 h *fire-resistance rating*,
 - (f) except as provided in Article 3.2.2.8., roof assemblies shall have a 1 h *fire-resistance rating*, and
 - (g) all *loadbearing walls*, columns and arches shall have a *fire-resistance rating* at least equivalent to that required for the supported assembly.

Table 3.2.2.E.
Forming Part of Sentence 3.2.2.27.(1)

No. of Storeys	Unsprinklered Maximum Area, m ²		
	Facing 1 Street	Facing 2 Streets	Facing 3 Streets
1	unlimited	unlimited	unlimited
2	6 000	unlimited	unlimited
3	4 000	5 000	6 000
4	3 000	3 750	4 500
5	2 400	3 000	3 600
6	2 000	2 500	3 000
Column 1	2	3	4

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

(4) Notwithstanding Sentence (1) a *building* may be constructed to conform to Sentence 3.2.2.26.(2) if

- (a) the *building* contains not more than 4 *storeys*,
- (b) the area limits of Clauses 3.2.2.26.(1)(b) and (c) are not exceeded,
- (c) the exterior walls of the lowest *storey* are of *noncombustible construction*, and
- (d) the *building* is not placed above a *storage garage* considered as a separate *building* under Article 3.2.1.3.

Group C, Any Height, Any Area

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

- (a) is not limited in *building height*, and
 - (b) is not limited in *building area*.
- (2) The *building* shall be of *noncombustible construction*, and
- (a) basements and cellars shall be subdivided by a 2 h *fire separation* into areas not exceeding 500 m², or they shall be *sprinklered*,

- (b) floor assemblies immediately above basements or cellars shall be a 2 h *fire separation*,
 - (c) floor assemblies immediately above crawl spaces shall have a 1 h *fire-resistance rating*, except that this requirement is waived if the crawl spaces are subdivided by a 1 h *fire separation* into areas not exceeding 500 m², or they are *sprinklered* (see Article 3.2.2.3.),
 - (d) other floor assemblies shall be a 2 h *fire separation*,
 - * (e) *mezzanines* shall have a 1 h *fire-resistance rating*,
 - (f) except as provided in Article 3.2.2.8., roof assemblies shall have a 1 h *fire-resistance rating*, and
 - (g) all *loadbearing* walls, columns and arches shall have a *fire-resistance rating* at least equivalent to that required for the supported assembly.
- (3) When *buildings* contain *dwelling units* consisting of more than 1 *storey*, as provided in Article 3.3.4.2., the provisions of Sentences (1) and (2) shall apply, ex-

cept that subject to the provision of Sentence 3.3.4.2.(2), the floor assemblies, including floors over basements or cellars, which are entirely contained within such *dwelling units*, shall have a 1 h *fire-resistance rating* and need not be constructed as a *fire separation*.

GROUP D—BUSINESS AND PERSONAL SERVICES BUILDINGS

Group D, 1 and 2 Storeys

3.2.2.29.(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*, is not greater in *building area* than the value in Table 3.2.2.F., and
- (c) if *sprinklered*, is not greater than twice the area limits of Clause (b).

Table 3.2.2.F.
Forming Part of Sentence 3.2.2.29.(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 *noncombustible construction* used either singly or in combination, and

- (a) crawl spaces in a *building of combustible construction*, and basements and cellars in every *building* shall be subdivided by $\frac{3}{4}$ h *fire separations* into areas not exceeding 500 m², or they shall be *sprinklered*,
- (b) floor assemblies immediately above basements or cellars shall be a $\frac{3}{4}$ h *fire separation* (see Article 3.2.2.3.),
- (c) other floor assemblies shall be *fire separations* and, if of *combustible construction*, shall have a $\frac{3}{4}$ h *fire-resistance rating*, and
- (d) all *loadbearing walls*, columns and arches supporting an assembly required to have a *fire-resistance rating* shall have a $\frac{3}{4}$ h *fire-resistance rating* or shall be of *noncombustible construction*, except that such members and assemblies supporting a *fire separation* as described in Clause (b) shall have a $\frac{3}{4}$ h *fire-resistance rating*.

Group D, up to 3 Storeys

3.2.2.30.(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*, is not greater in *building area* than the value in Table 3.2.2.G., and
- (c) if *sprinklered*, is not greater than twice the area limits of Clause (b).

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

- (a) basements and cellars shall be subdivided by a 1 h *fire separation* into areas not exceeding 500 m², or they shall be *sprinklered*,
- (b) floor assemblies immediately above basements or cellars shall be a 1 h *fire separation*.

- (c) floor assemblies immediately above crawl spaces shall have, if of *combustible construction*, a $\frac{3}{4}$ h *fire-resistance rating*, except that this requirement is waived if the crawl spaces are subdivided by a $\frac{3}{4}$ h *fire separation* into areas not exceeding 500 m², or they are *sprinklered* (see Article 3.2.2.3.),
- (d) other floor assemblies shall be a *fire separation* and, if of *combustible construction*, shall have a $\frac{3}{4}$ h *fire-resistance rating*,
- (e) *mezzanines* shall have, if of *combustible construction*, a $\frac{3}{4}$ h *fire-resistance rating*,
- (f) roof assemblies shall have, if of *combustible construction*, a $\frac{3}{4}$ h *fire-resistance rating*, or in *buildings* not exceeding 1 storey in *building height*, the *fire-resistance rating* may be waived provided that the roof assembly is constructed as a *fire-retardant treated wood* roof system conforming to Sentence 3.1.12.1.(1), and
- (i) if *unsprinklered*, the *building area* is not greater 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 greater than twice the area limits of Subclause (i), and
- (g) all *loadbearing* walls, columns and arches supporting an assembly required to have a *fire-resistance rating* shall have a $\frac{3}{4}$ h *fire-resistance rating* or shall be of *noncombustible construction*, except that such members and assemblies supporting a *fire separation* as described in Clause (b) shall have a 1 h *fire-resistance rating*.

Table 3.2.2.G.
Forming Part of Sentence 3.2.2.30.(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

Table 3.2.2.H.
Forming Part of Sentence 3.2.2.31.(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
4	3 600	4 500	5 400
5	2 800	3 600	4 320
6	2 400	3 000	3 600
Column 1	2	3	4

Group D, up to 6 Storeys

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

- (a) is not more than 6 *storeys* in *building height*,
- (b) if *unsprinklered*, is not greater in *building area* than the value in Table 3.2.2.H., and
- (c) if *sprinklered*, is not greater than twice the area limits of Clause (b).

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

- (a) basements and cellars shall be subdivided by a 2 h *fire separation* into areas not exceeding 500 m², or they shall be *sprinklered*,
- (b) floor assemblies immediately above basements or cellars shall be a 2 h *fire separation*,
- (c) floor assemblies immediately above crawl spaces shall have a 1 h *fire-resistance rating*, except that this requirement is waived if the crawl spaces are subdivided by a 1 h *fire separation* into areas not exceeding 500 m², or they are *sprinklered* (see Article 3.2.2.3.),
- (d) other floor assemblies shall be a 1 h *fire separation*,
- (e) *mezzanines* shall have a 1 h *fire-resistance rating*,
- (f) roof assemblies shall have a 1 h *fire-resistance rating*, except that in *buildings* of 1 *storey* in *building height* this requirement is waived, and
- (g) all *loadbearing* walls, columns and arches shall have a *fire-resistance rating* at least equivalent to that required for the supported assembly.

Group D, Any Height, Any Area

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

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

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

- (a) basements and cellars shall be subdivided by a 2 h *fire separation* into areas not exceeding 500 m², or they shall be *sprinklered*,
- (b) floor assemblies immediately above basements or cellars shall be a 2 h *fire separation*,
- (c) floor assemblies immediately above crawl spaces shall have a 1 h *fire-resistance rating*, except that this requirement is waived if the crawl spaces are subdivided by a 1 h *fire separation* into areas not exceeding 500 m², or they are *sprinklered* (see Article 3.2.2.3.),
- (d) other floor assemblies shall be a 2 h *fire separation*,
- (e) *mezzanines* shall have a 1 h *fire-resistance rating*,
- (f) roof assemblies shall have a 1 h *fire-resistance rating*, except that in *buildings* of 1 *storey* in *building height* this requirement is waived, and
- (g) all *loadbearing* walls, columns and arches shall have a *fire-resistance rating* at least equivalent to that required for the supported assembly.

GROUP E—MERCANTILE BUILDINGS

Group E, 1 and 2 Storeys

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

- (a) is not more than 2 *storeys* in *building height*,
- (b) if *unsprinklered*, is not greater in *building area* than the value in Table 3.2.2.I., and
- (c) if *sprinklered*, is not greater than twice the area limits of Clause (b).

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

- (a) crawl spaces in a *building of combustible construction* and basements and cellars in every *building* shall be subdivided by $\frac{3}{4}$ h *fire separations* into areas not exceeding 500 m², or they shall be *sprinklered*,
- (b) floor assemblies immediately above basements or cellars shall be a $\frac{3}{4}$ h *fire separation* (see Article 3.2.2.3.),
- (c) other floor assemblies, except floors over crawl spaces, shall be a $\frac{3}{4}$ h *fire separation*, and
- (d) all *loadbearing* walls, columns and arches shall have a *fire-resistance rating* at least equivalent to that required for the supported assembly.

Table 3.2.2.I.
Forming Part of Sentence 3.2.2.33.(1)

No. of Storeys	Uns sprinklered 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

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

No. of Storeys	Uns sprinklered 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	800	1 000	1 200

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

Group E, up to 3 Storeys

3.2.2.34.(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) is not greater in *building area* than the value in Table 3.2.2.J.

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

- (a) basements and cellars shall be subdivided by a 1 h *fire separation* into areas not exceeding 500 m², or they shall be *sprinklered*,

- (b) floor assemblies immediately above basements or cellars shall be a 1 h *fire separation*, except that where the basement or cellar is *sprinklered*, *heavy timber construction* may be used,
- (c) floor assemblies immediately above crawl spaces shall have, if of *combustible construction*, a $\frac{3}{4}$ h *fire-resistance rating*, except that this requirement is waived if the crawl spaces are subdivided by a $\frac{3}{4}$ h *fire separation* into areas not exceeding 500 m², or they are *sprinklered* (see Article 3.2.2.3.),
- (d) other floor assemblies shall be a $\frac{3}{4}$ h *fire separation*,
- (e) *mezzanines* shall have, if of *combustible construction*, a $\frac{3}{4}$ h *fire-resistance rating*,
- (f) roof assemblies shall have a $\frac{3}{4}$ h *fire-resistance rating*, except that in buildings not exceeding 1 storey in *building height*, the *fire-resistance rating* may be waived provided the roof assembly is of *noncombustible construction*, except that the roof assembly may be constructed as a *fire-retardant treated wood roof system* conforming to Sentence 3.1.12.1.(1),
 - (i) if *unsprinklered*, the *building area* is not greater than 1 500 m², and
 - (ii) if *sprinklered*, the *building area* is not greater than
 - 2 400 m² if facing 1 *street*,
 - 3 000 m² if facing 2 *streets*, or
 - 3 600 m² if facing 3 *streets*, and
- (g) all *loadbearing walls*, columns and arches supporting an assembly required to have a *fire-resistance rating* shall have a $\frac{3}{4}$ h *fire-resistance rating* or shall be of *noncombustible construction*, except that such members and assemblies supporting a *fire separation* as described in Clause (b) or (d) shall have a *fire-resistance rating* at least equivalent to that required for the supported assembly.

Table 3.2.2.K.
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	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

Group E, up to 6 Storeys

3.2.2.35.(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 is not greater in *building area* than 1 500 m², and
 - (b) if *sprinklered*, is not more than 6 storeys in *building height* and is not greater in *building area* than the value in Table 3.2.2.K.
- (2) The building shall be of *noncombustible construction*, and
- (a) basements and cellars shall be subdivided by a 2 h *fire separation* into areas not exceeding 500 m², or they shall be *sprinklered*,
 - (b) floor assemblies immediately above basements or cellars shall be a 2 h *fire separation*,

- (c) floor assemblies immediately above crawl spaces shall have a 1 h *fire-resistance rating*, except that this requirement is waived if the crawl spaces are subdivided by a 1 h *fire separation* into areas not exceeding 500 m², or they are *sprinklered* (see Article 3.2.2.3.),
- (d) other floor assemblies shall be a 2 h *fire separation*,
- (e) *mezzanines* shall have a 1 h *fire-resistance rating*,
- (f) except as provided in Article 3.2.2.8., roof assemblies shall have a 1 h *fire-resistance rating*, and
- (g) all *loadbearing* walls, columns and arches shall have a *fire-resistance rating* at least equivalent to that required for the supported assembly.

Group E, Any Height, Any Area, Sprinklered

3.2.2.36.(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*, except as provided in Clause (2)(b), and
 - (c) is not limited in *building area*.
- (2) The *building* shall be of *noncombustible construction*, and
- (a) floor assemblies immediately above basements or cellars shall be a 3 h *fire separation*,
 - (b) sprinklers may be omitted in crawl spaces provided
 - (i) floor assemblies immediately above crawl spaces have a 2 h *fire-resistance rating*, or
 - (ii) the crawl spaces are subdivided by a 2 h *fire separation* into areas not exceeding 500 m², (see Article 3.2.2.3.),
 - (c) other floor assemblies shall be a 3 h *fire separation*, except for floors above crawl spaces,
 - (d) *mezzanines* shall have a 1½ h *fire-resistance rating*,
 - (e) roof assemblies shall have a 1½ h *fire-resistance rating*, and
 - (f) all *loadbearing* walls, columns and arches shall have a *fire-resistance rating* at least equivalent to that required for the supported assembly.

GROUP F—INDUSTRIAL BUILDINGS

Group F, Division 1, 1 and 2 Storeys

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

- (a) is not more than 2 storeys in *building height*,
- (b) if unsprinklered, is not greater in *building area* than the value in Table 3.2.2.L., and
- (c) if *sprinklered*, is not greater than twice the area limits of Clause (b).

Table 3.2.2.L.

Forming Part of Sentence 3.2.2.37.(1)

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

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

- (a) basements and cellars shall be subdivided by a $\frac{3}{4}$ h *fire separation* into areas not exceeding 500 m², or they shall be *sprinklered*,
- (b) floor assemblies immediately above basements or cellars shall be a $\frac{3}{4}$ h *fire separation*,
- (c) floor assemblies immediately above crawl spaces shall have, if of *combustible construction*, a $\frac{3}{4}$ h *fire-resistance rating*, except that this requirement is waived if the crawl spaces are subdivided by a $\frac{3}{4}$ h *fire separation* into areas not exceeding 500 m², or they are *sprinklered* (see Article 3.2.2.3.),
- (d) other floor assemblies shall be a *fire separation* and if of *combustible construction* shall have a $\frac{3}{4}$ h *fire-resistance rating*, and
- (e) all *loadbearing* walls, columns and arches supporting an assembly required to have a *fire-resistance rating* shall have a $\frac{3}{4}$ h *fire-resistance rating* or shall be of *noncombustible construction*, except that such members and assemblies supporting a *fire separation* as described in Clause (b) shall have a $\frac{3}{4}$ h *fire-resistance rating*.

Group F, Division 1, up to 3 Storeys, Sprinklered

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

- (a) is not more than 3 storeys in building height,
- (b) is *sprinklered*, except as provided in Clause (2)(b), and
- (c) is not greater in building area than the value in Table 3.2.2.M.

Table 3.2.2.M.
Forming Part of Sentence 3.2.2.38.(1)

No. of Storeys	Sprinklered 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

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

- (a) floor assemblies immediately above basements or cellars shall be a 2 h *fire separation* of *noncombustible construction*,
- (b) sprinklers may be omitted in crawl spaces provided
 - (i) floor assemblies immediately above crawl spaces have a $\frac{3}{4}$ h *fire-resistance rating*, or
 - (ii) the crawl spaces are subdivided by a $\frac{3}{4}$ h *fire separation* into areas not exceeding 500 m² (see Article 3.2.2.3.),
- (c) other floor assemblies shall be a $\frac{3}{4}$ h *fire separation*, except for floors above crawl spaces, and
- (d) all *loadbearing* walls, columns and arches supporting an assembly required to have a *fire-resistance rating* shall be of *heavy timber* or *noncombustible construction*, except that such members and assemblies supporting a *fire separation* as required in Clause (a) or (c) shall have a *fire-resistance rating* at least equivalent to that required for the supported assembly.

Group F, Division 1, up to 4 Storeys

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

- (a) is not more than 4 storeys in building height,
- (b) if unsprinklered, is not greater in building area than the value in Table 3.2.2.N., and
- (c) if sprinklered, is not greater than twice the area limits of Clause (b).

Table 3.2.2.N.
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	2 400	3 000	3 600
2	1 200	1 500	1 800
3	800	1 000	1 200
4	600	750	900
Column 1	2	3	4

- (2) The building shall be of *noncombustible construction*, and
 - (a) basements and cellars shall be subdivided by a 2 h *fire separation* into areas not exceeding 500 m², or they shall be *sprinklered*,
 - (b) floor assemblies immediately above basements or cellars shall be a 2 h *fire separation*,
 - (c) floor assemblies immediately above crawl spaces shall have a 2 h *fire-resistance rating*, except that this requirement is waived if the crawl spaces are subdivided by a 2 h *fire separation* into areas not exceeding 500 m², or they are *sprinklered* (see Article 3.2.2.3.),
 - (d) other floor assemblies shall be a 2 h *fire separation*,
 - (e) *mezzanines* shall have a 1 h *fire-resistance rating*,
 - (f) except as provided in Article 3.2.2.8., roof assemblies shall have a 1 h *fire-resistance rating*, and
 - (g) all *loadbearing* walls, columns and arches shall have a *fire-resistance rating* at least equivalent to that required for the supported assembly.

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

No. of Storeys	Sprinklered 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

Group F, Division 1, up to 4 Storeys, Sprinklered

3.2.2.40.(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) is *sprinklered*, except as provided in Clause (2)(b), and
 - (c) is not greater in *building area* than the value in Table 3.2.2.O.
- (2) The *building* shall be of *noncombustible construction*, and
- (a) floor assemblies immediately above basements or cellars shall be a 3 h *fire separation*,
 - (b) sprinklers may be omitted in crawl spaces provided
 - (i) floor assemblies immediately above crawl spaces have a 2 h *fire-resistance rating*, or
 - (ii) the crawl spaces are subdivided by a 2 h *fire separation* into areas not exceeding 500 m² (see Article 3.2.2.3.),
 - (c) other floor assemblies shall be a 3 h *fire separation*, except for floors above crawl spaces,
 - (d) *mezzanines* shall have a 1½ h *fire-resistance rating*,
 - (e) roof assemblies shall have a 1½ h *fire-resistance rating*, and
 - (f) all *loadbearing walls*, columns and arches shall have a *fire-resistance rating* at least equivalent to that required for the supported assembly.

Group F, Division 2, 1 and 2 Storeys

3.2.2.41.(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) is not greater in *building area* than the value in Table 3.2.2.P.

Table 3.2.2.P.
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	1 000	1 250	1 500
2	600	750	900

No. of Storeys	Sprinklered Maximum Area, m ²		
	Facing 1 Street	Facing 2 Streets	Facing 3 Streets
1	3 000	3 750	4 500
2	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) crawl spaces in a *building of combustible construction*, and basements and cellars in every *building* shall be subdivided by ¾ h *fire separations* into areas not exceeding 500 m², or they shall be *sprinklered*,
- (b) floor assemblies immediately above basements or cellars shall be a ¾ h *fire separation* (see Article 3.2.2.3.),
- (c) other floor assemblies, except floors over crawl spaces, shall be a *fire separation* and, if of *combustible construction*, shall have a ¾ h *fire-resistance rating*, and
- (d) all *loadbearing walls*, columns and arches supporting an assembly required to have a *fire-resistance rating* shall have a ¾ h *fire-resistance rating* or shall be of *noncombustible construction*, except that such members

and assemblies supporting a *fire separation* as described in Clause (b) shall have a $\frac{3}{4}$ h *fire-resistance rating*.

Group F, Division 2, up to 4 Storeys

(See also Article 3.2.2.43.)

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

- (a) is not more than 4 storeys in building height.
- (b) if unsprinklered, is not greater in building area than the value in Table 3.2.2.Q., and
- (c) if sprinklered, is not greater than twice the area limits of Clause (b).

Table 3.2.2.Q.
Forming Part of Sentence 3.2.2.42.(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
4	800	1 000	1 200
Column 1	2	3	4

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

- (a) basements and cellars shall be subdivided by a 1 h *fire separation* into areas not exceeding 500 m², or they shall be *sprinklered*,
- (b) floor assemblies immediately above basements or cellars shall be a 1 h *fire separation* of *noncombustible construction*,
- (c) floor assemblies immediately above crawl spaces, shall have a $\frac{3}{4}$ h *fire-resistance rating*, except that this requirement is waived if the crawl spaces are subdivided by a $\frac{3}{4}$ h *fire separation* into areas not exceeding 500 m², or they are *sprinklered* (see Article 3.2.2.3.),
- (d) other floor assemblies shall be a $\frac{3}{4}$ h *fire separation*,
- (e) *mezzanines* shall have, if of *combustible construction*, a $\frac{3}{4}$ h *fire-resistance rating*,
- (f) roof assemblies shall have, if of *combustible construction*, a $\frac{3}{4}$ h *fire-resistance rating*, or in buildings not exceeding 1 storey in building height, the *fire-resistance rating* may be waived provided that the roof assembly is constructed as a *fire-retardant treated wood roof system* conforming to Sentence 3.1.12.1.(1), and
 - (i) if unsprinklered, the building area is not greater 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 greater than twice the area limits of Subclause (i), and
- (g) all loadbearing walls, columns and arches supporting an assembly required to have a *fire-resistance rating* shall have a $\frac{3}{4}$ h *fire-resistance rating* or shall be of *noncombustible construction*, except that such members and assemblies supporting a *fire separation* as described in Clause (b) or (d) shall have a *fire-resistance rating* at least equivalent to that required for the supported assembly.

Group F, Division 2, up to 4 Storeys
(See also Article 3.2.2.42.)

- 3.2.2.43(1)** A building classified as Group F, Division 2 shall conform to Sentence (2) provided the building
- (a) is not more than 4 storeys in building height,
 - (b) if unsprinklered, is not greater in building area than the value in Table 3.2.2.R., and
 - (c) if sprinklered, is not greater than twice the area limits of Clause (b).

Table 3.2.2.R.
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	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) basements and cellars shall be subdivided by a 2 h fire separation into areas not exceeding 500 m², or they shall be *sprinklered*,
 - (b) floor assemblies immediately above basements or cellars shall be a 2 h fire separation,
 - (c) floor assemblies immediately above crawl spaces shall have a 1 h fire-resistance rating, except that this requirement is waived if the crawl spaces are subdivided by a 1 h fire separation into areas not exceeding 500 m², or they are *sprinklered* (see Article 3.2.2.3.).
 - (d) other floor assemblies shall be a 1 h fire separation,
 - (e) mezzanines shall have a 1 h fire-resistance rating,
 - (f) except as provided in Article 3.2.2.8., roof assemblies shall have a 1 h fire-resistance rating, and
 - (g) all loadbearing walls, columns and arches shall have a fire-resistance rating at least equivalent to that required for the supported assembly.

Group F, Division 2, up to 6 Storeys

- 3.2.2.44.(1)** A building classified as Group F, Division 2 shall conform to Sentence (2) provided the building
- (a) is not more than 6 storeys in building height,
 - (b) if unsprinklered, is not greater in building area than the value in Table 3.2.2.S.,
 - (c) if sprinklered, is not greater than twice the area limits of Clause (b).
- (2) The building shall be of *noncombustible construction*, and
- (a) basements and cellars shall be subdivided by a 2 h fire separation into areas not exceeding 500 m², or they shall be *sprinklered*,
 - (b) floor assemblies immediately above basements or cellars shall be a 2 h fire separation,
 - (c) floor assemblies immediately above crawl spaces shall have a 2 h fire-resistance rating, except that this requirement is waived if the crawl spaces are subdivided by a 2 h fire separation into areas not exceeding 500 m², or they are *sprinklered* (see Article 3.2.2.3.).
 - (d) other floor assemblies shall be a 2 h fire separation,

- (e) *mezzanines* shall have a 1 h *fire-resistance rating*,
- (f) except as provided in Article 3.2.2.8., roof assemblies shall have a 1 h *fire-resistance rating*, and
- (g) all *loadbearing* walls, columns and arches shall have a *fire-resistance rating* at least equivalent to that required for the supported assembly.

Table 3.2.2.S.
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	9 000	11 250	13 500
2	4 500	5 625	6 750
3	3 000	3 750	4 500
4	2 250	2 812	3 375
5	1 800	2 250	2 700
6	1 500	1 875	2 250
Column 1	2	3	4

Group F, Division 2
Any Height, Any Area, Sprinklered

3.2.2.45.(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*, except as provided in Clause (2)(b), and
- (c) is not limited in *building area*.

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

- (a) floor assemblies immediately above basements or cellars shall be a 3 h *fire separation*,
- (b) sprinklers may be omitted in crawl spaces provided
 - (i) floor assemblies immediately above crawl spaces have a 2 h *fire-resistance rating*, or
 - (ii) the crawl spaces are subdivided by a 2 h *fire separation* into areas not exceeding 500 m² (see Article 3.2.2.3.),
- (c) other floor assemblies shall be a 3 h *fire separation*, except for floors above crawl spaces,
- (d) *mezzanines* shall have a 1½ h *fire-resistance rating*,
- (e) roof assemblies shall have a 1½ h *fire-resistance rating*, and
- (f) all *loadbearing* walls, columns and arches shall have a *fire-resistance rating* at least equivalent to that required for the supported assembly.

Group F, Division 3, 1 and 2 Storeys

3.2.2.46.(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) is not greater in *building area* than the value in Table 3.2.2.T.

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

- (a) basements and cellars shall be subdivided by a ¾ h *fire separation* into areas not exceeding 500 m², or they shall be *sprinklered*,
- (b) floor assemblies immediately above basements or cellars shall be a ¾ h *fire separation*,

- (c) floor assemblies immediately above crawl spaces shall have, if of *combustible construction*, a $\frac{3}{4}$ h *fire-resistance rating*, except that this requirement is waived if the crawl spaces are subdivided by a $\frac{3}{4}$ h *fire separation* into areas not exceeding 500 m², or they are *sprinklered* (see Article 3.2.2.3.).
- (d) other floor assemblies shall be *fire separations* and, if of *combustible construction*, shall have a $\frac{3}{4}$ h *fire-resistance rating*, and
- (e) all *loadbearing* walls, columns and arches supporting an assembly required to have a *fire-resistance rating* shall have a $\frac{3}{4}$ h *fire-resistance rating* or shall be of *noncombustible construction*, except that such members and assemblies supporting a *fire separation* as described in Clause (b) shall have a $\frac{3}{4}$ h *fire-resistance rating*.

Table 3.2.2.T.
Forming Part of Sentence 3.2.2.46.(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

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	1 600	2 000	2 400
Column 1	2	3	4

Table 3.2.2.U.
Forming Part of Sentence 3.2.2.47.(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
4	1 200	1 500	1 800
Column 1	2	3	4

Group F, Division 3, up to 4 Storeys

3.2.2.47.(1) A building classified as Group F, Division 3 shall conform to Sentence (2) provided the building

- (a) is not more than 4 storeys in building height,
- (b) if unsprinklered is not greater in building area than the value in Table 3.2.2.U., and
- (c) if *sprinklered*, is not greater than twice the area limits of Clause (b).

- (2) The *building* shall be of *combustible* or *noncombustible construction* used either singly or in combination, and
- (a) basements and cellars shall be subdivided by a 1 h *fire separation* into areas not exceeding 500 m², or they shall be *sprinklered*,
 - (b) floor assemblies immediately above basements or cellars shall be a 1 h *fire separation*,
 - (c) floor assemblies immediately above crawl spaces shall have, if of *combustible construction*, a $\frac{3}{4}$ h *fire-resistance rating*, except that this requirement is waived if the crawl spaces are subdivided by a $\frac{3}{4}$ h *fire separation* into areas not exceeding 500 m², or they are *sprinklered* (see Article 3.2.2.3.),
 - (d) other floor assemblies shall be a *fire separation* and, if of *combustible construction*, shall have a $\frac{3}{4}$ h *fire-resistance rating*,
 - (e) *mezzanines* shall have, if of *combustible construction*, a $\frac{3}{4}$ h *fire-resistance rating*,
 - (f) roof assemblies shall have, if of *combustible construction*, a $\frac{3}{4}$ h *fire-resistance rating*, or in *buildings* not exceeding 1 storey in *building height*, the *fire-resistance rating* may be waived provided that the roof assembly is constructed as a *fire-retardant treated wood* roof system conforming to Sentence 3.1.12.1.(1), and
 - (i) if *unsprinklered*, the *building area* is not greater 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 greater than twice the area limits of Subclause (i), and
 - (g) all *loadbearing walls*, columns and arches supporting an assembly required to have a *fire-resistance rating* shall have a $\frac{3}{4}$ h *fire-resistance rating* or shall be of *noncombustible construction*, except that such members and assemblies supporting a *fire separation* as described in Clause (b) shall have a $\frac{3}{4}$ h *fire-resistance rating*.

Table 3.2.2.V.
Forming Part of Sentence 3.2.2.48.(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

Group F, Division 3, 1 Storey

3.2.2.48.(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*, is not greater in *building area* than the value in Table 3.2.2.V., and
- (c) if *sprinklered*, is not greater than twice the area limits of Clause (b).

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

- (a) basements and cellars shall be subdivided by a $\frac{3}{4}$ h *fire separation* into areas not exceeding 500 m², or they shall be *sprinklered*,
- (b) floor assemblies immediately above basements or cellars shall be a $\frac{3}{4}$ h *fire separation*, and

- (c) all *loadbearing* walls, columns and arches supporting an assembly required to have a *fire-resistance rating* shall be of *heavy timber* or *noncombustible construction*, except that such members and assemblies supporting a *fire separation* as described in Clause (b) shall have a $\frac{3}{4}$ h *fire-resistance rating*.

Group F, Division 3, 1 Storey
Any Area, Low Fire Load Occupancy

3.2.2.49.(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*, and
- (a) basements and cellars shall be subdivided by a 1 h *fire separation* into areas not exceeding 500 m², or they shall be *sprinklered*,
 - (b) floor assemblies immediately above basements or cellars shall be a 1 h *fire separation*,
 - (c) floor assemblies immediately above crawl spaces shall have a 1 h *fire-resistance rating*, except that this requirement is waived if the crawl spaces are subdivided by a 1 h *fire separation* into areas not exceeding 500 m², or they are *sprinklered* (see Article 3.2.2.3.), and
 - (d) all *loadbearing* walls, columns and arches shall have a *fire-resistance rating* at least equivalent to that required for the supported assembly.

Group F, Division 3
Storage Garages up to 22 m in Height

3.2.2.50.(1) A building used as a *storage garage* and having no other *occupancy* above it may 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 in height measured between *grade* and the ceiling level of the top *storey*,
- (c) not more than 10 000 m² in *building area*,
- (d) ventilated in conformance with Sentence 6.2.2.2.(6), and
- (e) designed so that every portion of each *floor area* is within 60 m of an exterior wall opening.

Group F, Division 3, up to 6 Storeys

3.2.2.51.(1) A building classified as Group F, Division 3 shall conform to Sentence (2) provided the *building*

- (a) is not more than 6 *storeys* in *building height*,
 - (b) if unsprinklered, is not greater in *building area* than the value in Table 3.2.2.W... and
 - (c) if *sprinklered*, is not greater than twice the area limits of Clause (b).
- (2) The *building* shall be of *noncombustible construction*, and
- (a) basements and cellars shall be subdivided by a 2 h *fire separation* into areas not exceeding 500 m², or they shall be *sprinklered*,
 - (b) floor assemblies immediately above basements or cellars shall be a 2 h *fire separation*,
 - (c) floor assemblies immediately above crawl spaces shall have a 1 h *fire-resistance rating*, except that this requirement is waived if the crawl spaces

are subdivided by a 1 h *fire separation* into areas not exceeding 500 m², or they are *sprinklered* (see Article 3.2.2.3.),

- (d) other floor assemblies shall be a 1 h *fire separation*,
- (e) *mezzanines* shall have a 1 h *fire-resistance rating*,
- (f) except as provided in Article 3.2.2.8., roof assemblies shall have a 1 h *fire-resistance rating*, and
- (g) all *loadbearing walls*, columns and arches shall have a *fire-resistance rating* at least equivalent to that required for the supported assembly.

Table 3.2.2.W.
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	unlimited	unlimited	unlimited
2	7 200	9 000	10 800
3	4 800	6 000	7 200
4	3 600	4 500	5 400
5	2 880	3 600	4 320
6	2 400	3 000	3 600
Column 1	2	3	4

Group F, Division 3, Any Height, Any Area

3.2.2.52.(1) A building classified as Group F, Division 3 shall conform to Sentence (2) provided the building

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

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

- (a) basements and cellars shall be subdivided by a 2 h *fire separation* into areas not exceeding 500 m², or they shall be *sprinklered*,
- (b) floor assemblies immediately above basements or cellars shall be a 2 h *fire separation*,
- (c) floor assemblies immediately above crawl spaces shall have a 1 h *fire-resistance rating*, except that this requirement is waived if the crawl spaces are subdivided by a 1 h *fire separation* into areas not exceeding 500 m², or they are *sprinklered* (see Article 3.2.2.3.),
- (d) all other floor assemblies shall be at least a 2 h *fire separation*, except that such floor assemblies may be reduced to a 1 h *fire separation* in a *storage garage* conforming to Sentence 6.2.2.2.(6),
- (e) *mezzanines* shall have a 1 h *fire-resistance rating*,
- (f) except as provided in Article 3.2.2.8., roof assemblies shall have a 1 h *fire-resistance rating*, and
- (g) all *loadbearing walls*, columns and arches shall have a *fire-resistance rating* at least equivalent to that required for the supported assembly.

**SUBSECTION 3.2.3. SPATIAL SEPARATION AND EXPOSURE
PROTECTION OF BUILDINGS**

Area of
unprotected
openings

3.2.3.1.(1) Except as provided in Articles 3.2.3.6. and 3.2.3.8., the area of *unprotected openings* shall not exceed 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 Appendix 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	12	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							
1 500	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	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						
2 000	Less than 3:1	0	7	7	7	7	7	7	8	8	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	7	8	8	9	10	11	12	13	14	15	16	17	20	23	37	49	63	79	97	100		
	Over 10:1	0	7	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.
 W_L = Length of Exposing Building Face
 H = Height of Exposing Building Face
 (Apply whichever ratio is greater)

Table 3.2.3.B.
Forming Part of Subsection 3.2.3.

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	95	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	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	4	5	6	8	10	12	14	17	20	24	27	32	36	46	57	70	100													
	Over 10:1	0	4	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	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	4	5	5	7	9	11	13	15	17	19	21	24	26	29	35	41	48	68	92	100											
1 000	Less than 3:1	0	4	4	4	4	4	4	4	5	5	6	6	7	8	9	10	11	14	16	20	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	22	31	43	57	73	91	100								
	Over 10:1	0	4	4	4	4	4	5	6	7	8	9	11	12	13	15	16	18	20	23	26	30	41	53	68	84	100									
2 000	Less than 3:1	0	4	4	4	4	4	4	4	4	4	4	5	5	5	6	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	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	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
 (L_L) = Length of Exposing Building Face
 H = Height of Exposing Building Face
 (Apply whichever ratio is greater)

(2) The area of the *unprotected openings* in an *exposed building face* shall be the aggregate area of *unprotected openings*. This is 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) Where the exterior wall of a *building* is an irregular shape, the *limiting distance* may be determined by measuring from a vertical plane located so that no portion of the exterior wall of the *building* is between such vertical plane and the line to which the *limiting distance* is measured, and in such cases the area of *unprotected openings* shall be determined from the projection onto this plane of the *unprotected openings* occurring in the exterior wall.

Limiting
distance

(4) In respect to the *building* under consideration where fire fighting facilities and protective wetting facilities are not available within 10 min of the alarm being received, the *limiting distance* required by Article 3.2.3.1. shall be doubled.

3.2.3.2.(1) The area of an *exposing building face* shall be calculated as the total area of exterior wall facing in 1 direction on any side of a *building* measured from the finished ground level to the uppermost ceiling and any exterior wall that encloses an *attic or roof space*, 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 *fire separations*

Area of
exposing
building face

(a) in Group A, B, C, D or Group F, Division 3 *occupancy* have a *fire-resistance rating* at least equal to that required for the floor assembly, but shall not be less than $\frac{3}{4}$ h 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* of at least 2 h.

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

3.2.3.4.(1) Every wall that is a *party wall* shall be constructed as a *firewall*.

(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 as required for the grade of *fire separation* of the wall.

Walls with
limiting
distance less
than 1.2 m

3.2.3.5.(1) Except as permitted in Articles 3.2.3.6. and 3.2.3.7., 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

Construction of
exposing
building faces

(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 at least 1 h,

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

(c) greater than 25 per cent but less than 100 per cent of the *exposing building face*, the *exposing building face* shall have at least a $\frac{3}{4}$ h *fire-resistance rating*.

(2) Except as permitted in Article 3.2.3.6., 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 at least 2 h,

- (b) greater than 10 per cent but not greater than 25 per cent of the *exposing building face*, the *exposing building face* shall have a *fire-resistance rating* of at least 2 h, and be clad with *noncombustible* cladding, and
- (c) greater than 25 per cent but less than 100 per cent of the *exposing building face*, the *exposing building face* shall have at least a 1 h *fire-resistance rating*.

(3) In addition to the requirements in Sentences (1) and (2), where foamed plastic insulation is used in an *exposing building face* in *buildings* exceeding 3 storeys in *building height*, it shall be protected on the exterior surface by

- (a) concrete,
- (b) masonry,
- (c) mechanically fastened sheet metal having a melting point of not less than 650°C, or
- (d) other *noncombustible* material that will remain in place for at least 15 min when tested in conformance with ULC S101-1977, "Standard Methods of Fire Endurance Tests of Building Construction and Materials."

(See Appendix A.)

Protection of structural members

(4) Structural members, such as beams, columns and arches placed wholly or partly outside an exterior face of a *building* and which are 3 m or more from the property line or centre line of a public thoroughfare need not be protected from exterior fires.

(5) Structural members in Sentence (4) that are less than 3 m from the property line or centre line of a public thoroughfare shall be protected from exterior fire by fire protection having a *fire-resistance rating* at least equal to that required for their protection from inside fires in conformance with Articles 3.2.2.9. to 3.2.2.52., or by fire protection having a 1 h *fire-resistance rating*, whichever is the greater.

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

Unlimited unprotected openings

3.2.3.6.(1) An *exposing building face* is permitted to have unlimited *unprotected openings*

- (a) in a *storage garage* conforming to Sentence 6.2.2.2.(3) and having a *limiting distance* of at least 3 m, or
- (b) in the *first storey* of a *building* that faces a *street* and having a *limiting distance* of at least 9 m.

One-storey buildings with low fire load

3.2.3.7.(1) For any *building* of Group F, Division 3 *occupancy*, any *non-loadbearing* wall comprising an *exposing building face* may be of *noncombustible construction* without a required *fire-resistance rating* provided the *building*

- (a) does not exceed 1 *storey* in *building height*,
- (b) is used for low *fire load occupancies* such as described in Sentence 3.2.2.49.(1), and
- (c) is located so that the *limiting distance* is not less than 3 m.

Increased openings permitted

3.2.3.8.(1) The maximum area of *unprotected openings* in any *exposing building face* may be doubled where the *building* is *sprinklered*.

(2) The maximum area of *unprotected openings* in any *exposed building face* may be doubled where such openings are glazed with wired glass in fixed steel frames conforming to the requirements of Sentence 3.1.6.8.(2).

Equivalent opening factor

3.2.3.9. Where the surface temperature on the unexposed surface of a wall assembly exceeds the limitation of a standard fire test as permitted in Sentence 3.1.5.1.(3), 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,

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,

T_e = 892°C for a ¾ h *fire-resistance rating*,
927°C for a 1 h *fire-resistance rating*, and
1 010°C for a 2 h *fire-resistance rating*.

3.2.3.10. Where 2 exterior walls meet at a *fire separation* at an external angle of 135° or less, one or both of the intersecting exterior walls shall be constructed without openings and with a *fire-resistance rating* not less than that required for the *fire separation* within the limits, D_o , so that

Exterior walls meeting at a fire separation

$$D_o = 2D - \frac{\theta}{90} \cdot D, \text{ but in no case less than 1 m}$$

where D_o = the horizontal distance measured from the point of intersection of the exterior walls along either wall or measured diagonally from any point on one *exposing building face* to any point on the other *exposing building face*,

D = the greater required *limiting distance* of the *exposing building faces*, and

θ = the external angle between the two exterior walls.

3.2.3.11. 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.

Walls exposed to adjoining roof

3.2.3.12. In order to reduce the hazard of fire spread from the roof of one *building* to another, every *building* shall have a Class A, B or C roof covering, as described in Subsection 3.1.13., except that such classes of roof coverings are not required for *buildings* of Group A, Division 2 *occupancies* not exceeding 2 *storeys* in *building height* and not exceeding 1 000 m² in *building area* provided the roof covering is underlaid with *noncombustible* material.

3.2.3.13.(1) When part of a *building* is completely separated from the remainder of the *building* by a covered mall that provides a horizontal separation of not less than 9 m, then each portion of the *building* so separated may be considered as a separate *building* provided that

Separation of buildings connected by covered malls

- (a) the covered mall is designed and used only as a pedestrian thoroughfare, except that ornamental and pedestrian oriented uses that do not create a hazard may be permitted,
- (b) the covered mall is *sprinklered* and provided with a standpipe and hose system if the abutting *occupancies* are not *sprinklered*,
- (c) the covered mall is separated from the remainder of the *building* by a 1 h *fire separation* or the *floor area* not so separated is *sprinklered*.

- (d) the covered mall has no direct access to more than 1 *storey* of the *building* if the mall is below *grade*, and to not more than 2 *storeys* if the mall is above *grade* (see Article 3.4.2.4.),
- (e) the covered mall is equipped with a fire alarm and detection system that will satisfy the requirements of each of the abutting *occupancies*,
- (f) the covered mall roof-ceiling assembly is of *noncombustible construction* having a *fire-resistance rating* of at least 1 h, except that any part of the mall that is more than 6 m above the floor of the mall need not have a *fire-resistance rating*, and where none of the portions of the *building* separated by the covered mall is required to be of *noncombustible construction*, the ceiling may be of exposed *heavy timber construction*,
- (g) the interior finish of each covered mall has a *flame-spread rating* conforming to the *flame-spread rating* requirements of *exits*, except that roofs of exposed *heavy timber construction* may exceed these limits,
- (h) not more than 1 covered mall is located above another covered mall,
- (i) where 1 covered mall is located above another covered mall, the malls are separated by a *fire separation* of *noncombustible construction* having a *fire-resistance rating* of at least 2 h, and
- (j) where the *fire separation* is omitted as provided in Clause (c) and a heating, ventilating or air-conditioning duct system serves more than 1 *occupancy*, a *smoke detector* shall be installed in the return air duct leaving each *occupancy* so connected and shall, upon actuation, shut down the fans and sound the alarm system as prescribed in Subsection 3.2.4.

Covered
vehicular
passageways

3.2.3.14.(1) A covered vehicular passageway shall

- (a) be of *non-combustible construction* when constructed below *grade*,
- (b) have a *flame-spread rating* not greater than 25 for interior finish materials, except that this requirement does not apply to roofs of exposed *heavy timber construction*, and
- (c) be separated from every *building* or part of a *building* adjoining it by a *fire separation* having a *fire-resistance rating* of 1½ h where it is designed as a receiving or shipping area.

Separation of
buildings
connected by
walkways

3.2.3.15.(1) Except as provided in Sentence 3.2.3.16.(2), where *buildings* are connected by a *walkway*, each *building* shall be separated from the *walkway* by at least a ¾ h *fire separation*.

(2) A *walkway* shall be of *non-combustible construction* when connected to a *building* required to be of *non-combustible construction*, except that where at least 50 per cent of the area of the enclosing perimeter walls of *walkways* at or near ground level are open to the outdoors, such *walkways* may be of *heavy timber construction*.

Roof exposure

(3) The requirements of Article 3.2.3.11. shall not apply where *walkways* are of *noncombustible construction*.

Underground
walkway

3.2.3.16.(1) An underground *walkway* shall not be designed or used for any purpose other than pedestrian travel unless such other purpose is *acceptable* 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 1 h *fire separation*.

(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 not exceeding 100 m, or the travel distance from the door of an adjacent room or space to the nearest *exit* shall not exceed 1½ times the least allowable travel distance for any of the adjacent *occupancies* as prescribed in Sentence 3.4.2.3.(1).

(5) The interior finish of every underground *walkway* shall be of *noncombustible* materials having a *flame-spread rating* and a smoke developed classification not greater than 25.

SUBSECTION 3.2.4. FIRE ALARM AND DETECTION SYSTEMS

3.2.4.1.(1) Except as provided in Sentence (2) and (3), an *acceptable* fire alarm system shall be installed in all *buildings* containing 4 *storeys* or more, including *storeys* below *grade*, and as otherwise required in Table 3.2.4.A. and Subsection 3.2.6.

Where
required

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 1, 2 and 3 (except licensed beverage establishments, restaurants, schools and colleges)	300
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 person detained (Type 1, 2 or 3 system) 10 persons detained (Type 4 or 5 system)
* Group B, Division 2 (except children's custodial homes, convalescent homes, day-care centres, homes for the aged and orphanages)	10 persons having sleeping accommodation
* Group B, Division 2 (children's custodial homes, convalescent homes, day-care centres, homes for the aged and orphanages)	10 persons
Group C	10 having sleeping accommodation
Group D	300 total or 150 above or below the <i>first storey</i>
Group E	300 total or 150 above or below the <i>first storey</i> or in <i>buildings</i> exceeding 2 <i>storeys</i> in <i>building height</i>
Group F, Division 1	25
Group F, Division 2	100 total or 25 above or below the <i>first storey</i>
Group F, Division 3	500 total or 75 above or below the <i>first storey</i>
Column 1	2

(2) A fire alarm system is not required in a *building*, not more than 3 storeys in *building height*, containing only *dwelling units* if

- (a) not more than 4 *dwelling units* share a *public corridor* or an *exit*, or
- (b) each *dwelling unit* has direct access to the outdoors by a door
 - (i) at ground level, or
 - (ii) leading to a balcony with *exit* stairs to ground level.

(3) A fire alarm system is not required in hotels or motels 3 storeys or less in *building height* provided each *suite* or sleeping room not within a *suite* has direct access to the outdoors by a door at ground level or door providing direct access by a balcony with an *exit* stair to ground level.

Type of fire alarm required

(4) Except as provided in Sentences (5) and (6), required fire alarm systems shall consist of a Type 1, 2, 3, 4 or 5 system as described in Article 3.2.4.2.

(5) A Type 4 or 5 system shall be installed in Group B *occupancies* other than *

- (a) children's custodial homes, convalescent homes, day-care centres, homes for the aged and orphanages in *buildings* not more than 3 storeys in *building height*, and
- (b) Group B, Division 1 *occupancies* with not more than 10 persons detained.

(6) A Type 1, 2 or 3 system shall be installed in Group F, Division 1 *occupancies*.

Non-electric alarm systems

(7) Manually operated, non-electric alarm systems employing *acceptable* mechanical gongs may be used in *buildings* not more than 2 storeys in *building height* where not more than 2 manual fire alarm stations would be required in the *building* provided each gong is audible in every location in the *building*.

Continuity of fire alarm system

(8) Except as provided in Sentence (10), where a *building* contains more than 1 *major occupancy* and a fire alarm system is required, a single system shall serve all *occupancies*, and the type of operation in each *major occupancy* shall conform to the appropriate requirements for that *occupancy*.

(9) Except as provided in Sentence (10), where a fire alarm system is required in any portion of a *building*, it shall be installed throughout that *building*.

(10) In a *building* not exceeding 3 storeys in *building height*, where a vertical *fire separation* having a *fire-resistance rating* of at least 1 h separates a portion of the *building* from the remainder of the *building*, and there is no access to the remainder of the *building*, the requirements for fire alarm and detection systems may be applied to each portion so separated as if it were a separate *building*.

Annunciator required

(11) Where a fire alarm system is required by Sentence (1), an *acceptable* electrically supervised annunciator shall be provided on the *street* entrance floor of every *building*

- (a) which contains 4 storeys or more including basements and cellars,
- (b) in which more than 12 manual fire alarm stations are required,
- (c) in which more than 1 automatic alarm-initiating circuit is required,
- (d) in which a sprinkler system is required to be zoned, or
- (e) in which a sprinkler system functions as a fire detection system.

Area of coverage of alarm initiating circuits

(12) In *buildings* required to be equipped with an annunciator, the area of coverage of an alarm initiating circuit in a fire alarm system shall not exceed 1 storey.

Types of fire alarm systems

3.2.4.2.(1) Type 1 fire alarm systems in Sentences 3.2.4.1.(4) and (6) shall

- (a) be designed as a single stage, non-coded, non-indicating, local, general fire alarm system,
- (b) upon the operation of any alarm initiating device, cause a general fire alarm on all audible signal appliances in the system, and
- (c) not be used in *buildings* required to have an annunciator.

(2) Type 2 fire alarm systems in Sentences 3.2.4.1.(4) and (6) shall

- (a) be designed as a single stage, zoned, non-coded, indicating, local, general fire alarm system,

- (b) upon the operation of any alarm initiating device, cause a general fire alarm on all audible signal appliances in the system, and
 - (c) indicate on the annunciator the zone in which the alarm was initiated.
- (3) Type 3 fire alarm systems in Sentences 3.2.4.1.(4) and (6) shall
- (a) be designed as a single stage, zone-coded, indicating, local, general fire alarm system,
 - (b) upon the operation of any alarm initiating device, cause a coded signal indicating the zone in which the alarm was initiated to sound on all audible signal appliances in the system,
 - (c) repeat the coded signal in its entirety at least 4 times,
 - (d) cause a general fire alarm to sound upon the completion of the coded signal in Clause (c),
 - (e) indicate on the annunciator the zone in which each alarm is initiated in Clauses (c) and (f),
 - (f) when a second fire alarm is initiated in a zone other than that for which the first alarm was initiated, the coded signal for the first zone required in Clause (c) shall be completed before the coded signal for the second fire alarm is repeated 4 times, and
 - (g) upon completion of the coded signals in Clauses (c) and (f), cause a general fire alarm to sound.
- (4) Type 4 fire alarm systems in Sentences 3.2.4.1.(4) and (5) shall
- (a) be designed as a 2 stage, zoned, non-coded, indicating, local fire alarm system,
 - (b) upon the operation of any alarm initiating device, cause a distinctive alert alarm sounding device to warn persons on duty that a fire emergency exists,
 - (c) indicate on the annunciator the zone in which the alarm was initiated, and
 - (d) have each manual alarm station equipped so that the use of a key or other similar device causes a general fire alarm to sound on all audible signalling appliances in those zones to be evacuated and continue to sound upon the removal of the key or special device from the manual alarm station.
(See Appendix A.)
- (5) Type 5 fire alarm systems in Sentences 3.2.4.1.(4) and (5) shall
- (a) be designed as a 2 stage, zone-coded, indicating, local fire alarm system,
 - (b) operate in the same manner as required in Sentence (4) for Type 4 fire alarm systems; except that the operation of any alarm initiating device shall also cause a coded signal to sound at least 4 times on the alert alarm sounding devices indicating the zone in which the alarm was initiated, and
 - (c) where a second fire alarm is initiated in a zone other than that for which the first alarm was initiated, function in the same manner as required in Clause (3)(f) for Type 3 systems.
- (6) Except as provided in Sentence (7), the alert alarm sounding devices required in fire alarm systems described in Sentences (4) and (5) shall sound for at least 1 min, after which they may be manually silenced at the alarm control panel.
- (7) The alert alarm sounding devices in Sentence (6) may be automatically silenced after 1 min, where an auxiliary, remote or central station connection is provided.
- (8) In the 2 stage fire alarm system described in Sentences (4) and (5), the same type of audible signal appliance may be used to sound both the alert fire alarm and general fire alarm. (See Appendix A.)
- (9) When the first stage of a 2-stage fire alarm system described in Sentences (4) and (5) is not acknowledged within 5 min of the sounding of the first stage alarm, the system shall automatically cause a general fire alarm to sound throughout the *building*.
- (10) Except as provided in Sentence (11), every general fire alarm system shall be designed so that when activated it will sound for at least 3 min. (See Appendix A.)

2 stage fire
alarm systems

General fire
alarm systems

(11) A manually operated silencing switch may be included as part of a fire alarm system provided it is accessible only to authorized personnel.

Signals to fire department

3.2.4.3.(1) Where a fire alarm system is required to be installed, or where a sprinkler system functions as a fire detection system, provision shall be made to transmit a signal to the fire department in conformance with Sentence (2) in

- (a) Group A *occupancies* having an *occupant load* of more than 300,
- (b) Group B *occupancies*,
- (c) Group F, Division 1 *occupancies*, or
- (d) *buildings* regulated by the provisions of Subsections 3.2.6. and 3.2.9.

(2) The signal to the fire department in Sentence (1) shall be by way of the municipal fire alarm system, an independently owned system or by way of a central station or *proprietary control centre* with direct connection with the fire department.

(3) Where a 2-stage fire alarm system is provided, the system shall be designed so that upon the actuation of the first stage, the fire department is informed by means of a signal as described in Sentence (2).

Automatic detection required

3.2.4.4.(1) Automatic fire detection equipment required in Sentences (2) to (6) shall be connected to the fire alarm system of the *building*.

Heat or smoke detectors

(2) Except as provided in Sentence (7), where a fire alarm system is required to be installed, *heat detectors* or *smoke detectors* shall be installed in those portions of *buildings* intended to be used for storage, such as storage locker rooms, *service rooms* including machinery rooms, heating rooms and incinerator rooms, elevator shafts, dumbwaiter shafts, janitors' closets and any room where hazardous products are intended to be used or stored. *

Heat detectors

(3) Except as provided in Sentence (7), where a fire alarm system is required to be installed, *heat detectors* shall be installed *

- (a) in every room in *buildings* classified as Group A, Division 1 or Group B *major occupancy* other than sleeping rooms, and
- (b) in every *suite*, and room not located within a *suite*, in *buildings* classified as Group C *major occupancy* and exceeding 3 *storeys* in *building height*.
(See also Article 3.2.4.8. for *smoke alarms*.)

Smoke detectors

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

- (a) every sleeping room and corridor in *buildings* classified as Group B *major occupancy*,
- (b) every corridor in *buildings* classified as Group A, Division 1 *major occupancy*,
- (c) every *public corridor* in *buildings* classified as Group C *major occupancy*, and
- (d) every *exit stair shaft*.

Hazardous substances

(5) An *acceptable* type of automatic fire detection system shall be installed in an *occupancy* intended to contain hazardous substances regulated by Article 3.3.1.1. when such *occupancy* is to be unoccupied at night time or during weekends or during shutdowns for holidays, unless the *building* is *sprinklered* and a water flow switch incorporated in the sprinkler system is connected to the fire alarm system and supervised in conformance with Sentence 3.2.4.4.(8).

Duct-type smoke detectors

(6) Where a fire alarm system is required to be installed, every recirculating air handling system shall be designed to prevent the recirculation of smoke upon a signal from a duct-type *smoke detector* located as described in ULC-S524-M1980, "Standard * for the Installation of Fire Alarm Systems," where the system

- (a) serves a Group A, Division 1 or Group C *major occupancy* and supplies more than 1 *storey*,
- (b) serves a Group A, Division 2, 3 or 4 or Group D, E or F, Division 1 or 2 *major occupancy* and supplies more than 1 *occupancy* on the same floor or serves more than 1 *storey*,
- (c) serves a Group B *major occupancy* and supplies more than 1 zone as required in Article 3.3.3.6. or more than 1 *storey*, or
- (d) is installed in a *building* of more than 4 *storeys* in *building height* of Group E or F *major occupancy*.

*

(7) Except in those locations where *smoke detectors* are required, where automatic sprinkler systems are installed and provided with water flow *alarm signals* that will fulfil the functions of automatic fire detection requirements in addition to their primary function of fire extinguishment, they may be used in lieu of automatic fire detection systems.

Exception for
sprinklers

(8) When a sprinkler system functions as a fire detection system or part of a fire detection system, as provided in Sentence (7) or Sentence 3.2.4.4.(5), it shall be supervised electrically to indicate at the fire alarm annunciator the following conditions:

- (a) movement of a valve handle that would interfere with the operation of the sprinkler system,
- (b) loss of excess water pressure required to prevent false alarms in a wet pipe system,
- (c) loss of air pressure required to prevent water flow in a dry pipe system,
- (d) loss of air pressure required to supervise the integrity of a preaction system,
- (e) loss of electrical power supply to any automatic fire pump, auxiliary booster or special service pump required for the operation of the sprinkler system,
- (f) significant change of water levels within any on-site water container or pressure tank required to supply and supplement the sprinkler water supply, and
- (g) when the water temperature in the container in Clause (f) approaches the freezing point.

- * (9) 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.

- * (10) In a Group B, Division 2 *occupancy* each sleeping room *smoke detector* required by Clause 3.2.4.4.(4)(a) shall be individually annunciated on a panel at a continuously attended station within the zone containing the *smoke detector*.

- * (11) *Heat detectors* or *smoke 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.

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

3.2.4.5.(1) An *acceptable* electrically supervised emergency power supply shall be provided for every local electrical fire alarm system when there are required to be

Emergency
power supply

- (a) annunciators,
- (b) more than 12 manual fire alarm stations, or
- (c) more than 12 automatic alarm-initiating devices.

- * 3.2.4.6.(1) Fire alarm systems shall conform to ULC S524-M1980, "Standard for the Installation of Fire Alarm Systems."

Reference
standards for
fire alarm
systems

(2) Components of fire alarm and detection systems shall conform to the appropriate requirements of the following:

- (a) ULC-S525-1978, "Standard for Audible Signal Appliances for Fire Alarm Systems,"

- (b) ULC-S527-1978, "Standard for Control Units for Fire Alarm Systems,"
- (c) ULC-S528-1978, "Standard for Manually Actuated Signalling Boxes for Fire Alarm Systems,"
- (d) ULC-S529-1978, "Standard for Smoke Detectors for Fire Alarm Systems," and
- (e) ULC-S530-1978, "Standard for Heat Actuated Fire Detectors for Fire Alarm Systems."

Mounted notice

3.2.4.7. Where a fire alarm system has been installed with no provision to transmit a signal to the fire department or *independent central station*, a legible, permanently mounted notice shall be posted at each manual alarm station requesting that the fire department be notified and including the telephone number of the fire department and the location of the nearest municipal fire alarm box.

Smoke alarms

3.2.4.8.(1) *Smoke alarms* conforming to ULC-S531-1978, "Standard for Smoke Alarms" shall be installed in each *dwelling unit* and, except for *institutional occupancies* in which there is a fire alarm system, in each sleeping room not within a *dwelling unit*.

(2) *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 hallways.

(3) *Smoke alarms* shall be installed on or near the ceiling in conformance with *acceptable* installation instructions.

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

(5) 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.

(6) 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.

SUBSECTION 3.2.5. PROVISIONS FOR FIRE FIGHTING

Access above grade

3.2.5.1.(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 at least 1 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.

Access below grade

(4) Direct access from at least 1 *street* shall be provided from the outdoors to each basement and cellar having a horizontal dimension exceeding 25 m; such access may 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.

Exception for sprinklers

(5) The requirements of Sentences (1) to (4) need not apply to any *storey*, including basements and cellars, that is *sprinklered*.

Access routes required

3.2.5.2.(1) Except as provided in Sentences (3) and (5), every *building* which exceeds 3 *storeys* in *building height* or 600 m² in *building area* shall be provided with access routes for fire department vehicles to

- (a) the *building* face having a principal entrance, and

- (b) each *building* face having access openings for fire fighting as required in Article 3.2.5.1.

(2) The access routes in Sentence (1) shall be located so that the principal entrance and every access opening in Clause (1)(b) 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*.

Location of
access routes

(3) Except as provided in Sentence (5), 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 Sentences 3.2.5.4.(11) and 3.2.5.5.(4),
- (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.

(4) The unobstructed paths of travel for the fire fighter in Sentence (3) 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*.

(5) 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 in Sentence (3) shall be located so that the unobstructed path of travel from the vehicle to 1 entrance of each such portion is not more than 45 m.

(6) Where a required access route is provided by means of a private roadway or yard, the design and location of the portion of the roadway or yard required for fire department use shall

Design
requirements
for access
routes

- (a) have a clear width of at least 6 m, unless it can be shown that lesser widths are satisfactory,
- (b) have a centre-line radius of not less than 12 m,
- (c) have an overhead clearance of at least 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 exceeding 90 m, and
- (g) be connected with a public thoroughfare.

* (7) Compliance with this Article is not required for an *existing building* or a *new building* in which construction was started before May 31, 1981.

* 3.2.5.3.(1) A supply of water, *acceptable* to the *fire authority*, shall be provided for every *building* for firefighting.

* (2) Compliance with Sentence (1) is not required for an *existing building* or for a *new building* in which construction was started before May 31, 1981.

3.2.5.4.(1) Except as provided in Sentence 3.3.7.7.(8), a standpipe and hose system shall be installed in every *building* that is

Standpipe and
hose systems
required

- (a) more than 3 *storeys* in *building height* or more than 14 m in height measured between *grade* and the ceiling of the uppermost *storey*, or
- (b) greater in *building area* than the area shown in Table 3.2.5.A. for the applicable *building height* shown in the Table where the *building* is not *sprinklered* and does not exceed 14 m in height measured between *grade* and the ceiling of the top *storey*.

Size of hose connections

(2) Where a standpipe and hose system is required, 2½-in. 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 1½-in. diam.

Standpipe and hose for covered malls

(3) Where a covered mall or *public corridor* serves a *mercantile occupancy* and is greater than 5 m in width and is located in a *floor area* not equipped with a sprinkler system, a standpipe and hose system shall be provided for the mall or corridor portion.

Design, construction, installation and testing

(4) Except as provided in Sentences (5) to (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 14-1978, "Installation of Standpipe and Hose Systems."

Water supply

(5) Where more than 1 standpipe is provided, the total water supply need not exceed 30 L/s.

Table 3.2.5.A.
Forming Part of Sentence 3.2.5.4.(1)

Occupancy Classification	Building Area, m ²		
	1 storey	2 storeys	3 storeys
A	2 500	2 000	1 500
B (except hospitals)	2 000	1 500	1 000
Hospitals	500	500	500
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

Dry standpipes not permitted

(6) Dry standpipes that are not connected to a water supply shall not be considered as fulfilling the requirements of this Article.

Hose stations

(7) 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.

(8) A hose station located on one side of a *horizontal exit* shall be considered to serve only the *floor area* on that side of such *exit*.

(9) Every hose cabinet shall be located so that its door, when fully opened, will not obstruct any doorway or corridor.

(10) Hose connections shall be provided with sufficient clearance to permit the use of a standard fire department hose key.

Location of fire department connections

(11) Fire department connections for standpipe and hose systems shall be located so that the distance from a fire department connection to a hydrant does not exceed 45 m and is unobstructed.

Electrical supervision of valves required

(12) In *buildings* where a fire alarm system is required to have an annunciator, all valves controlling water supplies in a standpipe and hose system except for hose valves shall be equipped with an electrically supervised switch for transmitting a signal to an annunciator panel in the event of movement of the valve handle.

(13) Every 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.

Sprinkler systems

3.2.5.5.(1) Except as provided in Sentences (2) to (4), where a sprinkler system is required, it shall be designed, constructed, installed and tested in conformance with NFPA 13-1978, "Installation of Sprinkler Systems."

(2) Where a *building* contains fewer than 9 sprinklers, the water supply for such sprinklers may 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) Fire department connections for sprinkler systems shall be located so that the distance from a fire department connection to a hydrant does not exceed 45 m and is unobstructed.

Fire
department
connections

- * 3.2.5.6. Portable extinguishers shall be provided and installed in conformance with The Fire Prevention Act and regulations made pursuant to that Act.

Portable
extinguishers

3.2.5.7. Equipment forming part of a fire protection system that may be adversely affected by freezing temperatures and which is located in an unheated area shall be adequately protected from freezing.

Protection
from freezing

SUBSECTION 3.2.6. ADDITIONAL REQUIREMENTS FOR HIGH BUILDINGS

(See Appendix A.)

3.2.6.1.(1) This Subsection applies to

Application

- (a) every *building* of Group A, D, E or F *major occupancy* classification that is more than
 - (i) 36 m in height, measured between *grade* and the floor level of the top *storey*, or
 - (ii) 18 m in height, 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 the number of 550 mm units of *exit* width in all *exit* stairs at that *storey*, exceeds 300 persons,
- (b) every *building* containing a Group B *major occupancy* in which the floor level of the highest *storey* of such *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 *occupancy* for patients in bed or *infirm persons*, and
- (c) every *building* containing a Group C *major occupancy* whose floor level is more than 18 m above *grade*.

3.2.6.2.(1) Every *building* shall be designed to limit the danger to occupants and fire fighters from exposure to smoke in a *building* fire, as provided in Sentences (2) to (9).

Limits on
smoke
movement

(2) Except as provided in Sentences (5) to (8), every *building* shall be designed so that during a period of 2 h after the start of a fire all *floor areas* that are above the lowest *exit storey* will not contain more than 1 per cent by volume of contaminated air from the fire floor, assuming an outdoor temperature equal to the January design temperature on a 2½ per cent basis determined in conformance with Subsection 2.3.1. (See Appendix A.)

(3) Except as provided in Sentences (6) and (8), every *building* shall be designed so that during a fire the limit described in Sentence (2) on the movement of contaminated air into other *floor areas* is not exceeded in

- (a) each *exit* stair serving *storeys* above the lowest *exit level*, and
- (b) each *exit* stair serving *storeys* below the lowest *exit level*.

(See Appendix A.)

- (4) Except as provided in Sentences (6) and (8), every *building* shall be designed so that during a fire the limit described in Sentence (2) on the movement of contaminated air into other *floor areas* is not exceeded in a shaft that contains an elevator for use by fire fighters, as required by Sentence 3.2.6.4.(1). (See Appendix A.)
- *

(5) Except in *buildings* of Group B *major occupancy*, the requirements of Sentence (2) are waived in *buildings* where occupants above the *first storey* can enter and be safely accommodated in *floor areas* or parts of *floor areas* that

- (a) are designated as areas of refuge on the plans and are identified as such in the *building*,
 - (b) are located on every fifth *storey*, except that in the case of *buildings* of Group C *major occupancy* classification that are more than 75 m in height, measured between *grade* and the floor level of the top *storey*, are located on every *storey*,
 - (c) provide not less than 0.5 m² of floor space per ambulatory occupant and 1.5 m² of floor space per non-ambulatory occupant,
 - (d) have access corridors and doors leading to each designated part of a *floor area* on the same *storey* sufficient to provide one 550 mm unit of width for every 150 persons who may have to use these passages to reach the designated part of a *floor area*,
 - (e) have access stairs from intervening *storeys* leading to each designated part of a *floor area* sufficient to provide one 550 mm unit of width for every 100 persons who may have to use these stairs to reach the designated part of a *floor area*, and
 - (f) during a period of 2 h after the start of a fire do not contain more than 1 per cent by volume of contaminated air from the fire floor, assuming an outdoor temperature equal to the January design temperature on a 2½ per cent basis determined in conformance with Subsection 2.3.1.
- (See Appendix A.)

*

Sprinklers

(6) The requirements of Sentences (2) and (4) and Clause 3(a) are waived when a *building* is *sprinklered*, and

- (a) the sprinkler system is equipped with a water flow and *supervisory signal* system that will
 - (i) transmit automatically a water-flow signal directly to the fire department, or through an *independent central station*,
 - (ii) transmit automatically other *supervisory signals* to a *proprietary control centre* or to an *independent central station*, and
 - (iii) activate a signal at the central alarm and control facility described in Article 3.2.6.8.,
 - (b) each stairway that serves *storeys* above the lowest *exit level* is vented to the outdoors at or near the bottom of the stairshaft,
 - (c) measures are taken to limit movement of smoke from a fire in a *floor area* below the lowest *exit storey* into upper *storeys*, and
 - (d) except for exhaust fans in kitchens, washrooms and bathrooms in *dwelling units*, and except for fans used for smoke venting in Article 3.2.6.5., air moving fans are designed and installed so that in the event of a fire such fans can be stopped by means of a manually operated switch at the central control facility where the system serves more than 2 *storeys*.
- (See Appendix A.)

Exception for lower buildings

(7) The requirements of Sentence (2) are waived in a *building* of Group A, C, D, E or F *major occupancy* classification where

- (a) the *building* is not more than 75 m in height measured between *grade* and the floor level of the top *storey*, and
 - (b) the number of occupants of above *grade storeys* does not exceed 3.6 times the area in square metres of treads and landings in the *exit* stairs serving these *storeys*.
- (See Appendix A.)

Balconies

(8) The requirements of Sentences (2) and (4) and Clause (3)(a) are waived in a *building* of Group C *major occupancy* classification

- (a) that is not more than 36 m in height, measured between *grade* and the floor level of the top *storey*,
- (b) where each *suite* above *grade* has direct access to an exterior balcony that
 - (i) has a depth from the outside face of the exterior wall to the inside edge of the balcony of at least 1.5 m, and

- (ii) provides not less than 0.5 m² of balcony space for each occupant of the *suite*,
 - (c) where each stairway that serves *storeys* above the lowest *exit level* is vented to the outdoors at or near the bottom of the stairshaft,
 - (d) where measures are taken to limit movement of smoke from a fire in a *floor area* below the lowest *exit storey* into upper *storeys*, and
 - (e) where, except for exhaust fans in kitchens, washrooms and bathrooms in *dwelling units*, air moving fans are designed and installed so that in the event of a fire such fans can be stopped by means of a manually operated switch at the central control facility where the system serves more than 2 *storeys*. (See Appendix A.)
- (9) 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.)
- * 3.2.6.3.(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 operation when subjected to the standard fire exposure described in ULC-S101-1977, "Standard Methods of Fire Endurance Tests of Building Construction and Materials" for a period of not less than 1 h.
- * 3.2.6.4.(1) At least 1 elevator shall be provided and shall have a useable platform area not less than 2.2 m², and shall be capable of carrying a load of 900 kg from a *street* floor landing to the top floor that it serves in not more than 1 min.
- * (2) Except when Measure K of Chapter 3, "Measures for Fire Safety in High Buildings" of the Supplement to the NBC 1980 is used, each elevator 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-S104-77, "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) Except as provided in Sentence (4), the elevator described in Sentence (1) shall be capable of providing transportation from the *street* floor to every floor that is above *grade* in the *building*, normally served by the elevator system.
- * (4) If it is necessary to change elevators to reach any floor referred to in Sentence (3), the system shall be designed so that not more than 1 change of elevators is required when travelling from a *street* floor to any floor in the *building*.
- * (5) The elevator described in Sentence (1) shall be identified on the floor containing the central alarm and control facility described in Article 3.2.6.8., and at any interchange level described in Sentence (4).
- * (6) If Measure K of Chapter 3, "Measures for Fire Safety in High Buildings" of the Supplement to the NBC 1980 is used, at least one elevator conforming to Sentences (1), (3), (4) and (5) shall be provided in each smoke control region.

Connected
buildings

Elevators

Venting to Aid
Firefighting

3.2.6.5.(1) Means of venting each *floor area* to the outdoors shall be provided by windows, wall panels or smoke shafts, except that in a *sprinklered floor area* the *floor area* may be vented by the *building* exhaust system.

(2) Venting 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 1980.

(3) Fixed glass windows shall not be used for venting in Sentence (1) where the breaking of such windows may endanger pedestrians below.

(4) Openable windows used for venting in Sentence (1) shall be permanently marked so that they are easily identifiable.

Sprinklers

3.2.6.6.(1) The following spaces shall be *sprinklered*:

- (a) every *storey*, or part thereof, intended for a Group E or Group F, Division 1 or Division 2 *occupancy*,
- (b) every restaurant or licensed beverage establishment,
- (c) every *storey* or part thereof intended for the storage or handling of hazardous substances (see Article 3.3.1.1.), and
- (d) every *floor area* exceeding 1 000 m², except when the *floor area* is divided into *fire compartments* not exceeding 1 000 m² in area and separated from the remainder of the *floor area* by *fire separations* having at least a 1 h *fire-resistance rating*. (See also Article 3.2.2.7.)

Interior Finish

3.2.6.7.(1) Except as permitted in Sentences (2) to (4), the interior finish for every wall, *partition*, ceiling or floor of a room or space including *service spaces* and elevator cars shall have a *flame-spread rating* and a smoke developed classification conforming to Table 3.2.6.A. (See also Sentence 3.1.4.5.(2).)

(2) Except for *buildings* of Group B *major occupancy* classification and for elevator cars, the *flame-spread ratings* required elsewhere in this Part may be used in lieu of the requirements of Sentence (1) where a *building* is *sprinklered* and supervised, as provided in Sentence 3.2.6.2.(6).

(3) Trim, millwork and doors in *exit* stairways, vestibules to *exit* stairs, *exit* lobbies and corridors providing access to *exit* except within *suites* shall have a smoke developed classification not exceeding 300 provided they do not exceed 10 per cent of the area of the wall or ceiling in which they occur.

(4) Trim, millwork and doors in *exit* stairways, vestibules to *exit* stairs and *exit* lobbies that do not exceed 10 per cent of the wall or ceiling in which they occur shall have a *flame-spread rating* of not over 150.

Table 3.2.6.A.
Forming Part of Sentence 3.2.6.7.(1)

Location	Maximum <i>Flame-Spread Rating</i>			Maximum Smoke Developed Classification ⁽¹⁾		
	Wall Surface	Ceiling Surface	Floor Surface	Wall Surface	Ceiling Surface	Floor Surface
<i>Exit</i> stairways, vestibules to <i>exit</i> stairs and <i>exit</i> lobbies	25 ⁽²⁾	25 ⁽²⁾	25	50 ⁽³⁾	50 ⁽³⁾	50
Corridors providing <i>access</i> to <i>exit</i> except within <i>suites</i>	(4)	(4)	300	100 ⁽³⁾	50 ⁽³⁾	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 rooms or spaces	(4)	(4)	NA	300	50	NA
Column 1	2	3	4	5	6	7

Notes to Table 3.2.6.A.:

(1) See Article 3.1.11.1. for smoke developed classifications for lighting elements.

(2) See Sentence (4).

(3) See Sentence (3).

(4) See Section 3.3 and Subsections 3.1.4. and 3.1.11.

3.2.6.8.(1) A central alarm and control facility other than a *proprietary control centre* shall be provided on the *street* entrance floor that

- (a) is in a location that is readily accessible to fire fighters entering the *building*, and
- (b) takes into account the effect of background noise likely to occur under fire emergency conditions, so that the facility can properly perform its required function under such conditions.

(2) The central alarm and control facility shall include

- (a) means to control the voice communication system required by Article 3.2.6.9., and provisions to enable sending messages to all loudspeakers simultaneously and to individual *floor areas* and *exit* stairwells,

Central alarm
and control
facilities

- (b) means to give an audible and visual fire *alarm signal* when any fire alarm or detection device or sprinkler system alarm is actuated, and a switch to silence the audible signal causing a visual signal to indicate that the audible signal has been silenced,
- (c) an annunciator panel connected to indicate the type of signal and the floor or zone from which the fire alarm is received,
- (d) means to transmit automatically *alarm signals* to the fire department, either directly or through an *independent central station*, or through a *proprietary control centre*,
- (e) means to cause doors to vestibules, if these are normally held open, to close automatically on receipt of an *alarm signal*, as provided in Sentence 3.1.6.7.(3), unless this is effected automatically by proprietary system control equipment,
- (f) means to manually actuate the general fire alarm in the *building*, to silence it after it has operated initially for not less than 1 min and indicate by a visual signal that the fire alarm has been silenced, and
- (g) means to actuate auxiliary equipment or means to communicate with a continually manned auxiliary equipment control centre, as appropriate to the measure for fire safety provided in the *building*.

Voice
communication
system

3.2.6.9.(1) When the vertical distance between the floor of the top *storey* and *grade* exceeds 36 m, or in *buildings* containing a *floor area* or part of a *floor area* located above the third *storey* designed or intended as a Group B *occupancy* for patients in bed or *infirm persons*, a voice communication system or systems shall be provided in *buildings*, and shall consist of

- (a) a 2-way communication system at *acceptable* locations on 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 heard in all parts of the *building* except for elevator cars.

(2) The system shall include provision for silencing the fire alarm devices when the loudspeakers are in use, but only after the fire alarm devices have operated initially for not less than 1 min.

(3) Voice communication systems shall conform to ULC-S524-M1980, "Standard * for the Installation of Fire Alarm Systems".

Fire protection
of electrical
conductors

3.2.6.10.(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 3.2.6.6., 3.2.6.8. and 3.2.6.9., shall be separated from the remainder of the space by a *fire separation* having a *fire-resistance rating* of at least 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 at least 1 h.

(2) Where the central alarm and control facility and the fire alarm control panel are in different *fire compartments*, the electrical conductors connecting the alarm control panel to the central alarm and control facility shall be protected against fire exposure to ensure continued operation for a period of at least 1 h.

Emergency
electrical
power supply

3.2.6.11.(1) An *acceptable* local emergency power supply capable of operating under a full load for at least 2 h shall be provided for fire alarm and voice communication systems required in Articles 3.2.6.8. and 3.2.6.9.

(2) The local emergency power supply for voice communication systems in Sentence (1) shall be capable of full operation immediately upon the failure of the normal source of power.

(3) The local emergency power supply for fire alarm systems in Sentence (1) shall be designed so that in the event of a power failure, there will be an automatic transfer to emergency power.

(4) An *acceptable* emergency power supply capable of operating under a full load for at least 2 h shall be provided by an emergency generator or by a separate service not supplied by the same substation as the primary source for

- * (a) every elevator, assuming that only 1 elevator will operate at a time,
 - (b) water supply for fire fighting in conformance with Article 3.2.5.3., when the supply is dependent on electrical power supplied to the *building*, and
 - (c) fans required for venting in Article 3.2.6.5.
- (See Article 3.2.8.2. for emergency lighting.)

(5) Emergency electric power systems shall be installed in conformance with Article 3.2.8.4.

3.2.6.12. The systems for control of smoke movement and mechanical venting required in Articles 3.2.6.2. and 3.2.6.5. 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 1980.

Testing

SUBSECTION 3.2.7. PROVISIONS FOR PHYSICALLY HANDICAPPED PERSONS

- * **3.2.7.1.** Every *barrier free building* shall have at least 1 principal entrance designed in conformance with the ACNBC publication, "Building Standards for the Handicapped 1980," for use by physically handicapped persons, opening to the outdoors at sidewalk level or to a ramp conforming to Article 3.4.8.8. leading to a sidewalk.
- * **3.2.7.2.(1)** Every *barrier free building* shall provide access for physically handicapped persons from the entrance described in Article 3.2.7.1. to public spaces on the entrance floor, and to at least 1 elevator where elevators are provided.
- * **(2)** Where elevators are provided to *storage garages* in *barrier free buildings*, access for physically handicapped persons shall be provided from at least 1 parking level to the elevator.
- * **3.2.7.3.** Washroom facilities in *barrier free buildings* shall conform to Article 3.6.4.4.
(See Appendix A.)
- * **3.2.7.4.(1)** If residential projects are funded in part or in whole by the Government of Alberta, a project of 25 *dwelling units* or over shall contain *dwelling units* designed for the handicapped, in conformance with the ACNBC publication "Building Standards for the Handicapped 1980"
- * **(2)** The number of *dwelling units* for the handicapped to be provided in projects referred to in Sentence (1) shall be:
 - (a) 1 in a project of 25 to 50 *dwelling units*;
 - (b) 2 in a project of 51 to 100 *dwelling units*;
 - (c) 3 in a project of 101 to 200 *dwelling units*;
 - (d) 4 in a project exceeding 200 *dwelling units*.
- * **3.2.7.5.(1)** The Director may grant relaxation of one or more of the requirements of Articles 3.2.7.1. to 3.2.7.4. if an *owner* can demonstrate to the satisfaction of the Director that
 - (a) the specific requirements are unnecessary, or
 - (b) extraordinary circumstances prevent conformance.

SUBSECTION 3.2.8. LIGHTING AND EMERGENCY POWER SYSTEMS

3.2.8.1.(1) Every *exit*, *public corridor*, corridor providing *access to exit* for the public or serving patients' bedrooms or classrooms shall be equipped to provide illumination to an average level of at least 50 lx at floor level and at all points such as angles and intersections at changes of level where there are stairs or ramps.

Minimum
lighting levels

(2) Rooms and spaces used by the public shall be illuminated as described in Article 9.35.2.9.

Recessed lighting fixtures 3.2.8.2. Recessed lighting fixtures shall not be located in insulated ceilings unless such fixtures are *accepted* for such installation.

Emergency lighting 3.2.8.3.(1) Emergency lighting shall be provided to average levels of at least 10 lx at floor or tread level in

- (a) *exits*, corridors used by the public and principal routes providing *access to exit* in an open *floor area* where such *exits*, corridors and routes are below *grade* or are windowless.
- (b) the following parts of *buildings* required by Subsection 3.2.4. to have a fire alarm system
 - (i) *exits*,
 - (ii) corridors used by the public,
 - (iii) principal routes providing *access to exit* in an open *floor area*,
 - (iv) corridors serving patients' bedrooms, and
 - (v) corridors serving classrooms,
- (c) underground *walkways*,
- (d) covered malls, and
- (e) *floor areas* or parts thereof where the public may congregate and which are not provided with natural lighting in
 - (i) Group A, Division 1 *occupancies*, and
 - (ii) Group A, Division 2 and 3 *occupancies* having an *occupant load* of 60 persons or more.

Emergency power supply (2) An *acceptable* emergency power supply shall be provided to maintain the emergency lighting required by this Subsection from a power source such as batteries or generators that will continue to supply power in the event that the regular power supply to the *building* is interrupted and be so designed and installed that upon failure of the regular power 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) ½ h for *buildings* of all other *occupancies*.

(3) Where self-contained emergency lighting units are used, they shall conform to CSA C22.2 No. 141-1972, "Unit Equipment for Emergency Lighting."

3.2.8.4.(1) Emergency electric power systems shall be installed in conformance * with CSA C282-1977, "Emergency Electrical Power Supply for Buildings." *
(See Sentence 3.2.6.11.(2) for emergency power supply for voice communication systems.)

SUBSECTION 3.2.9. MEZZANINES AND OPENINGS THROUGH FLOOR ASSEMBLIES

Application 3.2.9.1.(1) Except as provided in Sentences (4) to (8) and 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 terminate at a vertical *fire separation* having a *fire-resistance rating* at least equal to that required for the floor assembly that terminates at the separation or shall be protected in conformance with the requirements in Articles 3.2.9.2. to 3.2.9.12.

(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 spaces*.

Exceptions (4) A *mezzanine* need not terminate at a vertical *fire separation* nor be protected in conformance with the requirements in Articles 3.2.9.2. to 3.2.9.12 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 exceeding 2 storeys in *building height*, or

- (c) is not considered as a *storey* in Sentences 3.2.1.2.(3) to 3.2.1.2.(5) in calculating *building height* provided the *mezzanine* does not exceed 500 m² in area and does not contain a Group B *occupancy*.
- (5) Except for floors described in Sentence 3.1.8.1.(6) and Article 3.2.1.3., 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.
- (6) Where unprotected openings are necessary in *fire separations* because of the nature of a manufacturing process, such as an unbroken flow of material from *storey* to *storey*, *closures* for such openings may be omitted provided *acceptable* precautions are taken to offset the hazard of the unprotected openings.
- (7) Openings for escalators and inclined moving walkways need not conform to the requirements of this Subsection provided
- (a) the opening for each escalator or walkway does not exceed 10 m²,
 - (b) the openings are protected in conformance with the Sprinkler-Vent Method, the Spray Nozzle Method, Rolling Shutter Method or Partial Enclosure Method as described in Subsection 6-1.2 of NFPA 101-1976, "Code for Safety to Life from Fire in Buildings and Structures," or to the method described in Appendix A-4-4.8.2.3 of NFPA 13-1978, "Installation of Sprinkler Systems,"
 - (c) the *building* is *sprinklered*, and
 - (d) the *building* is classified as Group A, Division 1 or 2, Group D or Group E *major occupancy*.
- (8) An *interconnected floor space* need not conform to the requirements of Articles 3.2.9.2. to 3.2.9.12. provided
- (a) the *interconnected floor space* consists of the *first storey* and the *storey* next above or below it, but not both,
 - (b) the openings through the floor are used only for stairways, escalators or moving walkways,
 - (c) the *building* is classified as Group A, Division 1 or 2, Group D or Group E *major occupancy*, and
 - (d) the *building area* is not greater than ½ the area permitted in Subsection 3.2.2.

3.2.9.2. Buildings constructed in conformance with Articles 3.2.9.3. to 3.2.9.12. 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*.

Construction

3.2.9.3.(1) Exits opening into *interconnected floor spaces* shall be protected at each floor level by vestibules which are

Vestibules

- (a) at least 1.8 m by 1.8 m in size,
 - (b) separated from the remainder of the *floor area* by a *fire separation* having a *fire-resistance rating* at least equal to that required for the *exit* which it serves,
 - (c) designed to limit the passage of smoke so that the level of contamination in *exit* stairshafts 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 1980, and
 - (d) located so that the travel distance from any point in *interconnected floor spaces* to the nearest door of the vestibule measured along the path of travel to *exit* is not more than 30 m.
- *

(2) Exits opening into *interconnected floor spaces* shall conform to Sentence 3.4.3.2.(6).

(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).

Protected floor space

3.2.9.4.(1) For the purposes of this Subsection, where the term “protected floor space” is used, it applies to that part of a *floor area* separated from the *interconnected floor space* by a *fire separation* having a *fire-resistance rating* at least equal to 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 3.2.9.3.(1).

(2) Protected floor spaces in Sentence (1) shall be designed so that it is not necessary to enter the *interconnected floor spaces* to reach an *exit*.

Sprinklers

3.2.9.5.(1) *Buildings* containing *interconnected floor spaces* shall be *sprinklered*.

(2) The opening or openings at each floor level in *buildings* containing *interconnected floor spaces* shall be protected by baffles or draft stops in combination with close-spaced sprinklers conforming to Sentences (3) to (5).

(3) Baffles or draft stops in Sentence (2) shall be

- (a) located immediately adjacent to the opening, and
- (b) at least 500 mm deep measured from ceiling level down to the underside of the baffle or draft stop.

(4) Sprinklers in Sentence (2) shall be

- (a) spaced not more than 1.8 m apart,
- (b) located 150 mm to 300 mm from the baffle or draft stop on the side away from the opening,
- (c) designed to provide a discharge of 0.62 L/s for each metre measured horizontally around the opening, with no sprinkler discharging less than 0.91 L/s, and
- (d) closed sprinklers of ordinary temperature classification.

(5) Cross baffles shall be provided midway between sprinklers in Sentence (4) and designed so that the operation of any sprinkler head will not wet an adjacent sprinkler head.

(6) In *buildings* containing *interconnected floor spaces*

- (a) waterflow *alarm signals* from sprinkler systems shall be transmitted to the fire department in conformance with Sentence 3.2.4.3.(2), and
- (b) sprinkler systems shall be electrically supervised as required in Sentence 3.2.4.4.(8).

Fire alarm and detection system

3.2.9.6.(1) *Buildings* containing *interconnected floor spaces* shall be provided with

- (a) an *acceptable* fire alarm system and electrically supervised annunciator conforming to Subsection 3.2.4.,
- (b) an *acceptable* system of *smoke detectors* located on the ceiling of each floor level in the vicinity of the draft stop or baffle required in Sentence 3.2.9.5.(3), and
- (c) facilities for transmitting a signal to the fire department in conformance with Sentence 3.2.4.3.(2).

(See Appendix A.)

Hose station

3.2.9.7. In *buildings* containing *interconnected floor spaces*, a hose station conforming to Article 3.2.5.4. shall be provided in each vestibule required in Sentence 3.2.9.3.(1).

Mechanical exhaust

3.2.9.8.(1) A mechanical exhaust system shall be provided to remove air at the top of an *interconnected floor space* at the rate of 6 air changes per hour.

(2) The mechanical exhaust system in Sentence (1) shall be activated by a switch located on the *street* entrance floor at an *acceptable* location.

3.2.9.9. The interior finish for every wall, *partition*, ceiling or floor of a room or space, including *service spaces* and elevator cars in *interconnected floor spaces*, shall have a *flame-spread rating* and a smoke developed classification conforming to Table 3.2.6.A. for unsprinklered *buildings* even though the *building* is required to be *sprinklered*.

Interior finish

3.2.9.10. Every *interconnected floor space* shall be designed so that the *combustible* contents in those parts of a *floor area* in which the ceiling is more than 5 m above the floor, is limited to not more than 16 g of *combustible* material for each cubic metre of volume of the *interconnected floor space*.

Combustible contents

3.2.9.11.(1) The height of an *interconnected floor space* in metres shall not exceed the value determined by the following expression:

Limits on size

$$\left(1 - \frac{H_s}{36}\right) \times \left(45 - \frac{H_b}{4}\right)$$

where H_s is the vertical distance in metres, measured between the floor immediately above the *interconnected floor space* and the ceiling of the top *storey* or 18 m, whichever is the lesser, and H_b is the height of the *building* in metres, measured between *grade* and the ceiling of the top *storey* or 108 m, whichever is the lesser, except that the height of the *interconnected floor space* need not be reduced to less than 9 m.

(2) The number of *fire compartments* that contain *interconnected floor spaces* located one above the other throughout the height of a *building* shall not exceed 2.

(3) Where *storeys* are located above an *interconnected floor space*, such *storeys* shall be separated from the *interconnected floor space* by a *fire separation* having a *fire-resistance rating* of at least 3 h if the *interconnected space* contains a Group A, Group B, Division 1, Group C, Group D or Group F, Division 3 *major occupancy* and 4 h if the *interconnected floor space* contains other *major occupancies*.

3.2.9.12. Openings in the exterior walls of *storeys* located above an *interconnected floor space* shall be separated from openings in the exterior walls of the *interconnected floor space* by a wall having at least a 1 h *fire-resistance rating*, constructed without openings for a distance of 3 m measured vertically between openings and extending at least 3 m horizontally on each side of such openings.

Openings in exterior walls

SECTION 3.3 SAFETY REQUIREMENTS WITHIN FLOOR AREAS (See Appendix A.)

SUBSECTION 3.3.1. REQUIREMENTS APPLYING TO ALL FLOOR AREAS

3.3.1.1.(1) Each *suite* in other than Group D *occupancies* shall be separated from adjoining *suites* by construction having a *fire-resistance rating* of at least 1 h, except that a $\frac{3}{4}$ h *fire-resistance rating* is permitted where the floor assembly is not required to exceed $\frac{3}{4}$ h.

Separation of suites

(See also Article 3.3.3.2. for *institutional occupancies* and Article 3.3.4.2. for *residential occupancies*.)

(2) Where hazardous substances are used in connection with the activities of any *occupancy* other than as provided in Subsection 3.3.7. 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.

Hazardous substances

*

Vaults	(3) Every room or vault where hazardous substances are stored shall be separated from all other <i>occupancies</i> by a 3 h <i>fire separation</i> . Such <i>fire separations</i> need not be supported as required in Sentence 3.1.5.4.(1).
Kitchens	(4) 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.
Access to Exits	3.3.1.2.(1) An <i>access to exit</i> shall be provided from every roof which is intended for <i>occupancy</i>, and from every podium, terrace, platform or contained open space. (2) <i>Access to exits</i> within <i>floor areas</i> shall conform to Subsections 3.3.2. to 3.3.7. in addition to the requirements of this Subsection. (3) No <i>access to exit</i> for patrons in an <i>assembly occupancy</i> shall pass through a * kitchen or <i>service space</i>. (4) Compliance with sentence (3) is not required for an <i>existing building</i> or a <i>new * building</i> in which construction was started before May 31, 1981. 3.3.1.3.(1) Except as otherwise permitted in this Section, each <i>suite</i> in a <i>floor area</i> that contains more than 1 <i>suite</i> shall have an exterior doorway at or near ground level or a doorway leading to an exterior passageway open to the outdoors, or to a <i>public corridor</i>; from the point where such doorway enters the exterior passageway or <i>public corridor</i> it shall be possible to go in opposite directions to each of 2 separate <i>exits</i>.
Public corridors	(2) Except as otherwise required in this Part, <i>public corridors</i> shall be separated from the remainder of the <i>building</i> by a <i>fire separation</i> having a <i>fire-resistance rating</i> at least equal to 1 h, except that (a) the <i>fire-resistance rating</i> need not exceed $\frac{3}{4}$ h when the <i>fire-resistance rating</i> of the floor assembly is not required to exceed $\frac{3}{4}$ h, (b) no <i>fire-resistance rating</i> is required when the <i>floor area</i> is <i>sprinklered</i> and the corridor does not serve an <i>institutional occupancy</i> or a <i>residential occupancy</i>, and (c) no <i>fire separation</i> is required where the corridor exceeds 5 m in unobstructed width, the <i>floor area</i> is <i>sprinklered</i> and the corridor does not serve an <i>institutional occupancy</i> or a <i>residential occupancy</i>. (3) The sprinkler system in Clauses (2)(b) and (c) shall be electrically supervised in conformance with Sentence 3.2.4.4.(8) and upon operation, cause an alarm signal to be transmitted to the fire department in conformance with Sentence 3.2.4.3.(2) when the corridor serves a Group E or Group F, Division 1 or 2 <i>occupancy</i>.
Doorways required	3.3.1.4.(1) Every room and every <i>suite</i> shall have 2 egress doorways placed in such a manner that one doorway could provide egress from the room or <i>suite</i> 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 <i>suite</i> (a) where the <i>occupancy</i> is classified as Group F, Division 1, (b) which is intended for an <i>occupant load</i> of more than 60 persons, or (c) where except for <i>dwelling units</i>, the area of a room or <i>suite</i> or the distance measured from any point within a room or <i>suite</i> to the nearest door opening onto a <i>public corridor</i>, a corridor used by the public or a corridor serving classrooms or patients' bedrooms or opening directly to an <i>exit</i> exceeds the values shown in Table 3.3.1.A.
Travel distance	(2) Where more than 1 egress door is required from a room or <i>suite</i> in Sentence (1), the travel distance within the room or <i>suite</i> to the nearest egress door shall not exceed the maximum travel distances described in Article 3.4.2.3. for <i>exits</i> .
Means of egress from other spaces	(3) Where a roof is used or intended for an <i>occupant load</i> of more than 60 persons, at least 2 separate <i>means of egress</i> shall be provided from the roof to stairs, designed in conformance with the requirements for <i>exit stairs</i> , located so that the distance between such stairs conforms to the requirements in Article 3.4.2.2. for <i>exits</i> .

(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 (1).

* (5) Notwithstanding Clause 3.3.1.4.(1)(c), operating suites in Group B, Division 2 major occupancies do not need 2 egress doors if

- (a) the area of the suite is less than 150 m²,
- (b) the distance from any point in the suite to the egress door is less than 15 m, and
- (c) the egress door opens onto a corridor leading directly to an exit.

Table 3.3.1.A.
Forming Part of Sentence 3.3.1.4.(1)

Occupancy of Room or Suite	Maximum Area of Room or Suite, m ²	Maximum Distance to Egress Door, m
Group A	150	15
Group B	75	10
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.A.:

⁽¹⁾See Article 3.3.4.3. for *dwelling units*.

3.3.1.5. The minimum headroom clearance in every *access to exit* shall conform to the requirements in Article 3.4.3.5. for *exits*.

Headroom

3.3.1.6.(1) The minimum width of every *public corridor* shall be 1 100 mm.

Corridors

(2) Except as provided in Sentence 3.3.3.3.(4), the minimum unobstructed width of every corridor used by the public and every corridor serving classrooms or patients' bedrooms shall be 1 100 mm.

(3) Where a *public corridor*, corridor used by the public or a corridor serving classrooms or patients' bedrooms contains an *occupancy*, such *occupancy* shall not reduce the unobstructed width of the corridor to less than its required width.

(4) Facilities for the illumination of corridors and other principal access routes to *exits* shall conform to the appropriate requirements in Subsection 3.2.8.

3.3.1.7.(1) Except as provided in Sentence (4), every door that opens onto a corridor or other facility that provides *access to exit* from 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.

Door swing

(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) Where sliding doors are provided in locations described in Sentence (1), they shall be designed and installed to swing on the vertical axis in the direction of *exit* travel when pressure is applied. Such doors shall be identified as a swinging door by means of a sign or decal affixed to the door.

(4) In Group B, Division 1 *occupancies*, a sliding door may be used in an *access to exit* where persons are under legal restraint.

3.3.1.8.(1) Every door that opens onto or is located within a *public corridor* or other facility that provides *access to exit* from a *suite* shall

Doors

- (a) be at least 813 mm in width where there is only 1 door leaf,
- (b) have no single leaf in any multiple leaf door less than 609 mm or more than 1 219 mm in width,
- (c) not open onto a step, and
- (d) be readily openable in travelling to an *exit* without requiring keys, special devices or specialized knowledge of the door opening mechanism, except that this requirement does not apply to doors of rooms where persons are under legal restraint.

Ramps,
stairways and
passageways

3.3.1.9.(1) Except as provided in Sentence (2) and Subsection 3.3.2., ramps, stairways and passageways used by the public as *access to exit* shall conform with the requirements in Subsection 3.4.8.

Curved or
spiral stairs

(2) In a stairway not required as an *exit*, a curved or spiral stairway having treads with a minimum run of 150 mm, a minimum average run of 200 mm and having risers in conformance with Sentence 3.4.8.9.(1) is permitted.

Capacity of
access to exits

3.3.1.10.(1) The capacity of any public *access to exit* shall be based on the *occupant load* of the *floor area* served and be computed on the basis of the following maximum number of persons per unit of width as determined by the method for computing units of *exit* width in Article 3.4.3.2.:

- (a) except as provided in Clause (c), doorways, corridors and passageways shall be assumed to accommodate not more than 90 persons per unit of *exit* width (550 mm),
- (b) except as provided in Clause (c), stairways and ramps, shall be assumed to accommodate not more than 60 persons per unit of *exit* width (550 mm), and
- (c) *access to exit* from a *floor area* intended for the treatment or care of *infirm persons* shall be assumed to accommodate not more than 30 persons per unit of *exit* width (550 mm).

Flame-spread
rating in
corridors

3.3.1.11.(1) Except as required in Sentences (2) and (3), interior finish materials used on a wall or ceiling of a *public corridor* or corridor serving classrooms or patients' bedrooms shall have a *flame-spread rating* of not more than 150.

(2) Except where the *building* is *sprinklered*, at least 90 per cent of the surface of the ceiling of any *public corridor* or corridor serving classrooms or patients' bedrooms shall have a *flame-spread rating* of not more than 25.

(3) Except where the *building* is *sprinklered*, at least 90 per cent of the surface of any wall, other than doors of any *public corridor* or corridor serving classrooms or patients' bedrooms, shall have a *flame-spread rating* of not more than 75, or at least 90 per cent of the surface of the upper half of such wall shall have a *flame-spread rating* of not more than 25.

(4) Where a *public corridor*, a corridor used by the public or a corridor serving classrooms or patients' bedrooms contains an *occupancy*, the interior finish materials used on the walls or ceilings of such *occupancy* shall have a *flame-spread rating* in conformance with Sentences (1) to (3).

Guards

3.3.1.12.(1) A *guard* at least 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 other locations where the difference in floor elevations is greater 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 1 070 mm around landings.

(3) Except as provided in Sentence 3.3.2.10.(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*, day-care 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.

3.3.1.13.(1) Except as provided in Sentence (3), every glass or transparent door accessible to the public shall be designed and constructed so that the existence and position of such door is readily apparent by attaching thereto non-transparent hardware, bars or other permanent fixtures, and when constructed of glass shall be constructed of wired glass or safety glass conforming to Part 9.

Transparent
doorways and
panels

(2) Except as provided in Sentence (3), 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.

(3) 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 (2), except that such partitions shall be suitably marked to indicate their existence and position.

(4) Glass in doors and side lights that could be mistaken for doors within or at the entrances to *dwelling units* and in public areas shall conform to the requirements in Part 9.

(5) 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 at least 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.

3.3.1.14.(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.)

Exhaust
ventilation
required

(2) When substances or conditions that may create an explosion hazard are present as the result of the principal use of a *building* space, such space shall be provided with *acceptable* explosion relief devices, vents or other protective measures in conformance with Sentence 6.2.2.3.(3).

- * **3.3.1.15.** 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* 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.
- * **3.3.1.16.** If an *occupancy* involves metal welding or flame cutting operations the room in which the metal welding or flame cutting is undertaken shall have a concrete floor and the room shall be separated from the remainder of the *building* by a *fire separation* having a *fire-resistance rating* not less than 2 h except that the *fire separation* is not required if the operation takes place entirely within a Group F *major occupancy*.
- * **3.3.1.17.** Except for a corridor that is entirely within a *suite* a dead end corridor shall be not more than 3 m in length.

SUBSECTION 3.3.2. ASSEMBLY OCCUPANCY

Scope	3.3.2.1. This Subsection applies to <i>floor areas</i> or parts thereof used or intended for use as <i>assembly occupancies</i> .
Fire separations	3.3.2.2.(1) The seating area of a Group A, Division 1 <i>occupancy</i> shall be separated from adjacent <i>occupancies</i> by a <i>fire separation</i> having a <i>fire-resistance rating</i> of at least 1 h where the <i>occupant load</i> in the seating area exceeds 200 persons, except that a <i>fire separation</i> having a <i>fire-resistance rating</i> of $\frac{3}{4}$ h may be used where the floor assembly is not required to have a <i>fire-resistance rating</i> greater than $\frac{3}{4}$ h. (2) Where usable space exists under tiers of seats in arena-type <i>buildings</i>, a $\frac{3}{4}$ h <i>fire separation</i> shall be provided between such space and the seats or the space shall be <i>sprinklered</i>. (3) An <i>assembly occupancy</i> shall be separated from a garage by a <i>fire separation</i> conforming to Article 3.3.7.7. (4) Storage rooms, more than 1 m² in area, in <i>assembly occupancies</i> shall be separated from the remainder of the <i>building</i> by a <i>fire separation</i> having a <i>fire-resistance rating</i> not less than 1 h, except that the <i>fire-resistance rating</i> may be reduced to 45 min if the <i>fire-resistance rating</i> of the floor assembly is permitted to be less than 1 h. (5) A clothes closet not exceeding 800 mm in depth shall not be considered as a * storage room for the purposes of this Article. (6) Each <i>suite</i> shall be separated from adjoining <i>suites</i> by construction having a * <i>fire-resistance rating</i> not less than 1 h, except that the <i>fire-resistance rating</i> may be reduced to 45 min if the <i>fire-resistance rating</i> of the floor assembly is permitted to be less than 1 h.
Flame-spread rating	3.3.2.3.(1) Except as provided in Sentences (2) and (3), interior finish materials used on the wall or ceiling of a room or space intended for assembly purposes shall have a <i>flame-spread rating</i> of not more than 150. (2) Group A, Division 1 <i>occupancies</i> shall have a <i>flame-spread rating</i> of not more than 25 over at least 90 per cent of the area of ceilings and at least 90 per cent of the area of walls. (3) The requirements of Sentence (2) shall not apply to doors or the exposed surfaces of <i>heavy timber construction</i>.
Fixed seats	3.3.2.4.(1) Except for bench-type seats as provided in Articles 3.3.2.9., 3.3.2.11. and 3.3.2.12., 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 at least 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) Aisles on the main floor and in balconies and galleries shall be located so that there are not more than 7 seats between any seat and the nearest aisle, except where (a) a door or doorway leading directly to an <i>access to exit</i> is provided for every 3 rows of seats, in which case such doors or doorways need not be provided with <i>exit</i> signs, and (b) the number of seats in a row does not exceed 100.
Aisles	3.3.2.5.(1) Except as required in Articles 3.3.2.9., 3.3.2.11. and 3.3.2.12., aisles leading to <i>exits</i> shall be provided in places of assembly which contain fixed seats in conformance with Sentences (2) to (9). (2) The minimum clear width of aisles shall be not less than 1 100 mm, except that the width may be reduced to not less than (a) 750 mm when serving 60 seats or fewer, and (b) 900 mm when serving seats on 1 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 in width 25 mm/m in length 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 at least 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 in length.

(6) The length of travel to an *exit* door by any aisle shall not be longer than 45 m.

(7) Side aisles shall be at least 1 100 mm wide when seating is provided in conformance with Sentence 3.3.2.4.(2).

(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 exceeds 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 at least 110 mm,
- (c) the riser height does not exceed 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 at least 430 mm,
- (e) treads have a run of at least 230 mm exclusive of nosing and a tread width of at least 250 mm,
- (f) aisle platforms that extend at least 430 mm in the direction of *exit* travel slope not more than 1 in 50,

- (g) an unobstructed platform at least 800 mm square is provided adjacent to an aisle where a step is used at the entry to a row of seats, and
- (h) the location of every riser is made apparent from both directions of travel by strategically placed lighting or contrasting marking stripes.

3.3.2.6.(1) Corridors used by the public in *assembly occupancies* or serving classrooms as *access to exits* shall

Corridors

- (a) 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
 - (i) the *fire-resistance rating* need not be greater than $\frac{3}{4}$ h where the floor assembly is permitted to have a $\frac{3}{4}$ h *fire-resistance rating*, and
 - (ii) no *fire-resistance rating* is required if the *floor area* is *sprinklered*,
- (b) be equipped with emergency lighting conforming to the requirements in Subsection 3.2.8., and
- (c) have surface finishes with a *flame-spread rating* conforming to the requirements in Sentence 3.3.1.11.(1) for *public corridors*.

3.3.2.7.(1) Every door in a principal *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 an *acceptable* hardware that will release and allow the door to swing wide open when a force of 90 N is applied to the device in the direction of travel to the *exit*.

Doors

- * (2) A door between a corridor and adjacent classrooms providing *access to exit* from the classrooms need not be equipped with a self-closing device where the *building* does not exceed 3 *storeys* in *building height*.

* **3.3.2.9.(1)** Where fixed bench-type seats without arms are provided, the seat width per person shall be assumed to be 450 mm.

Fixed bench-type seats without arms

(2) The centre-to-centre spacing between rows of bench-type seats shall be at least 760 mm where back rests are provided, and at least 550 mm where back rests are not provided.

(3) There shall be a space of at least 300 mm between the back of each seat and the front of the seat immediately behind it.

(4) Except as provided in Sentence 3.3.2.4.(2), 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.

(5) The width of every aisle serving bench-type seats shall conform to Article 3.3.2.5.

(6) Steps shall not be placed in any aisle unless the gradient exceeds 1 in 8. Such steps need not have handrails when the adjacent seating is on the same level.

3.3.2.10.(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

Height of guards

- (a) at the fascia of every box, balcony or gallery where the seats extend to the edge, the height of *guards* is at least 760 mm in front of the seats and at least 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 at least 660 mm, except that such *guards* need not be provided where the backs of the seats along the front side of the aisle are at least 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 exceeds 450 mm, the height of *guards* is at least 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) at least 1 070 mm in height above an adjacent aisle surface or foot rest, and
- (b) at least 920 mm in height 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* at least 840 mm in height 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 in size.

Outdoor places
of assembly

3.3.2.11.(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 at least 3 separate *exits*, or
- (b) 4,000 persons shall have at least 4 separate *exits*.

(2) In every Group A, Division 4 *occupancy*, every seat shall be located so that the travel distance does not exceed 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 be based on

- (a) 1 unit of *exit* width for each 300 persons for
 - (i) aisles,
 - (ii) stairs other than *exit* stairs, and
 - (iii) ramps and level passageways in vomitories and in *exits*, and
- (b) 1 unit of *exit* width for each 225 persons for *exit* stairs.

(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 at least 1 200 mm in width, except that an aisle serving fewer than 60 persons may be 750 mm in width, and
- (c) shall not have steps unless the gradient of the aisle exceeds 1 in 8.

(6) Except as provided in Sentences 3.3.2.12.(1) and (2), where steps are provided in aisles, such steps shall

- (a) extend the full width of the aisles,
- (b) have risers not exceeding 230 mm in height, and
- (c) have treads with a run of at least 250 mm.

Bleachers

3.3.2.12.(1) Where steps are provided in aisles of bleachers of the telescopic type, such steps shall

- (a) have risers not exceeding 250 mm, and
- (b) have treads with a run of at least 280 mm.

(2) When the vertical distance between seating platforms in bleachers exceeds 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 exceeds 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 $\frac{3}{4}$ of the centre-to-centre spacing between rows of seats, and
- (b) the spacing between footboard members shall not exceed 25 mm.

3.3.2.13.(1) Where a book storage room in a library exceeds 250 m² in area, or where the book stacks exceed 10 m in height or penetrate more than 1 storey

Libraries

- (a) the book storage room shall be separated from the remainder of the *building* by a 2 h *fire separation*, or
- (b) the *building* 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.

3.3.2.14.(1) Any portion of a *building* in which 3 or more bowling lanes are located shall be separated from other *occupancies* by at least a 1 h *fire separation*.

Bowling alleys

(2) Subsidiary *occupancies* such as offices, cocktail lounges and lunch counters operated in connection with 3 or more bowling lanes shall be separated by at least a 1 h *fire separation* where the combined area of these subsidiary *occupancies* exceeds 150 m².

3.3.2.15.(1) Structural members supporting the floor of any *stage* for theatrical performances shall be of *noncombustible construction* unless the *building* is permitted to be of *combustible construction*.

Stages for theatrical performances

(2) *Stages* for theatrical performances and ancillary spaces, such as workshops, dressing rooms and storage areas, shall be *sprinklered*.

(3) A 1 h *fire separation* shall be provided between every *stage* for theatrical performances and ancillary spaces, such as workshops, dressing rooms and storage areas.

(4) Every *stage* for theatrical performances and ancillary spaces, such as work, storage and dressing rooms, shall be separated from the audience space by a *fire separation* having a *fire-resistance rating* of at least 1 h, except for a proscenium opening which shall be protected with

- (a) an unframed fire curtain when the opening does not exceed 20 m in width, or
- (b) a semi-rigid fire curtain when the opening is more than 20 m in width.

(5) Every fire curtain as required by Sentence (4) shall be an *acceptable* type 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, 1 on the curtain control panel and 1 on each side of the *stage*.

(6) At least 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 at least $\frac{1}{8}$ 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.

* **3.3.2.16.(1)** Sentence (2) applies to kitchens and storerooms that are operated in conjunction with restaurants as defined in the Provincial Board of Health Regulations Respecting Restaurants (Alta. Reg. 399/70), as amended or replaced from time to time.

* (2) Walls and ceilings in every kitchen and storeroom shall be plastered or shall be finished with a durable material suitable for cleansing by washing and shall satisfy the regulation referred to in Sentence (1).

SUBSECTION 3.3.3. INSTITUTIONAL OCCUPANCY

Scope	3.3.3.1. This Subsection applies to <i>floor areas</i> or parts thereof used or intended for use as <i>institutional occupancies</i> .
Fire separations	3.3.3.2.(1) Except as provided in Sentence (2), sleeping rooms and patients' bedrooms shall be separated from adjacent rooms by a <i>fire separation</i> having a <i>fire-resistance rating</i> of at least 1 h, except that the <i>fire-resistance rating</i> need not be greater than $\frac{3}{4}$ h where the floor assembly is not required to exceed $\frac{3}{4}$ h. (2) Where 2 or more intercommunicating rooms such as patients' bedrooms and adjacent bathrooms are provided as patient accommodation, the <i>fire separation</i> required in Sentence (1) does not apply to the wall between the intercommunicating rooms provided the total number of patients served by the intercommunicating rooms does not exceed 5 where the <i>floor area</i> is not <i>sprinklered</i> and not more than 10 where the <i>floor area</i> is <i>sprinklered</i>. (3) Storage rooms, more than 1 m² in area, in <i>institutional occupancies</i> shall be * separated from the remainder of the <i>building</i> by a <i>fire separation</i> having a <i>fire-resistance rating</i> not less than 1 h, except that the <i>fire-resistance rating</i> may be reduced to 45 min if the <i>fire-resistance rating</i> of the floor assembly is permitted to be less than 1 h. (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.
Corridors	3.3.3.3.(1) Corridors used by the public or serving patients' bedrooms shall (a) be separated from the adjacent rooms or spaces by a <i>fire separation</i> having a <i>fire-resistance rating</i> conforming to Sentence 3.3.3.2.(1), (b) be equipped with emergency lighting conforming to the Subsection 3.2.8., and (c) have surface finishes with a <i>flame-spread rating</i> conforming to Article 3.3.1.11. for <i>public corridors</i>. (2) A door located between a corridor used by the public and an adjacent sleeping room or patients' bedroom may be equipped with an <i>acceptable</i> hold-open device designed to release the door upon a signal from a <i>smoke detector</i> located in conformance with NFPA 80-1979, "Fire Doors and Windows." * (3) In an active treatment hospital the requirement for a self-closing device in * Sentence 3.1.6.7.(1) may be waived for a door located between a corridor used by the public and adjacent sleeping rooms or patients' bedrooms provided the <i>building</i> is <i>sprinklered</i> and is designed on the basis that the bedrooms will be under constant supervision by suitably trained staff, so there is at least 1 such trained staff member for each 15 patients. (4) Every corridor in which it is necessary to move patients in beds shall be at least 2 400 mm wide. (5) Paired doors in corridors shall (a) swing in opposite directions, the right-hand doors swinging in the direction of travel, and (b) be at least 1 100 mm wide and 2 100 mm high to permit movement of beds. *
Openings	3.3.3.4. The <i>fire separation</i> required between an <i>institutional occupancy</i> and a <i>repair garage</i> shall have no openings.
Flame-spread rating	3.3.3.5. Except for doors, at least 90 per cent of the aggregate area of the interior finish of walls or ceilings in unsprinklered <i>buildings</i> shall have a <i>flame-spread rating</i> of not more than 75, and in no case shall the interior finish of walls or ceilings have a <i>flame-spread rating</i> greater than 150.
Separated zones in floor areas	3.3.3.6.(1) Every <i>floor area</i> used or intended to be used for patients in bed or <i>infirm persons</i> shall be divided into 2 or more zones separated by a <i>fire separation</i> in such a manner that the occupants in every zone have access to 2 <i>exits</i> either directly or through adjacent zones.

(2) *Fire separations* between zones shall have a *fire-resistance rating* of at least 1 h, except that a $\frac{3}{4}$ h *fire separation* is permitted where the *fire-resistance rating* of the floor assembly is not required to exceed $\frac{3}{4}$ h.

(3) Doors acting as *closures* in *fire separations* between zones shall be weather-stripped or otherwise designed and installed to retard the passage of smoke.

(4) Every zone shall accommodate, in addition to its own occupants, the occupants of the largest adjacent zone in a *floor area* determined by the requirements for *horizontal exits* in Article 3.4.8.11.

(5) The travel distance from any point within each zone to an adjacent zone shall not exceed 30 m.

3.3.3.7. The requirements of Subsection 3.2.6. shall also apply where a *building* containing a Group B *occupancy* falls within the scope of Article 3.2.6.1.

Special
requirements

- * 3.3.3.8. Sleeping rooms in *institutional occupancies* shall be provided with windows whose unobstructed glass area conforms with Table 9.7.2.A.

SUBSECTION 3.3.4. RESIDENTIAL OCCUPANCY

3.3.4.1. This Subsection applies to *floor areas* or parts thereof used or intended for use as *residential occupancies*.

Scope

3.3.4.2.(1) *Suites* of *residential occupancies* shall be separated from each other and the remainder of the *building* by a *fire separation* having a *fire-resistance rating* of at least 1 h, except that a $\frac{3}{4}$ h *fire-resistance rating* is permitted where the *fire-resistance rating* of the floor assembly is not required to exceed $\frac{3}{4}$ h.

Fire
separations

(2) Floors that separate *storeys* 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* does not exceed 6 m and provided that each *dwelling unit* is separated from the remainder of the *building* by

- (a) a *fire separation* having a *fire-resistance rating* of at least 1 h where the *building* is
 - (i) 3 *storeys* or less in *building height*, or
 - (ii) *sprinklered*, and
- (b) a *fire separation* having a *fire-resistance rating* of at least 2 h where the *building* is not *sprinklered* and is greater than 3 *storeys* in *building height*.

(3) 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 at least 1 h, except that a $\frac{3}{4}$ h *fire-resistance rating* is permitted where the *fire-resistance rating* of the floor assembly is not required to exceed $\frac{3}{4}$ h.

Storage rooms

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

Egress from
dwelling units

(2) A single *exit* is permitted from a *dwelling unit* provided the *exit* is an exterior door at or near 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.

(3) An egress door from either the uppermost *storey* or the lowest *storey* in a *dwelling unit*, as required in Sentence (1), need not be provided where the floor level has a door that opens directly into a stairway that

- (a) leads to a public *access to exit*,
- (b) has no direct access to any other floor level in the *dwelling unit*, and

(c) is separated from the *dwelling unit* by a *fire separation* having a *fire-resistance rating* of at least $\frac{3}{4}$ h.

(4) 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*.

(5) A doorway from a *dwelling unit* may 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*.

Automatic
locking
prohibited

(6) 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.

*

Flame-spread
rating

3.3.4.5. Interior finish material used on the wall or ceiling of every room or space used or intended to be used for *residential occupancy* shall have a *flame-spread rating* of not more than 150, except that the interior finish of walls and ceilings in bathrooms within *suites of residential occupancy* shall have a *flame-spread rating* of not more than 200.

Combustible
construction
permitted

3.3.4.6.(1) In every *building* required to be of *noncombustible construction*, *partitions of combustible construction* as described in Sentence (2) may be used within *dwelling units*.

(2) *Partitions of combustible construction* referred to in Sentence (1) shall be limited to wood studs covered on both sides by *noncombustible* cladding or gypsum wallboard, except that such cladding or wallboard may be covered with paint or tightly-adhering paper covering not exceeding 1 mm in thickness.

(3) Storage lockers in storage rooms shared by more than 1 tenant may be constructed of wood in *buildings* required to be of *noncombustible construction*.

Sound control

3.3.4.7. Walls and floors separating *dwelling units* shall be designed and constructed to restrict sound transmission in conformance with Part 9.

Guards

3.3.4.8. *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.

SUBSECTION 3.3.5. BUSINESS AND PERSONAL SERVICES OCCUPANCY

Scope

3.3.5.1. This Subsection applies to *floor areas* or parts thereof used or intended for use as *business and personal services occupancies*.

Partitions

3.3.5.2.(1) In every *building* required to be of *noncombustible construction*, *partitions of combustible construction* as described in Sentence (2) may be used within *floor areas* used or intended to be used for a *business and personal services occupancy* where the *partitions* are not required to act as *fire separations*

(a) where the *floor area* is *sprinklered*, or

(b) within spaces having an area not more than 500 m² where such spaces are separated from the remainder of the *floor area* by at least a 1 h *fire separation of noncombustible construction*.

(2) *Partitions of noncombustible construction* referred to in Sentence (1) shall be limited to

- (a) wood studs covered on both sides by *noncombustible* cladding or gypsum wallboard, except that such cladding or wallboard may be covered with paint or tightly adhering paper covering not exceeding 1 mm thickness,
- (b) wood studs covered on both sides by *fire-retardant treated wood* having a *flame-spread rating* of not more than 25,
- (c) glass in wood sash, or
- (d) solid lumber not less than 38 mm thickness.

3.3.5.3. Interior finish material used on the wall or ceiling of every room or space used or intended to be used for *business and personal services occupancy* shall have a *flame-spread rating* of not more than 150. Flame-spread rating

- * **3.3.5.4.** A door between a *public corridor* and adjacent rooms of Group D *occupancy* need not be equipped with a self-closing device where the *building* does not exceed 3 storeys in *building height*. Self-closing devices

*

SUBSECTION 3.3.6. MERCANTILE OCCUPANCY

3.3.6.1. This Subsection applies to *floor areas* or parts thereof used or intended for use as *mercantile occupancies*. Scope

3.3.6.2.(1) In every *building* required to be of *noncombustible construction*, *partitions* of *combustible construction* as described in Sentence (2) may be used within *floor areas* intended for a *mercantile occupancy* where the *partitions* are not required to act as *fire separations*. Partitions

- (a) where the *floor area* is *sprinklered*, or
- (b) where a *floor area* comprising a single tenancy does not exceed 500 m² and is enclosed by a 1 h *fire separation* of *noncombustible construction*.

(2) *Partitions* of *combustible construction* referred to in Sentence (1) shall be limited to

- (a) wood studs covered on both sides by *noncombustible* cladding or gypsum wallboard, except that such cladding or wallboard may be covered with paint or tightly-adhering paper covering not exceeding 1 mm thickness,
- (b) wood studs covered on both sides by *fire-retardant treated wood* having a *flame-spread rating* of not more than 25,
- (c) glass in wood sash, or
- (d) solid lumber not less than 38 mm in thickness.

3.3.6.3. Where any *storey* of a *building* classified as a Group E *major occupancy* is required to be separated from the *storey* above or below by a *fire separation*, openings in an exterior wall located vertically one above the other shall be separated by apron or spandrel walls at least 1 m in height or by a canopy at least 1 m wide at each floor level and such apron, spandrel or canopy shall have a *fire-resistance rating* equivalent to the construction required for the floor assembly and need not be greater than 1 h, except as required in Subsection 3.2.3. Exterior wall openings

3.3.6.4. Interior finish material used on the wall or ceiling of every room or space used or intended to be used for *mercantile occupancy* shall have a *flame-spread rating* of not more than 150. Flame-spread rating

3.3.6.5. 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. Posts or turnstiles

- * **3.3.6.6.** Each *suite* shall be separated from adjoining *suites* by construction 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.

SUBSECTION 3.3.7. INDUSTRIAL OCCUPANCY

3.3.7.1. This Subsection applies to *floor areas* or parts thereof used or intended for use as *industrial occupancies*. Scope

Fire separations	3.3.7.2.(1) Except in Group F, Division 1 <i>major occupancies</i>, every process room * where hazardous substances are used or intended to be used shall be separated from the remainder of the <i>building</i> by a 2 h <i>fire separation</i> unless the room is protected by an <i>acceptable</i> fire extinguishing system. (2) Each <i>suite</i> shall be separated from adjoining <i>suites</i> by construction having a * <i>fire-resistance rating</i> not less than 1 h, except that the <i>fire-resistance rating</i> may be reduced to 45 min if the <i>fire-resistance rating</i> of the floor assembly is permitted to be less than 1 h.
Fire extinguishing equipment	3.3.7.3. In a Group F, Division 1 <i>major occupancy</i>, every <i>floor area</i> shall be equipped with suitable fire extinguishing equipment in accordance with the nature of the risk present in conformance with The Fire Prevention Act and regulations made * pursuant to that Act.
Spaces below grade	3.3.7.4.(1) Basements or cellars 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 <i>exits</i> to basements, cellars and rooms containing <i>building</i> services in <i>buildings</i> involving the storage, manufacture or handling of volatile materials that generate explosive air-vapour mixtures or processes that produce explosive dusts shall be separated from the other parts of the <i>building</i>. Such basements, cellars and rooms shall be separated from other parts of the <i>building</i> with a vapour-tight separation.
Exterior wall openings	3.3.7.5. Where any <i>storey</i> of a <i>building</i> classified as a Group F, Division 1 or 2 <i>major occupancy</i> is required to be separated from the <i>storey</i> above or below by a <i>fire separation</i>, every opening in an exterior wall located vertically above another opening shall be separated by apron or spandrel walls at least 1 m in height or by a canopy at least 1 m wide at each floor level and such apron, spandrel or canopy shall have a <i>fire-resistance rating</i> equivalent to the construction required for the floor assembly and need not be greater than 1 h, except as required in Subsection 3.2.3.
Flame-spread rating	3.3.7.6. Interior finish material used on the wall or ceiling of every room or space used or intended to be used for <i>industrial occupancy</i> shall have a <i>flame-spread rating</i> of not more than 150.
Garages	3.3.7.7.(1) Where access is provided from a <i>storage garage</i> to a stair tower or elevator serving <i>occupancies</i> above the level of the <i>storage garage</i>, such access shall be through a vestibule conforming to Sentence (15). (2) Stairways extending to the roof of a <i>storage garage</i> shall be protected from ice and snow. (3) Mechanical <i>storage garages</i> of not more than 4 <i>storeys</i> in <i>building height</i>, where no persons other than parking attendants are permitted above the <i>street</i> floor level, need not have a <i>fire separation</i> between the <i>exits</i> and the remainder of the <i>building</i>.

(4) Every garage shall be provided with natural or mechanical ventilation in conformance with the requirements of Part 6 to prevent excessive accumulation of carbon monoxide, exhaust fumes or flammable and toxic vapours.

(5) The clear height of every storey in a storage garage shall be at least 2 m.

(6) A continuous curb at least 150 mm in height and a guard at least 1 070 mm in height shall be provided at every garage floor opening and around the perimeter of every floor where the exterior walls are omitted.

(7) The floor finish of every garage shall be of noncombustible material or asphalt.

(8) A standpipe need not be installed in storage garages conforming to Article 3.2.2.50. provided such buildings are not more than 15 m in height.

(9) Only 2 exits located remote from each other need be provided in storage garages conforming to Article 3.2.2.50. provided persons other than parking attendants are not permitted above the street floor level.

(10) Except for a basement in which the floor level is not more than 1 m below grade, and in which at least 25 per cent of the total area of the perimeter walls on each storey is open to the outdoors and distributed to provide cross ventilation, every storey of a storage garage or repair garage located below grade shall be sprinklered.

(11) A repair garage shall be separated from other occupancies by at least a 2 h fire separation. Repair garages

(12) A storage garage shall be separated from other occupancies by at least a 1½ h fire separation. Storage garages

(13) 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 (15). Vestibules

(14) In buildings exceeding 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 (15).

(15) Where access is provided through a vestibule, as required in Sentences (1), (13) and (14), the vestibule shall

- (a) be at least 1.8 m in length,
- (b) be naturally ventilated to outside air in an acceptable manner, or mechanically ventilated at a rate of 14 m³/h for each square metre of floor area, and
- (c) have the openings between the vestibule and an adjoining occupancy provided with self-closing doors having no hold-open devices.

* 3.3.7.8.(1) Facilities for the dispensing of gasoline, or associated products that have a flash point below 38°C as determined by the closed cup method, shall not be installed above any space intended for occupancy. Dispensing of gasoline

* (2) Facilities for the dispensing of gasoline, or associated products that have a flash point below 38°C as determined by the closed cup method, shall not be installed in any building, except that this requirement does not apply to a canopy which is open on at least 75% of its perimeter, or, when acceptable to a building of Group F occupancy that complies with regulations made pursuant to The Fire Prevention Act.

3.3.7.9. Rooms or spaces involving the use of explosive substances shall be ventilated in conformance with Article 3.3.1.14. Ventilation required

SECTION 3.4 REQUIREMENTS FOR EXITS

SUBSECTION 3.4.1. GENERAL REQUIREMENTS

- Scope** 3.4.1.1.(1) *Exit* facilities complying with this Section shall be provided to a public thoroughfare or to an *acceptable* open space with access to a public thoroughfare from every *floor area* which is intended for *occupancy*. (See Appendix A.)
- Separation of exits** (2) Where more than 1 *exit* is required from a *floor area*, each *exit* shall be separate from every other *exit* leading from that *floor area*.
- Access to exits** (3) *Access to exits* shall conform to Section 3.3.
- Types of exits** 3.4.1.2. Subject to the requirements of this Section, an *exit* from any *floor area* shall be one of the following used singly or in combination:
 exterior doorway,
 exterior passageway,
 exterior ramp,
 exterior stairway,
 fire escape (as described in Article 3.4.8.14.),
horizontal exit,
 interior passageway,
 interior ramp, or
 interior stairway.
- Restricted use of exits** 3.4.1.3.(1) *Horizontal exits* shall not comprise more than ½ of the required number of *exits* from any *floor area*.
 (2) A slide escape shall not be erected on any *building* as a required *exit*, but may be provided as an additional egress facility where unusual hazards may exist.
- Transparent doors and panels** 3.4.1.4. Glass and transparent door assemblies accessible to the public, transparent panels, sidelights and windows in *exits*, glass in *exit* doors and side lights for doors within and at the entrance to *dwelling units* shall conform to the requirements in Article 3.3.1.13. for such assemblies in *access to exits*.
 3.4.1.5. *Combustible* glazing shall not be used in wall or ceiling assemblies of an *exit*. *

SUBSECTION 3.4.2. NUMBER AND LOCATION OF EXITS FROM FLOOR AREAS

- Minimum number required** 3.4.2.1.(1) Except as provided in Sentences (2), (3), (4) and (7), every *floor area* as * regulated in Sentence 3.4.1.1.(1) shall be served by not fewer than 2 *exits*.
 (2) In *buildings* not exceeding 2 *storeys* in *building height*, a *floor area* may be served by 1 *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* does not exceed 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 door at or near ground level.

(4) *Exits* from *dwelling units* shall conform to Article 3.3.4.3.

(5) 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, except that 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 $\frac{3}{4}$ h, the travel distance may be measured from an egress door of the room or *suite* to the nearest *exit*.

Travel distance

(6) Except for *mezzanines* that are not required to be enclosed and are of a size permitted in Table 3.3.1.A. to have a single egress, *mezzanines* shall be provided with *exits* on the same basis as required for *floor areas* in this Section.

Mezzanines

* (7) *Service rooms* not more than 150 m² in area, within roof-top enclosures, do not require more than 1 *exit* if there is an alternate egress door leading to a separate *means of egress*.

3.4.2.2.(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

Distance between exits

- 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* serving more than 1 tenant, or
- one half the maximum diagonal dimension of the *floor area*, but not less than 9 m for all other *floor areas*.

(2) The minimum distance between *exits* referred to in Sentence (1) shall be the shortest distance that smoke would have to travel between the required *exits*, assuming that the smoke will not penetrate an intervening *fire separation*.

3.4.2.3.(1) Except as provided in Article 3.4.2.4., where more than 1 *exit* is required from a *floor area*, such *exits* shall be located so that the travel distance to at least 1 *exit* as described in Sentence 3.4.2.1.(5) shall be not more than

Location of exits

- 25 m in any Group F, Division 1 *occupancy*,
- 45 m in any *sprinklered floor area* that contains an *occupancy* other than Group F, Division 1,
- 40 m in any Group D *occupancy*, and
- 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 1 *exit* is required, every *exit* shall be considered as contributing not more than $\frac{1}{2}$ the required units of *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.

(5) Where an assembly hall or *theatre* has more than 1 balcony or gallery, every *exit* stair or ramp leading from a balcony or gallery above the first balcony shall be separate from any other stairway and in a separate enclosure.

Exits for covered malls **3.4.2.4.(1)** Where a covered mall is designed in conformance with Sentence 3.2.3.13.(1) for the purpose of considering a *building* to be subdivided into separate *buildings*, every covered mall shall

- (a) be served by at least 2 *exits* located remote from each other, so that the travel distance from any point within the covered mall to a mall *exit* does not exceed 60 m, and
- (b) have an unobstructed pedestrian travel space at least 3.6 m wide, parallel and adjacent to each connected *building*, and extending to each mall *exit*.

(2) *Exits* from *floor areas* of portions of *buildings* considered as separate *buildings* which adjoin a covered mall as described in Sentence 3.2.3.13.(1) shall not comprise more than ½ of the required units of *exit* width from that *floor area*.

(3) Every required *exit* from a *storey* above a *floor area* adjoining a covered mall shall lead directly to the outdoors where the covered mall is designed in conformance with Sentence 3.2.3.13.(1) for the purpose of considering a *building* to be subdivided into separate *buildings*.

(4) Required *exits* from a covered mall designed in conformance with Sentence 3.2.3.13.(1) for the purpose of considering a *building* to be subdivided into separate *buildings* shall not empty into another such covered mall.

SUBSECTION 3.4.3. WIDTH AND HEIGHT OF EXITS

Exit width **3.4.3.1.(1)** The aggregate width of required *exits* shall be at least the value computed in accordance with Articles 3.4.3.2. and 3.4.3.3.

(2) Except as provided in Sentences (3) to (8), Article 3.4.3.4. and Sentence 3.4.8.14.(9), the clear width of every *exit* shall be at least 900 mm.

(3) The clear width of any corridor used as an *exit* shall be at least 1 100 mm.

(4) The clear width of any *exit* serving patients in bed shall be at least 1 100 mm.

(5) The width of an *exit* stair shall be at least 1 100 mm where the stair serves more than 3 *storeys* above *grade* or more than 1 *storey* below *grade*.

(6) Every door leaf in an *exit* doorway shall be

- (a) not more than 1 219 mm in width,
- (b) not less than 610 mm in width where there is more than 1 leaf provided in the width of a doorway, and
- (c) not less than 813 mm in width if there is only 1 leaf provided in the doorway.

(7) The aggregate width of doorways to *exit* stairways, *exit* ramps and doorways providing direct access to the outside from a *floor area* shall be sufficient to provide the number of units of *exit* width required to serve the *floor area* from which they lead.

(8) Every doorway leading from *exit* stairways and *exit* ramps in the direction of *exit* travel shall provide at least the number of units of *exit* width required for *exit* purposes, but shall not be less in width than ¾ of the width of the stairway or ramp it serves.

3.4.3.2.(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 3.1.14.

Width based on
occupant load

(2) The aggregate width of *exits* from a room or *floor area* expressed as units of *exit* width (550 mm) shall be determined by dividing the *occupant load* of the room or *floor area* by the allowable number of persons per unit of *exit* width specified in Article 3.4.3.3.

(3) In determining the width in units of an individual *exit*, the width of an *exit* in millimetres shall be divided by 550. When the remainder is less than 300 mm, it shall not be considered as contributing to the number of units. Where the remainder is 300 mm or more, it shall be considered as contributing $\frac{1}{4}$ unit of *exit* width in the case of stairs, and $\frac{1}{2}$ unit of *exit* width in the case of other *exit* facilities.

(4) Except as provided in Sentence (5), the required units of *exit* width shall be cumulative where 2 or more *exits* converge.

Cumulative
exit widths

(5) Except as provided in Sentence (6), where an *exit* stair serves 2 or more *floor areas* one above the other, the required units of *exit* width are not cumulative.

(6) The required units of *exit* width for *exit* stairs that serve *interconnected floor spaces* as provided in Articles 3.2.9.3. to 3.2.9.12. shall be cumulative, except where

Exits from
interconnected
floor spaces

- (a) such stairs provide at least 0.3 m² of area of treads and landings for each occupant of the *interconnected floor spaces* (See Appendix A), or
- (b) where protected floor spaces conforming to Article 3.2.9.4. are provided at each floor level and such protected floor spaces provide at least 0.5 m² per occupant of the *interconnected floor spaces*.

3.4.3.3.(1) The aggregate width of required *exits* shall be computed on the basis of the maximum number of persons per unit of *exit* width as specified in Sentences (2) to (5).

Capacity per
unit of exit
width

(2) The number of persons per unit of *exit* width shall be assumed to be 30 in determining the *exit* requirements from *floor areas* containing Group B or Group C *occupancies*.

(3) Except as permitted in Sentences (2) and (4), the number of persons per unit of *exit* width shall be 90 for exterior *exit* doors.

(4) The number of persons per unit of *exit* width for outdoor places of assembly shall conform to Article 3.3.2.11.

(5) Except as provided in Sentences (2) to (4), the number of persons per unit of *exit* width shall be 60.

3.4.3.4.(1) No fixture, turnstile or construction shall project into or be fixed within the required width of any *exit*, except as permitted in Sentences (2) to (4).

Reduction of
exit width

(2) *Exit* doors shall be so hung and arranged that when open they shall neither diminish nor obstruct the required width of the *exit* by more than 50 mm for each full unit of *exit* width.

(3) Swinging doors in their swing shall not reduce the effective width of *exit* stairs or landings to less than 750 mm or reduce the effective width of an *exit* passageway to less than the minimum required width.

(4) No handrail or stair stringer shall project more than 100 mm into the required width of an *exit*.

3.4.3.5.(1) Except as provided in Sentences (2) to (4), every *exit* shall have a * headroom clearance of at least 2 100 mm.

Headroom
clearance

(2) The headroom clearance for stairways measured vertically above any landing or the nosing of any stair tread shall be at least 2 050 mm.

(3) The headroom clearance for doorways shall be at least 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.

SUBSECTION 3.4.4. FLAME-SPREAD RATING FOR EXITS

3.4.4.1.(1) Except as permitted in Sentences (2) and (3), the *flame-spread rating* of a wall or ceiling in an *exit* shall not exceed 25.

(2) The *flame-spread rating* of interior finish for doors, door frames and trim in *exits* may exceed 25 provided such finish has a *flame-spread rating* of not more than 150 and does not exceed 10 per cent of the wall or ceiling areas.

(3) The *flame-spread rating* of the wall finish of a lobby used as an *exit* as permitted in Sentence 3.4.5.1.(5) may exceed 25 provided such finish has a *flame-spread rating* of not more than 150 and does not exceed 25 per cent of the wall area.

SUBSECTION 3.4.5. REQUIRED FIRE SEPARATION FOR EXITS

Grade of fire
separations

3.4.5.1.(1) Except as provided in Sentences (5) and (6) and in Sentence 3.3.7.7.(3), every *exit* shall be separated from the remainder of the *building* it serves by a *fire separation* having a *fire-resistance rating* at least equal to the *fire-resistance rating* required for the floor assemblies of the *storeys* through which it penetrates or which it serves, but in no case shall the *fire-resistance rating* be less than $\frac{3}{4}$ h.

Exposure
protection

(2) 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 a *fire compartment* in the same *building*, the openings in either the exterior wall of the *exit* or the exterior wall of the *floor area* shall be protected with wired glass in fixed steel frames or glass block conforming to Article 3.1.6.8. when the openings in the exterior wall of the *floor area* are within 3 m horizontally and are

- (a) less than 3 *storeys* or 10 m below, or
- (b) less than 2 m above any openings in the exterior wall of the *exit*.

(3) Where an exterior *exit* door may be exposed to the hazards of a fire from openings in a separate *fire compartment* located within 3 m horizontally of the *exit*, such openings shall be protected with wired glass in fixed steel frames or glass block conforming to Article 3.1.6.8.

Exits through
lobbies

(4) Except as provided in Sentence (5) an *exit* from any *floor area* above or below the *first storey* shall not lead through a lobby, including the foyer or entrance hall of another *floor area* at ground level.

(5) Not more than 1 required *exit* from a *floor area* may lead through a lobby, and where the *exit* leads through the lobby

- (a) the lobby floor shall be not more than 4.5 m above *grade*,
- (b) the path of travel through the lobby shall not exceed 15 m,
- (c) the adjacent rooms or premises having direct access to the lobby shall not contain a Group C or Group F *occupancy*,
- (d) the *building* shall not contain a Group B, Division 2 *major occupancy*,
- (e) the lobby shall not be located within an *interconnected floor space* other than as described in Sentence 3.2.9.1.(8), and
- (f) the lobby shall conform in all respects with the requirements for *exits*, except that
 - (i) rooms other than garbage rooms, furnace rooms, boiler rooms, incinerator rooms and storage rooms may open on to 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 the adjacent *occupancies* are *sprinklered*.

(6) The requirements in Sentences (1) and (3) do not apply to an exterior passageway that is designed as an *exit* facility provided the passageway is open to the outdoors and is served by an *exit* stair at each end of the passageway.

Exception for
exterior
passageways

3.4.5.2.(1) Except as may be required by the provisions of Subsection 3.2.6., there shall be no openings in any *fire separation* separating *exits* except *exit* doorways and openings for standpipes.

Integrity of
exits

(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* at least equal to that required for the floor assembly through which they pass.

(3) *Fire separations* separating contiguous stairs in Sentence (2) shall not be pierced by doorways, ductwork, piping or any other openings that affect the continuity of the separation.

(4) An *exit* shall not be used as a *plenum* for a heating, ventilating or air-conditioning system.

(5) An *exit* shall be designed for no purpose other than for exiting, except that an *exit* may also be designed to serve as an access to a *floor area*.

(6) *Service rooms* such as boiler rooms, furnace and incinerator rooms and ancillary rooms such as storage rooms, washrooms, toilet rooms, garbage rooms and laundry rooms shall not open directly into an *exit*.

SUBSECTION 3.4.6. EXIT SIGNS

3.4.6.1.(1) Every *exit* door other than the main entrance to a room or *building* 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*,
- (d) a corridor exceeding 25 m in length and serving patients' or inmates' bedrooms in Group B, Division 2 *occupancies*, or
- * (e) a room, or *floor area* in Group A *occupancies* having an *occupant load* of more than 60 persons, except as provided in Clause 3.3.2.4.(2)(a).

(2) Every *exit* sign required in Sentence (1) shall

- (a) be visible from the *exit* approach,
- (b) have the word EXIT displayed in plain legible letters as described in Sentence (3),
- (c) be designed to be illuminated continuously while the *building* is occupied,
- (d) be connected to an electrical circuit separate from other electrical circuits, and
- (e) be designed to be illuminated by an emergency power supply as described in Sentence 3.2.8.3.(2) where emergency lighting is required in Sentence 3.2.8.3.(1).

(3) Lettering on *exit* signs shall be

- (a) red letters on a contrasting background or white letters on a red background, at least 114 mm high with 19 mm stroke spelling EXIT, when the sign is internally illuminated,
- (b) white letters on a red background or red letters on a white background at least 150 mm in height with 19 mm stroke spelling EXIT, when the sign is externally illuminated.

(4) 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).

*

SUBSECTION 3.4.7. LIGHTING FOR EXITS

3.4.7.1. Lighting for *exits* shall conform to Subsection 3.2.8.

SUBSECTION 3.4.8. TYPES OF EXIT FACILITY

Stairs and
ramps

3.4.8.1. Except when stated otherwise, the requirements in this Section apply to both interior and exterior *exits*.

3.4.8.2.(1) The finish for treads and landings of interior and exterior stairs and ramps accessible to the public shall have non-skid finish or be provided with non-skid strips.

(2) Treads and landings of exterior *exit* stairs more than 10 m in height shall be designed to be free of ice and snow accumulations.

3.4.8.3. Every flight of interior stairs shall have at least 3 risers.

3.4.8.4.(1) No flight of stairs shall have a vertical rise of more than 3.6 m between floors or landings, except that flights of stairs serving as *exits* from rooms intended for *infirm persons* shall have a vertical rise of not more than 2.4 m between floors or landings.

Landings for
stairways

(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 exceed 1 100 mm.

Handrails

3.4.8.5.(1) Every *exit* ramp or stairway shall have a handrail on at least 1 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 exceeds 2 200 mm, 1 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.

(4) 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, except that handrails not meeting these requirements are permitted provided they are installed in addition to the required handrails.

(5) A clearance of at least 40 mm shall be provided between every handrail and any wall to which it is fastened.

(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.

Guards

3.4.8.6.(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 (3), 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 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.

(4) 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 200 mm in buildings of other *occupancy*, except where the location and size of the openings that exceed this limit do not present a hazardous condition.

3.4.8.7. In *buildings* over 2 storeys in *building height*, any part of an *exit* ramp or stair that continues past the *exit* door at ground level to a basement or cellar shall be clearly marked by a sign indicating that it does not lead to an *exit*.

Sign for
basement stair

3.4.8.8.(1) The maximum gradient of ramps shall be

Ramp gradient
and landings

- (a) 1 in 10 in any Group A, B or C *occupancy*,
- (b) 1 to 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.

(2) 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 rampway, and for a distance of 300 mm on either side of the wall opening, excepting one side when it abuts on an end wall.

(3) 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 at least 900 mm.

* **3.4.8.9.(1)** Stair treads shall have a minimum run of 230 mm exclusive of nosing and stair risers shall have a maximum rise of 200 mm and a minimum rise of 125 mm.

Stair treads and
risers

(2) 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.

(3) Where the run of any tread in an *exit* stair is less than 250 mm, a nosing of at least 25 mm shall be provided beyond the face of the riser, or an equivalent back slope on the riser shall be provided.

(4) The front edge of stair treads in *exits* and public access to *exits* shall be at right angles to the direction of *exit* travel.

3.4.8.10. Winders shall not be used in a required *exit*.

Winders

3.4.8.11.(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 persons in wheelchairs and 2.5 m² for bedridden patients.

Horizontal
exits

(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 may not 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 3.4.8.8. may be used.

(4) No stairs or steps shall be used in a *horizontal exit*.

(5) Every opening used as a *horizontal exit* shall be protected by a *closure* consisting of an *acceptable* self-closing door or doors that swing on a vertical axis.

(6) Where 2 doors are provided in a *horizontal exit* they shall

- (a) be mounted adjacent to each other, and
- (b) swing in opposite directions and have signs on each side of the wall to indicate as the *exit* the door that swings in the direction of travel from that side.

Bridges and balconies as horizontal exits

(7) Where *horizontal exits* utilize bridges between *buildings* or outside balconies, such bridges or balconies shall conform to Article 3.2.3.15.

(8) *Guards* shall be at least 1.2 m in height and the least dimension of any opening through the *guard* shall not be greater than 100 mm.

(9) Every opening in the exterior walls of *buildings* to which such bridges or balconies are attached shall be protected, as required for openings adjacent to fire escapes in Sentence 3.4.8.14.(5), except that where bridges have solid sides not less than 1.8 m in height, such protection of wall openings may be omitted.

Exterior passageways

3.4.8.12.(1) Access to exterior passageways from a *floor area* shall be through *exit* doors at the floor level.

(2) Every exterior passageway which has a drop of more than 500 mm on any side shall have *guards* on the open sides at least 1 070 mm high.

Doors

3.4.8.13.(1) No *exit* door shall open immediately onto a flight of stairs, but shall open onto a landing at least 300 mm wider and longer than the width of such door.

(2) No riser of any flight of stairs shall be located within 300 mm of an *exit* door.

(3) No *exit* door shall open directly onto a step except that, where there is danger of blockage from ice or snow, an *exit* door may open onto not more than 1 step which shall not exceed 150 mm in height.

(4) *Exit* doors shall be clearly identifiable and no hangings or draperies shall be placed over *exit* doors to conceal or obscure any *exit*.

Mirrors

(5) No mirrors shall be placed in or adjacent to any *exit* in such a manner as to confuse the direction of *exit*.

Direction of swing

(6) 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.

Self-closing devices

(7) 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 3.1.6.7.(2).

Sliding doors

(8) *Exit* doors leading directly to outdoors at ground level may be sliding doors provided they conform to Sentence 3.3.1.7.(3).

Revolving doors

(9) Where revolving doors are used, they shall

- (a) be *acceptable* collapsible revolving doors,
- (b) have hinged doors providing equivalent units of *exit* width 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.

(10) A revolving door may be considered to provide not more than ½ unit of *exit* width.

(11) Acceptable hardware that will release and allow the door to swing wide open when a force of 90 N is applied to the hardware 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* stairshaft, and every exterior door leading from an *exit* stairshaft 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*.

(12) 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.

(13) Fastenings on any required *exit* door shall be such that the door may be readily opened from the inside without requiring keys, special devices or specialized knowledge of the door opening mechanism, except that this requirement shall not apply to the doors of rooms where persons are under legal restraint.

(14) In *buildings* that are regulated by the provisions of Subsection 3.2.6.

- (a) each door opening into an *exit* stairway shall be identified on the stairway side with the number assigned to that floor,
- (b) doors providing access to *floor areas* into which occupants have to enter in an emergency shall not have locking devices to prevent such entry, and
- (c) it shall be possible at all times at intervals of 5 *storeys* or less in an *exit* stair to pass through an unlocked door from the *exit* stairway into the *floor area*, and each such door shall be suitably identified by a sign on the stairway side.

Emergency
access to floor
areas

(15) Where access to *floor areas* is required in Clause (14)(c), 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*.

3.4.8.14.(1) Except as provided in Sentence (2), fire escapes shall not be erected on *buildings*.

Fire escapes

(2) Where it is impractical to provide 1 or more of the *exit* facilities in Article 3.4.1.2., fire escapes conforming to Sentences (3) to (13) may 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) 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 may be used on *buildings* of *combustible construction* if all posts and brackets are at least 89 mm in their least dimension and all other *woodwork* is at least 38 mm in its least dimension.

(4) Access to fire escapes shall be from corridors through doors at floor level, except that access from a *dwelling unit* may 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.

(5) 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 3.1.6. 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.

(6) Stairs shall be inclined at an angle of not more than 45° with the horizontal, and shall have risers of not more than 210 mm in height and treads of not less than 220 mm in width exclusive of nosing.

(7) Stairway headroom shall be not less than 1 950 mm plus the height of 1 riser measured vertically above the nosing of any tread or platform.

(8) Where doors open onto fire escape balconies, such balconies shall have a clear area of not less than 1 m².

(9) The width of a fire escape shall conform to Sentence 3.4.3.1.(1), except that the fire escape shall be at least 550 mm wide when serving

- (a) not more than 3 *storeys*, and
- (b) not more than 15 persons.

(10) The open sides of every platform, balcony and stairway shall be protected by *guards* at least 920 mm in height measured vertically above the nosing of any tread or platform.

(11) 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 may serve as a handrail if free from obstructions which could break a hand hold.

(12) A wall handrail shall be installed where the fire escape is more than 550 mm in width.

(13) 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 "up" 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.

SECTION 3.5 SERVICE SPACES

SUBSECTION 3.5.1. GENERAL

Scope	3.5.1.1. The provisions of this Section apply to attic, duct, crawl and shaft spaces and <i>service rooms</i> , mechanical penthouses and facilities contained therein.
Design and installation of service facilities.	3.5.1.2. Heating, ventilating and air-conditioning equipment shall be designed and installed in conformance with the requirements in Part 6.
Integrity of fire separations	3.5.1.3. All service facilities passing through required <i>fire separations</i> shall conform to Subsections 3.1.6., 3.1.7., 3.5.3. and 3.5.4. to ensure that the integrity of the <i>fire separation</i> is maintained.
Storage use prohibited	3.5.1.4. <i>Service spaces</i> provided to contain service facilities shall not be designed to facilitate subsequent use as storage space.

SUBSECTION 3.5.2. SERVICE ROOMS

Fire separations	3.5.2.1.(1) Fuel-fired <i>appliances</i> shall not be installed in any <i>exit</i> or any corridor serving as <i>access to exit</i> . (2) Except as provided in Sentences (3) and (4), fuel-fired <i>appliances</i> shall be located in a <i>service room</i> or <i>service space</i> separated from the remainder of the <i>building</i> by a <i>fire separation</i> having a <i>fire-resistance rating</i> of not less than (a) 2 h in <i>buildings</i> classified as Group B or Group F, Division 1 <i>occupancy</i> where such <i>buildings</i> exceed 2 <i>storeys</i> in <i>building height</i> or 400 m ² in <i>building area</i> , and (b) 1 h in <i>buildings</i> other than as described in Clause (a).

(3) No *fire separation* is required for fireplaces or for roof-top *appliances*.

(4) Except for *buildings* classified as Group B or Group F, Division 1 *major occupancy*, the *fire separations* required in Sentence (2) need not be provided for fuel-fired *appliances* where it can be shown that the separation is not necessary and the appliance

(a) serves not more than 1 room or *suite*, or

(b) serves a *building* with a *building area* of not more than 400 m² and a *building height* of not more than 2 *storeys*.

(5) The *fire separation* required by Sentence (2) need not be supported as required in Sentence 3.1.5.4.(1).

3.5.2.2. *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*.

Service rooms
prohibited
under exits

3.5.2.3. *Service rooms* containing *space heating*, *space cooling* and *service water heating appliances* may contain other service equipment such as electrical service equipment.

Service
equipment

3.5.2.4.(1) Except as provided in Sentence (3), *service rooms* used for purposes other than those described in Articles 3.5.2.1., 3.5.2.5. and 3.5.2.6. shall be separated from the remainder of the *building* by a *fire separation* having a *fire-resistance rating* of at least 1 h when the *floor area* containing such rooms is not *sprinklered* and is not intended to contain a hazardous substance.

Service
machinery
rooms

(2) Where the *service room* is intended to contain a hazardous substance the requirements in Article 3.5.2.1. shall apply.

(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* in Sentence (1) shall not apply.

3.5.2.5.(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 at least 2 h.

Incinerator
rooms

(2) *Service rooms* containing an incinerator may contain *building service machinery*.

3.5.2.6. Except as provided in Sentence 3.5.3.2.(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 1 h *fire separation* and be *sprinklered*.

Combustible
refuse

3.5.2.7. 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 used for assembly purposes. (See also Sentence 3.4.5.2.(6).)

Doors to
service rooms

* **3.5.2.8.(1)** Where a transformer vault is required by The Electrical Protection Act and regulations made pursuant to that Act the transformer 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 *sprinklered* or provided with any other *acceptable* automatic fire extinguishing system, and not less than 2 h if the vault is so protected.

Transformer
vaults

(2) Where a *building* is required to be *sprinklered*, the transformer vault described in Sentence (1) need not be *sprinklered* provided

(a) the vault is designed for no purpose other than to contain the transformer and its associated equipment, and

(b) a *smoke detector* is provided in the vault which will actuate the *building alarm system* in the event of a fire in the vault.

(3) Only pipes or ducts necessary for fire protection or the proper operation of the electrical installation shall penetrate the *fire separations* surrounding the transformer vault.

(4) *Acceptable* explosion-relief devices and vents or other protective measures shall be provided for every transformer vault containing an oil-filled transformer in conformance with Sentence 3.3.1.14.(2).

(5) Every transformer vault shall be provided with a ventilation system in conformance with Part 6 designed to prevent the ambient temperature in the vault from exceeding 40°C.

(6) The vault ventilation system 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) Every transformer vault containing an oil-filled transformer shall be equipped with a drainage system in conformance with Part 7.

(8) Doorways in *fire separations* between a transformer vault containing an oil-filled transformer and the remainder of the *building* shall be provided with concrete sills of sufficient height to confine within the vault all the oil from the largest transformer, but which in no case shall be less than 100 mm in height.

Flame-spread
rating

3.5.2.9. The *flame-spread rating* of finishes in *service rooms* shall conform to the appropriate requirements in Subsection 3.3.7. for *industrial occupancies*, and where *buildings* are within the scope of Subsection 3.2.6., the *flame-spread rating* shall conform to Article 3.2.6.7.

SUBSECTION 3.5.3. VERTICAL SERVICE SPACES AND SERVICE FACILITIES

Fire
separations

3.5.3.1.(1) Except as provided by Sentence 3.5.3.2.(2), every *vertical service space* * shall be separated from the remainder of the *building* by a *fire separation* having a *fire-resistance rating* conforming to Table 3.5.3.A. for the grade of *fire separation* required for the floor assemblies of the *storeys* that it penetrates.

Table 3.5.3.A.
Forming Part of Sentence 3.5.3.1.(1)

*

Grade of <i>Fire Separation</i> Floor Assembly h	Minimum <i>Fire-Resistance Rating</i> of <i>Vertical Service Spaces</i> h	Minimum <i>Fire-Resistance Rating</i> of Elevator Shafts h
not more than 1	0.75	0.75
1.5	1	1
2	1	1.5
3	1.5	2
4	2	3
Column 1	2	3

(2) Every *vertical service space* that does not extend through the roof of a *building* shall be enclosed at the top with construction of the same *fire-resistance rating* as the *service space* walls.

(3) 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.

(4) Vents from *vertical service spaces* not extending to the roof shall be enclosed within the *building* with construction having a *fire-resistance rating* at least equal to that required for the *service space* walls.

Openings

(5) Only openings that are necessary for the use of the *vertical service space* shall be permitted in the *service space* enclosure.

(6) The interior finish of every *vertical service space* shall have a *flame-spread rating* of not more than 25, and when constructed in a *building* within the scope of Subsection 3.2.6., shall conform to Article 3.2.6.7.

Flame-spread
rating

- * (7) *Foamed plastic* insulation in *vertical service spaces* shall be protected in conformance with Sentence 3.1.4.5.(2).

Foamed plastic

3.5.3.2.(1) Every linen or refuse chute shall be internally smooth, impervious to moisture, corrosion-resistant and *noncombustible* and shall be located in a shaft in which there are no other services.

Linen and
refuse chutes
and rooms

(2) Every shaft containing a linen or refuse chute shall conform to the requirements of Article 3.5.3.1. and shall be constructed of *noncombustible* materials having a *fire-resistance rating* not less than that required by 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 *acceptable*, 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 at least 1 m above the roof and shall be vented above the roof with a vent which

- (a) has an unobstructed area at least equal to the cross-sectional area of the chute, and
- (b) is equipped with a *closure* or 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) be not greater in area than 60 per cent of the cross-sectional area of the chute, and
- (b) be fitted with *acceptable 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 at least a $\frac{3}{4}$ h *fire separation*, and
- (c) are designed for no other purpose.

- * (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 at least a 1 h *fire separation*.

(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 at least a 2 h *fire separation*.

(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 garbage handling and disposal.

3.5.3.3. Where a *vertical service space* contains an exhaust duct that serves more than 1 *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*.

Negative
pressure
required

SUBSECTION 3.5.4. HORIZONTAL SERVICE SPACES AND SERVICE FACILITIES

Scope	3.5.4.1. This Subsection applies to <i>horizontal service spaces</i> and service facilities, including ceiling spaces, duct spaces, crawl spaces and <i>attic or roof spaces</i> .
Fire separations	3.5.4.2. A <i>horizontal service space</i> that penetrates a required vertical <i>fire separation</i> shall be separated from the remainder of the <i>building</i> it serves in conformance with Sentence 3.1.6.3.(2).
Access	3.5.4.3.(1) <i>Buildings</i> shall be provided with permanent access to the roof if they are more than 4 m in height from <i>grade</i> to roof elevation and have heating, ventilating or air-conditioning equipment installed on the roof. (2) Every <i>attic space</i> more than 600 mm in height shall be provided with access from the floor immediately below by a hatchway at least 550 mm by 900 mm or by a stairway. (3) <i>Horizontal service spaces</i> consisting of ceiling and duct spaces which are more than 1 200 mm in height and 600 mm in width shall have access doors at least 600 mm in both horizontal and vertical dimensions, or shall have inspection doors at least 300 mm in both horizontal and vertical dimensions placed so that the entire interior of the duct or space can be viewed. (4) Every crawl space shall have at least 1 access opening at least 550 mm by 900 mm. (5) <i>Buildings</i> more than 3 storeys in <i>building height</i>, having a roof slope less than 1:4, shall be provided with direct access by an interior stairway to all main roof areas.
Ventilation	3.5.4.4. Every unheated crawl space, <i>attic or roof space</i> shall be ventilated by natural or mechanical means in accordance with Part 9.

SUBSECTION 3.5.5. ELEVATORS, DUMBWAITERS AND ESCALATORS

- 3.5.5.1.(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) Before being placed in service, every elevator, dumbwaiter or escalator installation, including safety and control devices, shall be inspected and tested in accordance with The Elevator and Fixed Conveyances Act and regulations made pursuant to that Act.
- (3) Elevators in *buildings* within the scope of Subsection 3.2.6. shall conform to Article 3.2.6.3.

SECTION 3.6 HEALTH REQUIREMENTS

SUBSECTION 3.6.1. HEIGHT AND AREA OF ROOMS

- 3.6.1.1.(1)** The height of every room and space shall be such that adequate light and air may be provided for the intended *occupancy*, and that no obstruction to movement or activities below is caused by the ceiling or ceiling fixtures.
- (2) The unobstructed height in *dwelling units* shall conform to Part 9.
- 3.6.1.2.** The areas and widths of rooms in *dwelling units*, dormitories, boarding houses and rooming houses shall conform to Part 9.

SUBSECTION 3.6.2. WINDOWS

- 3.6.2.1.** Unless otherwise *accepted* every room used for sleeping in any *building*, and every principal room such as living room, dining room or combination thereof in *dwelling units*, shall be provided with windows in conformance with Part 9.

SUBSECTION 3.6.3. VENTILATION

3.6.3.1. Ventilation shall conform to Part 6.

SUBSECTION 3.6.4. PLUMBING FACILITIES

3.6.4.1.(1) Each *building* situated on property that abuts on a *street* in which a public or municipal water main is located shall be provided with or have accessible to its occupants a *plumbing system* including a potable water supply, a *sanitary drainage system* and toilet fixtures.

Systems
required

(2) When the installation of a *sanitary drainage system* is not possible because of the absence of a water supply, sanitary privies, chemical closets or other means for the disposal of human waste shall be provided.

3.6.4.2.(1) Water closets shall be provided for each sex in accordance with the anticipated proportion of each sex in the *occupancy* when this can be determined with reasonable accuracy, except that when such a determination cannot be made with reasonable accuracy, it shall be assumed that the *occupancy* is equally divided between the sexes.

Minimum
number of
fixtures

(2) Where water closets are required in this Subsection, urinals may be substituted for $\frac{2}{3}$ of the required number of water closets and may be counted as water closets, except that where only 2 water closets are required, 1 urinal may be substituted for 1 of the water closets.

(3) Except as provided in Sentence (4), at least 1 lavatory shall be provided in a room containing 1 or 2 water closets or urinals, and at least 1 additional lavatory shall be provided for each additional 2 such fixtures.

(4) Wash fountains in circular form may be provided in lieu of lavatories required in Sentence (3) provided each 500 mm of its circumference is considered to be equivalent of 1 lavatory.

(5) The number of water closets required for Group A, Division 1, 3 and 4 *occupancies* and for auditoria, gymnasias, lecture halls, secondary schools, non-residential colleges and similar *occupancies* shall conform to Table 3.6.4.A.

* (6) Except as provided in Sentence (13), 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, court rooms and similar *occupancies* shall conform to Table 3.6.4.B.

Table 3.6.4.A.
Forming Part of Sentence 3.6.4.2.(5)

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 200 males over 400	9 plus 1 for each additional 150 females over 400
Column 1	2	3

(7) The number of water closets required for primary schools shall be at least 1 * fixture for each 30 males and 1 fixture for each 25 females.

(8) The number of water closets required for places of worship and undertaking premises shall be at least 1 fixture for each 150 persons of each sex.

(9) The number of water closets required for Group B, Division I *occupancies* shall * be determined on the basis of the special needs of such *occupancies*.

(10) Except as provided in Sentence (13), the number of water closets required for *residential occupancies* shall be at least 1 fixture for each 10 persons of each sex, except that *dwelling units* shall conform to the requirements in Part 9.

(11) Except as provided in Sentence (13), the number of water closets required for *mercantile occupancies* shall be at least 1 fixture for each 300 males and 1 fixture for each 150 females.

Table 3.6.4.B.
Forming Part of Sentence 3.6.4.2.(6)

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 50 persons of each sex over 50	*
Column 1	2	

(12) Except as provided in Sentence (13), the number of water closets required for Group B, Division 2 *occupancies*, Group D *occupancies*, establishments primarily serving * alcoholic beverages, including lounges, taverns and clubs, and *industrial occupancies* shall conform to Table 3.6.4.C.

Table 3.6.4.C.
Forming Part of Sentence 3.6.4.2.(12)

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 30 persons of each sex over 100	*
Column 1	2	

Exception for
small occupant
load

(13) Where the *occupant load* in an *occupancy* described in Sentences (6), (10), (11) and (12) does not exceed 10 persons, both sexes may be served by 1 water closet.

(14) Where mobile homes do not have individual sanitary facilities connected to a central water supply and drainage system, a service *building* shall be provided for public use and shall contain at least 1 water closet for each sex where the facilities serve not more than 10 mobile homes, and where the facilities serve more than 10 mobile homes, an additional water closet for each sex shall be provided for each additional 10 mobile homes.

Service
building for
mobile homes

(15) Where a service *building* is required by Sentence (14), it shall contain lavatories as required in Sentence (3) and at least

- (a) 1 laundry tray or similar facility, and
- (b) 1 bathtub or shower for each sex.

- * (16) Unless otherwise *accepted* the minimum number of water closets shall be determined according to Article 3.6.4.2. for the *occupant load* of the *occupancy* calculated from Table 3.1.14.A., except that for Group D *occupancies* the *occupant load* shall be calculated by assuming a net area of 14 m² for each person.
- * (17) The number of water closets required for dining rooms, restaurants and banquet rooms shall be at least 1 fixture for each 35 males and 1 fixture for each 25 females, except that in washrooms provided for males at least one urinal shall be provided if the male portion of the *occupant load* is more than 20 persons and this urinal shall be in addition to the one water closet required when the male portion of the *occupant load* is not more than 35 persons.
- * (18) Facilities provided for employees may be counted as part of those required for the *occupancy* if those facilities are made accessible to the public.
- * (19) Except for facilities provided for handicapped persons, every cubicle containing a water closet shall have a minimum depth of 1 400 mm and a minimum width of 800 mm.
- * (20) Every urinal shall be installed so that water from the urinal cannot run onto the floor beneath the fixture or onto the walls.
- * (21) 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.
- * (22) No water closet or urinal shall be installed in a room used for sleeping unless *accepted*.
- * (23) No water closet or urinal shall be installed in a basement unless *acceptable* light and ventilation are provided.
- * (24) Every room containing sanitary facilities serving one sex only shall be enclosed by a full height door that shall be clearly marked to show the sex served.
- * (25) Rooms providing separate water closets or urinals for more than 1 male or female shall be designed so that the water closets or urinals are not visible if the doors to the rooms open onto a place where persons of the other sex work or pass.

3.6.4.3. Glass, other than safety glass, shall not be used for a shower or bathtub enclosure.

Glass around
showers or
bathtubs

- * 3.6.4.4. In every *barrier free building* where more than 2 water closets are required, at least 1 washroom shall be provided that is designed for and is accessible to physically handicapped persons in conformance with the appropriate provisions in the ACNBC publication, "Building Standards for the Handicapped 1980."

Washrooms for
handicapped
persons

SUBSECTION 3.6.5. MEDICAL GAS PIPING SYSTEMS

3.6.5.1. Non-flammable medical gas piping systems shall be installed in conformance with CSA Z305.1-1975, "Non-Flammable Medical Gas Piping Systems."

- * 3.6.5.2.(1) Upon completion of the installation of, or the *alteration* of, a non-flammable medical gas piping system in a *new* or *existing building*

- (a) the non-flammable medical gas piping system shall be inspected and tested in conformance with CSA Standard Z305.1-1975, "Non-flammable 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 non-flammable medical gas piping system.

3.6.5.3.(1) A non-flammable medical gas piping system shall not be used until the report * required by Clause 3.6.5.2.(1)(b) has

- (a) been certified by the person making the report that the non-flammable medical gas piping that is the subject of the report conforms to CSA Standard Z305.1-1975, "Non-flammable Medical Gas Piping Systems", and
- (b) in the case of a hospital, been filed with and accepted by the Director of Design and Construction, Hospital Services, Department of Hospitals and Medical Care.

3.6.5.4. If an *alteration* is made to an existing non-flammable 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 Z305.1-1975, "Non-flammable Medical Gas Piping Systems", are affixed to both the existing system and the *alteration*.

3.6.5.5. Types of air compressors other than water sealed rotary types may be *accepted* * if *alterations* are being made to existing non-flammable medical gas piping systems.

PART 4

DESIGN

TABLE OF CONTENTS

SECTION 4.1 STRUCTURAL LOADS AND PROCEDURES

Subsection 4.1.1.	General	137
Subsection 4.1.2.	Specified Loads and Effects	138
Subsection 4.1.3.	Working Stress Design	138
Subsection 4.1.4.	Limit States Design	139
Subsection 4.1.5.	Dead Loads	140
Subsection 4.1.6.	Live Loads Due to Use and Occupancy	141
Subsection 4.1.7.	Live Loads Due to Snow and Rain	144
Subsection 4.1.8.	Live Loads Due to Wind	145
Subsection 4.1.9.	Live Loads Due to Earthquakes	147
Subsection 4.1.10.	Other Effects	154

SECTION 4.2 FOUNDATIONS

Subsection 4.2.1.	General	155
Subsection 4.2.2.	Subsurface Investigations, Drawings and Reviews	156
Subsection 4.2.3.	Materials Used in Foundations	157
Subsection 4.2.4.	Design Requirements	158
Subsection 4.2.5.	Excavations	159
Subsection 4.2.6.	Shallow Foundations	159
Subsection 4.2.7.	Deep Foundations	160
Subsection 4.2.8.	Special Foundations	160

SECTION 4.3 WOOD

Subsection 4.3.1.	General	161
Subsection 4.3.2.	Design Requirements	161

SECTION 4.4 PLAIN AND REINFORCED MASONRY

Subsection 4.4.1.	General	161
Subsection 4.4.2.	Design Requirements	161

**SECTION 4.5 PLAIN, REINFORCED AND PRESTRESSED
CONCRETE**

Subsection 4.5.1.	General	162
Subsection 4.5.2.	Design Requirements	162

SECTION 4.6 STEEL

Subsection 4.6.1.	General	162
Subsection 4.6.2.	Design Requirements	162

SECTION 4.7 ALUMINUM

Subsection 4.7.1.	General	162
Subsection 4.7.2.	Design Requirements	163

PART 4 DESIGN

SECTION 4.1 STRUCTURAL LOADS AND PROCEDURES

SUBSECTION 4.1.1. GENERAL

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

Definitions in Part 4

4.1.1.2.(1) Words that appear in italics in this Part are defined in Part 1.

Designer

(2) The *designer* shall be a professional engineer or architect as appropriate under provincial or territorial legislation.

Design Requirements

4.1.1.3.(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.)

Minimum safety, performance and integrity

(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.

Loads during construction

(3) 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. *Buildings* and their structural members shall be designed in conformance with Parts 4 and 5.
(See Subsection 2.6.2. for other methods of design.)

Design basis

4.1.1.5.(1) Structural members shall be specified so that their deflections under specified loads will be acceptable with regard to

Deflections

- (a) the intended use of the *building* or member,
- (b) possible damage to nonstructural members and materials whose physical properties are known at the time of the design, and
- (c) possible damage to the structure itself.

(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. (See Appendix A.)

Sway effects

(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.

Lateral deflection of buildings due to wind

(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 Sections 4.3 to 4.7. (See Appendix A.)
	(6) The deflection limits required in Sentence (5) do not apply to industrial <i>buildings</i> or sheds if it is known by experience that greater movement is acceptable. (See Appendix A.)
Vibrations of floors	4.1.1.6.(1) Special considerations shall be given to floor systems susceptible to vibration to ensure that such vibration is acceptable for the intended <i>occupancy</i> of the <i>building</i> . (See Appendix A.)
Lateral vibrations of tall buildings	(2) Unusually flexible <i>buildings</i> and <i>buildings</i> whose ratio of height to minimum effective width exceeds 4 to 1 shall be investigated for lateral vibrations under dynamic wind load, and lateral accelerations of the <i>building</i> shall be checked to ensure that such accelerations are acceptable to the intended <i>occupancy</i> of the <i>building</i> . (See Appendix A.)
Stability	4.1.1.7. 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.
Drawings and related documents	4.1.1.8. Structural drawings and related documents shall conform to the appropriate requirements of Part 2. (See Subsection 2.4.4.)

SUBSECTION 4.1.2. SPECIFIED LOADS AND EFFECTS

Loads	4.1.2.1.(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 <i>building</i> and its structural members and connections: D—<i>dead loads</i> as provided for in Subsection 4.1.5. L—<i>live load</i> due to intended use and <i>occupancy</i> (includes vertical loads due to cranes); snow, ice and rain; earth and hydrostatic pressure; horizontal components of static or inertia forces. Q—<i>live load</i> 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.
Loads not listed	4.1.2.2.(1) Where a <i>building</i> 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 do not affect the structural safety and serviceability, they need not be considered in the calculations.
Structural design	4.1.2.3. Structural design shall be carried out in accordance with Subsection 4.1.3., "Working Stress Design" or Subsection 4.1.4., "Limit States Design."

SUBSECTION 4.1.3. WORKING STRESS DESIGN

Load combinations	4.1.3.1. In designing <i>buildings</i> 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 <i>building</i>, <i>foundation</i> or structural member concerned, when appropriately reduced according to Article 4.1.3.2.: (i) D (ii) D + L

- (iii) $D + Q$
- (iv) $D + T$
- (v) $D + L + Q$
- (vi) $D + L + T$
- (vii) $D + Q + T$
- (viii) $D + L + Q + T$

4.1.3.2.(1) The total of the combined load effects may be multiplied by the following load combination factors:

- (a) 1.0 for combinations (i) to (iv),
- (b) 0.75 for combinations (v) to (vii), and
- (c) 0.66 for combination (viii).

Load
combination
factors

4.1.3.3. 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.)

Stress reversal

4.1.3.4.(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.

Overturning
and sliding

(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.

SUBSECTION 4.1.4. LIMIT STATES DESIGN

(See Appendix A.)

4.1.4.1.(1) In this Subsection, the term

Terms

(a) limit states means those conditions of a *building* structure in which the *building* ceases to fulfil the function for which it was designed,

(Those states concerning safety are called ultimate limit states and include exceeding the load carrying capacity, overturning, sliding, fracture and fatigue, while those states which restrict the intended use and *occupancy* of the *building* are called serviceability limit states, and include deflection, vibration, permanent deformation and cracking.)

- (b) specified loads (D , L , Q and T) mean those loads defined in Article 4.1.2.1. and given in this Section,
- (c) load factor, α , means a factor in Sentence 4.1.4.2.(4) applied to a specified load which, for the limit states under consideration, takes into account the variability of the loads and load patterns and analysis of their effects,
- (d) factored load means the product of a specified load and its load factor,
- (e) load combination factor, 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) performance 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 performance factor.

Safety check
for strength
and stability

4.1.4.2.(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).

Effect of
factored loads

(3) Except as provided in Sentence (8), 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

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

Load factors

(4) The load factors, α , shall be equal to

- (a) $\alpha_D = 1.25$ or, in cases of overturning, uplift and stress reversal 0.85,
- (b) $\alpha_L = 1.5$,
- (c) $\alpha_Q = 1.5$, and
- (d) $\alpha_T = 1.25$.

Load
combination
factor

(5) The load combination factor, ψ , shall be equal to

- (a) 1.0 when only 1 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.

Importance
factor

(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.

Concrete
buildings

(8) For concrete *buildings*, the load factors and load combination factors to establish the effect of factored loads shall be determined in accordance with CSA CAN3-A23.3-M77, "Code for the Design of Concrete Structures for Buildings."

Serviceability
and fatigue

4.1.4.3.(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 Sections 4.3, 4.4, 4.5, 4.6 and 4.7.

(2) Where more than 1 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).

SUBSECTION 4.1.5. DEAD LOADS

Dead loads

4.1.5.1.(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, including permanent *partitions*,
- (c) the weight of permanent equipment, and
- (d) forces due to prestressing.

Non-
permanent
partitions

(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 shall be determined from the actual or anticipated weight of the *partitions* placed in any probable position, but shall be not less than 1 kN/m² over the area of floor being considered.

(4) *Partition* loads used in design shall be shown on the drawings as provided in Clause 2.4.4.3.(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.

SUBSECTION 4.1.6. LIVE LOADS DUE TO USE AND OCCUPANCY

4.1.6.1. 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 4.1.6.4., whichever produces the most critical effect.

Loads due to
use of floors
and roofs

4.1.6.2.(1) Where the use of an area of floor 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

Uses not
stipulated

- (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.(1) The uniformly distributed load shall be not less than the values listed in Table 4.1.6.A., reduced as may be provided for in Sentences (5) or (6), applied uniformly over the entire area, or on any portions of the area, whichever produces the most critical effects in the members concerned.

Full and partial
loading

(2) Corridors, lobbies and aisles not over 1 200 mm in width and all upper floor corridors of residential areas of apartments, hotels and motels shall be designed to carry not less than the specified load required for the *occupancies* they serve.

(3) Equipment areas and service rooms, factories, storage areas, warehouses and underground slabs with earth cover 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) 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.

More than one
occupancy

(5) Where a structural member supports a tributary area of floor, roof or combination of these greater than 80 m² used for storage, manufacturing, retail stores, garage or assembly, the specified *live load* due to use and *occupancy*, excluding snow, is the load provided for in Sentence (1) multiplied by

Variation with
tributary area

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

where A is the tributary area in square metres for this type of use and *occupancy* excluding the area supporting snow.

(6) 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 those indicated in Sentence (5), the specified *live load* due to use and *occupancy*, excluding snow, is the load provided for in Sentence (1) multiplied by

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

where B is the tributary area in square metres for this type of use and *occupancy* excluding the area supporting snow. (See Appendix A.)

Table 4.1.6.A.
Forming Part of Sentence 4.1.6.3.(1)

Use of Area of Floor or Roof	Minimum Specified Load, kN/m ²
Assembly areas with fixed seats that have backs over at least 80 per cent of the assembly area and including <i>Auditoria</i> <i>Churches</i> <i>Classrooms (also without fixed seats)</i> <i>Courtrooms</i> <i>Lecture halls</i> <i>Theatres</i> and other areas with similar uses	2.4
Assembly areas other than those listed above, including <i>Arenas</i> <i>Balconies</i> <i>Churches</i> <i>Dance floors</i> <i>Dining areas</i> <i>Foyers and entrance halls</i> <i>Grandstands, reviewing stands and bleachers</i> <i>Gymnasias</i> <i>Museums</i> <i>Promenades</i> <i>Rinks</i> <i>Stadia</i> <i>Stages</i> <i>Theatres</i> and other areas with similar uses	4.8
Attics having limited accessibility so that there is no storage of equipment or material	0.5
Balconies, exterior and interior	4.8
Corridors, lobbies and aisles over 1 200 mm wide (except upper floor corridors of residential areas of apartments, hotels and motels)	4.8
Corridors, lobbies and aisles not over 1 200 mm in width and all upper floor corridors of residential areas only of apartments, hotels and motels	(1)
Equipment areas and service rooms including <i>Generator rooms</i> <i>Mechanical equipment exclusive of elevators</i> <i>Machine rooms</i> <i>Pump rooms</i> <i>Transformer vaults</i> <i>Ventilating or air-conditioning equipment</i>	3.6 ⁽²⁾
Column 1	2

Table 4.1.6.A. (Cont'd)

Use of Area of Floor or Roof	Minimum Specified Load, kN/m ²
<i>Exits</i> and fire escapes	4.8
Factories	6.0 ⁽²⁾
Garages for	
Passenger cars	2.4
Unloaded buses and light trucks	6.0
Loaded buses and trucks and all other trucking spaces	12.0
Kitchens (other than residential)	4.8
Libraries	
Stack rooms	7.2
Reading and study rooms	2.9
Office areas in office buildings and other buildings (not including record storage and computer rooms) located in	
Basement and first floor	4.8
Floors above first floor	2.4
Operating rooms and laboratories	3.6
Recreation areas that cannot be used for assembly purposes including	
Billiard rooms	
Bowling alleys	
Pool rooms	3.6
Residential areas	
Sleeping and living quarters in apartments, hotels, motels, boarding schools, colleges and hospitals	1.9
Retail and wholesale areas	4.8
Roofs	1.0 ⁽³⁾
Sidewalks and driveways over areaways and basements	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 Sentence 4.1.6.3.(2).⁽²⁾ See Sentence 4.1.6.3.(3).⁽³⁾ See Article 4.1.7.1.

4.1.6.4. 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 ef-

Concentrated loads

fects, 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 4.1.6.4.

Area of Floor or Roof	Minimum Specified Concentrated Load, kN
Roof surfaces	1.3
Floors of classrooms	4.5
Floors of offices, manufacturing <i>buildings</i> , 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

Bleacher seats

4.1.6.5. 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.

Heliports

4.1.6.6. Helicopter landing areas on roofs shall be constructed in conformance with the regulations for Heliports established by Transport Canada.

SUBSECTION 4.1.7. LIVE LOADS DUE TO SNOW AND RAIN

Ground snow load

4.1.7.1. The specified load due to the accumulation of snow on a surface shall be not less than the ground snow load determined in conformance with Subsection 2.3.1., decreased or increased as provided for in Articles 4.1.7.2. to 4.1.7.4., but in no case shall the roof load be less than 1 kN/m² for roofs with a slope of 30° or less.

Roof snow load

4.1.7.2.(1) The specified snow load on a roof or other *building* surface subject to loads due to snow accumulation shall be determined by multiplying the ground snow load given in Article 4.1.7.1. by appropriate snow load-coefficient C_s given in Articles 4.1.7.3. and 4.1.7.4.

Full and partial loading

(2) A roof or other *building* surface and its structural members subject to loads due to snow accumulation shall be designed for the following snow load distributions:

- (a) specified load distributed over the entire area,
- (b) specified load distributed on any one portion of the area and half of this load on the remainder of the area, in such a way as to produce the greatest effects on the member concerned, and
- (c) where appropriate, more severe load imbalances than given in Clause (b) which may result from such effects as snow removal or melting of snow due to roof fans or uninsulated roof areas in heated *buildings*.

4.1.7.3.(1) Except for roofs exposed to wind as provided for in Article 4.1.7.4., the basic snow load coefficient, C_s , is 0.8, which shall be increased or decreased to account for the following influences:

Snow load
coefficients

- (a) the decrease of snow load because of the effect of slope for roof slopes exceeding 30° ,
- (b) the accumulation of nonuniform snow load on gable and hip roofs,
- (c) the accumulation of nonuniform snow load on arched and curved roofs,
- (d) the accumulation of increased snow loads in valleys of butterfly as well as multispans curved or sloped roofs,
- (e) the accumulation of increased nonuniform snow loads due to drifting snow on the lower of 2-level or multi-level roofs, such as a canopy, marquee or porch roof provided the upper roof is part of the same *building* or of an adjacent *building* not more than 5 m away,
- (f) the accumulation of increased nonuniform snow loads on areas adjacent to roof projections such as penthouses, large *chimneys* and ventilating equipment, and
- (g) the accumulation of increased snow or ice loads on areas due to snow sliding or melt water draining onto these areas from an adjacent roof sloping towards this area so that the magnitude and distribution of the increase are appropriate to the relative portions and sizes of the surfaces. (See Appendix A.)

4.1.7.4.(1) The basic snow load coefficient of 0.8 may be reduced to 0.6 provided the *designer* has satisfactorily demonstrated that the following conditions are fulfilled:

Roofs exposed
to wind

- (a) the *building* is located in an exposed location such as open level terrain with only scattered *buildings*, trees or other obstructions, so that the roof is exposed to the winds on all sides and is not likely to become shielded in the future by obstructions higher than the roof within a distance from the *building* equal to 10 times the height of the obstruction above the roof level, and
- (b) the roof does not have any significant projection such as parapet walls, which exceed a height in metres of S_o divided by 4 where S_o is the ground snow load in kN/m^2 , which may prevent snow from being blown off the roof.

4.1.7.5.(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 2.3.1. over the horizontal projection of the surface and all tributary surfaces. (See Appendix A.)

Rain loads

(2) The provisions of Sentence (1) apply whether or not the surface is provided with drainage, such as rain water leaders.

(3) Loads due to rain need not be considered to act simultaneously with loads due to snow.

SUBSECTION 4.1.8. LIVE LOADS DUE TO WIND

4.1.8.1.(1) The specified external pressure or suction due to wind on part or all of a surface of a *building* shall be calculated from

External
pressure or
suction

$$p = qC_eC_gC_p$$

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.

Net wind load
on whole
building

(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 suctions and the areas of the surfaces over which they are averaged as provided in Sentence (1). (See Appendix A.)

Internal
pressure or
suction

(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 either

$$(a) p_i = qC_eC_{pi}$$

or

$$(b) p_i = qC_eC_gC_{pi}$$

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.

Formula (b) shall be used if the *building* has large openings such that the effects of wind gusts are transmitted to the internal air space of the *building*. In the design of cladding adequate allowance shall be made for regions of high local external pressures or suctions. (See Appendix A.)

Reference
velocity
pressure

(4) The reference velocity pressure, q , is the appropriate value determined in conformance with Subsection 2.3.1. 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.

Exposure
factor

(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.)

Gust effect
factor

(6) The gust effect factor C_g is one of the following values:

- (a) 2.0 for the *building* as a whole and main structural members,
- (b) 2.5 for small elements including cladding, or
- (c) 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.)

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

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.(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

Dynamic effects of wind

- (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.(1) *Buildings* and structural members shall be capable of withstanding the effects of

Full and partial loading

- (a) the full wind load over the entire area, or
- (b) 0.75 times the full wind load acting over any portion of the area and full load on the rest of the area,

whichever produces the greatest effect on the *building* or member concerned.

4.1.8.4.(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

Interior walls and partitions

- (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*.

SUBSECTION 4.1.9. LIVE LOADS DUE TO EARTHQUAKES

4.1.9.1.(1) The specified loading due to earthquake motion shall be determined

Types of analysis

- (a) by the analysis given in this Subsection, or
- (b) by a dynamic analysis provided that the acceleration ratio, A , is not less than that determined in conformance with Subsection 2.3.1. and provided that the dynamically determined value of V is not less than 90 per cent of that determined by the analysis of Clause (a). (See Appendix A.)

(2) In this Subsection

Nomenclature

A = acceleration ratio = the ratio of the specified horizontal ground acceleration to the acceleration due to gravity.

D = the dimension of the *building* in a direction parallel to the applied forces.

D_n = plan dimension of the *building* in the direction of the computed eccentricity.

- D_x = the dimension of the lateral force-resisting system in a direction parallel to the applied forces.
 e = distance between the location of the resultant of all forces at and above the level being considered and the centre of rigidity at the level being considered.
 e_x = design eccentricity at level x .
 F = foundation factor as given in Sentence 4.1.9.1.(10).
 F_t = portion of V to be concentrated at the top of the structure as defined in Sentence 4.1.9.1.(12).
 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.
 I = importance factor of the structure as described in Sentence 4.1.9.1.(9).
 J = numerical reduction coefficient for base overturning moment as defined in Sentence 4.1.9.1.(19).
 J_x = numerical reduction coefficient for moment at level "x" as defined in Sentence 4.1.9.1.(20).
 K = numerical coefficient that reflects the material and type of construction, damping, ductility and/or energy-absorptive capacity of the structure as given in Sentence 4.1.9.1.(7).
 Level i = any level in the *building*, $i=1$ 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 = the total number of *storeys* above exterior *grade* to level "n". (N is usually numerically equal to n .)
 S = seismic response factor for the structure as defined in Sentence 4.1.9.1.(5).
 S_p = horizontal force factor for part or portion of a *building*, as given in Table 4.1.9.C.
 T = fundamental period of vibration of the *building* or structure in seconds in the direction under consideration.
 V = minimum lateral seismic force at the base of the structure.
 V_p = lateral force on a part of the structure.
 W = *dead load* including the following:
 25 per cent of the design snow load specified in Subsection 4.1.7.;
 for areas used for storage, the full design live load modified according to Sentence 4.1.6.3.(5); 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.

Direction of
forces

(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.)

Lateral seismic
force

(4) The minimum lateral seismic force, V , assumed to act nonconcurrently in any direction on the *building* shall be equal to the product of

$$A \cdot S \cdot K \cdot I \cdot F \cdot W$$

where A is the acceleration ratio, determined in conformance with Subsection 2.3.1., and the value of this ground acceleration is assumed constant within each seismic zone as defined in the Commentary on Effects of Earthquakes in Chapter 4 of the "Supplement to the NBC 1980." (See Appendix A.)

(5) The seismic response factor, S , shall be equal to $0.5/\sqrt{T}$ but need not exceed 1.00.

Seismic
response factor

(6) Except where technical data proves otherwise, the fundamental period, T , in Sentence (5) shall be equal to $0.09h_n/\sqrt{D}$ where h_n and D are in metres, except that 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, the fundamental period, T , shall equal 0.1 N.

Fundamental
period

(7) Except as provided for in Sentence 4.1.9.3.(1), values of the numerical coefficient, K , shall conform to Table 4.1.9.A. (See Appendix A.)

Types of
construction

(8) For the purpose of applying Table 4.1.9.A.

- (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 (See Appendix A.),
- (c) A ductile flexural wall shall mean a ductile flexural member cantilevering from the *foundation* consisting of a ductile reinforced concrete wall designed and detailed according to CAN3-A23.3-M77, "Code for the Design of Concrete Structures for Building," Chapter 19, Special Provisions for Seismic Design, and
- (d) Shear walls shall mean either flexural walls or shear walls as defined in CAN3-A23.3-M77, "Code for the Design of Concrete Structures for Buildings," Chapter 19, Special Provisions for Seismic Design.

(9) The importance factor, I , shall equal 1.3 for all *post-disaster buildings* and schools, and 1.0 for all other *buildings*.

Importance
factor

(10) The foundation factor, F , shall conform to Table 4.1.9.B., except that the product FS need not exceed 1.

Foundation
factor

(11) The weight, W , of the structure shall be calculated in accordance with the following formula:

Weight of
structure

$$W = \sum_{i=1}^n W_i$$

(12) The total lateral seismic force, V , shall be distributed as follows:

Distribution of
lateral seismic
force

- (a) a portion F_t shall be assumed to be concentrated at the top of the structure and equal to $0.004V(h_n/D_s)^2$, except that F_t need not exceed 0.15 V and may be considered as zero for $(h_n/D_s) \leq 3$,
- (b) the remainder, $V - F_t$, shall be distributed along the height of the *building* including the top level in accordance with the following formula:

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

- (c) the total shear in any horizontal plane shall be distributed to the various elements of the lateral force-resisting system in proportion to their rigidities with due regard to the capacities and stiffnesses of the nonstructural elements.

Table 4.1.9.A.
Forming Part of Sentence 4.1.9.1.(7)

Case	Type or Arrangement of Resisting Elements	Value of K
1	<i>Buildings</i> with a ductile moment-resisting space frame with the capacity to resist the total required force.	0.7
2	<i>Buildings</i> with a dual structural system consisting of a complete ductile moment-resisting space frame and ductile flexural walls designed in accordance with the following criteria: The frames and ductile flexural walls shall resist the total lateral force in accordance with their relative rigidities considering the interaction of the flexural walls and frames. In this analysis the maximum shear in the frame must be at least 25 per cent of the total base shear.	0.7
3	<i>Buildings</i> with a dual structural system consisting of a complete ductile moment-resisting space frame and shear walls or steel bracing designed in accordance with the following criteria: (a) The shear walls or steel bracing acting independently of the ductile moment-resisting space frame shall resist the total required lateral force. (b) The ductile moment-resisting space frame shall have the capacity to resist not less than 25 per cent of the required lateral force, but in no case shall the ductile moment-resisting space frame have a lower capacity than that required in accordance with the relative rigidities.	0.8
4	<i>Buildings</i> with ductile flexural walls and <i>buildings</i> with ductile framing systems not otherwise classified in this Table as Cases 1, 2, 3 or 5.	1.0
5	<i>Buildings</i> with a dual structural system consisting of a complete ductile moment-resisting space frame with masonry infilling designed in accordance with the following criteria: (a) The wall system comprising the infilling and the confining elements acting independently of the ductile moment-resisting space frame shall resist the total required lateral force. (b) The ductile moment-resisting space frame shall have the capacity to resist not less than 25 per cent of the required lateral force.	1.3
6	<i>Buildings</i> (other than Cases 1, 2, 3, 4 and 5) of continuously reinforced concrete, structural steel or reinforced masonry shear walls.	1.3
7	<i>Buildings</i> of unreinforced masonry and all other structural systems except Cases 1 to 6 inclusive and those set forth in Table 4.1.9.C.	2.0
Col. 1	2	3

Table 4.1.9.A. (Cont'd)

Case	Type or Arrangement of Resisting Elements	Value of K
8	Elevated tanks plus full contents, on 4 or more cross-braced legs and not supported by a <i>building</i> , designed in accordance with the following criteria: (a) The minimum and maximum value of the product SKI shall be taken as 1.2 and 2.5, respectively. (b) For overturning, the factor J as set forth in Sentence 4.1.9.1.(19) shall be 1.0. (c) The torsional requirements of Sentence 4.1.9.1.(21) shall apply.	3.0
Col. 1	2	3

(See Appendix A.)

Table 4.1.9.B.
Forming Part of Sentence 4.1.9.1.(10)

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

(13) Parts of *buildings* as described in Table 4.1.9.C. and their anchorage shall be designed for a lateral force, V_p , equal to AS_pW_p , distributed according to the distribution of mass of the element under consideration.

(14) Except as provided in Sentences (15) to (18), the values of S_p in Sentence (13) shall conform to Table 4.1.9.C.

(15) The value of S_p in Sentence (13), acting in any direction, for towers, *chimneys*, smokestacks and penthouses when connected to or forming part of a *building* having a h/D ratio equal to or greater than 5 shall be 4.5.

(16) The value of S_p in Sentence (13), acting in any direction, for pipes and containers plus contents for toxic or explosive materials, for materials having a flash point below 38°C or for fire fighting fluids shall be 15, except that where a tank plus contents rests on the ground within a *building*, the value of S_p shall be 3.0.

(17) Floors and roofs acting as diaphragms shall be designed for a minimum force corresponding to a value of S_p equal to 1.0 applied to loads tributary from that *storey*, unless a greater force F_x is assigned to the level under consideration as in Sentence (12).

- (18) 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.

Table 4.1.9.C.
Forming Part of Sentence 4.1.9.1.(14)

Category	Part or Portion of <i>Building</i>	Direction of Force	Value of S_p
1	All exterior and interior walls except those of category 2 and 3	Normal to flat surface	2
2	Cantilever parapet and other cantilever walls except retaining walls	Normal to flat surface	10
3	Exterior and interior ornamentations and appendages	Any direction	10
4	Machinery, fixtures and equipment, pipes, and tanks plus contents when connected to or forming part of a <i>building</i> (See Appendix A.)	Any direction	10
5	Towers, chimneys, smokestacks and penthouses when connected to or forming part of a <i>building</i> (See Appendix A.)	Any direction	3
6	Tanks plus contents when resting on the ground within a <i>building</i>	Any direction	2
7	Floors and roofs acting as diaphragms	Any direction	1
8	Connections for exterior and interior walls and elements, except those forming part of the main structural system	Any direction	25
Column 1	2	3	4

Overturning

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

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

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

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

The incremental changes in the design overturning moments, in the *storey* under consideration, shall be distributed to the various resisting elements in the same proportion as the distribution of shears in the resisting system. Where other vertical members are provided which are capable of partially resisting the overturning moments, a redistribution may be made to these members if framing members of sufficient strength and stiffness to transmit the required loads are provided. Where a vertical-resisting element is discontinuous, the overturning moment carried by the lowest *storey* of that element shall be carried down as loads to the *foundation*.

Torsional moments

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

$$M_{ix} = \left(V - \sum_{i=1}^x F_i \right) e_x \quad (\text{See Appendix A.})$$

(22) The design eccentricity, e_x , in Sentence (21) shall be computed by one of the following equations, whichever provides the greater stresses:

- (a) $e_x = 1.5e + 0.05D_n$, or
 (b) $e_x = 0.5e - 0.05D_n$.

Design
eccentricity

$$\text{Where } e = \frac{\sum_{i=x}^N F_i e_{ix}}{\sum_{i=x}^N F_i}$$

F_i = the lateral force applied at level i ,
and

e_{ix} = the distance between the centre of
mass at floor i and the centre of rigid-
ity at floor x .

(23) When the maximum design eccentricity exceeds $0.25D_n$,

- (a) a dynamic analysis shall be made, or
 (b) the adverse effects of torsion as computed in Sentence 4.1.9.1.(21) shall be doubled. (See Appendix A.)

(24) The *building* design shall take full account of the possible effects of setbacks. (See Appendix A.)

Setbacks

4.1.9.2.(1) Lateral deflections of a *storey* relative to its adjacent *storeys* shall be considered in accordance with accepted practice.

General
provisions

(2) Lateral deflections of a *storey* relative to its adjacent *storeys* obtained from an elastic analysis using the loads given in Sentence 4.1.9.1. (12) shall be multiplied by 3 to give realistic values of anticipated deflections.

(3) 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 4.1.9.2.(2).

(4) 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.

(5) To prevent collision of *buildings* in an earthquake, adjacent structures shall either be separated by twice the sum of their individual deflections obtained from an elastic analysis using the loads given in Sentence 4.1.9.1.(12) or shall be connected to each other.

(6) The method of connection in Sentence (5) shall take into account the mass, stiffness, strength, ductility and anticipated motion of the connected *buildings* and the character of the connection.

(7) The connected *buildings* in Sentence (5) shall be assumed to have a K value equal to that of the least ductile of the *buildings* connected, unless a lower value can be justified by rational analysis.

(8) Except in seismic Zone 0, *pile* footings of every *building* or structure shall be interconnected continuously by ties in at least 2 directions, designed to carry by tension or compression a horizontal force equal to 10 per cent of the larger *pile* cap

Special
Provisions

loading, unless it can be demonstrated that equivalent restraints can be provided by other means.

4.1.9.3.(1) *Buildings* more than 3 storeys in height in seismic Zones 2 and 3 shall have a structural system as described in Cases 1 to 6 of Table 4.1.9.A., and in seismic Zone 3, for *buildings* more than 60 m in height with a structural system of Case 6 the value of K shall be increased to 2.0.

(2) The design for any structural system which has an assigned value of K of 1 or less 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.

(3) For *buildings* in Zones 2 and 3 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.

(4) In seismic Zones 2 and 3, reinforcement conforming to Clause 3.1.19. of CAN3-S304-M78, "Masonry Design and Construction 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 per sq metre in weight, and
 - (ii) do not exceed 3 m in height and are laterally supported at the top.

SUBSECTION 4.1.10. OTHER EFFECTS

Loads on
guards

4.1.10.1.(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 guard rails 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, and
- (e) a 0.55 kN concentrated load applied at any point for industrial catwalks and other areas where crowding by many people is very 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 kN/m² 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).

Inertia sway
forces

4.1.10.2. 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, stadium and theatre balconies, shall be designed to resist a horizontal force equal to at least 0.3 kN/m of seats acting parallel to each row of seats, and at least 0.15 kN/m acting at right angles to each row of seats, assuming such forces to be acting independently of each other.

4.1.10.3.(1) The minimum specified load due to equipment, machinery or other objects or persons that may produce impact, is the total of the weight of the equipment or machinery plus its maximum lifting capacity, or the appropriate *live load*, multiplied by an appropriate factor listed in Table 4.1.10.A.

Impact and vibrations

(2) Where dynamic effects such as resonance and fatigue are likely to be important as a result of vibration, a dynamic analysis shall be carried out.

Table 4.1.10.A.
Forming Part of Article 4.1.10.3.(1)

Impact Due to	Factor
Operation of motor driven cranes	1.25
Operation of hand driven cranes	1.10
<i>Live loads</i> on hanger supported floors and stairs	1.33
Operation of elevators	See regulations made pursuant to The Elevator and Fixed Conveyances Act
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

- 4.1.10.4.(1)** The minimum horizontal specified loads on crane runway rails are
- (a) the lateral force which shall be
 - (i) for power-operated crane trolleys, 20 per cent, and for hand operated trolleys, 10 per cent of the sum of the weights of the lifted loads and of the crane trolley, excluding other parts of the crane,
 - (ii) applied at the top of the rail, one-half on each side of the runway, and
 - (iii) considered as acting in either direction normal to the runway rail, and
 - (b) the longitudinal force which shall be
 - (i) 10 per cent of the maximum wheel loads of the crane, and
 - (ii) applied at the top of the rail.

Horizontal crane loads

4.1.10.5.(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.

Bleachers

(2) Telescopic bleachers shall be provided with locking devices to ensure stability while in use.

SECTION 4.2 FOUNDATIONS

SUBSECTION 4.2.1. GENERAL

4.2.1.1. This Section applies to *excavations* and *foundation* systems for *buildings*.

SUBSECTION 4.2.2. SUBSURFACE INVESTIGATIONS, DRAWINGS AND REVIEWS

4.2.2.1. A *subsurface investigation* shall be carried out, which shall include *groundwater* conditions. (See Appendix A.)

Subsurface investigation

4.2.2.2. Drawings associated with *foundations* and *excavations* shall conform to the appropriate requirements of Part 2.
(See Article 2.4.4.6.)

4.2.2.3.(1) A review shall be carried out by the *designer* or by another suitably qualified person to ensure that the subsurface conditions are consistent with the

Review

design and that construction is carried out in accordance with the design and good engineering practice.

- (2) The review required in Sentence (1) shall be carried out
 - (a) on a continuous basis
 - (i) during the construction of all *deep foundation units* with all pertinent information recorded for each unit, and
 - (ii) during the installation and removal of retaining structures and related backfilling operations, and
 - (b) as required, unless otherwise directed by the *authority having jurisdiction*,
 - (i) in the construction of all *shallow foundation units*, and
 - (ii) in excavating, dewatering and other related works. (See Appendix A.)

Altered
subsurface
conditions

4.2.2.4.(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*.

SUBSECTION 4.2.3. MATERIALS USED IN FOUNDATIONS

Wood

4.2.3.1. Wood used in *foundations* or in support of *soil* or *rock* shall conform with the appropriate requirements of Section 4.3.

Preservative
treatment of
wood

4.2.3.2.(1) Wood exposed to *soil* or air above the lowest anticipated *groundwater* table shall be treated with preservative in conformance with CSA O80-1974, "Wood Preservation" and the requirements of the appropriate commodity standard as follows:

- (a) CSA O80.2-1974, "Preservative Treatment of Lumber, Timbers, Bridge Ties and Mine Ties by Pressure Processes,"
- (b) CSA O80.3-1974, "Preservative Treatment of Piles by Pressure Processes," or
- (c) CSA O80.15-1974, "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-M4-1974, "Instructions for the Care of Pressure-Treated Wood After Treatment."

Plain and Reinforced Masonry

4.2.3.3. Plain or reinforced masonry used in *foundations* or in support of *soil* or *rock* shall conform with the requirements of Section 4.4.

4.2.3.4. 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.

Concrete

4.2.3.5. Plain, reinforced or prestressed concrete used in *foundations* or in support of *soil* or *rock* shall conform with the requirements of Section 4.5.

Chemical
attack on
concrete

4.2.3.6. Where concrete in *foundations* may be subject to chemical attack, it shall be treated in conformance with the requirements in CAN3-A23.1-M77, "Concrete Materials and Methods of Concrete Construction."

Steel

4.2.3.7. Steel used in *foundations* or in support of *soil* or *rock* shall conform with

the appropriate requirements of Sections 4.5 or 4.6, unless otherwise specified in Section 4.2.

4.2.3.8. 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:

- CSA G40.21-M1978, "Structural Quality Steels,"
- * ASTM A252-80, "Welded and Seamless Steel Pipe Piles,"
- * ASTM A283-79, "Low and Intermediate Tensile Strength Carbon Steel Plates, Shapes and Bars,"
- * ASTM A570-79, "Hot-Rolled Carbon Steel Sheet and Strip, Structural Quality," or
- ASTM A611-72 (1979), "Steel, Cold-Rolled Sheet, Carbon, Structural."

Steel piles

4.2.3.9. Where high strength steel is used for tendons in anchor systems used for the permanent support of a *foundation* or in the erection of temporary support of *soil* or *rock* adjacent to an *excavation*, it shall conform with the requirements of CAN3-A23.1-M77, "Concrete Materials and Methods of Concrete Construction."

High strength steel tendons

4.2.3.10. Where conditions are corrosive to steel, adequate protection of exposed steel shall be provided.

(See Subsection 2.6.1. for other materials)

Corrosion of steel

SUBSECTION 4.2.4. DESIGN REQUIREMENTS

4.2.4.1.(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:

Basis of design for foundations

- (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. 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*.

Subsurface investigation

4.2.4.3. 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.

Identification and classification of soil, rock and groundwater

4.2.4.4. The *foundation* of a *building* shall be capable of resisting all loads as stipulated in Section 4.1.

Loads on foundations

4.2.4.5. 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.

Total and differential movement

4.2.4.6.(1) The *bearing surface* of a *foundation* shall be below the level of any potential damage, including damage resulting from *frost action*, except as provided in Sentence (2), and the *foundation* shall be designed to prevent damage resulting from *adfreezing*.

Depth of foundations

(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*.

Sloping ground	4.2.4.7. Where a <i>foundation</i> is to rest on, in or near sloping ground, this particular condition shall be provided for in the design.
Eccentric and inclined loads	4.2.4.8. Where there is eccentricity or inclination of loading in <i>foundation units</i> , this effect shall be fully investigated and provided for in the design.
Dynamic loading	4.2.4.9. Where dynamic loading conditions apply, <i>allowable loads</i> or <i>allowable bearing pressures</i> shall be assessed by a special investigation of these conditions.
Hydrostatic uplift	4.2.4.10. Where a <i>foundation</i> or any part of a <i>building</i> is subject to hydrostatic uplift, the effects shall be provided for in the design.
Water table change	4.2.4.11. Where proposed construction will result in a temporary or permanent change in the <i>groundwater level</i> , the effects of this change on adjacent property shall be fully investigated and provided for in the design.
Permafrost	4.2.4.12. Where conditions of permafrost or perennially frozen <i>soil</i> or <i>rock</i> are encountered or proven to exist, the design of the <i>foundation</i> shall be based upon analysis of these conditions by a person especially qualified in that field of work.
Swelling and shrinking soil	4.2.4.13. Where swelling or shrinking <i>soils</i> , 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.
Expanding and deteriorating rock	4.2.4.14. Where <i>rock</i> 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.
Construction on fill	4.2.4.15.(1) <i>Buildings</i> may be placed on <i>fill</i> if it can be shown by <i>subsurface investigation</i> that (a) the <i>fill</i> is or can be made capable of supporting the <i>design loads</i>, (b) detrimental movement of the <i>building</i> or services leading to the <i>building</i> will not occur, and (c) explosive gases can be controlled or do not exist.
Structural design of foundations	4.2.4.16. The structural design of the <i>foundation</i> of a <i>building</i> , the procedures and construction practices shall conform with the appropriate Sections of this Code unless otherwise specified in Section 4.2.

SUBSECTION 4.2.5. EXCAVATIONS

Excavation design	4.2.5.1. The design of <i>excavations</i> and of supports for the sides of <i>excavations</i> shall conform with the requirements of Subsection 4.2.4. and to this Subsection. (See Appendix A.)
Excavation construction	4.2.5.2.(1) Every <i>excavation</i> 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. 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.

Supported excavations

4.2.5.4. 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.

Unsupported excavations

4.2.5.5. Surface water, all *groundwater*, *perched groundwater* and in particular *artesian groundwater* shall be kept under control at all stages of *excavation* and construction.

Control of water around excavations

4.2.5.6. At all stages of *excavation* and construction, loss of ground due to water or any other cause shall be prevented.

Loss of ground

4.2.5.7. 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.

Protection and maintenance at excavations

4.2.5.8.(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.

Backfilling

(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.

SUBSECTION 4.2.6. SHALLOW FOUNDATIONS

4.2.6.1. The design of *shallow foundations* shall be in conformance with Subsection 4.2.4. and the requirements of this Subsection. (See Appendix A.)

Design of shallow foundations

4.2.6.2. 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*.

Foundation support

4.2.6.3. 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 2.4.4.7.

Incorrect placement of shallow foundations

4.2.6.4. 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 2.4.4.7.

Damaged shallow foundation unit

SUBSECTION 4.2.7. DEEP FOUNDATIONS

4.2.7.1. A *deep foundation unit* shall provide support for a *building* by transferring loads by end-bearing to a competent stratum at considerable depth below the structure, or by mobilizing resistance by adhesion or friction, or both, in the *soil* or *rock* in which it is placed. (See Appendix A.)

General

4.2.7.2.(1) *Deep foundation units* shall be designed in conformance with Subsection 4.2.4. and this Subsection. (See Appendix A.)

Design of deep foundations

Load testing of deep foundations	(2) Where <i>deep foundation units</i> are load tested as required in Clause 4.2.4.1.(1)(c), an adequate number of load tests shall be carried out in accordance with ASTM D 1143-74, "Piles under Axial Compressive Load" or other acceptable methods, and the results interpreted by a person especially qualified in this field of work.
Deep foundations not load tested	(3) Where <i>deep foundation units</i> 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.
Allowable load	4.2.7.3.(1) The <i>allowable load</i> on a <i>deep foundation</i> 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 <i>foundation units</i> and group effects, and (d) other requirements of this Subsection. (2) The <i>allowable load</i> on a <i>deep foundation</i> as determined in Sentence (1) shall not be greater than the unfactored load determined on the basis of structural considerations in accordance with the appropriate requirements of Sections 4.3, 4.5 and 4.6. (3) The portion of a <i>deep foundation unit</i> permanently in contact with <i>soil</i> or <i>rock</i> shall be structurally designed as a laterally supported compression member. (4) The portion of a <i>deep foundation unit</i> in contact with air or water shall be structurally designed as a laterally unsupported compression member. (5) The structural design of prefabricated <i>deep foundation units</i> shall allow for all stresses resulting from driving, handling and testing.
Tolerance in location and alignment	4.2.7.4. Permissible deviations from the design alignment and the location of the top of <i>deep foundation units</i> shall be determined by design analysis, and shall be indicated on the drawings.
Incorrect location or alignment	4.2.7.5. Where a <i>deep foundation unit</i> has not been placed within the permissible deviations referred to in Article 4.2.7.4., the condition of the <i>foundation</i> shall be assessed by the person responsible for the design, any necessary changes made and action taken as required in Article 2.4.4.7.
Installation of deep foundations	4.2.7.6.(1) <i>Deep foundation units</i> shall be installed in such a manner as not to impair (a) the strength of the <i>deep foundation units</i> and the properties of the <i>soil</i> or <i>rock</i> on or in which they are placed beyond the calculated or anticipated limits, (b) the integrity of previously installed <i>deep foundation units</i>, or (c) the integrity of neighbouring structures and services.
Damaged deep foundation unit	4.2.7.7. Where inspection shows that a <i>deep foundation unit</i> is damaged or not consistent with design or good engineering practice, the <i>allowable load</i> 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 2.4.4.7.
SUBSECTION 4.2.8. SPECIAL FOUNDATIONS	
Special foundation systems	4.2.8.1. Where special <i>foundation systems</i> are used, such systems shall conform to Subsection 4.2.4. and Section 2.6.
Use of existing foundations	4.2.8.2. Existing <i>foundations</i> may be used to support new or altered <i>buildings</i> provided they comply with all pertinent requirements of Section 4.2.

SECTION 4.3 WOOD

SUBSECTION 4.3.1. GENERAL

Scope

4.3.1.1. This Section applies to *buildings* and their structural members made from wood with respect to structurally graded lumber, lumber not structurally graded, glued-laminated timber, plywood, piling, pole construction and major fastenings.

Minimum Safety and Performance

4.3.1.2. *Buildings* and their structural members shall be designed to resist effectively all effects of loads and influences that may be expected, and shall satisfy the requirements of Section 4.1.

4.3.1.3. In areas known to be infested by termites, the requirements in Articles 9.3.2.10., 9.12.1.1., 9.15.5.1., 9.16.8.1. and 9.18.4.1. shall apply.

SUBSECTION 4.3.2. DESIGN REQUIREMENTS

4.3.2.1. Except as provided in Subsection 2.6.2., *buildings* and their structural * members made of wood shall conform to CAN3-O86-M1980, "Code for Engineering Design in Wood."

4.3.2.2. Glued-laminated members shall be fabricated in plants conforming to CSA O177-1977, "Qualification Code for Manufacturers of Structural Glued-Laminated Timber."

SECTION 4.4 PLAIN AND REINFORCED MASONRY

SUBSECTION 4.4.1. GENERAL

Scope

4.4.1.1. This Section applies to *buildings* and their structural members made from plain or reinforced masonry.

Minimum Safety and Performance

4.4.1.2. *Buildings* and their structural members shall be designed to resist effectively all effects of loads and influences that may be expected, and shall satisfy the requirements of Section 4.1.

SUBSECTION 4.4.2. DESIGN REQUIREMENTS

4.4.2.1. Except as provided in Subsection 2.6.2., *buildings* and their structural members made of plain and reinforced masonry shall conform to CAN3-S304-M78, "Masonry Design and Construction for Buildings."

SECTION 4.5 PLAIN, REINFORCED AND PRESTRESSED CONCRETE

SUBSECTION 4.5.1. GENERAL

Scope

4.5.1.1. This Section applies to *buildings* and their structural members made from plain, reinforced and prestressed concrete whether precast or cast in place.

Minimum Safety and Performance

4.5.1.2. *Buildings* and their structural members shall be designed to resist effectively all effects of loads and influences that may be expected, and shall satisfy the requirements of Section 4.1.

SUBSECTION 4.5.2. DESIGN REQUIREMENTS

4.5.2.1. Except as provided in Subsection 2.6.2., *buildings* and their structural members made of plain, reinforced and prestressed concrete shall conform to CAN3-A23.3-M77, "Code for the Design of Concrete Structures for Buildings." (See Appendix A.)

SECTION 4.6 STEEL

SUBSECTION 4.6.1. GENERAL

Scope

4.6.1.1. This Section applies to *buildings* and their structural members made from structural and cold formed steel.

Minimum Safety and Performance

4.6.1.2. *Buildings* and their structural members shall be designed to resist effectively all effects of loads and influences that may be expected, and shall satisfy the requirements of Section 4.1.

SUBSECTION 4.6.2. DESIGN REQUIREMENTS

4.6.2.1. Except as provided in Subsection 2.6.2., *buildings* and their structural members made of structural steel shall conform to CSA S16-1969, "Steel Structures for Buildings," or CAN3-S16.1-M78, "Steel Structures for Buildings-Limit States Design."

4.6.2.2. Except as set forth in Subsection 2.6.2., *buildings* and their structural members made of cold formed steel shall conform to CSA S136-1974, "Cold Formed Steel Structural Members." (See Appendix A.)

SECTION 4.7 ALUMINUM

SUBSECTION 4.7.1. GENERAL

Scope

4.7.1.1. This Section applies to *buildings* and their structural members made from structural and light gauge aluminum.

Minimum Safety and Performance

4.7.1.2. *Buildings* and their structural members shall be designed to resist effectively all effects of loads and influences that may be expected, and shall satisfy the requirements of Section 4.1.

SUBSECTION 4.7.2. DESIGN REQUIREMENTS

4.7.2.1. Except as provided in Subsection 2.6.2., *buildings* and their structural members made of structural aluminum shall conform to CSA S157-1969, "Structural Use of Aluminum in Buildings."

4.7.2.2. Except as provided in Subsection 2.6.2., *buildings* and their structural members made of light gauge aluminum shall conform to CSA S190-1968, "Design of Light Gauge Aluminum Products."

PART 5

WIND, WATER AND VAPOUR PROTECTION

TABLE OF CONTENTS

Section 5.1	General	167
Section 5.2	Control of Condensation	167
Section 5.3	Control of Wind and Rain Penetration	167
Section 5.4	Control of Groundwater	168
Section 5.5	Materials	169
Section 5.6	Practices	169

PART 5 WIND, WATER AND VAPOUR PROTECTION

SECTION 5.1 GENERAL

SUBSECTION 5.1.1. SCOPE

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

5.1.1.2. 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.

5.1.1.3. The design and structural requirements of other Parts of this Code shall apply.

SECTION 5.2 CONTROL OF CONDENSATION

SUBSECTION 5.2.1. VAPOUR AND AIR BARRIERS

5.2.1.1. Where a *building* assembly is to be subjected to a temperature differential and differential in water vapour pressure and will be adversely affected by condensation, the assembly shall be designed to prevent condensation by providing a continuous vapour and air barrier in the assembly on the high vapour pressure side of the material that has the major thermal resistance.

5.2.1.2. 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 2.6)

SECTION 5.3 CONTROL OF WIND AND RAIN PENETRATION

SUBSECTION 5.3.1. JOINTS

5.3.1.1. Joints in *exterior cladding* and the junctions of different *exterior claddings* shall be constructed to minimize the entrance of rain water into the *building* assembly.

SUBSECTION 5.3.2. AIR INFILTRATION AND EXFILTRATION

5.3.2.1. Components of a *building* assembly shall be so constructed as to limit the amount of air infiltration and exfiltration at junctions of components.

SUBSECTION 5.3.3. OPENINGS

5.3.3.1. An opening in an exterior wall or roof shall be so constructed as to prevent the entrance of rain or snow into the *building*.

SUBSECTION 5.3.4. ROOFING

5.3.4.1.(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.

SUBSECTION 5.3.5. PARAPETS

5.3.5.1.(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 the cap of the wall and at such other points in the wall as are necessary to divert to the outside rainwater that has penetrated.

SUBSECTION 5.3.6. EXTERIOR WALL CLADDING

5.3.6.1. Exterior wall cladding shall be so installed that it sheds water to prevent its entry into other components of the *building* assembly. Where there is a likelihood of some penetration, drainage shall be provided to take water to the outside.

SECTION 5.4 CONTROL OF GROUNDWATER

SUBSECTION 5.4.1. THROUGH-WALL FLASHING

5.4.1.1. 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.

SUBSECTION 5.4.2. DAMPPROOFING AND WATERPROOFING

5.4.2.1. The portion of an exterior basement or cellar wall below ground level or any floor slab in contact with the ground shall be dampproofed or waterproofed as appropriate in accordance with the requirements in Part 9 where such wall or floor is not impervious to water.

SUBSECTION 5.4.3. CRAWL SPACES

5.4.3.1. Crawl spaces shall be provided with a ground cover in conformance with Part 9.

5.4.3.2. 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 5.5 MATERIALS

SUBSECTION 5.5.1. SPECIFICATIONS

5.5.1.1. A material used for *exterior cladding*, vapour barrier, flashing, thermal insulation or fastening device shall comply with the appropriate material requirements as set forth in the appropriate Sections of Parts 3, 4 and 9.

SUBSECTION 5.5.2. DETERIORATION

5.5.2.1. A material exposed to corrosive conditions shall be corrosion-resistant or shall be resistant to deterioration under those conditions.

SUBSECTION 5.5.3. FASTENING DEVICES

5.5.3.1. Fastening devices shall be made of a material which is compatible with the materials to be so joined and shall be resistant to the type of corrosion likely to be present.

SECTION 5.6 PRACTICES

SUBSECTION 5.6.1. INSTALLATION

5.6.1.1. Except as provided in Article 5.6.1.2. for glass, where a material is used for *exterior cladding*, vapour barrier, thermal insulation, sheathing paper, flashing or fastening device, the practices to be followed in installing it shall be in accordance with the requirements set forth in the appropriate Sections of Parts 3, 4 and 9.

5.6.1.2. Glass shall be designed and installed to resist the loads specified in Section 4.1. (See Appendix A.)

5.6.1.3.(1) *Exterior cladding* shall be securely fastened to backing that is

- (a) an integral structural element of a *building*, or
- (b) an element added to the structure for the purpose of supporting such *exterior cladding*.

(2) Backing for *exterior cladding* as provided for in Sentence (1) shall be suitably located, secured and of a kind suitable for the type of fasteners to be used for attachment.

5.6.1.4. *Exterior cladding* shall be designed, constructed and attached so as to accommodate stresses and deformations within the structure, the cladding system and all points of attachment caused by wind, earthquake and temperature effects. (See Appendix A.)

PART 6

HEATING, VENTILATING AND AIR-CONDITIONING

TABLE OF CONTENTS

SECTION 6.1 GENERAL

Subsection 6.1.1.	Scope	173
Subsection 6.1.2.	Application	173
Subsection 6.1.3.	Definitions	173
Subsection 6.1.4.	Minimum Metal Thickness	173
Subsection 6.1.5.	Plans and Specifications	173

SECTION 6.2 DESIGN AND INSTALLATION

Subsection 6.2.1.	General	173
Subsection 6.2.2.	Ventilation	175
Subsection 6.2.3.	Air Duct Systems	176
Subsection 6.2.4.	Heating Appliances, General	180

Subsection 6.2.5.	Boilers and Furnaces using Solid Fuel	181
Subsection 6.2.6.	Stoves, Ranges, Space Heaters and Service Water Heaters Using Solid Fuel	185
Subsection 6.2.7.	Incinerators	186
Subsection 6.2.8.	Indirect Service Water Heaters and Unit Heaters	186
Subsection 6.2.9.	Radiators and Convectors	187
Subsection 6.2.10.	Piping For Heating and Cooling Systems	187
Subsection 6.2.11.	Refrigerating Systems and Equipment for Air-Conditioning	188
Subsection 6.2.12.	Storage Bins	188

SECTION 6.3 CHIMNEYS AND VENTING EQUIPMENT

Subsection 6.3.1.	General	189
Subsection 6.3.2.	Rectangular Brick Masonry Chimneys	190
Subsection 6.3.3.	Radial Brick Masonry Chimneys	191
Subsection 6.3.4.	Reinforced Concrete Chimneys	191
Subsection 6.3.5.	Metal Chimneys	191
Subsection 6.3.6.	Factory-Built Chimneys	192
Subsection 6.3.7.	Chimney Flues	192
Subsection 6.3.8.	Flue Pipes and Breechings for Appliances Burning Solid Fuel	193

SECTION 6.4 SERVICE SHAFTS AND CHUTES

Subsection 6.4.1.	General	195

PART 6 HEATING, VENTILATING AND AIR-CONDITIONING

SECTION 6.1 GENERAL

SUBSECTION 6.1.1. SCOPE

6.1.1.1.(1) The scope of this Part shall be as described in Subsection 2.1.2.

(2) Repairs, adjustments or component replacements that change the capacity or extent of safety of an existing heating, ventilating or air-conditioning system and that alter the method of operation shall conform to this Code. Repairs or adjustments

SUBSECTION 6.1.2. APPLICATION

6.1.2.1. This Part applies to systems and equipment for heating, ventilating and air-conditioning services.

6.1.2.2.(1) *Service water heaters* shall conform to the appropriate requirements in this Part and in Part 7.

* (2). Pressure vessels shall conform to The Boilers and Pressure Vessels Act and regulations made pursuant to that Act.

SUBSECTION 6.1.3. DEFINITIONS

6.1.3.1. Words that appear in italics are defined in Part 1.

SUBSECTION 6.1.4. MINIMUM METAL THICKNESS

6.1.4.1. Where reference documents in this Part specify metal thickness by gauge, the equivalent thickness in millimetres, including allowance for negative tolerance, shall conform to Table 6.1.4.A.

SUBSECTION 6.1.5. PLANS AND SPECIFICATIONS

6.1.5.1. Plans, specifications and other information for heating, ventilating and air-conditioning systems shall conform to Subsection 2.4.5.

SECTION 6.2 DESIGN AND INSTALLATION

SUBSECTION 6.2.1. GENERAL

6.2.1.1. Heating, ventilating and air-conditioning systems shall be designed, constructed and installed to conform to good engineering practice such as described in the ASHRAE Guide and Data Books, the ASHRAE Handbooks, the HRA Digest and the Hydronics Institute Manuals. Good engineering practice

* 6.2.1.2.(1) Heating and air-conditioning equipment shall be installed to 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,
- (c) The Electrical Protection Act and regulations made pursuant to that Act,
- (d) The Fire Prevention Act and regulations made pursuant to that Act, and
- (e) CSA B52-M1977, "Mechanical Refrigeration Code."

Table 6.1.4.A.
Forming Part of Article 6.1.4.1.

Gauge No.	Minimum Thickness of Sheet Metal, mm			
	Galvanized Steel	Uncoated Steel	Stainless Steel	Aluminum Alloy
	GSG	MSG	USSG	B&SG
6	—	4.67	—	3.71
7	—	4.34	—	3.25
8	4.04	3.96	4.01	2.92
9	3.66	3.61	3.61	2.69
10	3.28	3.23	3.28	2.39
11	2.90	2.85	2.92	2.13
12	2.52	2.46	2.54	1.88
13	2.13	2.08	2.18	1.65
14	1.78	1.70	1.80	1.45
15	1.65	1.52	1.63	1.27
16	1.47	1.35	1.45	1.12
17	1.35	1.19	1.30	0.99
18	1.19	1.09	1.14	0.86
19	1.04	0.97	0.99	0.76
20	0.91	0.84	0.86	0.66
21	0.84	0.76	0.76	0.58
22	0.76	0.69	0.69	0.53
23	0.69	0.61	0.61	0.48
24	0.61	0.53	0.56	0.41
25	0.53	0.46	0.48	0.36
26	0.48	0.41	0.41	0.31
27	0.43	0.36	0.36	0.28
28	0.41	0.33	0.36	0.23
29	0.36	—	0.31	0.20
30	0.33	—	0.28	0.20
Column 1	2	3	4	5

Design conditions

6.2.1.3. The outside conditions to be used in designing heating, ventilating and * air-conditioning systems shall be the values given in Part 11.

Access

6.2.1.4.(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.

Guards

(2) Mechanical equipment shall be guarded to prevent injury to the public or maintenance staff.

Protection from freezing

(3) Equipment forming part of a heating or air-conditioning system that may be adversely affected by freezing temperatures and which is located in unheated areas shall be adequately protected from freezing.

Expansion and contraction

6.2.1.5. 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.

6.2.1.6. Electrical wiring and electrical equipment shall be installed to conform to The * Electrical Protection Act and regulations made pursuant to that Act.

6.2.1.7. 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*.

SUBSECTION 6.2.2. VENTILATION

6.2.2.1.(1) Except as provided in Sentences (2) and (3), the ventilation of rooms or spaces shall conform to the requirements of this Part.

(2) The ventilation of rooms or spaces by natural methods in Group C *occupancies* shall conform to Part 9.

(3) The ventilation of rooms and spaces in *occupancies* other than *residential occupancies* by natural methods shall be permitted in lieu of mechanical ventilation where such ventilation will provide sufficient air change to provide healthful conditions in that *occupancy*.

- * **6.2.2.2.(1)** Except as permitted by Sentence (3), an enclosed *storage garage* shall have a mechanical ventilation system designed to limit the maximum concentration of carbon monoxide at any time to not more than 100 parts per million parts of air.
- * (2) Mechanical ventilation systems required by Sentence (1) shall include automatic ventilating fan control by means of *acceptable* carbon monoxide monitoring devices.
- * (3) The requirements of Sentences (1) and (2) are waived for those *storeys* in a *storage garage* in which
 - (a) at least 25% of the total area of the perimeter walls on the *storey* is open to the outdoors and distributed to provide cross ventilation,
 - (b) no portion of the *storey* is more than 1 m below the adjacent ground level, and
 - (c) no tarpaulins, glass or other materials are used to close the required openings at any time.

Garage
ventilation

6.2.2.3.(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.

Air
contaminants

(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.

Systems for
contaminated
spaces

(3) Systems serving spaces that contain hazardous gases, dusts or liquids such as grain elevators, metal powder plants and ammonium nitrate storage shall be designed, constructed and installed to conform to the requirements of the appropriate provincial legislation or, in the absence of such legislation, to good engineering practice such as is described in the publications of the National Fire Protection Association and in the National Fire Code of Canada 1980. (See Appendix A.)

(4) Systems for the ventilation of restaurant and other commercial cooking equipment shall be designed, constructed and installed to conform to NFPA 96-1978, "Installation of Equipment for the Removal of Smoke and Grease-Laden Vapors from Commercial Cooking Equipment," except as required by Sentence 3.5.3.1.(1) and Article 3.5.4.2.

SUBSECTION 6.2.3. AIR DUCT SYSTEMS

6.2.3.1.(1) This Subsection applies to the design, construction and installation of air duct systems for mechanical ventilation or air-conditioning in which the rated fan capacity exceeds $2 \text{ m}^3/\text{s}$.

Scope

- * (2) Where the rated fan capacity of ventilation or air-conditioning systems in *residential occupancies* does not exceed $2 \text{ m}^3/\text{s}$, the requirements of Part 9 shall apply.

6.2.3.2.(1) Except as provided in Sentences (2) to (4), all ducts, duct connectors, associated fittings and *plenums* used in air duct systems shall be constructed of steel, aluminum alloy, copper, clay, asbestos-cement or similar *noncombustible* material.

Duct
construction
materials

(2) Ducts, associated fittings and *plenums* may contain limited amounts of *combustible* material provided they

- (a) conform to the appropriate requirements for Class 1 air duct materials in ULC-S110-1970, "Standard for Air Ducts,"
- (b) conform to Sentence 3.1.4.5.(4) and Subsection 3.1.7.,
- (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 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 ULC-S110-1970, "Standard 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*.
- Ceiling spaces used as plenums (4) The concealed space between the ceiling and floor or ceiling and roof of a *building* may be used as a *plenum* and need not conform to Sentences (1) and (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 tubing for pneumatic controls and except for minor components of electrical wiring systems as permitted in The Electrical Protection Act * and regulations made pursuant to that Act,
- (b) the supports for the ceiling membrane are of *noncombustible* material having a melting point of at least 760°C, and
- (c) when the concealed space 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 in the event of a fire
- (i) stop the flow of air into the concealed space, and
- (ii) be supported in a manner that will maintain the integrity of the *fire resistance* of the ceiling membrane for the duration of time required to provide the required *fire-resistance rating*.
- (See Subsection 3.1.7.)
- Materials subjected to moisture (5) Materials in Sentences (1) to (4) which 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.
- Duct construction and support 6.2.3.3.(1) The construction and support of air ducts, fittings and *plenums*, including joints, seams, stiffening, reinforcing and access openings shall conform to the applicable requirements of the duct construction standards contained in the ASHRAE Guide and Data Book 1975 (Equipment) and ASHRAE Handbook 1976 (Systems), or to manuals issued by SMACNA. *
- Access openings (2) Air duct systems shall be made substantially air tight throughout, and shall have no openings other than those required for proper operation and maintenance of the system.
- (3) Access openings shall be provided in duct systems where lint, grease, debris, paper or other *combustible* material may accumulate in *plenums* and ducts.
- (4) Removable grilles requiring only the loosening of catches or screws for removal may be considered as access openings.
- (5) Fastenings on access doors provided for personnel shall be such that the door may be readily opened from the inside without the use of keys.
- Vibration isolation connectors 6.2.3.4.(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 ULC-S109-1969, "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 used for sealing joints in air ducts, *plenums* and other parts of air duct systems shall meet the flame-resistance requirements for fabric in ULC-S109-1969, "Standard for Flame Tests of Flame-Resistant Fabrics and Films."

Joint tape

6.2.3.6.(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.

Coverings
and linings

(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 C411-61 (1975), "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 3.1.4.5.(2).

(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 *fire dampers*, *fire stop flaps* and other *closures*.

* **6.2.3.7.(1)** Underground ducts shall be constructed to provide interior drainage and shall not be connected directly to a sewer.

Underground
ducts

* (2) A clean-out or pump out shall be included in underground duct systems at every low point of the duct system.

6.2.3.8. The clearances from *combustible* material of supply *plenums*, *supply ducts*, boots and register boxes of heating systems shall conform to the requirements of Subsection 9.34.3.

Clearances

6.2.3.9.(1) *Fire dampers* shall conform to the requirements of Article 3.1.6.5. and of this Article. (See Appendix A.)

Fire dampers

(2) *Fire dampers* shall be arranged to close automatically upon the operation of a fusible link conforming to ULC-S505-1974, "Standard for Fusible Links for * Fire Protection Service" or other *acceptable* 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 resetting of the release device.

Fire stop
flaps

6.2.3.10.(1) Where *fire stop flaps* are used in air duct systems in membrane ceilings required in Subsection 3.1.7., such *fire stop flaps* shall be constructed of steel having a minimum thickness of 1.47 mm, covered on both sides with *acceptable* ceramic * fibre paper at least 1.6 mm thick and equipped with pins and hinges of corrosion-resistant material. (See Appendix A.)

(2) *Fire stop flaps* shall be held open with a fusible link conforming to ULC-S505-1974, "Standard for Fusible Links for Fire-Protection Service" or other heat-actuated device 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.

Exhaust
ducts

6.2.3.11.(1) Except as provided in Sentence (2), *exhaust ducts* of nonmechanical ventilating systems serving separate rooms or spaces shall not be combined.

(2) *Exhaust ducts* of nonmechanical ventilating systems serving similar *occupancies* may be combined immediately below the point of final delivery to the outside, such as at the base of a roof ventilator.

(3) *Exhaust ducts* of ventilating systems shall have provision for the removal of condensation where this may be a problem.

(4) Exhaust outlets shall be designed to prevent back draft under wind conditions.

(5) Except as provided in Sentence (7), *exhaust ducts* serving rooms containing water closets, urinals, basins, showers or slop sinks shall be independent of *exhaust ducts* serving other areas of the *building*.

(6) Except as provided in Sentence (7), *exhaust ducts* serving rooms containing residential cooking equipment shall be independent of *exhaust ducts* serving other areas of the *building*.

(7) Two or more exhaust systems in Sentences (5) and (6) 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.

(8) 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 duct.

Air
recirculation

6.2.3.12. In *residential occupancies* sleeping rooms occupied separately and not as suites, suites or *dwelling units* shall not have air duct systems that allow air to be circulated from such rooms, suites or *dwelling units* to other rooms, suites or *dwelling units* or to *public corridors*.

Make-up air

6.2.3.13.(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 efficiency of the exhaust system is not adversely affected. (See Appendix A.)

Air openings

(2) 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 a substantial grille having openings of a size that will not allow the passage of a 15 mm diam sphere.

(3) *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.

(4) 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.

(5) 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.

(6) Screens required in Sentence (5) shall be accessible for maintenance.

6.2.3.14.(1) Air filters for air duct systems shall conform to the requirements for Class 2 air filter units as described in CAN4-S111-79, "Standard Method of Fire Tests For Air Filter Units."

Air filters

(2) The filter and water evaporation medium of every air washer and evaporative cooling section enclosed within a *building* shall be made of *noncombustible* material.

Air washers

(3) Sumps for air washer and evaporative cooling sections shall be constructed and installed so that they can be flushed and drained.

Sumps

(4) Evaporative cooling sections or towers of *combustible* material located on or outside *buildings* shall have a clearance of at least 12 m from sources of ignition such as *chimneys* or incinerators when the tower exterior construction is *noncombustible*, and a clearance of at least 30 m when the tower exterior construction is *combustible*.

Evaporative cooling equipment

(5) Evaporative cooling sections or towers the main structure of which exceeds a volume of 55 m³ shall comply with the requirements of NFPA 214-1977, "Water-Cooling Towers."

(6) Electrostatic-type filters when used shall be installed to ensure that the electric circuit is automatically de-energized when access doors are opened.

Electrostatic filters

(7) Facilities for flushing and drainage shall be provided where filters are designed to be washed in place.

(8) When odour removal equipment of the adsorption type is used it shall be

Odour removal equipment

(a) installed to provide access so that adsorption material can be reactivated or renewed, and

(b) protected from dust accumulation by air filters installed on the inlet side.

6.2.3.15.(1) Fans for heating, ventilating and air-conditioning systems shall be located and installed so that their operation

Fans

(a) does not adversely affect the draft required for proper operation of fuel-fired *appliances*, and

(b) does not allow the air in the air duct system to be contaminated by air or gases from the boiler-room or furnace-room.

(2) Fans and associated air handling equipment such as air washers, filters and heating and cooling units, when installed on the roof or otherwise outside the *building*, shall be of a type suitable for outdoor use.

Equipment installations outdoors

(3) Exposed drive assemblies and openings into fan housings shall be protected with substantial metal screens or gratings to prevent accidents.

Protection screens or gratings

* **6.2.3.16.(1)** Ducts in or under slabs-on-ground shall be of metal and of gauges recommended by ASHRAE or SMACNA and they shall be surrounded by concrete with a minimum thickness of 50 mm.

* (2) If perimeter warm air ducts are installed in or under slabs within 900 mm of ground level, not less than 25 mm thickness of rigid water-resistant type insulation with thermal conductivity not more than 0.04 W·m⁻¹·°C⁻¹ shall be installed between the duct and the outside edge of the *building*.

6.2.3.17.(1) This Article applies to projection rooms in which equipment is used to * handle film more than 16 mm in width.

(2) Unless *acceptable* engineering calculations, demonstrating the adequacy of the * ventilation system, are submitted to the *authority having jurisdiction*, a projection room shall be provided with 2 or more fresh air inlet ducts, located at opposite ends of the room, with screened openings terminating within 300 mm of the floor.

(3) The supply air to a projection room shall be independent of any other *building* * air supply system.

(4) 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 24°C.

(5) In addition to the air supply requirements for the lamp exhaust systems, the air * supply system for a projection room shall be capable of supplying not less than 0.12 m³/s for the first projector plus an additional 0.06 m³/s for each additional projector, film handling device, floodlight, spot-light, or similar piece of equipment.

(6) A projection room shall be provided with one or more exhaust air outlets which * may be manifolded into a single duct outside the room, and the outlets shall be located to ensure circulation of air throughout the room.

(7) Projection room exhaust air systems shall be independent of any other air system * in the *building*.

(8) Projection room exhaust air ducts shall terminate at the exterior of the *building* * in a location where exhaust air cannot readily enter any supply air system.

(9) A projection room exhaust system shall be mechanically operated and fan motors * shall be located outside the duct system.

(10) Each projection machine shall be provided with an exhaust duct that shall be * of rigid material, except for an *acceptable* continuous flexible connector, that will draw air from each lamp and exhaust it directly to the outside of the *building*, and the lamp exhaust system shall not be interconnected with any other system.

(11) In the case of xenon projection equipment, the lamp exhaust system shall * exhaust not less than 0.14 m³/s for each lamp, but not less than the exhaust volume required or recommended by the equipment manufacturer, and the external temperature of the lamp housing shall be not more than 54°C when operating.

SUBSECTION 6.2.4. HEATING APPLIANCES, GENERAL

Scope

6.2.4.1.(1) This Subsection applies to the design, construction and installation of
(a) solid-fuel-fired heating systems, and
(b) heating systems in which the rated heat input exceeds 120 kW.

(2) Where the rated heat input of heating systems or equipment does not exceed 120 kW, the requirements of Part 9 shall apply, except for solid fuel fired *appliances*, * other than stoves, ranges and space heaters.

Enclosures
and
separations

6.2.4.2.(1) Fuel-fired heating *appliances* shall be located, enclosed or separated from the remainder of the *building* in conformance with Section 3.5.

Outdoor
installation of
appliances

(2) Fuel-fired *appliances* installed on the roof of a *building* or otherwise outside the *building* shall be

- (a) *acceptable* for such location.
- (b) installed not closer than 1.2 m measured horizontally from the property line, and
- (c) installed at least 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 $\frac{3}{4}$ h *fire-protection rating* determined in conformance with Article 3.1.6.4., or by wired glass conforming to Article 3.1.6.8.

(3) Heating *appliances* using oil, gas or electrical energy shall be installed so that possible movements of the *building* structure will not cause damage to the piping or equipment.

Appliances
using oil, gas
or electricity

(4) Heating *appliances* using solid fuel shall be connected to a *chimney* directly or by a *flue pipe* or *breeching* conforming to Section 6.3.

Chimney
connection

SUBSECTION 6.2.5. BOILERS AND FURNACES USING SOLID FUEL

6.2.5.1.(1) Steam and hot water *boilers* using solid fuel shall be designed, constructed and installed in conformance with the requirements of The Boilers and Pressure Vessels Act and regulations made pursuant to that Act.

General

(2) *Boilers* and *furnaces* using solid fuel shall be installed in a room or space having

- (a) a volume sufficiently large to permit accessibility for inspection and servicing of the *appliance* and to provide clearances as required in Article 6.2.5.3., and
- (b) a permanent opening or openings providing an area of at least 3.3 mm²/W input, connecting with the outdoors or with some space that freely connects with the outdoors. (See Appendix A.)

6.2.5.2.(1) Except as provided in Sentences (2) to (5), every *boiler* and *furnace* using solid fuel shall be mounted

Mounting

- (a) on the ground,
- (b) on a concrete floor, or
- (c) on any type of floor that is protected by 2 courses of 90 mm thick hollow masonry units arranged so that the hollow cores in the 2 courses are at right angles to each other and will permit air circulation through them.

(2) A solid-fuel-fired *boiler* or *furnace* of a type in which flame or hot gases do not come in contact with its base may be mounted on any type of floor when

- (a) the floor is protected with at least 90 mm of hollow masonry units covered with sheet metal at least 0.56 mm thick, and
- (b) the masonry units are arranged so that the hollow cores will permit air circulation through them.

(3) Except as provided in Sentence (6), a solid-fuel-fired *forced-air furnace* may be mounted on any type of floor provided the blower compartment

- (a) occupies the entire area beneath the combustion chamber and is at least 450 mm in height, and
- (b) has at least 1 metal baffle between the combustion chamber and the base of the *appliance*.

(4) Except as provided in Sentence (6), a solid-fuel-fired hot water *boiler* may be mounted on any type of floor provided the water chamber extends under the whole of the ash pit and combustion chamber, or under the whole of the combustion chamber if there is no ash pit.

(5) Except as provided in Sentence (6), a solid-fuel-fired *boiler* or *furnace* may be mounted on any type of floor provided the *boiler* or *furnace*

- (a) is mounted on legs that provide a clear space at least 100 mm high, and
- (b) is of a type in which flame or hot gases do not come in contact with its base.

(6) A floor surface of *combustible* material beneath a solid-fuel-fired *boiler* or *furnace* shall be protected by a layer of sheet metal at least 0.56 mm thick over a * layer of *acceptable* resilient *noncombustible* insulation for a distance of at least 450 mm beyond the *appliance* on both the firing side and the side where ashes are removed, and extending at least 150 mm beyond the *appliance* on the other sides.

6.2.5.3.(1) Except as provided in Sentence (2), the minimum clearance between *boilers* or *furnaces* using solid fuel and any *combustible* material, whether or not such material is covered with *noncombustible* material, shall conform to Table 6.2.5.A (See Appendix A.)

Clearances

Table 6.2.5.A
Forming Part of Article 6.2.5.3.

MINIMUM CLEARANCES TO COMBUSTIBLE MATERIAL FOR FURNACES AND BOILERS USING SOLID FUEL				
Type of <i>Furnace</i> or <i>Boiler</i>	Minimum Clearance, mm			
	Above and Sides of Bonnet or <i>Plenum</i>	Jacket Sides and Rear	Front	Projecting <i>Flue</i> <i>Collar</i>
Automatically stoker fired, <i>forced-air</i> <i>furnace</i>	150	150	1 200	(1)
Steam <i>boilers</i> limited to 100 kPa (Gauge) max.	150	150	1 200	(1)
Hot water <i>boilers</i> limited to 120°C max. of the water-wall type or having a jacket or lining of masonry or other <i>acceptable</i> insulating material	150	150	1 200	(1)
Hot water <i>boilers</i> and <i>forced-air</i> <i>furnaces</i> not limited to 120°C max.	450	450	1 200	(1)
Steam <i>boilers</i> limited between 100 kPa (Gauge) and 350 kPa (Gauge)	450	450	1 200	(1)
Steam <i>boilers</i> not limited to 350 kPa (Gauge) max. but not over 120 kW rated heat input	450	450	1 200	(1)
Other <i>boilers</i> and other <i>forced-air</i> <i>furnaces</i>	900	900	2 400	900
Column 1	2	3	4	5

Note to Table 6.2.5.A:

⁽¹⁾ See Sentence 6.3.8.1.(7).

Table 6.2.5.B.
Forming Part of Article 6.2.5.3.

MINIMUM CLEARANCES TO COMBUSTIBLE MATERIAL WITH SPECIFIED FORMS OF PROTECTION FOR FURNACES AND BOILERS USING SOLID FUEL, mm				
Minimum Protection for <i>Combustible</i> Material	Where in Table 6.2.5.A the minimum clearance is:			
	450 mm		150 mm	
	Above and Sides of Bonnet or <i>Plenum</i>	Jacket Sides and Rear	Above and Sides of Bonnet or <i>Plenum</i>	Jacket Sides and Rear
6 mm <i>acceptable</i> resilient ceramic fibre thermal insulation spaced out 25 mm by <i>noncombustible</i> material	380	230	75	50
0.33 mm sheet metal on 6 mm <i>acceptable</i> resilient ceramic fibre thermal insulation	300	230	75	50
0.33 mm sheet metal spaced out 25 mm by <i>noncombustible</i> material	230	150	50	50
0.33 mm sheet metal on 3 mm <i>acceptable</i> resilient ceramic fibre thermal insulation spaced out 25 mm by <i>noncombustible</i> material	230	150	50	50
6 mm <i>acceptable</i> resilient ceramic fibre thermal insulation on 25 mm mineral wool batts reinforced with wire mesh or equivalent	150	150	50	50
0.68 mm sheet metal on 25 mm mineral wool batts reinforced with wire mesh or equivalent	100	75	50	50
6 mm asbestos-cement board	450	450	100	100
Column 1	2	3	4	5

(2) Where *combustible* materials are protected in conformance with the type of protection described in Table 6.2.5.B., the minimum clearances between *boilers* or *furnaces* using solid fuel and *combustible* material shall conform to the clearances in that Table. (See Appendix A.)

Reduced
clearances

(3) Clearances in Sentences (1) and (2) shall be measured from the outer surface of the *appliance* or of the insulation protecting the *appliance* to the *combustible* material, disregarding the protection applied over the *combustible* material. (See Appendix A.)

Measurement
of clearances

6.2.5.4.(1) Every steam and hot water *boiler* using solid fuel shall be equipped with controls and safety devices in conformance with The Boilers and Pressure * Vessels Act and regulations made pursuant to that Act.

General
control
requirements

(2) Every stoker serving a steam *boiler* using solid fuel shall be equipped with the following controls:

Stoker
controls for
steam boilers

- (a) a device for manually stopping the supply of fuel to the stoker located near the entrance to the stoker space,
- (b) an automatic device for stopping the stoker motor under conditions of
 - (i) low water level,
 - (ii) pressure exceeding the design working pressure of the *boiler* or the setting of the pressure relief valve whichever is lower, and

- (iii) failure of a fan providing combustion air,
- (c) a device for maintaining a minimum fire, and
- (d) at least 1 automatic control to regulate or control the normal operation of the stoker.

Stoker
controls for
hot water
boilers

(3) Every stoker serving a hot water *boiler* using solid fuel shall be equipped with the following controls:

- (a) a device for manually stopping the supply of fuel to the stoker located near the entrance to the stoker space,
- (b) an automatic device for stopping the stoker motor under conditions of
 - (i) low water level,
 - (ii) temperatures exceeding the design working temperature of the *boiler* or the setting of the temperature relief valve whichever is lower.
 - (iii) failure of a fan providing combustion air, and
 - (iv) pressure exceeding the design working pressure,
- (c) a device for maintaining a minimum fire, and
- (d) at least 1 automatic control to regulate or control the normal operation of the stoker.

Stoker
controls for
furnaces

6.2.5.5.(1) Every stoker serving a *forced-air furnace* using solid fuel shall be equipped with the following controls:

- (a) a device for manually stopping the supply of fuel to the stoker located near the entrance to the stoker space.
- (b) an automatic device for stopping the stoker motor under conditions of
 - (i) temperature exceeding 120°C in the *furnace* supply *plenum*, and
 - (ii) failure of a fan providing combustion air,
- (c) a device for maintaining a minimum fire, and
- (d) at least 1 automatic control to regulate or control the normal operation of the stoker.

(2) Every stoker-fired *forced-air furnace* using solid fuel shall be provided with an automatic control to operate the circulating fan when the air temperature in the *furnace* supply *plenum* exceeds 120°C.

(3) Where a manually operated switch is installed in the electric circuit serving the circulating fan, it shall be installed so as to de-energize simultaneously the motors of the circulating fan and the stoker.

Furnace
controls

(4) Every *forced-air furnace* using solid fuel and equipped with a mechanical draft fan for the supply of combustion air shall be equipped with a limit control to stop the mechanical draft fan when the temperature in the *furnace* supply *plenum* exceeds 120°C.

(5) Every hand-fired *forced-air furnace* using solid fuel and operating on natural draft shall be equipped with a barometric draft control

- (a) located in the *flue pipe* downstream from any check damper if a check damper is used, and
- (b) permanently set to limit the draft to a maximum of 32 Pa or to the maximum draft for which the *furnace* is designed, whichever is lower.

(6) Every *forced-air furnace* using solid fuel shall be equipped with a temperature combustion regulator to control the rate of combustion and to prevent the temperature in the *furnace* supply *plenum* from exceeding 120°C.

(7) Every *forced-air furnace* using solid fuel shall have a supply *plenum* that extends at least 300 mm above the top surface of the heat exchanger and the limit control shall be installed in the supply *plenum* and not more than 250 mm above the top surface of the heat exchanger.

SUBSECTION 6.2.6. STOVES, RANGES, SPACE HEATERS AND SERVICE WATER HEATERS USING SOLID FUEL

6.2.6.1.(1) Except for fireplaces, space heaters, solid fuel burning *stoves, ranges* and *service water heaters* shall be installed in a room or space sufficiently large to permit access to the *appliance* and to provide clearances as required in Article 6.2.6.2.

Access

(2) Except for fireplaces, the requirements for the mounting of space heaters, solid fuel burning *stoves, ranges* and *service water heaters* shall be as required in Article 6.2.5.2. for *boilers* and *furnaces* of similar construction.

Mounting

6.2.6.2.(1) Except as provided in Sentence (2), the minimum clearance between *stoves, ranges, space heaters* or *service water heaters* using solid fuel and any *combustible* material, whether exposed or concealed, shall conform to Table 6.2.6.A. (See Appendix A.)

Clearances

Table 6.2.6.A.
Forming Part of Article 6.2.6.2.

Appliances	Minimum Clearance, mm			
	Top	Sides	Rear	Front
<i>Stoves and ranges</i> without refractory lining:	750		900	1 200
fire box side		900		
other side		450		
<i>Stoves and ranges</i> with refractory lining:	750		600	1 200
fire box side		600		
other side		450		
<i>Space heaters</i> with an air space between the outside of the fire chamber and the external casing to allow air circulation	900	300	300	1 200
<i>Space heaters</i> other than above	900	900	900	1 200
Column 1	2	3	4	5

(2) Where *combustible* materials are protected in conformance with the type of protection described in Table 6.2.6.B., the minimum clearance between *stoves, ranges, space heaters* or *service water heaters* using solid fuel and *combustible* material shall conform to the clearances in that Table. (See Appendix A.)

Reduced clearances

(3) Clearances in Sentences (1) and (2) shall be measured in conformance with Sentence 6.2.5.3.(3). (See Appendix A.)

Measurement of clearances

* **6.2.6.3.** *Service water heaters* shall conform to The Plumbing and Drainage Act and regulations made pursuant to that Act.

Service water heaters

6.2.6.4. Site-built and factory-built fireplaces shall conform to the requirements of Section 9.22.

Fireplaces

Table 6.2.6.B.
Forming Part of Article 6.2.6.2.

*

MINIMUM CLEARANCES TO COMBUSTIBLE MATERIAL WITH SPECIFIED FORMS OF PROTECTION FOR STOVES, RANGES, SPACE HEATERS AND SERVICE WATER HEATERS USING SOLID FUEL, mm					
Minimum Protection for Combustible Material	Where the Minimum Clearance in Table 6.2.6.A. is:				
	300 mm	450 mm	600 mm	750 mm or 900 mm	
	Sides and Rear	Sides	Sides	Top	Sides and Rear
6 mm <i>acceptable</i> resilient ceramic fibre thermal insulation spaced out 25 mm by <i>noncombustible</i> material	150	230	300	750	450
0.33 mm sheet metal on 6 mm <i>acceptable</i> resilient ceramic fibre thermal insulation	150	230	300	600	450
0.33 mm sheet metal spaced out 25 mm by <i>noncombustible</i> material	100	150	200	450	300
6 mm <i>acceptable</i> resilient ceramic fibre thermal insulation on 25 mm mineral wool batts reinforced with wire mesh or equivalent	100	150	200	450	300
0.68 mm sheet metal on 25 mm mineral wool batts reinforced with wire mesh or equivalent	50	100	200	450	300
Column 1	2	3	4	5	6

SUBSECTION 6.2.7. INCINERATORS

6.2.7.1. The design, construction, installation and *alteration* of every indoor incinerator shall conform to NFPA 82-1977, "Incinerators, Waste and Linen Handling Systems and Equipment."

Chimney flue **6.2.7.2.** Every incinerator shall be served by a *chimney flue* conforming to Section 6.3.

SUBSECTION 6.2.8. INDIRECT SERVICE WATER HEATERS AND UNIT HEATERS

6.2.8.1.(1) *Indirect service water heaters* for installation within the heat exchanger of * a *boiler* shall be installed in accordance with

- (a) The Boilers and Pressure Vessels Act and regulations made pursuant to that Act, and
- (b) The Plumbing and Drainage Act and regulations made pursuant to that Act.

Relief valves **(2)** Where *indirect service water heaters* are supplied by a cold water line containing a check valve, a pressure relief valve shall be installed downstream from the check valve.

(3) Valves shall not be installed between a relief valve and a *service water heater*.

6.2.8.2. Every *indirect service water heater* and *unit heater* using either steam or hot water as the heating medium shall be installed so as to provide a clearance of at least 25 mm between the *appliance* and adjacent *combustible* material.

SUBSECTION 6.2.9. RADIATORS AND CONVECTORS

6.2.9.1. 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.

SUBSECTION 6.2.10. PIPING FOR HEATING AND COOLING SYSTEMS

6.2.10.1. Every pipe used in a heating or air-conditioning system shall be designed to have adequate strength and durability.

Materials

6.2.10.2. Piping other than metallic shall not be used unless *accepted*.

6.2.10.3. Every pipe used in a heating or air-conditioning system shall be installed to allow for expansion and contraction due to temperature changes.

Expansion
and
contraction

6.2.10.4. Supports and anchors for piping in a heating or air-conditioning system shall be designed to ensure that undue stress is not placed on the supporting structure.

Supports and
anchors

6.2.10.5.(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.

Insulation
and
coverings

(2) Insulation and coverings on pipes in which the temperature of the fluid exceeds 120°C.

- (a) shall be composed of *acceptable noncombustible* material, or
- (b) shall not flame, glow, smoulder or smoke when tested in accordance with the method of test ASTM C411-61 (1975), "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 (9), 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 not exceeding 25 in *buildings of noncombustible construction* and not exceeding 75 in *buildings of combustible construction*.

(4) Except as provided in Sentence (9), 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 exceeding that required for the interior finish for the ceiling of the room or space.

(5) Except as provided in Sentence (9), 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) *Foamed plastic* pipe insulation shall be protected by not less than 12.7 mm thick gypsum board, lath and plaster or other material that when subjected to the standard fire exposure described in ULC-S101-1977, "Standard Methods of Fire Endurance Tests of Building Construction and Materials," will not exceed a temperature rise of 139°C on the unexposed face after a period of 10 min.

Protection of
foamed
plastic

(8) Protective finishes required in Sentence (7) shall be mechanically fastened, unless it can be demonstrated on the basis of fire tests that such fasteners are not necessary.

(9) No *flame-spread rating* or smoke developed classification limitations are required where *combustible* insulation and coverings are used on piping when such piping is

Concealed or
protected
piping

- (a) located within a concealed space in a wall,
- (b) located in a floor slab, or
- (c) enclosed in a *noncombustible* raceway or conduit.

Clearances **6.2.10.6.** Clearances between *combustible* material and bare pipes carrying steam or hot water shall conform to Table 6.2.10.A.

Table 6.2.10.A.
Forming Part of Article 6.2.10.6.

Steam or Water Temperature, °C	Minimum Clearance, mm
up to 120	15
above 120	25
Column 1	2

Sleeves **6.2.10.7.(1)** Where a pipe carrying steam or hot water at a temperature in excess of 120°C passes through a *combustible* floor, ceiling or wall, the construction shall be protected by a sleeve of metal or other *noncombustible* material at least 50 mm larger in diameter than the pipe.

Pipes in storage spaces **(2)** Steam or hot water pipes that pass through a storage space shall be insulated with at least 25 mm of *acceptable noncombustible* material or otherwise protected to prevent direct contact between the surface of the pipe and the material stored.

Pipes in shafts **6.2.10.8.** Where piping for heating or air-conditioning systems is enclosed in a shaft, the requirements for shafts of Article 3.5.3.1. shall apply.

SUBSECTION 6.2.11. REFRIGERATING SYSTEMS AND EQUIPMENT FOR AIR-CONDITIONING

Refrigeration code **6.2.11.1.(1)** Mechanical refrigerating systems and equipment shall conform to * CSA B52-M1977, "Mechanical Refrigeration Code."

Cooling units combined with furnaces **(2)** 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.

SUBSECTION 6.2.12. STORAGE BINS

Pipes in storage bins **6.2.12.1.(1)** Service pipes passing through a storage bin for solid fuel shall be protected or so located to avoid damage to the pipes.

(2) Except for fuel-thawing pipes, every pipe designed to operate at a temperature of 50°C or more shall be located where fuel cannot be stored in contact with it.

(3) Sewer or drain openings shall not be located under a storage bin for solid fuel.

Construction of fuel bins. **(4)** The floor and walls of a storage bin for solid fuel shall be constructed of *noncombustible* material.

(5) 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 more.

Construction of ash bins **6.2.12.2.(1)** Every ash storage bin shall be constructed of *noncombustible* material. Where the bin is not covered, the ceiling of the room in which it is located shall be of *noncombustible* material.

(2) Every opening in an ash storage bin shall be protected by a tight-fitting metal door with metal frame securely fastened to the bin.

SECTION 6.3 CHIMNEYS AND VENTING EQUIPMENT

SUBSECTION 6.3.1. GENERAL

- 6.3.1.1.(1)** Except as provided in Sentences (2) and (3), this Subsection applies to the construction and installation of
- (a) *masonry chimneys, concrete chimneys, metal chimneys, factory-built chimneys and chimney flues* serving all fuel-fired *appliances*, and
 - (b) *flue pipes and breechings* serving *appliances* using solid fuel.
- (2)** The construction and installation of *chimneys* serving fireplaces or *appliances* using gas or oil having a combined total rated heat input of 120 kW or less shall conform to Section 9.21.
- (3)** The venting of gas or oil-fired *appliances* shall conform to Sentence 6.2.1.2.(1).
- (4)** Every *chimney* shall be capable of providing sufficient draft to vent properly the *appliance* that it serves.
- (5)** Every *gas vent* intended for use with an *appliance* using gas but which is not suitable for *appliances* using solid or liquid fuel shall be plainly and permanently marked to that effect.
- (6)** Every *chimney* intended for use with an *appliance* using oil but which is not suitable for an *appliance* using solid fuel shall be plainly and permanently marked to that effect.
- (7)** The walls of any *chimney, gas vent or flue pipe* shall be constructed to be gas-, smoke- and flame-tight.
- (8)** The top of every *chimney* shall be at least
- (a) 900 mm above the highest point at which it comes in contact with the roof, and
 - (b) 600 mm above a roof surface or structure within a horizontal distance of 3 m from the *chimney*. (See Appendix A.)
- 6.3.1.2.** Every *chimney* shall be designed and constructed to withstand the forces due to its weight and the design wind, temperature and earthquake conditions conforming to the requirements of Part 4.
- 6.3.1.3.** Foundations for *chimneys* shall be designed and constructed to conform to Section 4.2.
- 6.3.1.4.(1)** Every *masonry or concrete chimney* shall be provided with a cleanout opening located at the base of the *flue* and equipped with a metal frame and tight-fitting metal door.
- (2)** Except for a *factory-built chimney* located directly above a solid fuel burning *appliance*, every *factory-built chimney* serving a solid fuel burning *appliance* shall be provided with a readily accessible tee section to provide access for cleaning the *chimney*.
- (3)** Where a *chimney* is of a size requiring entry for cleaning, the cleanout opening shall be at least 600 mm by 900 mm.
- * 6.3.1.5.** A protection system for lightning, if used, shall conform to The Lightning Rod Act and regulations made pursuant to that Act.
- 6.3.1.6.(1)** Access ladders, when used, shall consist of steel or bronze rungs, built into the walls.
- (2)** In the case of external ladders, rungs shall begin at least 2.5 m from ground level.

Scope

Oil and gas venting

Marking

Clearances of chimney top

Design loads

Foundations

Provision for cleaning

Lightning protection

Access ladders

SUBSECTION 6.3.2. RECTANGULAR BRICK MASONRY CHIMNEYS

- Materials** **6.3.2.1.(1)** Brick and mortar for rectangular brick *masonry chimneys* shall conform to Section 4.4, except that fire-clay brick shall be laid with fireclay mortar conforming to ASTM C105-47 (1976), "Ground Fire Clay as a Refractory Mortar for Laying-up Fireclay Brick."
- Liners** (2) Every rectangular brick *masonry chimney* shall be lined with
- (a) *chimney liners* of clay conforming to ASTM C315-78c, "Clay Flue * Linings,"
 - (b) fireclay refractory brick conforming to ASTM C64-72 (1977), "Refractories for Incinerators and Boilers,"
 - (c) hard burned lining brick conforming to ASTM C279-79, "Chemical- * Resistant Masonry Units," or
 - (d) metal having durability and resistance to corrosion and heat at least equivalent to 0.30 mm thick stainless steel provided the intended flue gas temperature does not exceed 540°C.
- Construction** (3) Every rectangular brick *masonry chimney* shall be constructed so that
- (a) the *chimney* lining is installed as the surrounding masonry is constructed,
 - (b) the *chimney* lining extends from a point at least 600 mm below the lowest point of a *flue pipe* connection to at least the top of the *chimney* cap, and
 - (c) *chimney* caps and flashing at the junctions with adjacent construction conform to Part 9.
- Partitions** (4) Two or more *flues* in a rectangular brick *masonry chimney* shall be separated by partitions of at least
- (a) 75 mm of solid unit masonry when clay *chimney liners* are used, or
 - (b) 89 mm of firebrick when a firebrick lining is used.
- Corbelling** (5) A *masonry chimney* may be corbelled provided
- (a) the wall from which the *chimney* is corbelled is at least 290 mm thick,
 - (b) the corbelling does not project more than 150 mm,
 - (c) the *chimney* is not supported on a cavity wall or a wall made of hollow units, and
 - (d) no brick projects more than 25 mm beyond the brick immediately below.
- Clearances** (6) The clearance between *masonry chimneys* and *combustible* framing shall be at least 50 mm for interior *chimneys* and 12 mm for exterior *chimneys*.
- (7) The clearance between a cleanout opening for a *masonry chimney* and *combustible* material shall be at least 150 mm.
- (8) Spaces between *chimneys* and floor or ceiling assemblies shall be fire stopped with *noncombustible* material.
- (9) Where floor or ceiling assemblies have wood framing members the fire stopping required in Sentence (8) shall not exceed 25 mm in depth.
- (10) The clearance between *masonry chimneys* and flooring shall be at least 12 mm.

SUBSECTION 6.3.3. RADIAL BRICK MASONRY CHIMNEYS

- Materials** **6.3.3.1.(1)** Radial brick used in the construction of a radial brick *chimney* shall be acid resistant and shall conform to Type 1-B, C, D or E brick in CSA A82.1-M1977, "Burned Clay Brick," and shall be cut radially with curved inner and outer faces conforming closely to the circular and radial lines of the finished *chimney*.
- (2) Mortar used in the construction of a radial brick *chimney* shall consist of a mixture of portland cement, lime and sand conforming to Section 4.4 in the proportion of 1 part cement, 2 parts lime and not less than 5 parts sand by volume.
- (3) Fireclay brick shall be laid up with fireclay mortar, conforming to ASTM C105-47 (1976), "Ground Fire Clay as a Refractory Mortar for Laying-up Fireclay Brick."

- (4) Every radial brick *masonry chimney* shall be lined with a material suitable for the temperature and corrosion conditions to be encountered in service. Linings
- (5) A radial brick *chimney* may be constructed without the masonry outer shell provided Construction
- (a) the *chimney* is contained within a *noncombustible* shaft or structure protecting it from the weather, and
 - (b) the lining is laid up with fireclay mortar conforming to ASTM C105-47 (1976), "Ground Fire Clay as a Refractory Mortar for Laying-up Fireclay Brick."
- (6) Every radial brick *chimney* shall be provided with Caps and ladders
- (a) a chimney cap of cast iron or reinforced concrete to protect the top of the *chimney* and lining, and
 - (b) an access ladder conforming to Article 6.3.1.6.

SUBSECTION 6.3.4. REINFORCED CONCRETE CHIMNEYS

- 6.3.4.1.(1) The design and construction of reinforced *concrete chimneys* shall conform to Section 4.5. Design and construction
- (2) Every reinforced *concrete chimney* shall be lined with material suitable for the temperature and corrosion conditions to be encountered in service. Linings
- (3) Reinforced *concrete chimneys* shall be provided with a chimney cap conforming to Sentence 6.3.3.1.(6) and an access ladder conforming to Article 6.3.1.6. Caps and ladders

SUBSECTION 6.3.5. METAL CHIMNEYS

- 6.3.5.1.(1) Except as provided in Sentence (2), every *metal chimney* shall be supported by a foundation as described in Article 6.3.1.3. Supports
- (2) A *metal chimney* not supported on a foundation shall be supported by *non-combustible* material and the support shall
- (a) be independent of the *appliance* it serves, and
 - (b) have at least a 4 h *fire-resistance rating*, except as provided in Sentence (3).
- (3) The *fire-resistance rating* required for the supports described in Sentence (2) need not apply below the floor of the room containing the *appliance*.
- (4) The thickness of metal in every *metal chimney* shall be at least 3.2 mm and shall be adequate to resist all stresses. Material
- (5) A *metal chimney* shall be constructed of Corrosion protection
- (a) corrosion-resistant alloy,
 - (b) * galvanized metal having a weight of coating of not less than that specified in ASTM A525-80, "Steel Sheet, Zinc-Coated (Galvanized) by the Hot Dip Process, General Requirements" for G90 coating designation provided the design temperature of the flue gases entering the chimney does not exceed 320°C, or
 - (c) other metal provided the exterior of the *chimney* is painted to protect it against corrosion.
- (6) Joints of every *metal chimney* shall be riveted, bolted or welded, and such joints shall be at least as corrosion resistant as the sheets or plates so joined. Joints
- (7) Every *metal chimney* in which the design temperature of the flue gases entering the *chimney* is greater than 540°C shall be lined with at least 114 mm of fire-brick set in fireclay mortar and extending at least 7.5 m above the *flue pipe* or *breeching* connection and to a point where the flue gas temperature is not more than 540°C. Linings
- (8) The minimum clearance between an exterior *metal chimney* and

- (a) *combustible* material shall be 900 mm,
- (b) an opening in a wall or a means of egress shall be 1.8 m,
- (c) a masonry or concrete wall shall be 100 mm.

Clearances
for interior
chimneys

(9) Except as provided in Sentence (10), every interior *metal chimney* shall have a clearance of at least 900 mm to *combustible* material within the *storey* in which the heating *appliance* is contained.

(10) Where a *metal chimney* passes through a *combustible* roof assembly, the clearance between the *chimney* and the nearest *combustible* material may be reduced to 300 mm provided the *metal chimney* is guarded by a metal thimble extending at least 230 mm above and 230 mm below the roof construction.

(11) Thimbles required in Sentence (10) shall have double cylindrical walls with a ventilated space between the walls and between the *metal chimney* and *thimble*, and the clearance between the metal thimble and *combustible* material shall be at least 150 mm.

Enclosures

(12) Every interior *metal chimney* that passes through more than 1 *storey* or through an *attic space* shall be enclosed above the room in which the heating *appliance* is located by a *noncombustible fire separation* extending through the roof having a *fire-resistance rating* of at least 4 h.

(13) *Fire-resistance ratings* required in Sentence (12) shall apply to the enclosure only and not to its supporting structure.

(14) The space between the enclosing *fire separation* and the *metal chimney* shall be

- (a) sufficient to permit examination and repair of the *chimney*,
- (b) ventilated to the outside air at the top, and
- (c) provided with suitable air inlets below the required *fire separation*.

SUBSECTION 6.3.6. FACTORY-BUILT CHIMNEYS

6.3.6.1. *Factory-built chimneys* shall conform to CAN4-S604-78, "Standard for Factory-Built, Type A Chimneys."

SUBSECTION 6.3.7. CHIMNEY FLUES

General

6.3.7.1.(1) A *chimney flue* serving a fuel-fired *appliance* shall

- (a) be contained in a *chimney*,
- (b) not have an offset inclined more than 45° to the vertical, and
- (c) have a cross-sectional area sufficient to vent the *appliance* which it serves.

(2) The width of a rectangular or oval *chimney flue* shall be at least $\frac{2}{3}$ its breadth.

(3) A *chimney flue* serving a fireplace or incinerator shall not serve any other fuel-fired *appliance*.

Multiple
connections

(4) Two or more fuel-fired *appliances*, other than fireplaces or incinerators, may be connected to the same *chimney flue* provided

- (a) adequate draft (negative *flue* outlet pressure) is maintained at each *appliance*,
- (b) every *appliance* is equipped with individual draft control so as to maintain the over-fire draft (over-fire pressure) for which the *appliance* is designed,
- (c) the *flue pipes* or *breechings* of the *appliances* are connected directly to a common *flue pipe* or *breeching* of adequate cross-sectional area and as close to the *chimney* as practical, or directly to the *chimney flue* so that
 - (i) where all *appliances* utilize the same fuel, the *flue pipe* from the smallest *appliance* is on top, and
 - (ii) where different fuels are used, the *flue pipe* serving a gas-fired *appliance* is on top, that serving an oil-fired *appliance* is in the middle and that serving a solid-fuel fired *appliance* is at the bottom, and
- (d) the *chimney flue* is capable of venting the flue gas by natural draft when all *appliances* are firing at the same time or a mechanical flue gas exhauster (draft inducer) is used.

(5) The installation of *flue pipes* for oil-fired and gas-fired *appliances* shall conform to Sentence 6.2.1.2.(1)

Installation

SUBSECTION 6.3.8. FLUE PIPES AND BREECHINGS FOR APPLIANCES BURNING SOLID FUEL

6.3.8.1.(1) A *flue pipe* or *breeching* serving 1 or more solid-fuel-burning *appliances* shall be constructed of steel, masonry or other *noncombustible* material with a melting point of not less than 1 100°C.

Material

(2) Galvanized steel shall not be used where the design temperature of the flue gas exceeds 300°C.

(3) Tile shall not be used as a *flue pipe*.

(4) The thickness of metal used in steel *flue pipes* for solid-fuel-burning *appliances* shall conform to Table 6.3.8.A.

Minimum
metal
thickness

(5) A *flue pipe* or *breeching* serving a solid-fuel-fired *appliance* shall not pass through

Installation

- (a) an *attic* or *roof space*, closet or similar concealed space, or
- (b) a floor, ceiling, wall or *partition* of *combustible construction*.

(6) A *flue pipe* or *breeching* serving a solid-fuel-fired *appliance* shall

- (a) be securely supported by metal or other *noncombustible* supports,
- (b) be as short and straight as possible,
- (c) be designed and constructed to allow for expansion,
- (d) be sloped upward toward the *chimney* at least 1 in 50,
- (e) have a cross-sectional area not less than
 - (i) the area of the *flue* outlet of the *appliance* served by a *flue pipe*, or
 - (ii) the combined area of the *flue* outlets of all the *appliances* served by a *breeching*,
- (f) enter the side of a *chimney* through a metal thimble or masonry *flue* ring,
- (g) not extend into the *chimney flue*, and
- (h) have a tight connection with the *chimney*.

Table 6.3.8.A.
Forming Part of Sentence 6.3.8.1.(4)

Diameter of <i>Flue Pipe</i> , mm	Minimum Thickness of Metal, mm	
	Uncoated Steel	Galvanized Steel
Below 152	0.41	0.41
152 to 203 (incl.)	0.53	0.48
Over 203 to 254	0.69	0.61
Over 254 to 305	0.84	0.76
Over 305 to 406	1.09	0.91
Over 406	1.70	1.48
Column 1	2	3

(7) Except as provided in Sentence (8), the minimum clearance between a projecting *flue collar*, *flue pipe* or *breeching* serving a solid-fuel-fired *appliance* and any *combustible* material, whether exposed or concealed, shall be 450 mm. (See Appendix A.)

Clearances

(8) Where *combustible* materials are protected in conformance with the type of protection described in Table 6.3.8.B., the minimum clearances between projecting *flue collars*, *flue pipes* or *breeching* serving a solid-fuel-fired *appliance* and *combustible* material shall conform to the clearances in that Table. (See Appendix A.)

Reduced
clearances

(9) Clearances in Sentences (7) and (8) shall be measured from the outer surface of the projecting *flue collar*, *flue pipe* or *breeching* or of the insulation protecting it to the *combustible* material, disregarding the protection applied over the *combustible* material. (See Appendix A.)

Table 6.3.8.B.
Forming Part of Sentence 6.3.8.1.(8)

*

Minimum Protection for <i>Combustible</i> Material	Minimum Clearance with Protection, mm
6 mm <i>acceptable</i> resilient ceramic fibre thermal insulation spaced out 25 mm by <i>noncombustible</i> material	300
0.33 mm sheet metal on 6 mm <i>acceptable</i> resilient ceramic fibre thermal insulation	300
0.33 mm sheet metal spaced out 25 mm by <i>noncombustible</i> material	230
0.33 mm sheet metal on 3 mm <i>acceptable</i> resilient ceramic fibre thermal insulation spaced out 25 mm by <i>noncom- bustible</i> material	230
40 mm mineral wool covering on <i>flue pipe</i> or breeching	230
0.68 mm sheet metal on 25 mm mineral wool batts reinforced with wire mesh or equivalent	75
Column 1	2

SECTION 6.4 SERVICE SHAFTS AND CHUTES

SUBSECTION 6.4.1. GENERAL

6.4.1.1. Service shafts, linen and refuse chutes shall conform to Part 3.

PART 7

PLUMBING SERVICES

TABLE OF CONTENTS

SECTION 7.1 GENERAL

Subsection 7.1.1.	Scope	199
Subsection 7.1.2.	Application	199
Subsection 7.1.3.	Required Facilities	199
Subsection 7.1.4.	Definitions	199

PART 7 PLUMBING SERVICES

SECTION 7.1 GENERAL

SUBSECTION 7.1.1. SCOPE

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

7.1.1.2. This Part applies to the design, construction, extension, *alteration*, renewal or repair of *plumbing systems*.

SUBSECTION 7.1.2. APPLICATION

* 7.1.2.1. Every *plumbing system* shall conform to The Plumbing and Drainage Act and regulations made pursuant to that Act.

SUBSECTION 7.1.3. REQUIRED FACILITIES

7.1.3.1. *Buildings* shall be equipped with plumbing facilities as required in Subsection 3.6.4.

7.1.3.2. *Dwelling units* shall be equipped with plumbing facilities as required in Section 9.32.

SUBSECTION 7.1.4. DEFINITIONS

7.1.4.1. Words that appear in italics are defined in Part 1.

PART 8

CONSTRUCTION SAFETY MEASURES

-PUBLIC SAFETY AT CONSTRUCTION SITES

TABLE OF CONTENTS

SECTION 8.1 GENERAL

Subsection 8.1.1.	Scope	203
Subsection 8.1.2.	Application	203
Subsection 8.1.3.	Definitions	203

SECTION 8.2 PROTECTION OF THE PUBLIC

Subsection 8.2.1.	Fencing and Barricades	203
Subsection 8.2.2.	Fire Protection	204
Subsection 8.2.3.	Excavation	205
Subsection 8.2.4.	Use of Streets or Public Property	205
Subsection 8.2.5.	Direction of Vehicular Traffic	206
Subsection 8.2.6.	Waste Material	206

PART 8 CONSTRUCTION SAFETY MEASURES

SECTION 8.1 GENERAL

SUBSECTION 8.1.1. SCOPE

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

8.1.1.2. This Part applies to the protection of the public during the construction, *alteration* or demolition of every *building*, including any incomplete or abandoned *building*.

* 8.1.1.3. Measures shall be taken during construction, *alteration* or demolition to protect the public in conformance with CSA S350-M1980, "Code of Practice for Safety in Demolition of Structures."

SUBSECTION 8.1.2. APPLICATION

8.1.2.1. Where a *building* is undergoing construction, *alteration* or demolition, measures shall be taken to protect the public at the *building* site in conformance with this Code. (See Appendix A.)

8.1.2.2. Precautions shall be taken to ensure that no person is exposed to undue risk.

SUBSECTION 8.1.3. DEFINITIONS

8.1.3.1. Words that appear in italics are defined in Part 1.

SECTION 8.2 PROTECTION OF THE PUBLIC

SUBSECTION 8.2.1. FENCING AND BARRICADES

8.2.1.1.(1) Where the construction may constitute a hazard to the public, work shall not commence on the construction, *alteration* or repair of a *project* 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.(1) A covered way shall

- (a) have a clear height of not less than 2.5 m
- (b) have a clear width of at least 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 kN/m² on the roof,
- (d) have a weathertight roof sloped toward the *project*,
- (e) be totally enclosed on the *project* side with a structure having a reasonably smooth surface facing the *public way*,
- (f) have a railing 1 070 mm in height 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 at least 1200 mm high that can be locked or bolted in a closed position to prevent the entry of pedestrians.

8.2.1.3.(1) When a *project* 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 in height shall be erected between the *project* 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 *project* is unattended and shall be maintained in place until completion of the *project*.

8.2.1.4. Where any special hazard exists from which it is not possible to protect the public by other means, watchmen shall be employed to prevent the public from entering the danger zone at any time of the day or night.

8.2.1.5.(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.

SUBSECTION 8.2.2. FIRE PROTECTION

8.2.2.1. Fire extinguishing equipment shall be provided and installed in accordance * with The Fire Prevention Act and regulations made pursuant to that Act.

8.2.2.2.(1) Fire extinguishing equipment shall be

- (a) provided where risk of fire exists,
- (b) suitable as to type and size for combatting any likely fire,
- (c) protected from mechanical damage,
- (d) located for easy access at suitably marked stations,
- (e) maintained in good operating condition, and
- (f) protected from freezing.

8.2.2.3. Where a permanent standpipe and hose system is to be installed in a *building*, it shall be installed progressively so far as is practicable as the *building* construction proceeds.

8.2.2.4.(1) In *buildings* that are heated, at least one *acceptable* portable extin- * guisher having a rating of at least 2-A shall be provided

- (a) in every workshop,
- (b) in every storage *building* for *combustible* materials,
- (c) in places where welding or flame-cutting operations are being carried on and for a reasonable time thereafter, and
- (d) on each *storey* having a *floor area* of 500 m² or less in an enclosed *building* being constructed or altered, and an additional portable extinguisher provided for each additional 500 m² of *floor area* or any fraction thereof, except that this does not apply to *buildings of residential occupancy* of not more than 2 *storeys* in *building height* or a single-storey *building* of any *occupancy* without basement or cellar.

8.2.2.5.(1) At least one portable extinguisher of the dry chemical type with a minimum * rating of 2-A, 20-B,C shall be provided

- (a) in *buildings* that are not heated, in
 - (i) every workshop,
 - (ii) every storage *building* for *combustible* materials, and
 - (iii) on each *storey* having a *floor area* of 500 m² or less in an enclosed *building* being constructed or altered, and an additional portable extinguisher shall be provided for each additional 500 m² of *floor area* or any fraction thereof, except that this does not apply to *buildings of residential occupancy* of not more than 2 *storeys* in *building height* or

- a single *storey building* of any *occupancy* without basement or cellar,
- (b) where flammable liquids are handled or stored,
- (c) where temporary oil-fired or gas-fired equipment is used, or
- (d) a tar or asphalt kettle is used.

8.2.2.6.(1) A portable extinguisher shall

- (a) be recharged immediately after use and returned to its designated position,
- (b) be inspected at least monthly and the date of the last inspection recorded on it, and
- (c) not contain carbon tetrachloride, methyl bromide or other similar vapourizing liquid.

8.2.2.7.(1) Access shall be provided and maintained at all times to all fire fighting equipment including fire hose, extinguishers, sprinkler valves and hydrants.

(2) Access to the *project* shall be provided for the local fire department at all times.

SUBSECTION 8.2.3. EXCAVATION

8.2.3.1.(1) Except as provided in Article 8.2.3.2., 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 to afford safety to the public.

8.2.3.2.(1) Existing gas, electrical, water, steam and other services may be left within the area of the excavation provided

- (a) before work begins the approval of the service company involved is obtained to the proposed method of operation,
- (b) their location is determined before excavation commences,
- (c) a suitable method of excavation is adopted which will ensure that they are not damaged, and
- (d) suitable temporary supports are provided.

8.2.3.3. 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.

8.2.3.4. 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.

SUBSECTION 8.2.4. USE OF STREETS OR PUBLIC PROPERTY

8.2.4.1.(1) Except as provided in Article 8.2.4.2., provisions shall be made at all times for the safe passage past the *project* site of both pedestrian and vehicular traffic. Material or equipment shall not be placed on any *street* or other public property except as authorized.

(2) Except as provided in Sentence (3), where a sidewalk exists adjacent to the *project* it shall be kept clear of obstructions at all times.

(3) 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.

8.2.4.2. Operations from which the public cannot be protected by barricades or similar means, such as the hoisting of major components onto a tall *building*, shall not be carried out until the *street* or other *public way* is closed.

8.2.4.3. Excavations in *streets* or public property shall be adequately barricaded and warning signs or lights shall be installed on each section of such barricades.

8.2.4.4. All sidewalks, *streets* or other public property that have been damaged shall be restored to a safe condition, and all obstructions pertaining to the *project* shall be removed when the need for such obstruction is ended.

8.2.4.5. Warning lights shall be placed and shall be in operation during the hours of darkness at all obstructions on *streets* or other *public ways*.

8.2.4.6. If other measures are not being taken to control the passage of pedestrians * past a *project* site while hoisting or other hazardous operations are underway, every gate required by Clause 8.2.1.2.(1)(h) shall be closed and fastened, and pedestrians diverted away from any area into which material or equipment could fall.

SUBSECTION 8.2.5. DIRECTION TO VEHICULAR TRAFFIC

8.2.5.1.(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 flagmen,
- (b) warning signs,
- (c) barriers,
- (d) lane control devices, or
- (e) flashing lights or flares located at a suitable distance from the hazard.

8.2.5.2.(1) When a flag is used to direct traffic it shall be

- (a) red,
- (b) not less than 450 mm by 500 mm,
- (c) mounted on a staff at least 1 m long with the long side attached securely to the staff along its entire length, and
- (d) maintained in a clean and untorn condition when being used.

8.2.5.3.(1) When a sign is used to direct traffic it shall be

- (a) diamond-shaped and of material at least as rigid as 6 mm thick plywood,
- (b) at least 450 mm by 450 mm in size and mounted at 1 corner on a substantial pole approximately 1.2 m in length,
- (c) red on one side with black corner areas so that the red area is a regular 8-sided figure, and with the word "STOP" or "ARRET" in clearly distinguishable white letters approximately 150 mm in height located centrally on the sign,
- (d) yellow on the other side with the word "SLOW" or "LENTEMENT" as appropriate for the district in which the *project* is located, in clearly distinguishable black letters approximately 150 mm in height located centrally on the sign or symbols recognized by the International Traffic Code, and
- (e) maintained in a clean condition when being used.

8.2.5.4.(1) A workman who is directing traffic shall

- (a) be equipped as required by Article 8.2.5.5.,
- (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.

8.2.5.5.(1) A workman 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 extended from above the elbow to the wrist.

SUBSECTION 8.2.6. WASTE MATERIAL

8.2.6.1. Except as provided in Article 8.2.6.2., waste material or other material shall not be permitted to fall freely from one *storey* to another.

8.2.6.2.(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 (3), or
- (c) be carried out by means of a hoisting apparatus if large pieces or objects are involved.

(2) Waste material cleared as provided in Sentence (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.

(3) The chute described in Clause (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

TABLE OF CONTENTS

Section 9.1	General	211
Section 9.2	Definitions	211
Section 9.3	Materials, Systems and Equipment	211
Section 9.4	Loads	214
Section 9.5	Room and Space Dimensions	219
Section 9.6	Doors	221
Section 9.7	Windows	223
Section 9.8	Stairs, Ramps, Handrails and Guards	225
Section 9.9	Means of Egress	229
Section 9.10	Fire Protection	236
Section 9.11	Sound Control	255
Section 9.12	Excavation	259
Section 9.13	Waterproofing and Dampproofing	261
Section 9.14	Drainage	262
Section 9.15	Footings and Foundations	264
Section 9.16	Slabs on Ground	269
Section 9.17	Columns	270
Section 9.18	Crawl Spaces	271
Section 9.19	Roof Spaces	272
Section 9.20	Above-Grade Masonry	273

Section 9.21	Chimneys and Flues	282
Section 9.22	Fireplaces	286
Section 9.23	Wood-Frame Construction	287
Section 9.24	Post, Beam and Plank Construction	303
Section 9.25	Sheet Steel Stud Wall Framing	306
Section 9.26	Thermal Insulation and Vapour Barriers	308
Section 9.27	Roofing	310
Section 9.28	Siding	318
Section 9.29	Stucco	324
Section 9.30	Interior Wall and Ceiling Finishes	327
Section 9.31	Flooring	333
Section 9.32	Plumbing Facilities	336
Section 9.33	Ventilation	337
Section 9.34	Heating and Air-Conditioning	339
Section 9.35	Electrical Facilities	345
Section 9.36	Garages and Carports	347

PART 9 HOUSING AND SMALL BUILDINGS

SECTION 9.1 GENERAL

SUBSECTION 9.1.1. APPLICATION

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

Scope

SECTION 9.2 DEFINITIONS

SUBSECTION 9.2.1. GENERAL

9.2.1.1. Words in italics are defined in Part 1.

Words in italics

SECTION 9.3 MATERIALS, SYSTEMS AND EQUIPMENT

SUBSECTION 9.3.1. CONCRETE

9.3.1.1. Concrete shall be designed, mixed, placed and cured in accordance with CAN3-A23.1-M77, "Concrete Materials and Methods of Concrete Construction," and tested in accordance with CAN3-A23.2-M77, "Methods of Test for Concrete."

Design criteria

9.3.1.2. Cement shall meet the requirements of CAN3-A5-M77, "Portland Cements." Sulphate-resisting cement shall be used for concrete in contact with sulphate soil deleterious to normal cement. Such concrete shall conform to the requirements in Section 16 of CAN3-A23.1-M77, "Concrete Materials and Methods of Concrete Construction."

Sulphate soils

9.3.1.3. Aggregates shall consist of sand, gravel, crushed rock, crushed air-cooled blast furnace slag, expanded shale or expanded clay conforming to CAN3-A23.1-M77, "Concrete Materials and Methods of Concrete Construction." Aggregate shall be clean, well-graded and free of injurious amounts of organic and other deleterious material.

Aggregate

9.3.1.4. Water shall be clean and free of injurious amounts of oil, organic matter, sediment or any other deleterious material.

Water

9.3.1.5. Unless otherwise specifically required elsewhere in this Part, the compressive strength of unreinforced concrete shall be not less than 14 MPa after 28 days.

Compressive strength

9.3.1.6. 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 7 per cent.

9.3.1.7. The concrete mixes described in Table 9.3.1.A. shall be considered acceptable if the slump does not exceed 100 mm when measured according to the slump test described in CAN3-A23.2-M77, "Methods of Test for Concrete." Aggregate shall not exceed 50 mm in size.

Concrete mix

9.3.1.8. Admixtures shall conform to CAN3-A266.1-M78, "Air Entraining Admixtures for Concrete" or CAN3-A266.2-M78, "Chemical Admixtures for Concrete," as applicable.

Admixtures

Table 9.3.1.A.
Forming Part of Article 9.3.1.7.

CONCRETE MIXES, BY VOLUME			
Concrete Strength, MPa	Cement, part	Sand, parts	Coarse Aggregate
14	1	2	4 parts
	1	—	6 parts pit run gravel
17	1	2	3½ parts up to 40 mm in size
	1	—	5½ parts pit run gravel
Column 1	2	3	4

Reinforced concrete design

9.3.1.9. Reinforced concrete shall be designed to conform to the requirements of Part 4.

Cold weather requirements

9.3.1.10. 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. No frozen material or ice shall be used in the mix.

SUBSECTION 9.3.2. LUMBER AND WOOD PRODUCTS

Grade marking

9.3.2.1. 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 1978 NLGA Grading Rules for Canadian lumber.
(See Appendix A.)

9.3.2.2. 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 9.23.13.15. for trusses).

9.3.2.3. Machine stress rated lumber shall conform to the requirements of Section 4.3.

9.3.2.4. On site cross-cutting of a piece of lumber shall not be considered to affect the grade.

9.3.2.5. Waferboard 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 exterior type.

Moisture content

9.3.2.6. Moisture content of lumber shall be not greater than 19 per cent at the time of installation.

9.3.2.7. Lumber dimensions referred to in this Part are actual dimensions determined in conformance with CSA O141-1970, "Softwood Lumber."

9.3.2.8. The thicknesses specified in this Part for plywood, hardboard, particleboard and waferboard shall be subject to the tolerances permitted in the standards referenced for these products unless otherwise specifically indicated herein.

9.3.2.9. 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.

Table 9.3.2.A.
Forming Part of Article 9.3.2.2.

*

MINIMUM LUMBER GRADES FOR SPECIFIC END USES								
USE	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				
				Stud	Light Framing	Structural Light Framing	Structural Joists and Planks	Posts and Timbers
	Para 113	Para 114	Para 118	Para 121	Para 122	Para 123	Para 124	Para 131
Stud wall framing (loadbearing members)	—	—	—	Stud	Standard	No. 2	No. 2	—
Stud wall framing (non-loadbearing members)		—	—	Stud	Utility	No. 3	No. 3	—
Plank frame construction (loadbearing members)	3 Common	—	3 Common	—	—	—	No. 2	—
Plank frame construction (non-loadbearing members)	5 Common	—	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
Roof sheathing	3 Common	Standard	3 Common	—	—	—	—	—
Sub-flooring	3 Common	Standard	3 Common	—	—	—	—	—
Wall sheathing required as a nailing base	4 Common	Utility	4 Common	—	—	—	—	—
Wall sheathing not required as a nailing base	5 Common	Economy	5 Common	—	—	—	—	—
Column 1	2	3	4	5	6	7	8	9

9.3.2.10. Where wood is pressure treated to resist termites, such treatment shall be in accordance with the requirements of one of the following standards:

CSA O80.1-1974, "Preservative Treatment of All Timber Products by Pressure Processes,"

CSA O80.2-1974, "Preservative Treatment of Lumber, Timber, Bridge Ties and Mine Ties by Pressure Processes,"

CSA O80.9-1974, "Preservative Treatment of Plywood by Pressure Processes," or
 CSA O80.15-1974, "Preservative Treatment of Wood for Building Foundation Systems, Basements and Crawl Spaces by Pressure Processes."

SUBSECTION 9.3.3. METAL

9.3.3.1. Minimum thickness 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. 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 at least equal to the G90 coating designation in ASTM A525-80, "Steel Sheet, Zinc-Coated (Galvanized) by * the Hot-Dip Process, General Requirements."

SECTION 9.4 LOADS

SUBSECTION 9.4.1. GENERAL

9.4.1.1. When the size of structural members and their connections are not given in this Part, the members and their connections shall conform to Part 4, except that design *live loads* and deflection limits shall conform to Subsection 9.4.2. to 9.4.6.

SUBSECTION 9.4.2. FLOOR LOADS

Floor loads **9.4.2.1.** The minimum design *live load* on a floor area is the load listed in Table 9.4.2.A. and Articles 9.4.2.2. to 9.4.2.4. applied uniformly over the entire area, or the load listed in Table 9.4.2.B. applied over an area 750 mm by 750 mm located so as to cause maximum effects, whichever causes the greater stresses.

9.4.2.2. Floors in equipment rooms, factories and storage areas shall be designed to carry the loads due to their intended use, but not less than the loads shown in Table 9.4.2.A.

9.4.2.3. Corridors, lobbies and aisles shall be designed to carry not less than the design *live load* required for the *occupancies* they serve.

9.4.2.4. Residential balconies not used as passageways shall be designed to carry the design roof snow load or the load shown in Table 9.4.2.A., whichever is greater.

Table 9.4.2.A.
Forming Part of Article 9.4.2.1.

UNIFORM DESIGN LOADS FOR FLOORS	
Use of Area of Floor	Minimum Design Live Load, kN/m^2
Corridors	(1)
* Balconies and decks, residential, not used as passage ways	1.9 ⁽²⁾
Balconies, other types	4.8
Equipment rooms	3.6 ⁽³⁾
<i>Exits</i>	4.8
Factories	6.0 ⁽³⁾
Garages	
for passenger cars	2.4
for unloaded buses and light trucks	6.0
for loaded trucks and buses and all trucking spaces	12.0
Kitchens	
other than domestic type	4.8
Office areas	
basements	4.8
all other storeys	2.4
Laboratories	3.6
<i>Residential occupancies</i>	
attics not accessible by a stairway	0.5
attics accessible by a stairway	1.4
bedrooms	1.4
all other rooms	1.9
stairs within <i>dwelling units</i>	1.9
<i>Mercantile occupancies</i>	4.8
Driveways not supported by the ground	12.0
Sidewalks not supported by the ground and adjacent to driveways that may be subject to loads from cars or trucks	12.0
Walks not supported by the ground and not subject to loads from cars or trucks	4.8
Storage areas	4.8 ⁽³⁾
* Water-closet rooms except in <i>residential occupancies</i>	2.4
Column 1	2

Notes to Table 9.4.2.A.:

- (1) See Article 9.4.2.3.
 (2) See Article 9.4.2.4.
 (3) See Article 9.4.2.2.

Table 9.4.2.B.
Forming Part of Article 9.4.2.1.

CONCENTRATED DESIGN LOADS FOR FLOORS	
Use of Area of Floor	Minimum Concentrated Design Load, kN
Floors of offices, manufacturing buildings	9
Floors and areas used by passenger cars	11
Floors and areas used by vehicles not exceeding 3 600 kg gross mass and walks not subject to vehicular traffic over basements, cellars or other open areas	18
Floors and areas used by vehicles exceeding 3 600 kg but not exceeding 9 000 kg gross mass	36
Floors and areas used by vehicles exceeding 9 000 kg gross mass	54
Driveways or sidewalks adjacent to driveways over basements, cellars or other open areas	54
Column 1	2

SUBSECTION 9.4.3. SNOW LOADS

Snow loads **9.4.3.1.** Except for the requirements of Articles 9.4.3.2. to 9.4.3.5., design snow load * shall be not less than 60% of the ground snow load given in Part 11, but in no case less than 1 kPa on the horizontal roof projection.

9.4.3.2. If the entire width of a roof does not exceed 4.3 m, the design snow load shall be * not less than 50% of the ground snow load given in Part 11, but in no case less than 1 kPa on the horizontal roof projection.

9.4.3.3. Bow string, arch or semi-circular roof trusses having an unsupported span greater than 6 m, steel or wood roof framing members having an unsupported span greater than 12 m or a spacing greater than 600 mm and reinforced concrete roof slabs shall be designed in conformance with the snow load requirements in Section 4.1.

9.4.3.4. Except for roofs of wood-frame construction, roofs of *buildings* shall be designed in conformance with the snow-load requirements in Section 4.1 where the greatest horizontal area of the *building* above *grade*, measured within the exterior surfaces of the exterior walls, notwithstanding the presence of *firewalls*, exceeds * 600 m².

9.4.3.5. If roofs are at different levels or there are projections above the roof level, * allowance shall be made for the effects of drifting snow in accordance with Part 4.

SUBSECTION 9.4.4. WIND LOADS

Wind loads **9.4.4.1.** Design wind loads shall conform to the appropriate requirements in Section 4.1.

SUBSECTION 9.4.5. DEFLECTIONS

Deflections **9.4.5.1.** The maximum deflection of structural members shall conform to Table 9.4.5.A. *Dead loads* need not be considered in computing such deflections.

Table 9.4.5.A.
Forming Part of Article 9.4.5.1.

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

SUBSECTION 9.4.6. EARTHQUAKE LOADS

9.4.6.1. Except for *buildings* of wood-frame construction, *buildings* shall be designed for the earthquake loads in Section 4.1 where the greatest horizontal area of the *building* above *grade*, measured within the exterior surfaces of the exterior walls, exceeds 600 m².

Earthquake loads

9.4.6.2. Except as provided in Articles 9.4.6.3. to 9.4.6.5., 2- and 3-storey *buildings* in seismic Zone 3 and 3-storey *buildings* in seismic Zone 2 shall be designed for the earthquake loads in Section 4.1 where the greatest horizontal area of the *building* above *grade*, measured within the exterior surfaces of the exterior walls, does not exceed 600 m².

9.4.6.3. *Buildings* with structural *loadbearing* precast concrete elements (normal or lightweight) shall have connections designed for the earthquake loads in Section 4.1.

9.4.6.4. *Buildings* constructed with *loadbearing* masonry walls which are required to resist the earthquake loads specified in Articles 9.4.6.1. and 9.4.6.2. may, in lieu of engineered design, be reinforced as required in Subsection 9.20.18.

9.4.6.5. *Buildings* with structural systems of wood frame construction need not be designed for the earthquake loads in Section 4.1.

SUBSECTION 9.4.7. BEARING CAPACITY FOR SOIL AND ROCK

9.4.7.1. Except as provided in Articles 9.4.7.2. to 9.4.7.4. and Section 9.15, where the footing width does not exceed 1 m, the *allowable bearing pressure* for soil or rock shall be determined in conformance with ASTM D1194-72 (1977), "Bearing Capacity of Soil for Static Load on Spread Footing," provided the bearing plate used in the test is at least 300 mm by 300 mm and the *allowable bearing pressure* does not exceed $\frac{1}{3}$ the ultimate bearing capacity of the soil or rock and does not exceed $\frac{1}{3}$ the pressure that would cause the plate to settle 25 mm.

9.4.7.2. Where allowable bearing pressures for soil or rock are not established in conformance with Article 9.4.7.1., or on the basis of the requirements of Section 4.2, the values in Table 9.4.7.A. may be used.

Table 9.4.7.A.
Forming Part of Article 9.4.7.2.

Type and Condition of Soil or Rock	Maximum Allowable Bearing Pressure, kN/m ²
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 9.4.7.A.:

⁽¹⁾ See Appendix A.

9.4.7.3. 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 9.4.7.2., 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*. In calculating such subsurface pressures, 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.

9.4.7.4. Where a foundation bears on gravel, sand or silt and where 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 Articles 9.4.7.1. and 9.4.7.2.

9.4.7.5. The design procedures described in Section 4.2 may be used in lieu of the design procedures in this Subsection, and shall be used where *deep foundations* are used, or if the footing size falls outside the scope of this Section, or if the foundation is constructed on peat or on filled ground.

9.4.7.6. Where a foundation is located in an area in which soil movement caused by changes in soil moisture content is known to occur to the extent that it will cause significant damage to a *building*, measures shall be taken to minimize the effect of such movement on the *building*.

9.4.7.7. Walls shall be designed to resist the lateral pressure of the retained material. Walls supporting drained earth may be designed for pressure equivalent to

that exerted by a fluid weighing not less than 480 kg/m³ and having a depth equal to that of the retained earth. Any surcharge shall be in addition to the equivalent fluid pressure.

SECTION 9.5 ROOM AND SPACE DIMENSIONS

SUBSECTION 9.5.1. GENERAL

9.5.1.1. 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.

Scope

9.5.1.2. Unless otherwise indicated herein, the areas, dimensions and heights of rooms or spaces shall be measured between finished wall surfaces and between finished floor and ceiling surfaces.

Method of measurement

9.5.1.3. Minimum dimensions listed for rooms or spaces in combination with other rooms or spaces refer to the minimum dimension of the combined space.

Combined space

9.5.1.4. Minimum floor areas specified in this Section do not include closets or built-in bedroom cabinets unless otherwise indicated.

Floor areas

9.5.1.5. Two or more areas are considered as a combination room if the dividing wall occupies less than 60 per cent of the separating plane.

Combination rooms

9.5.1.6. 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.

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 at least 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 at least 50 per cent of the required floor area of 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 basement or cellar 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

SUBSECTION 9.5.2. CEILING HEIGHTS

9.5.2.1. Heights of rooms or spaces in *residential occupancies* shall conform to Table 9.5.2.A.

Room heights

9.5.2.2. The clear height above and below a *mezzanine* floor assembly in all *occupancies* shall be not less than 2.15 m.

9.5.2.3. The clear height in a *storage garage* shall be not less than 2 m.

SUBSECTION 9.5.3. LIVING ROOMS OR SPACES WITHIN DWELLING UNITS

Living room
area

9.5.3.1. Living areas within *dwelling units*, either as separate rooms or in combination with other spaces, shall have at least 13.5 m² of floor area and shall have no dimension less than 3 m within the required area. Where the area of a living space is combined with a kitchen and dining area, the living area alone in a *bachelor dwelling unit* shall be at least 11 m².

SUBSECTION 9.5.4. DINING ROOMS OR SPACES WITHIN DWELLING UNITS

Dining room
area

9.5.4.1. A dining space in combination with other space shall have a minimum floor area of 3.25 m². Dining rooms not combined with other space shall have a minimum area of 7 m².

9.5.4.2. Except as permitted in Article 9.5.4.3., 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.

9.5.4.3. When a required dining area is provided in a kitchen or serves a *bachelor dwelling unit*, the minimum dimension of such space may be reduced to 1.7 m.

SUBSECTION 9.5.5. KITCHENS WITHIN DWELLING UNITS

Kitchen area

9.5.5.1. Kitchen areas within *dwelling units* either separate from or in combination with other space shall have at least 4.2 m² of floor area including the area occupied by the base cabinets, except that in *bachelor dwelling units* the minimum floor area shall be 3.7 m².

SUBSECTION 9.5.6. BEDROOMS OR SPACES IN DWELLING UNITS AND DORMITORIES

9.5.6.1. Except as provided in Articles 9.5.6.2. and 9.5.6.3., bedrooms in *dwelling units* shall have at least 7 m² of floor area where built-in cabinets are not provided and 6 m² of floor area where built-in cabinets are provided. The minimum dimension within the required area shall be 2 m.

9.5.6.2. Except as provided in Article 9.5.6.3., at least 1 bedroom in every *dwelling unit* shall have at least 9.8 m² of floor area where built-in cabinets are not provided and 8.8 m² of floor area where built-in cabinets are provided. The minimum dimension within the required area shall be 2.7 m.

Combination
bedroom areas

9.5.6.3. Bedroom spaces in combination with other spaces in *dwelling units* shall have at least 4.2 m² of floor area and have no dimension less than 2 m within the required area.

9.5.6.4. Sleeping rooms other than in *dwelling units* shall have at least 7 m² of floor area per person for single occupancy and 4.6 m² per person for multiple occupancy. The minimum dimension within the required area shall be 2 m.

SUBSECTION 9.5.7. BATHROOMS AND WATER-CLOSET ROOMS

Bathroom
areas

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.

SUBSECTION 9.5.8. HALLWAYS

Width of
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 exceeding 4.3 m in width the hallway width may be 710 mm where a second *exit* is provided near the end of a hallway farthest from the living area.

SECTION 9.6 DOORS

SUBSECTION 9.6.1. GENERAL

9.6.1.1. Requirements relating to doors in *fire separations* and *means of egress* shall conform to the appropriate requirements in Sections 9.9 and 9.10.

Doors in fire separations

SUBSECTION 9.6.2. REQUIRED DOORS

9.6.2.1. A door shall be provided at each entrance to a *dwelling unit*, bathroom, water-closet room, shower room and room containing a *boiler* or *furnace*.

Required doors

9.6.2.2. In *buildings* containing more than 1 *dwelling unit*, doors shall be provided at the exterior entrances, laundry or drying rooms, storage rooms, public water-closet rooms, garbage and incinerator rooms, furnace rooms, recreation rooms and any other locations required by Section 9.10.

Required doors in multiple dwelling units

- * **9.6.2.3.** Notwithstanding the installation of overhead doors for vehicular access, at least one egress door not less than 1980 mm high and 760 mm wide, swinging on a vertical axis, shall be installed in a *storage garage*.

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 at least one line of passage from the exterior to the basement Utility rooms	810	1 980
Walk-in closet	610	1 980
Bathroom, water-closet room, shower room	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

SUBSECTION 9.6.3. DOORWAY SIZES

9.6.3.1. 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. Where folding doors are to be provided, the same openings apply.

Doorway openings

9.6.3.2. Doors to public water-closet rooms shall be not less than 810 mm in width and 2 030 mm in height.

- * **9.6.3.3.** The door height from a *dwelling unit* to an exterior balcony required by Table 9.6.3.A. 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.

SUBSECTION 9.6.4. EXTERIOR DOORS

Exterior doors **9.6.4.1.** Exterior wood doors shall be of exterior type conforming to CSA O132.2-M1977, "Wood Doors."

9.6.4.2. Aluminum frame sliding glass doors shall conform to the appropriate requirements in CGSB 82-GP-1M(1977), "Doors, Glass, Aluminum Frame, Sliding, Standard-Duty" or to CGSB 82-GP-2M(1977), "Doors, Glass, Aluminum Frame, Sliding, Medium-Duty."

SUBSECTION 9.6.5. GLASS

9.6.5.1. Except for tempered glass, glass thickness and the size of glass for doors shall conform to Table 9.6.5.A.

Table 9.6.5.A.
Forming Part of Article 9.6.5.1.

GLASS SIZE FOR DOORS	
Minimum Glass Thickness	Maximum Area, m ²
2 mm	0.25
3 mm	0.50
4 mm	1.00
5 mm	1.25
6 mm	Not limited
Column 1	2

9.6.5.2. Glass side lights greater than 500 mm in width 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-M79, "Glass, Safety, Tempered or Laminated," or shall be of wired glass conforming to CAN2-12.11-M76, "Glass, Wired, Safety."

9.6.5.3. Glass in entrance doors to *dwelling units* and in public areas, other than the entrance doors described in Article 9.6.5.2., shall be safety glass or wired glass of the type described in Article 9.6.5.2. where the glass area exceeds 0.5 m² and extends to less than 900 mm from the bottom of the door.

9.6.5.4. Mirrored glass doors may be used only at the entrance to clothes closets. Such doors shall be reinforced with hardboard, plywood or particleboard securely fastened to the back of the mirror unless the glass is safety glass of the laminated or tempered type.

9.6.5.5. Except as provided in Article 9.7.6.3., 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.

9.6.5.6. Glass other than safety glass shall not be used for a shower or bathtub enclosure.

SECTION 9.7 WINDOWS

SUBSECTION 9.7.1. SCOPE

Natural lighting **9.7.1.1.** This Section applies to installation of windows and to the requirements for natural lighting to be provided by windows in *residential occupancies*.

9.7.1.2. Requirements for windows in relation to fire protection are described in Section 9.10.

Ventilation **9.7.1.3.** Requirements for ventilation are described in Section 9.33.

SUBSECTION 9.7.2. GENERAL

9.7.2.1. Windows shall be designed and installed so that they shed water.

Window design

9.7.2.2. The minimum window glass area for rooms in *buildings* of *residential occupancy* or which are used for sleeping shall conform to Table 9.7.2.A. The unobstructed glass area of a door or skylight is considered equivalent to that of a window.

Minimum window glass areas

Table 9.7.2.A.
Forming Part of Article 9.7.2.2.

MINIMUM GLASS AREAS FOR ROOMS OF RESIDENTIAL OCCUPANCY		
Location	Unobstructed Glass Area	
	With No Electric Lighting	With Electric Lighting
Laundry, basement recreation room, unfinished basement or cellar	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 with at least 1 window having a minimum area of 0.55 m ² and a minimum dimension of 600 mm	5 per cent of area served with at least 1 window having a minimum area of 0.55 m ² and a minimum dimension of 600 mm
Column 1	2	3

9.7.2.3. Wherever practicable, windows shall be provided to light corridors, stairways and similar public space in *buildings*.

Windows in public spaces

- * **9.7.2.4.** Openable windows shall not be located in that part of a wall separating a *dwelling unit* from an attached garage or carport.

SUBSECTION 9.7.3. WINDOW STANDARDS

9.7.3.1. Unless otherwise specified in this Section, windows shall conform to one of the following:

- CSA O132.1-M1977, "Wood Windows,"
- CAN2-12.8-M76, "Insulating Glass Units,"
- CGSB 63-GP-2M(1976), "Windows, Extruded Aluminum, Vertical and Horizontal Sliding, Medium Duty,"
- CGSB 63-GP-3M(1976), "Windows, Extruded Aluminum, Vertical and Horizontal Sliding, Standard Duty,"
- CGSB 63-GP-5M(1976), "Windows, Steel, Vertical and Horizontal Sliding, Standard Duty," or
- CGSB 63-GP-6M(1976), "Windows, Steel, Vertical and Horizontal Sliding, Medium Duty."

Windows, manufactured in conformance with CGSB window standards may be either Grade 1 or Grade 2, regardless of height above *grade*.

SUBSECTION 9.7.4. GLASS

Quality of glass **9.7.4.1.** Glass shall conform to one of the following:
 CAN2-12.1-M79, "Glass, Safety, Tempered or Laminated,"
 CAN2-12.2-M76, "Glass, Sheet, Flat, Clear," or
 CAN2-12.3-M76, "Glass, Polished Plate or Float, Flat, Clear."

Thickness of glass **9.7.4.2.** Thickness of glass in windows shall conform to Table 9.7.4.A.

Table 9.7.4.A.
 Forming Part of Article 9.7.4.2.

MAXIMUM GLASS PERIMETER FOR VARIOUS THICKNESSES, mm			
Minimum Glass Thickness of Inner and Outer Panes, mm	Sash Type or Fixed Glazing	Factory-Sealed Double Glazing	
		Fused Edges	Other than Fused Edges
2	3 050	4 575	3 810
3	4 270	6 405	5 340
4	6 100	9 150	7 625
5	7 120	10 680	8 900
6	8 620	12 930	10 775
8	No limit	No limit	No limit
Column 1	2	3	4

SUBSECTION 9.7.5. CAULKING AND GLAZING

Glazing compound **9.7.5.1.** Sealing compound used in the glazing of factory-sealed double-glazed units shall be compatible with the material used to edge seal the units.

Caulking **9.7.5.2.** Caulking shall be provided between window frames or trim and the exterior siding or masonry in conformance with Subsection 9.28.4.

SUBSECTION 9.7.6. WINDOWS IN PUBLIC AREAS

9.7.6.1. Except as provided in Article 9.7.6.3., transparent panels that could be mistaken as a *means of egress* shall be protected by barriers or railings.

9.7.6.2. 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.

9.7.6.3. Sliding glass *partitions* which separate a *public corridor* from an adjacent *occupancy* and which are open during normal working hours need not conform to Articles 9.7.6.1. and 9.6.5.3., except that such *partitions* shall be suitably marked to indicate their existence and position.

9.7.6.4. 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.

SECTION 9.8 STAIRS, RAMPS, HANDRAILS AND GUARDS

SUBSECTION 9.8.1. SCOPE

9.8.1.1. This Section applies to the design and construction of interior and exterior stairs, steps, ramps, railings and *guards*.

Design and construction of stairs

9.8.1.2. Where the stair forms part of an *exit*, the appropriate requirements in Sections 9.9 and 9.10 shall also apply.

Stairs as part of exit

9.8.1.3. Escalators and moving *walkways* shall conform to the appropriate requirements in Part 3.

Escalators and moving walkways

SUBSECTION 9.8.2. GENERAL

9.8.2.1. Treads and risers shall have uniform rise and run in any one flight.

Treads and risers

9.8.2.2. Except for interior stairs within a *dwelling unit*, at least 3 risers shall be provided for interior stairs.

Number of risers required in stairs

9.8.2.3. Interior stairways extending through the roof of a *building* shall be protected from ice and snow.

Stairway protection

SUBSECTION 9.8.3. STAIR DIMENSIONS

*** 9.8.3.1.** Except as permitted in Subsection 9.8.5., interior stairs within *dwelling units* and exterior stairs serving not more than one *dwelling unit* shall have a maximum rise of 200 mm, a minimum run of 210 mm and a minimum tread width of 235 mm.

9.8.3.3. Interior stairs not contained within *dwelling units* and exterior stairs for *buildings*, except those serving not more than 1 *dwelling unit*, shall have a maximum rise of 200 mm, a minimum rise of 125 mm, a minimum run of 230 mm and a minimum tread width of 250 mm.

9.8.3.4. Where the run of any stair is less than 250 mm, a nosing of at least 25 mm shall be provided beyond the face of the riser, or an equivalent back slope on the risers shall be provided.

Nosing

9.8.3.5. Except as required in Article 9.9.3.4., *exit* stairs and stairs used by the public shall have a width, measured between wall faces or *guards*, of at least 900 mm.

9.8.3.6. At least 1 stairway between each floor level in a *dwelling unit* shall have a minimum width between wall faces of at least 860 mm.

9.8.3.7. The head room measured vertically from a line drawn through the outer edges of the nosings shall be at least 1.95 m for stairs located in *dwelling units* and 2.05 m for all other stairs.

Clear height

SUBSECTION 9.8.4. LANDINGS

9.8.4.1. 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 1 *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.

Landings

9.8.4.2. Where a door swings towards a stair, the full arc of its swing shall be over a landing. Except as provided in Article 9.8.4.3., a landing shall be provided at the top and bottom of each flight of interior stairs and where a doorway occurs in a stairway.

Door swing on stairs

9.8.4.3. Where a door occurs at the top of the stair in a *dwelling unit*, no landing is *** required** between the doorway and the stair, if the door does not swing over the stair.

9.8.4.4. 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.

Height
between
landings

9.8.4.5. The vertical height between any landings shall not exceed 3.6 m.

Clear height
over landings

9.8.4.6. The clear height over landings shall be at least 1.95 m in *dwelling units* and 2.05 m for other landings.

SUBSECTION 9.8.5. CURVED STAIRS AND WINDERS

Curved stairs in
exits

9.8.5.1. Curved stairs used in *exits* shall conform to the requirements for *exit* stairs in this Section.

Curved stairs
not in exits

9.8.5.2. Except as permitted in Article 9.8.5.3., a curved stair not required as an *exit* shall have a minimum average run of 200 mm and a minimum run of 150 mm and shall have risers conforming to Articles 9.8.3.1. to 9.8.3.3.

Winders

9.8.5.3. 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°. Only 1 set of such winders shall be permitted between floor levels.

9.8.5.4. Spiral stairs, not required as part of a *means of egress*, may be used within * *dwelling units* if

- (a) individual treads turn through an angle not less than 30 degrees,
- (b) the minimum tread width is 150 mm,
- (c) the maximum rise is 230 mm, and
- (d) the average run is not less than 200 mm.

SUBSECTION 9.8.6. PEDESTRIAN RAMPS

Maximum
gradient for
ramps

9.8.6.1. The maximum gradient for pedestrian ramps shall be 1 in 10 for *residential occupancies*, 1 in 6 for *mercantile* or *industrial occupancies* and 1 in 8 for all other *occupancies*. The maximum gradient for every exterior ramp shall be 1 in 10.

Level area in
ramps

9.8.6.2. 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 at least 300 mm on either side of the wall opening.

Doorways near
ramps

9.8.6.3. 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 the ramp for at least 900 mm.

SUBSECTION 9.8.7. HANDRAILS

9.8.7.1. Except as permitted in Articles 9.8.7.2. and 9.8.7.3, a handrail shall be provided on at least 1 side of stairs less than 1 100 mm in width, and on 2 sides of stairs 1 100 mm in width or greater.

9.8.7.2. 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 1 *dwelling unit*.

9.8.7.3. Only 1 handrail is required on exterior stairs having more than 3 risers provided such stairs serve not more than 1 *dwelling unit*.

9.8.7.4. Handrails on stairways shall be located between 800 mm and 900 mm measured vertically above a line drawn through the outside edges of the stair nosings.

9.8.7.5. A clearance of at least 40 mm shall be provided between each handrail and the wall to which it is fastened.

9.8.7.6. Handrails shall be so constructed that there will be no obstruction on or above them to break a handhold.

9.8.7.7. Handrails and stair stringers shall not project more than 100 mm into the required width of stairway.

9.8.7.8. Where ramps are used in lieu of stairs, the handrail requirements for stairs in Article 9.8.7.1. and Articles 9.8.7.3. to 9.8.7.7. shall apply where the gradient exceeds 1 in 10.

SUBSECTION 9.8.8. GUARDS

* **9.8.8.1.** Every exterior landing, porch and every balcony, raised deck, *mezzanine*, gallery, raised *walkway* and roof to which access is provided for other than for maintenance purposes, shall be protected by *guards* on all open sides where the difference in elevation between adjacent levels exceeds 600 mm, and 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.

9.8.8.2. 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 or cellar in a *dwelling unit* may have 1 unprotected side.

9.8.8.3. Except as provided in Articles 9.8.8.4. and 9.8.8.5., all *guards* including those for balconies shall be at least 1 070 mm in height.

9.8.8.4. Except as provided in Article 9.8.8.5., *guards* for stairs shall be at least 900 mm in height measured vertically from a line drawn through the outside edges of the stair nosings, and 1 070 mm in height at landings.

9.8.8.5. *Guards* for stairs within *dwelling units* and stairs serving not more than 1 *dwelling unit* shall be at least 800 mm measured vertically above a line drawn through the outside edges of stair nosings, and at least 900 mm above landings. All other required *guards* within *dwelling units* shall be at least 900 mm in height.

9.8.8.6. Except for floors of garages in Section 9.36, a continuous curb at least 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 where the top of the floor is 600 mm or more above an adjacent ground or floor level.

* **9.8.8.7.** Openings through a *guard* on a balcony, raised deck or an *exit* stair, except an *exit* stair serving not more than 1 *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 such openings which exceed this limit do not represent a hazard.

* **9.8.8.8.** *Guards* around exterior balconies or raised decks of *buildings of residential occupancy* shall be designed so that no member, attachment or opening located between 100 mm and 900 mm above the balcony floor will facilitate climbing.

9.8.8.9. *Guards* for ramps including vehicular ramps shall conform to the requirements for *guards* for stairs in Articles 9.8.8.3., 9.8.8.4. and 9.8.8.7.

SUBSECTION 9.8.9. CONSTRUCTION

9.8.9.1. Exterior concrete stairs with more than 2 risers and 2 treads shall be supported on unit masonry or concrete walls or piers at least 150 mm by 150 mm or shall be cantilevered from the main foundation wall. When such steps are cantilevered from the foundation wall, they shall be constructed and installed in conformance with * Subsection 9.8.10. The depth below ground level for foundations for exterior steps shall conform to the requirements in Section 9.12. Exterior wood steps shall not be in direct contact with the ground unless suitably treated with a wood preservative.

9.8.9.2. Wooden stair stringers shall have a minimum effective depth of 90 mm and an over-all depth of at least 235 mm. Stringers shall be supported and secured top and

Support for
exterior stairs

Wooden stair
stringers

bottom. Stringers shall be at least 25 mm actual thickness if supported along their length and 38 mm actual thickness if unsupported along their length. Stringers shall be spaced not more than 900 mm o.c. in *dwelling units* and 600 mm o.c. when located in other than *dwelling units*, except that in *dwelling units* where risers support the front portion of the tread, the space between stringers shall not exceed 1 200 mm unless the stringers are designed for wider spacings.

- Wooden treads **9.8.9.3.** Lumber or plywood treads for stairs within *dwelling units* shall be at least 25 mm actual thickness, except that if open risers are used, and the distance between stringers exceeds 750 mm, the treads shall be at least 38 mm actual thickness.
- Tread finish **9.8.9.4.** The finish for treads and landings of interior stairs in *dwelling units*, other than stairs to unfinished basements and cellars, shall consist of hardwood, vertical grain softwood, resilient flooring or other material providing equivalent performance.
- Non-skid finish **9.8.9.5.** The finish for treads and landings of interior and exterior stairs, other than those in *dwelling units*, shall have a non-skid finish or shall be provided with non-skid strips.

SUBSECTION 9.8.10. CANTILEVERED PRECAST CONCRETE STEPS

9.8.10.1. Exterior concrete steps and their anchorage system that are cantilevered from a foundation wall shall be designed and installed to support the loads to which they may be subjected.

9.8.10.2. Cantilevered concrete steps in Article 9.8.10.1. shall be anchored to concrete foundation walls at least 200 mm thick.

9.8.10.3. 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

SUBSECTION 9.9.1. SCOPE

9.9.1.1. This Section applies to requirements that are designed to permit the safe and convenient access to the exterior of a *building*, to a public thoroughfare or to *acceptable* open space.

- Stairs, handrails and guards **9.9.1.2.** 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.

- Fire protection **9.9.1.3.** *Flame-spread ratings*, *fire-resistance ratings* and *fire-protection ratings* shall conform to Section 9.10.

SUBSECTION 9.9.2. GENERAL

9.9.2.1. An *access to exit* shall be provided from every roof intended for *occupancy* and from every podium, terrace, platform or contained open space. Where a roof is 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 and located remote from each other. Where a podium, terrace, platform or contained open space is provided, egress requirements shall conform to the appropriate requirements for rooms or *suites* in Article 9.9.7.4.

9.9.2.2. *Exits* may consist of doorways, passageways, ramps, stairways and *horizontal exits*. Fire escapes may be used as *exits* on existing *buildings* provided they are designed and installed in conformance with Part 3.

- Not considered as exits **9.9.2.3.** Elevators, slide escapes or windows shall not be considered as being part of a required *means of egress*.

- Use of exits **9.9.2.4.** 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*.

9.9.2.5. *Service rooms* such as boiler rooms, furnace rooms or incinerator rooms and ancillary rooms such as storage rooms, washrooms, water-closet rooms, garbage rooms and laundry rooms shall not open directly into an *exit*.

9.9.2.6. Fire escapes shall not be installed on any new *building*.

Fire escapes

* **9.9.2.7.** Every *barrier free building* shall have at least 1 principal entrance designed in conformance with the ACNBC document, "Building Standards for the Handicapped 1980" for use by physically handicapped persons, opening to the outdoors at sidewalk level or to a ramp leading to a sidewalk.

* **9.9.2.8.** Every *barrier free building* shall provide access for physically handicapped persons from the entrance described in Article 9.9.2.7. to public spaces on the entrance floor, and to at least 1 elevator when elevators are provided in conformance with the ACNBC document, "Building Standards for the Handicapped 1980."

9.9.2.9. Where a *horizontal exit* is used, it shall conform to Part 3.

SUBSECTION 9.9.3. DIMENSIONS OF MEANS OF EGRESS

9.9.3.1. This Subsection applies to every *means of egress* except *exits* that serve not more than 1 *dwelling unit* and *access to exits* within *dwelling units*.

Scope

9.9.3.2. Except for *dwelling units*, the *occupant load* of *floor area* or part of *floor areas* used in determining the minimum required width of a *means of egress* shall be the number of persons for which such areas are designed, but not fewer than that determined from Table 9.9.3.A. unless otherwise *acceptable*.

Table 9.9.3.A.
Forming Part of Article 9.9.3.2.

MAXIMUM AREA PER PERSON TO BE ASSUMED IN CALCULATING OCCUPANT LOAD	
Occupancy or Use of Floor Area	Max. Area per Person, m ²
Residential	
<i>Dwelling units</i>	(1)
Dormitories	4.6
Business and personal services	
Shops	4.6
Offices	9.3
Mercantile	
Retail sales floors at <i>grade</i> , cellar or basement	2.8
Other mercantile uses	5.6
Industrial	
Manufacturing or process rooms	4.6
<i>Storage garage</i>	46
Warehouse storage space	28
Other storage space	46
Aircraft hangars	46
Other uses	
Cleaning and repair	4.6
Kitchens	9.3
Column 1	2

Note to Table 9.9.3.A.:

(1) See Article 9.9.3.3.

9.9.3.3. The *occupant load* for *dwelling units* shall be based on 2 persons per bedroom or sleeping area.

9.9.3.4. Except as provided in Subsection 9.9.6., the width of an *exit* corridor shall be at least 1 100 mm and the width of other *exits* at least 900 mm, unless greater widths are required because of the *occupant load*. In computing the *exit* width on the basis of *occupant load*, the minimum aggregate width of exterior *exit* doors shall be 1 unit (see Article 9.9.3.7.) per 90 persons, and the minimum aggregate width of other *exits* shall be 1 unit per 30 persons for *residential occupancies* and 1 unit per 60 persons for other *occupancies*. (See also Article 9.8.3.5.)

9.9.3.5. Except as provided in Subsection 9.9.6., the minimum width of a doorway, corridor or passageway in an *access to exit* shall be 1 unit (see Article 9.9.3.7.) per 90 persons, but in no case shall the minimum width of a *public corridor* or in a corridor used by the public be less than 1 100 mm.

Width of stairs
in an access to
exit

9.9.3.6. Except as provided in Subsection 9.9.6., the minimum width of a stairway or ramp in an *access to exit* shall be 1 unit per 60 persons (see Article 9.9.3.7.).

Calculation of
units of exit
width

9.9.3.7. The units of *exit* width in Articles 9.9.3.4. to 9.9.3.6. shall be determined by dividing the width (in millimetres) of an *exit* by 550. Where the remainder is less than 300 mm, it shall not be considered as contributing to the number of units. Where the remainder is 300 mm or more, it shall be considered as contributing $\frac{1}{4}$ unit of *exit* width in the case of stairs and $\frac{1}{2}$ unit of *exit* width in the case of other *exit* facilities.

Aggregate
width of exits

9.9.3.8. Where an *exit* serves more than 1 *floor area*, the aggregate width of such *exit* need not be cumulative from floor to floor, except that where *exits* from above or below converge at an intermediate level, the width beyond the convergence in the direction of *exit* travel shall be not less than the aggregate required width of the converging *exits*.

Height of
means of egress

9.9.3.9. Except as provided in Subsection 9.9.6. and Articles 9.8.3.7. and 9.8.4.6., * the minimum height of *exits* and corridors which provide *access to exits* shall be 2.15 m.

SUBSECTION 9.9.4. FIRE PROTECTION OF EXITS

Scope

9.9.4.1. This Subsection applies to the fire protection of all *exits* except *exits* serving not more than 1 *dwelling unit*.

Fire separation
of exits

9.9.4.2. Except as provided in Articles 9.9.4.3. and 9.9.4.6., every *exit* other than a doorway opening directly to the outdoors at ground level shall be separated from the remainder of the *building* or from another *exit* by a *fire separation* having a *fire-resistance rating* of at least $\frac{3}{4}$ h. 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.

9.9.4.3. The area of wired glass in a door or side light 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 $\frac{3}{4}$ h fire-resistance rating.

Protection of
windows in
exits

9.9.4.4. Openings in the exterior wall of an *exit* shall be protected with wired glass or glass block installed in accordance with Articles 9.10.14.5 and 9.10.14.7., where openings may be exposed to the hazard of a fire in another *fire compartment* of the same *building*.

9.9.4.5. Where an exterior *exit* door may be exposed to the hazards of a fire from openings in a separate *fire compartment* located within 3 m horizontally of the *exit*, such openings shall be protected with wired glass in fixed steel frames conforming to Article 9.10.14.5. or glass block conforming to Article 9.10.14.7.

9.9.4.6. The requirements in Article 9.9.4.2. do not apply to an exterior passageway that is designed as an *exit* facility provided the passageway is open to the outside air and is served by an *exit* stair at each end of the passageway.

SUBSECTION 9.9.5. OBSTRUCTIONS AND HAZARDS IN MEANS OF EGRESS

- 9.9.5.1.** This Subsection applies to obstructions and hazards in every *means of egress* except those within a *dwelling unit* or serving not more than 1 *dwelling unit*. Scope
- 9.9.5.2.** 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. Occupancies in public corridors
- 9.9.5.3.** Except as permitted in Subsection 9.9.6. and Article 9.8.7.7., no fixture, turnstile or construction shall project within the required width of *exit*. Obstructions in exits
- 9.9.5.4.** 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.
- 9.9.5.5.** 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. Mirrors in exits
- 9.9.5.6.** Fuel-fired *appliances* shall not be installed in an *exit* or corridor serving as *access to exit*. Appliances in a means of egress
- 9.9.5.7.** *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*. Location of boiler rooms

SUBSECTION 9.9.6. DOORS IN A MEANS OF EGRESS

- 9.9.6.1.** This Subsection applies to all doors in a *means of egress* except exterior doors serving not more than 1 *dwelling unit* unless otherwise stated herein. Scope
- 9.9.6.2.** *Exit* doors shall not decrease the required *exit* width by more than 50 mm for each full unit of *exit* width (550 mm), and where such doors lead out of stairs or ramps in the direction of *exit* travel, they shall not be less than $\frac{3}{4}$ of the width of such stairs or ramps. Door obstructions
- 9.9.6.3.** Doors in their swing shall not reduce the effective width of *exit* stairs or landings to less than 750 mm, nor shall they reduce the effective width of an *exit* passageway to less than the required width. Doors over landings
- 9.9.6.4.** No door closer or other device shall be installed in an *exit* in such a manner as to reduce the head room clearance to less than 1 980 mm. Door closure headroom
- 9.9.6.5.** An *exit* door or a door that opens to or is located in a *public corridor* or other facility providing *access to exit* from *suites* shall be not less than 2 030 mm in height. Except as required in Articles 9.6.3.1. and 9.9.6.2., such doors shall be at least 810 mm in width when only 1 door leaf is installed in an opening, and 600 mm in width where more than 1 door leaf is provided in the width of an opening. The width of an individual door leaf shall not exceed 1 200 mm in such openings. Door height and width
- 9.9.6.6.** 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. This shall not be considered to prohibit *acceptable* sliding doors designed to swing on a vertical axis when pressure is applied provided such doors are identified as swinging doors by means of a sign or decal. Direction of door swing
- 9.9.6.7.** Except as permitted in Article 9.9.6.8., where an *exit* door opens onto a landing, the landing shall be not less than 300 mm wider and longer than the width of the door. Such doors either in the open or closed position shall be not closer than 300 mm to the nearest riser. Size of landings
- 9.9.6.8.** Where there is a danger of blockage from ice or snow, an *exit* door may open onto not more than 1 step provided the rise of such step does not exceed 150 mm. Exterior doors

9.9.6.9. Except for accessory *buildings* where there is no danger to life safety, every * required *exit* door, including an *exit* door serving a *dwelling unit*, shall swing on a vertical axis. Such door shall open in the direction of *exit* travel, except that a door serving not more than 1 *dwelling unit* is permitted to swing inward.

Revolving
doors

9.9.6.10. Revolving doors used as *exits* shall be of an *acceptable* collapsible type, and shall be permitted only at ground floor level away from the foot of any stairway. Not more than ½ unit of *exit* width may be assumed for such doors. Swing doors shall be provided adjacent to such doors.

9.9.6.11. *Exit* doors and doors to *dwelling units* shall be openable from the inside without requiring keys, special devices or specialized knowledge of the door opening mechanism.

Automatic
locking
prohibited

9.9.6.12. 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.

9.9.6.13. 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.

SUBSECTION 9.9.7. ACCESS TO EXITS

General
requirements

9.9.7.1. Except as permitted in Article 9.9.7.4. and Subsection 9.9.9., each *suite* on a *floor area* occupied by more than 1 *suite* shall have an exterior doorway at or near ground level or a doorway leading to an exterior passageway open to the outdoors or to a *public corridor*. From the point where such doorway enters the exterior passageway or interior corridor, it shall be possible to go in opposite directions to each of 2 separate *exits*, except as otherwise permitted in this Section.

9.9.7.2. Except for a corridor that is entirely within a *suite*, a dead end corridor shall be * not more than 3 m in length.

Table 9.9.7.B.
Forming Part of Article 9.9.7.4.

<i>Occupancy of Room, Suite or Floor Area</i>	<i>Maximum Area of Room, Suite or Floor Area, m²</i>	<i>Maximum Distance to Egress Door, m</i>
Group C (except <i>dwelling units</i>)	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

Number of
egress doors

9.9.7.4. Except for *dwelling units*, at least 2 egress doors shall be provided when the area of a room or a *suite*, or the distance measured from any point within the room or *suite* to the nearest door opening directly onto a *public corridor*, exceeds the values in Table 9.9.7.B. Such doors shall be spaced so that in the event that one doorway is made inaccessible by a fire within such room or *suite*, the other doorway will provide safe egress.

Location of
access to exits

9.9.7.5. Required *access to exit* from *suites* shall not be through any other *dwelling unit*, *service room* or *other occupancy*.

SUBSECTION 9.9.8. EXITS FROM FLOOR AREAS

9.9.8.1. 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, except that 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 $\frac{3}{4}$ h, the travel distance may be measured from an egress door of the room or *suite* to the nearest *exit*.

9.9.8.2. Except as provided in Article 9.9.8.6. and Subsection 9.9.9., at least 2 *exits* shall be provided from every *floor area* spaced so that the travel distance to the nearest *exit* is not greater than 40 m in the case of *business and personal services occupancies* and 30 m for all other *occupancies*. Where the *floor area* is *sprinklered* and is subdivided into *suites*, the travel distance may be increased to 45 m for all *occupancies*.

Number of
exits

9.9.8.3. Where more than 1 *exit* is required from a *floor area*, each *exit* shall be considered as contributing not more than $\frac{1}{2}$ the required units of *exit* width.

Size of exits

9.9.8.4. 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 9.9.7.4.

9.9.8.5. Where more than 1 *exit* is required from a *floor area*, at least 2 *exits* shall be independent of each other and be placed remote from each other along the path of travel between them.

Distance
between exits

9.9.8.6. 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 9.9.7.4. and the total *occupant load* served by an *exit* facility does not exceed 60 persons.

Single exit
permitted

9.9.8.7. Not more than 1 *exit* from a *floor area* above or below the main entrance lobby shall lead through the lobby. Such lobby shall be not more than 5 m above *grade*, and the path of travel through the lobby shall not exceed 15 m. The lobby shall conform in all respects with the requirements for *exits*, except that rooms other than garbage rooms, boiler rooms, furnace rooms, incinerator rooms, storage rooms and rooms containing a *residential* or *industrial occupancy* may open directly onto such lobby. Where the lobby 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*.

Exits through
lobbies

9.9.8.8. A *mezzanine* shall be provided with *exits* on the same basis as required for a *floor area* where a *mezzanine* is considered to be a *storey* in Article 9.10.8.7. or is of a

* **9.9.8.9.** *Mobile homes* shall have at least 2 exterior doors located remotely from each other.

SUBSECTION 9.9.9. EGRESS FROM DWELLING UNITS

9.9.9.1. Except as provided in Articles 9.9.9.2. and 9.9.9.3., every *dwelling unit* 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 an *exit* or egress door to a *public corridor* or exterior passageway.

9.9.9.2. Where there is no *dwelling unit* above 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.

9.9.9.3. 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.

9.9.9.4. Except as provided in Article 9.9.7.3., 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*.

9.9.9.5. Where an egress door from a *dwelling unit* opens onto an enclosed *exit* stairway that serves more than one *dwelling unit*, the *dwelling unit* shall be provided with a second and separate *means of egress*.

SUBSECTION 9.9.10. EXIT SIGNS

Scope	9.9.10.1. This Subsection applies to all <i>exits</i> except those serving not more than 1 <i>dwelling unit</i> .
Location	9.9.10.2. <i>Exits</i> shall be located so as to be clearly visible or their locations shall be clearly indicated. 9.9.10.3. Except for the main entrance door to a <i>building</i> , every <i>exit</i> door in a 3-storey <i>building</i> , or a <i>building</i> having an <i>occupant load</i> greater than 150, shall have an <i>exit</i> sign over it.
Exit direction sign	9.9.10.4. <i>Exit</i> direction signs shall be placed in corridors and passageways where necessary to indicate the direction of <i>exit</i> travel. 9.9.10.5. <i>Exit</i> signs shall be installed so as to be visible from the <i>exit</i> approach. Such signs shall have the word "EXIT" in red letters on a contrasting background or white letters on a red background 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. Lettering shall be made with at least 20 mm wide strokes and be at least 150 mm high when the signs are externally lighted, and at least 115 mm high if the sign is internally lighted.
Illumination	9.9.10.6. Provisions shall be made to illuminate <i>exit</i> signs required in Article 9.9.10.3. by an electrical circuit separate from other electrical circuits. 9.9.10.7. In 3-storey <i>buildings</i> any part of an <i>exit</i> ramp or stair that continues past the <i>exit</i> door at ground level shall be clearly marked to indicate that it does not lead to an <i>exit</i> , where there is a possibility that the portion below ground level may be mistaken as the direction of <i>exit</i> travel.

SUBSECTION 9.9.11. LIGHTING

Scope	9.9.11.1. This Subsection applies to the lighting of all <i>exits</i> except those serving not more than 1 <i>dwelling unit</i> .
Means of egress lighting	9.9.11.2. Every <i>exit</i> and <i>public corridor</i> shall be provided with lighting in accordance with the requirements in Article 9.35.2.9.
Emergency lighting	9.9.11.3. Emergency lighting shall be provided in <i>exits</i> , corridors used by the public and principal routes providing <i>access to exit</i> in an open <i>floor area</i> where such <i>exits</i> , corridors and access routes are below <i>grade</i> , are windowless or are required in <i>buildings</i> in Subsection 9.10.18. to have a fire alarm system.
Automatic emergency lighting	9.9.11.4. Emergency lighting required in Article 9.9.11.3. shall be provided from a source of energy separate from the electrical supply for the <i>building</i> . Such lighting shall be designed to be automatically actuated when the electric lighting in the affected area is interrupted. Illumination from such lighting shall be at least 10 lx for a period of at least ½ h. Where incandescent lighting is provided, lighting equal to 1 W/m ² of floor area shall be considered to meet this requirement. 9.9.11.5. Where self-contained emergency lighting units are used, they shall conform to CSA C22.2 No. 141-1972, "Unit Equipment for Emergency Lighting."

SECTION 9.10 FIRE PROTECTION

SUBSECTION 9.10.1. SCOPE

9.10.1.1. This Section contains requirements to protect the lives of the occupants by resisting the collapse of *buildings* in the event of fire and by resisting the spread of fire throughout the *buildings* or to other *buildings*. Scope of fire protection

SUBSECTION 9.10.2. GENERAL

9.10.2.1. Except as provided in Articles 9.10.2.2. and 9.10.8.3., a construction required to have a *fire-resistance rating* shall be supported by construction having at least the same *fire-resistance rating*. Support of rated assemblies

9.10.2.2. Floors over crawl spaces that are not required by Article 9.10.8.5. to have a *fire-resistance rating* and construction supporting a *service room* need not conform to Article 9.10.2.1.

9.10.2.3. An assembly required to be *noncombustible construction* shall be supported by *noncombustible construction*. Support of noncombustible construction.

9.10.2.4. Where a *firewall* divides a *building*, each portion of the *building* so divided may be considered as a separate *building*. Such *firewalls* shall be constructed to conform to Articles 9.10.11.3. to 9.10.11.12. Connected buildings

9.10.2.5. For the purposes of this Section, a basement or cellar means any *storey* located below the *first storey*. Basements or cellars

9.10.2.6. 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.

* **9.10.2.7.(1)** Facilities for the dispensing of gasoline, or associated products that have a flash point below 38°C as determined by the closed cup method, shall not be installed above any space intended for *occupancy*.

* **(2)** Facilities for the dispensing of gasoline, or associated products that have a flash point below 38°C as determined by the closed cup method, shall not be installed in any *building*, except that this requirement does not apply to a canopy which is open on at least 75% of its perimeter, or if *acceptable*, to a *building of industrial occupancy* that complies with regulations made pursuant to The Fire Prevention Act.

9.10.2.8. 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. Commercial cooking equipment

9.10.2.9. The finish of every garage floor shall be of *noncombustible* material or asphalt. Garage floors

* **9.10.2.10.** Tents, *air-supported structures*, transformer vaults, covered malls, *walkways*, elevators and escalators shall conform to Part 3. Tents, etc.

9.10.2.11. Except as permitted in Articles 9.10.9.5., 9.10.9.7. and 9.10.9.8., openings through floors that are not protected by shafts or *closures* shall be protected in conformance with Subsection 3.2.9. of Part 3. Openings through floors

9.10.2.12. Where rooms or spaces are intended for an *assembly occupancy*, or for the storage, manufacture or use of hazardous or explosive material, such rooms or spaces shall conform to Part 3. Special occupancies

9.10.2.13. Where fuel-fired *appliances* are installed on a roof, such *appliances* shall be installed in conformance with Part 6. Roof top appliances

Sprinklers,
standpipes, fire
alarm and
detection
systems

9.10.2.14. Where sprinkler, standpipe and hose systems or fire alarm and detection systems are installed, they shall be installed to conform to Part 3.

9.10.2.15. If an *occupancy* involves metal welding or flame cutting operations the room * in which the metal welding or flame cutting is undertaken shall have a concrete floor and the room shall be separated from the remainder of the *building* by a *fire separation* having a *fire-resistance rating* of not less than 2 h except that the *fire separation* is not required if the operation takes place entirely within an *industrial occupancy*.

SUBSECTION 9.10.3. OCCUPANCY CLASSIFICATION

Building
classification

9.10.3.1. A *building* to be used for one or more *major occupancies* shall be classified according to all *major occupancies* for which it is intended.

Residential
occupancy

9.10.3.2. For the purposes of the classification of *buildings* according to *occupancy*, a *major occupancy* shall be considered to include the subsidiary *occupancies* which are contingent upon it.

9.10.3.3. *Buildings* or parts of *buildings* used for sleeping accommodation, except those of *institutional occupancy* (Group B), shall be classified as *residential occupancy* (Group C). These shall include apartments, boarding houses, convents, dormitories, houses, hotels, lodging houses, monasteries, motels, residential clubs, residential colleges and residential schools. 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 also be classified as *residential occupancy* (Group C).

Business and
personal
services
occupancy

9.10.3.4. *Buildings* or parts of *buildings* used for conducting business and rendering of professional or personal services shall be classified as *business and personal services occupancy* (Group D). These shall include banks, barber and hairdressing shops, beauty parlours, dental offices, self-service dry-cleaning establishments not employing flammable or explosive cleaners, self-service laundries, medical offices, offices, police stations without detention quarters, radio stations, small tool and appliance rental and service establishments and telephone exchanges.

Mercantile
occupancy

9.10.3.5. *Buildings* or parts of *buildings* used for displaying or selling retail goods, wares or merchandise, shall be classified as *mercantile occupancies* (Group E). These shall include department stores, exhibition halls, markets, shops, stores and supermarkets.

Medium hazard
industrial
occupancy

9.10.3.6. *Buildings* or parts of *buildings* used for assembling, fabricating, manufacturing, processing, repairing or storing of goods and materials in which the *combustible* content is greater than 50 kg/m² or 1 200 MJ/m² of floor area, but do not involve sufficient quantities of highly *combustible* and flammable or explosive material to constitute a special fire hazard shall be classified as *medium hazard industrial occupancies* (Group F, Division 2). These shall include aircraft hangars, box factories, candy plants, dry cleaning plants not using flammable or explosive cleaners, electrical substations, factories, freight depots, heliports, laboratories, laundries (except self-service), mattress factories, planing mills, printing plants, *repair garages*, sales rooms, service stations, storage rooms, television studios that do not admit viewing audiences, warehouses, wholesale rooms, wood working factories and workshops.

High hazard
industrial
occupancy

9.10.3.7. Where *buildings* or parts of *buildings* of *industrial occupancy* involve sufficient quantities of flammable or explosive materials that constitute a special fire hazard, they shall conform to the requirements in Part 3 for *high hazard industrial occupancy* (Group F, Division 1).

Low hazard
industrial
occupancy

9.10.3.8. *Buildings* or parts of *buildings* used for assembling, fabricating, manufacturing, processing, repairing or storing goods and materials in which the *fire load* is less than 50 kg/m² or 1 200 MJ/m² of floor area shall be classified as *low hazard industrial occupancies* (Group F, Division 3). These shall include creameries, factories, laboratories, power plants, sales rooms, sample display rooms, garages except those serving individual *dwelling units*, storage rooms, workshops and warehouses.

SUBSECTION 9.10.4. RATINGS

9.10.4.1. 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 Tables 9.11.2.A. and 9.11.2.B., Chapter 2 of the Supplement to the NBC 1980, or in conformance with the test methods described in Part 3.

Test methods

9.10.4.2. 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 1980. Unless such 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.

Flame-spread rating

9.10.4.3. Floor and roof assemblies shall be rated for exposure to fire on the underside.

Floors and roofs

9.10.4.4. Exterior walls shall be rated for exposure to fire from inside the *building*. Such walls need not comply with the temperature rise limitations required by the standard tests referred to in Article 9.10.4.1. if such walls have a *limiting distance* of at least 1.2 m, and due allowance is made for the effects of heat radiation in accordance with the requirements in Part 3.

Exterior walls

9.10.4.5. *Firewalls* and interior vertical *fire separations* required to have *fire-resistance ratings* shall be rated for exposure to fire on each side.

Firewalls

9.10.4.6. 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.

SUBSECTION 9.10.5. PERMITTED OPENINGS IN WALL AND CEILING MEMBRANES

9.10.5.1. Except as permitted in Articles 9.10.5.2. and 9.10.5.3., 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.

9.10.5.2. 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. Where such boxes 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*.

Permitted openings

9.10.5.3. A membrane ceiling forming part of an assembly required to have a *fire-resistance rating* may be pierced by openings into *noncombustible* ducts within the ceiling space provided such openings are located not less than 2 m apart and do not constitute more than 1 per cent of the ceiling area within a *fire compartment*. Individual openings shall not exceed 900 cm² in area, and if greater than 130 cm² shall be protected by a *fire stop flap* as described in Article 9.10.14.14.

Openings for ducts

SUBSECTION 9.10.6. CONSTRUCTION TYPES

9.10.6.1. 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 Article 3.1.4.5.

Non-combustible construction

9.10.6.2. *Heavy timber construction* shall be considered to have $\frac{3}{4}$ h *fire-resistance rating* when it is constructed in accordance with the requirements for *heavy timber construction* in Part 3.

Heavy timber
construction

SUBSECTION 9.10.7. PROTECTION OF STEEL MEMBERS

9.10.7.1. Except as permitted in Articles 9.10.7.2. to 9.10.7.8., structural steel members used in construction required to have a *fire-resistance rating* shall be protected to provide the required *fire resistance*.

Protection of
steel members

9.10.7.2. Steel lintels in *loadbearing* walls spanning not more than 2 m and steel lintels in *non-loadbearing* walls spanning not more than 3 m need not be protected.

Lintels

9.10.7.3. The bottom flanges of shelf angles and plates that are not part of the structural frame need not be protected as required in Article 9.10.7.1.

Shelf angles

9.10.7.4. Steel members around elevator shaft doorways or supporting elevator and dumbwaiter guides, counterweights and other such equipment when entirely enclosed in a shaft and not forming part of the structural frame of the *building* need not be protected.

Elevator shafts

9.10.7.5. Steel members for stairways and escalators that are not part of the structural frame of the *building* need not be protected.

Stairs and
escalators

9.10.7.6. Steel members of porches, balconies, stairways, fire escapes, cornices, marquees and other similar constructions need not be protected provided they are outside of the *building*.

Exterior steel

9.10.7.7. Except in *buildings of medium hazard industrial occupancy or mercantile occupancy*, steel members not less than 3 m from a property line or a centreline of a public thoroughfare and which are at least 1 m away from an *unprotected opening* need not be protected.

9.10.7.8. *Loadbearing* steel or concrete members such as columns, beams and arches at least 3 m from a property line or centreline of a public thoroughfare and which are shielded from a possible fire within the *building* by construction having a *fire-resistance rating* at least equivalent to that required for the *loadbearing* walls, columns and arches in Subsection 9.10.8. need not be protected provided such members are located so that they are not closer to an *unprotected opening* than the maximum horizontal projection of the member from the wall face.

Loadbearing
walls, columns
and arches

SUBSECTION 9.10.8. FIRE RESISTANCE IN RELATION TO OCCUPANCY AND HEIGHT

9.10.8.1. Except as provided in Articles 9.10.8.2. and 9.10.21.3., the *fire-resistance rating* of floors, roofs, walls, columns, arches and mezzanines shall conform to Table 9.10.8.A.

Fire-resistance
ratings

9.10.8.2. *Mezzanines* required to be counted as *storeys* in Article 9.10.8.7. shall be constructed in conformance with the requirements of Column 4 of Table 9.10.8.A.

9.10.8.3. Except as permitted in Article 9.10.8.4., in any *building* containing more than 1 *major occupancy* in which 1 *major occupancy* is located entirely above another *major occupancy*, 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*. *Fire separations* for such *major occupancies* need not conform to Article 9.10.2.1., except that in no case shall the *fire-resistance rating* of the structure supporting the *major occupancy* be less than $\frac{3}{4}$ h.

Table 9.10.8.A.
Forming Part of Article 9.10.8.1.

MINIMUM REQUIRED FIRE-RESISTANCE RATING FOR STRUCTURAL MEMBERS AND ASSEMBLIES, h						
<i>Major occupancy</i>	<i>Maxi- mum Building Height, Storeys</i>	<i>Building Element</i>				
		<i>Floors Above Basements and Cellars</i>	<i>Other Floors Except Floors Over Crawl Spaces</i>	<i>Mezzanines</i>	<i>Roofs</i>	<i>Load- bearing Walls, Columns and Arches</i>
<i>Residential (Group C)</i>	3	$\frac{3}{4}$ (2)	$\frac{3}{4}$ (2)	$\frac{3}{4}$ (3)	—	(1)
<i>Business and personal services (Group D)</i>	2	$\frac{3}{4}$	$\frac{3}{4}$ (3)	—	—	(4)
	3	1	$\frac{3}{4}$ (3)	$\frac{3}{4}$ (3)	$\frac{3}{4}$ (3)	(4)
<i>Mercantile (Group E)</i>	2	$\frac{3}{4}$	$\frac{3}{4}$	—	—	(1)
	3	1(5)	$\frac{3}{4}$	$\frac{3}{4}$ (3)	$\frac{3}{4}$	(4)
<i>Medium hazard industrial (Group F Division 2)</i>	2	$\frac{3}{4}$	$\frac{3}{4}$ (3)	—	—	(4)
	3	1(6)	$\frac{3}{4}$	$\frac{3}{4}$ (3)	$\frac{3}{4}$ (3)	(4)
<i>low hazard industrial (Group F Division 3)</i>	2	$\frac{3}{4}$	$\frac{3}{4}$ (3)	—	—	(4)
	3	1	$\frac{3}{4}$ (3)	$\frac{3}{4}$ (3)	$\frac{3}{4}$ (3)	(4)
Column 1	2	3	4	5	6	7
(1) <i>Fire-resistance rating</i> shall be not less than that required for supported construction. (2) No <i>fire-resistance rating</i> is required for floors within a <i>dwelling unit</i> where there is no <i>dwelling unit</i> above another <i>dwelling unit</i> or above another <i>major occupancy</i> . (3) No <i>fire-resistance rating</i> is required if built of <i>noncombustible construction</i> , but such floor assemblies shown in Column 4 shall be constructed as a <i>fire separation</i> . (4) <i>Fire-resistance rating</i> shall be not less than that required for the supported assembly, except that when the supported assembly is not required to be a <i>fire separation</i> , unrated <i>noncombustible construction</i> may be used for loadbearing walls, columns and arches. (5) May be of <i>heavy timber construction</i> where basement or cellar is <i>sprinklered</i> . (6) Shall be of <i>noncombustible construction</i> .						

9.10.8.4. In a building containing more than 1 *major occupancy*, where the aggregate area of all *major occupancies* in that 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 9.10.8.3. provided they are not classified as Group F, Division 2 *occupancies*.

Crawl space

9.10.8.5. Where a crawl space exceeds 1.8 m in height or is used for any *occupancy* or as a *plenum* in *combustible construction* or for the passage of *flue pipes*, it shall be considered as a cellar or basement in applying the requirements in Article 9.10.8.1.

9.10.8.6. Elevator machine rooms, stairway bulkheads and penthouse *service rooms* need not be considered as a *storey* in applying the requirements in Article 9.10.8.1., and need not be constructed in conformance with Article 9.10.8.1.

Storey height

9.10.8.7. *Mezzanines* shall not be considered as *storeys* for the purpose of determining *building height* if they occupy a total area of less than 10 per cent of the *floor area* of the *storey* in which they are located. *Mezzanines* shall not be considered as *storeys* where they occupy a total area of less than 40 per cent of the *floor area* of the *storey* provided the space above the *mezzanine* floors and the floor below them have no visual obstructions more than 1 070 mm above such floors. Where more than one tier of *mezzanine* is provided in a *storey*, each tier additional to the first shall be considered as a *storey*.

9.10.8.8. Basements and cellars containing more than one *storey* or exceeding 600 m² in area shall conform to the requirements contained in Part 3.

Basements and cellars

9.10.8.9. Where a basement is used primarily as a *storage garage*, the basement may be considered as a separate *building* for the purpose of this Section provided the floor above the basement is constructed as a *fire separation* of reinforced concrete having a *fire-resistance rating* of at least 2 h.

SUBSECTION 9.10.9. FIRE SEPARATIONS BETWEEN ROOMS AND SPACES WITHIN BUILDINGS

9.10.9.1. This Subsection applies to *fire separations* required between rooms and spaces in *buildings* except between rooms and spaces within a *dwelling unit*.

Scope

9.10.9.2. Except as permitted in Articles 9.10.9.3. to 9.10.9.11., a wall, *partition* or floor assembly required to be a *fire separation* shall be constructed as a continuous element of a *fire compartment*.

9.10.9.3. Except as permitted in Articles 9.10.9.5. to 9.10.9.11., openings in required *fire separations* shall be protected with *closures* conforming to Subsection 9.10.14.

Closures

9.10.9.4. Except as permitted in Articles 9.10.9.5. to 9.10.9.8., all floor assemblies except those contained within *dwelling units* and those for which no *fire-resistance rating* is listed in Table 9.10.8.A. shall be constructed as *fire separations*.

Floor assemblies

9.10.9.5. Where openings through floors required to be *fire separations* are essential to a manufacturing process in an *industrial occupancy*, *closures* for such openings may be omitted provided adequate precautions are taken to offset the fire hazard caused by such openings.

Openings in floor assemblies

9.10.9.6. Where a crawl space is not required by Article 9.10.8.5. to be constructed as a basement or cellar, the floor above it need not be constructed as a *fire separation*.

Crawl spaces

9.10.9.7. The *first storey* may be connected either to the *storey* above or below the *first storey* by an open stairway not forming part of a required *exit* where the *building* is intended only for *business and personal services* or *mercantile occupancy* provided such *building* is *sprinklered* or is of *noncombustible construction*.

Open stairways

9.10.9.8. Openings in floors for vehicle ramps in a *low hazard industrial occupancy* need not be protected with *closures*.

Openings in floors for ramps

9.10.9.9. Pipes and ducts that penetrate through a required *fire separation* shall be tightly fitted or *fire stopped* to prevent the passage of smoke and flame if such pipes or ducts are not enclosed in a shaft. Unenclosed ducts that penetrate through a required *fire separation* shall be provided with *fire dampers* installed to conform to Part 6. (See also Subsection 9.10.5.)

Fire stopping of pipes and ducts

Pipes, ducts,
outlet boxes or
similar service
equipment

9.10.9.10. Every pipe, duct, electrical conduit, electrical outlet box or other similar service equipment that partly or wholly penetrates a required *fire separation* shall be *noncombustible* unless the separation has been tested incorporating such equipment, except that electrical or other similar wiring not exceeding 25 mm in overall diameter or enclosed in a *noncombustible* conduit, and *combustible* electrical outlet boxes that have a face area of not more than 160 cm² shall be permitted without such tests. Where wires are grouped together, the 25 mm diam shall apply to the group.

Non-
combustible
fire separations

9.10.9.11. Where a *fire separation* required to be of *noncombustible construction* terminates on the exterior wall or roof surface, no *combustible* material shall extend across the end of the *fire separation* to form a bridge where fire could cross.

Support of
combustible
construction

9.10.9.12. *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*.

Concealed
horizontal
space

9.10.9.13. Except as provided in Article 9.10.9.14., 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.

9.10.9.14. 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 Article 9.10.9.13. provided the construction between such space and the space below is constructed as a *fire separation* having a *fire-resistance rating* 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* greater than $\frac{3}{4}$ h, the *fire-resistance rating* of the ceiling may be reduced to $\frac{1}{2}$ h.

9.10.9.15. Except as required in Article 9.10.9.16., *residential occupancies* shall be separated from all other *major occupancies* by a *fire separation* having a *fire-resistance rating* of at least 1 h.

9.10.9.16. A *major occupancy* classified as *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 at least 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 a 1 h *fire-resistance rating*.

9.10.9.17. Except as provided in Articles 9.10.9.18., 9.10.9.19. and 9.10.21.2., *suites* in *residential occupancies* shall be separated from adjacent rooms and *suites* by a *fire separation* having a *fire-resistance rating* of at least $\frac{3}{4}$ h.

9.10.9.18. 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 Article 9.10.9.17. where the sleeping rooms form part of the proprietor's residence.

9.10.9.19. *Dwelling units* that contain 2 or more *storeys* including basements or cellars shall be separated from the remainder of the *building* by a *fire separation* having a *fire-resistance rating* of not less than 1 h.

9.10.9.20. Except as provided in Article 9.10.9.21., *public corridors* shall be separated from the remainder of the *building* by a *fire separation* having at least a $\frac{3}{4}$ h *fire-resistance rating*.

9.10.9.21. In other than *residential occupancies*, where a *floor area* is *sprinklered*, no *fire-resistance rating* is required between a *public corridor* and the remainder of the *building* where the corridor does not exceed 5 m in unobstructed width. No *fire separation* is required for such corridors where they exceed 5 m in unobstructed width. Such sprinkler systems shall be electrically supervised and, upon operation,

shall transmit an alarm signal to the fire department when the *public corridor* serves a *mercantile occupancy* or a *medium hazard industrial occupancy*.

9.10.9.22. Except as provided in Articles 9.10.9.23. and 9.10.9.24., a *storage garage* shall be separated from other *occupancies* by a *fire separation* having not less than a 1½ h *fire-resistance rating*. A *repair garage* shall be separated from other *occupancies* by a *fire separation* having not less than a 2 h *fire-resistance rating*.

Separation of
garages

9.10.9.23. Except as permitted in Article 9.10.9.24., *storage garages* containing 5 cars or fewer shall be separated from other *occupancies* by a *fire separation* of not less than 1 h.

Separation of
storage
garages, 5 cars
or fewer

9.10.9.24. 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 Article 9.10.9.23. need not be provided between the garage and the *dwelling unit* where the construction between the garage and the *dwelling unit* provides an effective barrier to gas and exhaust fumes, and every door between the
* garage and *dwelling unit* conforms to Article 9.10.14.17. Where an *attic space* is common to 2 *dwelling units* and to the garage, the *attic space* adjacent to the garage shall be separated from such common *attic space* by a membrane at least equivalent to Type B, C or D finishes in Table 9.11.2.A., or the ceiling of the garage shall be protected with a similar membrane.

9.10.9.25. The *fire separation* requirements for vertical shafts and chutes shall comply with Subsection 9.10.12.; boiler, furnace, incinerator and *service rooms* shall comply with Subsection 9.10.10.; *firewalls* shall comply with Subsection 9.10.11.

Separation of
shafts, chutes
and service
rooms

* **9.10.9.26.(1)** Except as permitted by Sentences (2), (3) and (4), no *combustible* drain, waste or vent piping shall be used in a *plumbing system* within a *building* if any part of the *plumbing system* is located within or passes through a *fire separation* required to have a *fire-resistance rating*.

* **(2)** If drain, waste or vent piping passes through a vertical *fire separation*, the piping within a *fire compartment* on one side of the *fire separation* may be *combustible*.

* **(3)** If *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*, if no *combustible* piping passes through the wall of or is located within the *fire separation* or the vertical *service space*.

* **(4)** 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 if

(a) the *combustible* piping is within the basement and is restricted to a single *fire compartment*, and

(b) the basement is not more than 1 *storey* in height.

* **9.10.9.27.** Except as exempted by Article 9.10.9.28., trunk rooms and storage rooms in *residential occupancies* shall be separated from the remainder of the *building* by a *fire separation* having a *fire-resistance rating* not less than 45 min.

* **9.10.9.28.** Article 9.10.9.27. does not apply to trunk rooms and storage rooms that are

(a) part of an individual *dwelling unit*,

(b) part of a sleeping room occupied separately and not within a *suite*,

(c) part of an individually occupied *suite*, or

(d) less than 1 m² in area.

* **9.10.9.29.** 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* 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.

* **9.10.9.30.** *Foamed plastic* shall not be used in any *fire separation*.

SUBSECTION 9.10.10. SERVICE ROOMS

Application	9.10.10.1. This Subsection applies to <i>service rooms</i> in all <i>buildings</i> except rooms located within a <i>dwelling unit</i> .
Fire separation	9.10.10.2. Except as required in Articles 9.10.10.3., 9.10.10.6. and 9.10.10.10., <i>service rooms</i> shall be separated from the remainder of the <i>building</i> by a <i>fire separation</i> having a <i>fire-resistance rating</i> of at least 1 h when the <i>floor area</i> containing the <i>service room</i> is not sprinklered. 9.10.10.3. Where a room contains a limited quantity of service equipment and the service equipment does not constitute a fire hazard, the requirements in Article 9.10.10.2. shall not apply.
Separation of fuel-fired appliances	9.10.10.4. Except as provided in Articles 9.10.10.5. and 9.10.10.6., fuel-fired <i>appliances</i> other than fireplaces shall be located in a <i>service room</i> or <i>service space</i> designed for that purpose, and separated from the remainder of the <i>building</i> by a <i>fire separation</i> having not less than a 1 h <i>fire-resistance rating</i> . 9.10.10.5. Fuel-fired <i>space-heating appliances</i> , <i>space-cooling appliances</i> and <i>service water heaters</i> that serve only a room or <i>suite</i> , or serve a <i>building</i> having a <i>building area</i> of not more than 400 m ² and not more than 2 <i>storeys</i> in <i>building height</i> , need not be separated from the remainder of the <i>building</i> as required in Article 9.10.10.4. where the equipment has been <i>accepted</i> for such use.
Incinerator rooms	9.10.10.6. <i>Service rooms</i> containing incinerators shall be separated from the remainder of the <i>building</i> by a <i>fire separation</i> having a <i>fire-resistance rating</i> of not less than 2 h.
Incinerators	9.10.10.7. The design, construction, installation and alteration of each indoor incinerator shall conform to NFPA 82-1977, "Incinerators, Waste and Linen Handling Systems and Equipment."
Chimneys for incinerators	9.10.10.8. Every incinerator shall be connected to a <i>chimney flue</i> conforming to the requirements in Section 9.21. Such <i>chimney flue</i> shall serve no other <i>appliance</i> . 9.10.10.9. An incinerator shall not be located in a room with other fuel-fired <i>appliances</i> .
Storage rooms	9.10.10.10. Rooms for the temporary storage of <i>combustible</i> refuse in all <i>occupancies</i> or for public storage in <i>residential occupancies</i> shall be separated from the remainder of the <i>building</i> by a <i>fire separation</i> having not less than a 1 h <i>fire-resistance rating</i> , except that a $\frac{3}{4}$ h <i>fire separation</i> is permitted where the <i>fire-resistance rating</i> of the floor assembly is not required to exceed $\frac{3}{4}$ h, or where such rooms are <i>sprinklered</i> .

SUBSECTION 9.10.11. FIREWALLS

Firewalls	9.10.11.1. Except as provided in Article 9.10.11.2., a <i>party wall</i> on a property line shall be constructed as a <i>firewall</i> .
Party walls between dwelling units	9.10.11.2. In a <i>building</i> of <i>residential occupancy</i> in which there is no <i>dwelling unit</i> above another <i>dwelling unit</i> , a <i>party wall</i> on a property line between <i>dwelling units</i> need not be constructed as a <i>firewall</i> provided it is constructed as a <i>fire separation</i> having not less than a 1 h <i>fire-resistance rating</i> . Such wall shall provide continuous protection from the top of the footings to the underside of the roof deck. Any space between the top of such wall and the roof deck shall be tightly sealed by caulking with mineral wool or <i>noncombustible</i> material.
Fire-resistance rating	9.10.11.3. A required <i>firewall</i> (see Articles 9.10.2.4. and 9.10.11.1.) shall be constructed as a <i>fire separation</i> of <i>noncombustible construction</i> having a <i>fire-resistance rating</i> of not less than 2 h, except that where there is a <i>mercantile</i> or <i>medium hazard industrial occupancy</i> adjacent to a <i>firewall</i> , the <i>fire-resistance rating</i> of the <i>firewall</i> shall be not less than 4 h. Except for <i>closures</i> , the required <i>fire-resistance rating</i> of every <i>firewall</i> shall be provided by masonry or concrete.

9.10.11.4. Except as permitted in Article 9.10.11.5., 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*. Structural stability

9.10.11.5. Article 9.10.11.4. does not apply when a *firewall* consists of 2 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 $\frac{1}{2}$ the *fire-resistance rating* required for the *firewall* in Article 9.10.11.3., and designed so that the collapse of one wall will not cause the collapse of the other.

9.10.11.6. Piping and conduit shall be installed so that the collapse of such piping or conduit will not cause the collapse of the *firewall*. Piping and conduit

9.10.11.7. Except as permitted in Articles 9.10.11.8. and 9.10.11.9., every *firewall* shall extend from the top of the footings continuously through all *storeys* and not less than 150 mm above the roof surface where the *firewall* is required to have a 2 h *fire-resistance rating*, and not less than 900 mm above the roof surface where the *firewall* is required to have a 4 h *fire-resistance rating* (see also Article 9.10.9.11.). 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 2 roofs so separated is greater than 3 m. Parapets for firewalls

9.10.11.8. In *buildings* of *noncombustible construction*, a *firewall* need not extend above the roof provided the roof assembly on both sides of the *firewall* has not less than a 1 h *fire-resistance rating* where the *firewall* is required to have a 2 h *fire-resistance rating*, and not less than a 2 h *fire-resistance rating* where the *firewall* is required to have a 4 h *fire-resistance rating*. Such *firewall* shall terminate at the underside of a solid roof slab or deck with a smoketight joint, and there shall be no concealed spaces within the roof slab in that portion directly above the *firewall*. Parapet not required

9.10.11.9. *Firewalls* located above a basement used primarily as a *storage garage* that is separated from the remainder of the *building* by a *fire separation* as described in Article 9.10.8.9. may terminate at the floor assembly immediately above the *storage garage*.

9.10.11.10. Openings in a *firewall* shall be protected with *closures* in conformance with Subsection 9.10.14., and the temperature rise on the unexposed face of such *closures* shall not exceed 250°C after $\frac{1}{2}$ h when a 2 h *firewall* is required, and 250°C after 1 h when a 4 h *firewall* is required, when tested in conformance with the test method described in Part 3 for *closures*. Wired glass in doors located in 2 h *firewalls* shall not exceed 645 cm² in area. Wired glass shall not be permitted in *firewalls* required to have a 4 h *fire-resistance rating*.

9.10.11.11. Openings in *firewalls* shall conform to Article 9.10.14.8., except that the aggregate width of all openings shall not exceed 25 per cent of the length of the *firewall*.

9.10.11.12. Where the external walls of 2 *buildings* meet a *firewall* at an external angle of 135° or less, the requirements of Article 9.10.15.13. shall apply. External walls meeting at a firewall

SUBSECTION 9.10.12. CHUTES AND VERTICAL SHAFTS

9.10.12.1. This Subsection applies to shafts and chutes in all *buildings* except where such shafts and chutes are entirely contained within a *dwelling unit*. Scope

9.10.12.2. Refuse chutes shall be located in shafts in which there are no other *building* services.

* **9.10.12.3.(1)** If a vertical shaft penetrates a floor assembly required to be a *fire separation*, the shaft shall be separated from the *floor area* by a *fire separation*.

* **(2)** Except as required by Article 9.10.12.5., shaft walls required by Sentence (1) to be a *fire separation* shall conform to Table 9.10.12.A.

Table 9.10.12.A.
Forming Part of Article 9.10.12.3.

*

MINIMUM FIRE-RESISTANCE RATINGS FOR SHAFT WALLS		
Minimum Required <i>Fire-Resistance Rating</i> for Floor Assembly Through Which the Shaft Passes, h	Type of Shaft	
	<i>Exit and Elevator Shafts</i> h	<i>Other Shafts</i> h
not more than 1	0.75	0.75
1.5	1	1
2	1.5	1
Column 1	2	3

- Top of shaft** **9.10.12.4.** Where the top of a shaft does not extend through the roof of the *building*, or where the bottom of the shaft does not extend to the bottom of the *building*, the top or bottom of the shaft shall be separated from the remainder of the *building* by a *fire separation* having a *fire-resistance rating* not less than that required for the shaft walls, except that a service shaft may terminate in a *service room* provided the *service room* is separated from the remainder of the *building* by a *fire separation* having a *fire-resistance rating* at least equal to that required for the shaft.
- Linen and refuse chutes** **9.10.12.5.** Linen and refuse chutes shall be enclosed in a shaft constructed of *noncombustible* materials. Such shafts shall have a *fire-resistance rating* of not less than 1 h where the chute outlet is protected with an *acceptable* automatic self-latching *closure* held open by a fusible link. Where such *closure* is not provided, the shaft shall have not less than a 2 h *fire-resistance rating*.
- Lining** **9.10.12.6.** Linen and refuse chutes shall be lined with not less than 0.41 mm thick copper-bearing galvanized steel, or 0.48 mm thick aluminum.
- Intake openings** **9.10.12.7.** The intake openings for refuse and linen chutes shall be located in a compartment having no dimension less than 750 mm, separated from the remainder of the *building* by a *fire separation* having a *fire-resistance rating* of not less than $\frac{3}{4}$ h. Such compartment shall be used only as a facility for separating the intake opening from the remainder of the *floor area* and shall not open into an *exit*. The intake openings for such chutes shall be not greater in area than 60 per cent of the cross-sectional area of the chutes. Such openings shall be fitted with *closures* designed to close automatically after use.
- Discharge** **9.10.12.8.** A refuse or linen chute shall discharge into a room or bin separated from the remainder of the *building* by a *fire separation*. Such separations shall have a *fire-resistance rating* of not less than 1 h in the case of linen chutes and not less than 2 h in the case of refuse chutes. Doors into such rooms shall not be located in an *exit*.
- Design of refuse room or bin** **9.10.12.9.** The room or bin into which a refuse chute discharges shall be of sufficient size to contain the refuse between normal intervals of emptying. Such room or bin shall be impervious to moisture and shall have wash water supply and floor drains. Chute discharge rooms shall contain no service equipment other than that associated with garbage handling and disposal.
- Sprinklers** **9.10.12.10.** Automatic sprinklers shall be installed at the top of each refuse or linen chute, and in the room or bin into which the chute discharges.
- Washing equipment** **9.10.12.11.** Every refuse chute shall be equipped at the top with spray equipment for washing the chute.
- 9.10.12.12.** Refuse and linen chutes exceeding 1 000 cm² in cross-sectional area shall be provided with a vent equal in cross-section to the area of the chute and extending at least 1 m above the roof. Such vents shall be equipped with a *closure* that can be opened in the event of fire in the chute.

SUBSECTION 9.10.13. PREVENTION OF FIRE SPREAD AT EXTERIOR WALLS AND BETWEEN STOREYS

9.10.13.1. 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 at least equal to that required for the floor assembly, except that the rating need not exceed 1 h.

Separation of openings

9.10.13.2. Except as provided in Articles 9.10.2.11., 9.10.9.5., 9.10.9.7., 9.10.9.8. and 9.10.13.3., 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 at least equal to that required for the floor assembly that terminates at the separation.

9.10.13.3. A mezzanine need not terminate at a vertical fire separation where the mezzanine is not required to be considered as a storey in Article 9.10.8.7.

9.10.13.4. 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, the roof shall contain no sky-lights within a horizontal distance of 5 m of the windows in the exposed wall.

9.10.13.5. Except as provided in Article 9.10.15.13., 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 another opening in the other wall shall be not less than 1.2 m where the openings are in different fire compartments.

Exterior walls meeting at an angle.

SUBSECTION 9.10.14. DOORS, DAMPERS AND OTHER CLOSURES IN FIRE SEPARATIONS

9.10.14.1. Except as provided in Article 9.10.14.2., openings in required fire separations shall be protected with a closure conforming to Table 9.10.14.A. and shall be installed in conformance with Chapters 2 to 13 of NFPA 80-1979, "Fire Doors and Windows" unless otherwise specified herein. (See also Article 9.10.4.1.)

Table 9.10.14.A.
Forming Part of Article 9.10.14.1.

FIRE-PROTECTION RATINGS FOR CLOSURES	
Required Fire-Resistance Rating of Fire Separation, h	Required Fire-Protection Rating of Closure, h
1/2 or 3/4	1/3 ⁽¹⁾
1	3/4 ⁽¹⁾
1 1/2	1
2	1 1/2
3	2
4	3
Column 1	2

Note to Table 9.10.14.A.:

⁽¹⁾See Articles 9.10.14.2. and 9.10.14.3.

- * **9.10.14.2.(1)** A door assembly having a 20 min fire-protection rating may be used as a closure in
- (a) a fire separation, whose fire-resistance rating is not required to be more than 1 h, located between
 - (i) a public corridor and a suite, or
 - (ii) a corridor and a sleeping room that is not within a suite, and
 - (b) other fire separations, whose fire-resistance rating is not required to be more than 45 min, in buildings not more than 3 storeys in building height.

(2) The requirements for *noncombustible* sills and *combustible* floor coverings in NFPA 80-1979, "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.

9.10.14.3. Door assemblies required to provide a 20 min *fire-protection rating* may include an unrated wood frame that is not less than 38 mm in thickness.

Doors in a public means of egress **9.10.14.4.** Doors forming part of an *exit* or a public *means of egress* shall conform to Subsection 9.9.6. in addition to this Subsection.

Wired glass **9.10.14.5.(1)** An opening or openings in a *fire separation* having a *fire-resistance rating* of not more than 1 h may be protected by fixed wired glass assemblies that have not been tested in conformance with Article 9.10.4.1. if the wired glass

- (a) is not less than 6 mm thick,
- (b) conforms to CAN2-12.11-M76, "Glass, Wired, Safety",
- (c) is set in steel frames, having a minimum metal thickness of 1.35 mm, and including a glazing stop not less than 20 mm on each side of the glass, and
- (d) is 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,
 - (ii) the maximum area unsupported by structural mullions is not more than 7.5 m², and
 - (iii) the total area of wired glass in all openings in a *fire separation* between 2 *fire compartments* is not more than 11 m².

9.10.14.6. Steel door frames forming part of a *closure* in a *fire separation*, including anchorage requirements, shall conform to CAN4-S105-79, "Standard Specification for Fire Door Frames Meeting the Performance Required by CAN4-S104-77."

Glass block **9.10.14.7.** Glass block that has not been tested in accordance with Article 9.10.4.1. is permitted as a *closure* in a *fire separation* required to have a *fire-resistance rating* of not more than 1 h provided each horizontal joint is reinforced with metal.

Maximum closure size **9.10.14.8.** *Closures* in *fire separations* shall not exceed 11 m² in area and 3.7 m in height or width.

9.10.14.9. Every swing type door in a *fire separation* shall be equipped with a latch.

9.10.14.10. Except for doors between *public corridors* and *suites of business and personal services occupancy* that are not located in dead-end corridors, every door in a *fire separation* shall have an *acceptable* self-closing device.

9.10.14.11. Hold-open devices may be installed on *exit* doors provided they are designed to release the door upon a signal from a *smoke detector* located as described in NFPA 80-1979, "Fire Doors and Windows" and by a signal from the *building* alarm system if an alarm system is provided.

Service room doors **9.10.14.12.** Swing-type doors to *service rooms* such as boiler, furnace or incinerator rooms shall swing into such rooms where such doors lead to *public corridors* or rooms used for assembly. Such doors shall swing outward from such rooms in all other cases. (See also Article 9.9.2.5.)

9.10.14.13. Except as permitted in Articles 9.10.2.8., 9.10.5.3., 9.10.14.15. and 9.10.14.16., ducts that connect 2 *fire compartments* shall be equipped with a *fire damper* installed in conformance with Article 6.2.3.9. to prevent the spread of fire from one *fire compartment* to the other.

Fire stop flaps **9.10.14.14.** *Fire stop flaps* in ceiling membranes required in Article 9.10.5.3. shall be constructed of not less than 1.47 mm thick sheet steel with *acceptable* ceramic fibre paper not less than 1.6 mm thick on the unexposed side and be equipped with corrosion-resistant pins and hinges. Such flaps shall be designed to close automatically at a temperature 30°C above the maximum temperature that will normally be encountered in the system.

9.10.14.15. A fire damper is not required where a *noncombustible* branch duct pierces a required *fire separation* provided the duct has a melting point of at least 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.

9.10.14.16. A fire damper is not required where a *noncombustible* branch duct pierces a required *fire separation* around an *exhaust duct* riser in which the air flow is upward provided the branch duct has a melting point of at least 760°C, the branch duct is carried up inside the riser at least 500 mm and the *exhaust duct* is under negative pressure as described in Article 9.33.4.4.

9.10.14.17. 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. A doorway between an attached or built-in garage and a *dwelling unit* shall not be located in a * room intended for sleeping. Doors between garages and dwelling units

9.10.14.19. 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. Door stops

SUBSECTION 9.10.15. SPATIAL SEPARATIONS BETWEEN BUILDINGS

* **9.10.15.1.(1)** Except as provided in Articles 9.10.15.2. to 9.10.15.7., the maximum percentage of *unprotected openings* in an *exposing building face* shall conform to Table 9.10.15.A. or to Subsection 3.2.3., whichever is the least restrictive for the *occupancy* being considered.

* **(2)** 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 and any exterior wall that encloses an *attic* or *roof space*, except that if a *building* is divided by *fire separations* into *fire compartments*, the area of *exposing building face* may be calculated for each *fire compartment* if the *fire separations* have not less than a 2 h *fire-resistance rating* in the case of *mercantile* and *medium hazard industrial occupancies* and not less than a 45 min *fire-resistance rating* in the case of *residential, business and personal services, and low hazard industrial occupancies*.

Table 9.10.15.A.
Forming Part of Article 9.10.15.1.

MAXIMUM PERCENTAGE OF UNPROTECTED OPENINGS IN EXTERIOR WALLS													
Occupancy Classification of Building	Maximum Area of Exposing Building Face, m ²	Limiting Distance											
		Less than 1.2 m	1.2 m	1.5 m	2.0 m	4.0 m	6.0 m	8.0 m	10.0 m	12.0 m	16.0 m	20.0 m	25.0 m
<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

9.10.15.2. In respect to a *building* under consideration, if fire fighting facilities and * protective wetting facilities are not available within 10 min of the alarm being received, the *limiting distance* required by Article 9.10.15.1. shall be doubled.

9.10.15.3. The *limiting distance* shown in Table 9.10.15.A. may be reduced provided it is not less than the square root of the aggregate area of *unprotected openings* in an *exposing 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*.

Allowance for
wired glass,
sprinklers

9.10.15.4. 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 9.10.14.5. and 9.10.14.7.

9.10.15.5. An *exposing building face* is permitted to have unlimited *unprotected openings* in the *first storey* when the *exposing building face* faces a *street* and has a *limiting distance* of at least 9 m.

9.10.15.6. When a *storage garage* has at least 25 per cent of the total area of the perimeter walls open to the outdoors and such open area is distributed to provide cross ventilation, the *exposing building face* of such garage is permitted to have unlimited *unprotected openings* provided the *storage garage* has a *limiting distance* of at least 3 m.

9.10.15.7. Except as permitted in Articles 9.10.15.8. to 9.10.15.11., 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 9.10.15.B. and Subsection 9.10.8.

Table 9.10.15.B.
Forming Part of Article 9.10.15.7.

MINIMUM CONSTRUCTION REQUIREMENTS FOR EXPOSING BUILDING FACES				
<i>Occupancy Classification of Building</i>	<i>Maximum Percentage of Unprotected Openings Permitted, per cent</i>	<i>Minimum Required Fire-Resistance Rating, h</i>	<i>Type of Construction Required</i>	<i>Type of Cladding Required</i>
<i>Residential, business and personal services, and low hazard industrial</i>	0-10	1	Noncombustible	Noncombustible
	11-25	1	Combustible or noncombustible	Noncombustible
	26-100	$\frac{3}{4}$	Combustible or noncombustible	Combustible or noncombustible
<i>Mercantile, and medium hazard industrial</i>	0-10	2	Noncombustible	Noncombustible
	11-25	2	Combustible or noncombustible	Noncombustible
	26-100	1	Combustible or noncombustible	Combustible or noncombustible
Column 1	2	3	4	5

9.10.15.8. Except as required in Article 9.10.15.12., in *buildings* containing only *dwelling units* in which there is no *dwelling unit* above another *dwelling unit*, the requirements of Article 9.10.15.7. do not apply provided that the *exposing building face* has a *fire-resistance rating* of at least $\frac{3}{4}$ h 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. Window openings in such *exposing building face* 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 9.10.15.1. where the *limiting distance* is 1.2 m or greater.

Fire resistance
of exterior
walls of houses

9.10.15.9. Except as required in Article 9.10.15.12., the *exposing building face* of a detached garage that serves 1 *dwelling unit* only shall have a *fire-resistance rating* of at least $\frac{3}{4}$ h, except that no *fire-resistance rating* is required where the *limiting distance* is 0.6 m or greater. The *exterior cladding* of such detached garages is not required to be *noncombustible* regardless of the *limiting distance*. The percentage of window openings permitted in the *exposing building face* of such detached garages shall conform to the requirements for *unprotected openings* in Article 9.10.15.1. 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*.

Fire resistance
of a garage
serving a
dwelling unit

9.10.15.10. Heavy timber and steel columns need not conform to the requirements of Table 9.10.15.B. provided the *limiting distance* is at least 3 m.

9.10.15.11. Except as required in Article 9.10.15.12., 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.

Unrated non-
combustible
construction
permitted

9.10.15.12. Where a paid or volunteer fire department is not available, the *limiting distances* required in Articles 9.10.15.8., 9.10.15.9. and 9.10.15.11. shall be doubled.

9.10.15.13. Where 2 exterior walls meet at a *firewall* at an external angle of 135° or less, the construction of each exterior wall adjacent to the intersection and the *unprotected openings* in each exterior wall adjacent to the intersection shall conform to Article 3.2.3.10.

Firewalls

- * **9.10.15.14.** 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 Article 9.10.15.8. if the *building* contains not more than 2 *dwelling units* and not more than 3 *storeys* including any basements.

SUBSECTION 9.10.16. FIRE STOPPING

Fire stopping between storeys	9.10.16.1. <i>Fire stops</i> shall be provided at floor, ceiling and roof levels as well as the space between the upper and lower portions of a mansard style roof to cut off all concealed draft openings occurring between <i>storeys</i> and between the top <i>storey</i> and roof space, including spaces filled with batt, loose fill or <i>foamed plastic</i> insulation. * (See Article 9.19.1.4. for ventilation of mansard style roofs.) 9.10.16.2. <i>Fire stops</i> shall be provided at the ceiling and floor level of furred walls and <i>partitions</i>. The vertical dimension of any concealed space in a wall or <i>partition</i> of <i>combustible construction</i> shall not exceed 3 m.
Stairs	9.10.16.3. <i>Fire stops</i> shall be provided at the top and bottom of each run of stairs where they pass through a floor containing concealed space.
Concealed spaces	9.10.16.4. In unsprinklered <i>buildings</i> of <i>combustible construction</i>, every concealed space created by a suspended ceiling, roof space or unoccupied attic space shall be separated by <i>fire stops</i> into draft-tight compartments not more than 300 m² in area where such space contains materials having a <i>flame-spread rating</i> greater than 25. No dimension of such space shall exceed 20 m. 9.10.16.5. Concealed spaces in mansard roofs, exterior cornices, balconies and canopies of <i>combustible construction</i> shall have vertical <i>fire stops</i> at intervals of not more than 20 m and at each required <i>fire separation</i>.
Fire-stopping materials	9.10.16.6. <i>Fire stops</i> shall consist of not less than 0.91 mm sheet steel, 6 mm asbestos board, 12.7 mm gypsum board, 12 mm plywood or waferboard with joints backed with similar material, 2 layers of 19 mm lumber with joints staggered or 38 mm lumber.
Pipes and ducts piercing fire stops	9.10.16.7. Where <i>fire stops</i> are pierced by pipes, ducts or other elements, the effectiveness of the <i>fire stops</i> shall be maintained around such elements.

SUBSECTION 9.10.17. INTERIOR FINISH FLAME SPREAD LIMITS

Flame-spread rating of interior finishes	9.10.17.1. Except as provided in Articles 9.10.17.2. to 9.10.17.7., the exposed surface of every wall and ceiling shall have a surface <i>flame-spread rating</i> of not more than 150.
Means of egress ceilings	9.10.17.2. Not less than 90 per cent of the exposed surface of every ceiling in an <i>exit</i> , or unsprinklered ceiling in a <i>public corridor</i> shall have a surface <i>flame-spread rating</i> of not more than 25.
Exit walls	9.10.17.3. Not less than 90 per cent of the exposed surfaces of every wall of an <i>exit</i> , exclusive of doors, shall have a surface <i>flame-spread rating</i> of not more than 25, except that 25 per cent of the wall surface of a lobby at or near <i>grade</i> used as an <i>exit</i> may have a surface <i>flame-spread rating</i> of not more than 150.
Walls in a public access to exit	9.10.17.4. At least 90 per cent of the total wall surface, exclusive of doors, in any unsprinklered <i>public corridor</i> shall have a surface <i>flame-spread rating</i> of not more than 75, or not less than 90 per cent of the upper half of such walls, exclusive of doors, shall have a surface <i>flame-spread rating</i> of not more than 25. 9.10.17.5. Where a <i>public corridor</i> or a corridor used by the public contains an <i>occupancy</i>, the interior finish materials used on the walls or ceiling of such <i>occupancy</i> shall have a <i>flame-spread rating</i> in conformance with that required for <i>public corridors</i>.
Plastic light diffusers and lenses	9.10.17.6. Where transparent or translucent lighting elements such as light diffusers and lenses are used which have <i>flame-spread ratings</i> that exceed those permitted for the ceiling finish, such elements shall conform to the requirements of Article 3.1.11.1.
	9.10.17.7. The interior finish of walls and ceilings in bathrooms within <i>suites</i> of <i>residential occupancy</i> shall have a <i>flame-spread rating</i> of not more than 200.
Duct covers and liners	9.10.17.8. Where a covering or a lining is used with a duct, such lining or covering shall have a <i>flame-spread rating</i> conforming to Part 6.

SUBSECTION 9.10.18. ALARM AND DETECTION SYSTEMS

9.10.18.1. Except as provided in Article 9.10.18.2., an *acceptable* fire alarm system shall be installed in every *building* that contains more than 3 *storeys* including *storeys* below the *first storey*, and as required in Table 9.10.18.A.

Table 9.10.18.A.
Forming Part of Article 9.10.18.1.

<i>Occupancy Classification</i>	<i>Occupant Load Above which a Fire Alarm System is Required</i>
<i>Residential</i>	10 (sleeping accommodation)
<i>Business and personal services</i>	300 total, or 150 above or below the <i>first storey</i>
<i>Mercantile</i>	300 total, or 150 above or below the <i>first storey</i> or in <i>buildings</i> of 3 <i>storeys</i> in <i>building height</i>
<i>Medium hazard industrial</i>	100 total, or 25 above or below the <i>first storey</i>
<i>Low hazard industrial</i>	500 total, or 75 above or below the <i>first storey</i>
Column 1	2

9.10.18.2. No fire alarm system is required in a *residential occupancy* where an *exit* or *public corridor* serves not more than 4 *suites*, or each *suite* has direct access to outdoors by a door near ground level, or to a balcony with an *exit* stair to ground level.

9.10.18.3. 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*.

9.10.18.4. Except for *sprinklered buildings* in which the sprinkler system is electrically supervised and equipped with a water flow alarm, *buildings* required to have a fire alarm system in Article 9.10.18.1. shall be equipped with *heat detectors* or *smoke detectors* in storage rooms, storage locker rooms, *service rooms*, including furnace rooms and incinerator rooms, elevator shafts, chutes, janitors' closets and any other rooms where hazardous substances are intended to be used or stored.

9.10.18.5. Except for a recirculating air system serving not more than 1 *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 1 *suite* on the same floor or serves more than 1 *storey*.

9.10.18.6. Except as provided in Article 9.10.18.7., where a fire alarm system is required in more than 1 *major occupancy*, the systems shall be designed so that the actuation of any alarm initiating device in one *occupancy* shall cause an alarm signal to be transmitted to all other *occupancies*.

9.10.18.7. Where a vertical *fire separation* having a *fire-resistance rating* of at least 1 h separates a portion of a *building* from the remainder of the *building* and there is no access to the remainder of the *building*, the requirements for fire alarm and detection systems may be applied to each portion so separated as if it were a separate *building*.

9.10.18.8. Fire alarm, fire detection and smoke detection devices and their installation shall conform to Part 3.

9.10.18.9. 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.

SUBSECTION 9.10.19. SMOKE ALARMS

9.10.19.1. *Smoke alarms* conforming to ULC-S531-1978, “Standard for Smoke Alarms” shall be installed in each *dwelling unit* and in each sleeping room not within a *dwelling unit*.

9.10.19.2. *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.

9.10.19.3. *Smoke alarms* in Articles 9.10.19.1. and 9.10.19.2. shall be installed on or near the ceiling in conformance with *acceptable* installation instructions.

9.10.19.4. *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*. Where the *building* is not supplied with electrical power, *smoke alarms* may be battery operated.

9.10.19.5. Where more than one *smoke alarm* is required in a *dwelling unit*, the *smoke alarms* shall be wired so that the activation of one alarm will cause all alarms within the *dwelling unit* to sound.

9.10.19.6. 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.

SUBSECTION 9.10.20. FIRE FIGHTING

Access wall
panels

9.10.20.1. Except as provided in Article 9.10.20.2., a window or access panel providing an opening not less than 1 100 mm high and 550 mm wide and having a sill height of not more than 900 mm above the floor shall be provided on the second and third *storeys* of every *building* in at least 1 wall facing on a *street* if such *storeys* are not *sprinklered*. Such access panels shall be readily openable from both inside and outside or be glazed with plain glass.

Exception

9.10.20.2. Access panels as described in Article 9.10.20.1. need not be provided in *buildings* containing only *dwelling units* where there is no *dwelling unit* above another *dwelling unit*.

Access to
basements

9.10.20.3. Except in basements serving not more than 1 *dwelling unit*, each unsprinklered basement or cellar exceeding 25 m in length or width shall be provided with direct access to the outdoors to at least 1 *street*. Such access 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. Access may also be provided by an interior stair accessible from the outdoors.

9.10.20.4. Access for fire department equipment shall be provided to each *building* by means of a *street*, private roadway or yard.

9.10.20.5. Where access to a *building* as required in Article 9.10.20.4. is provided by means of a private roadway or yard, the design and location of such roadway or yard shall be *acceptable*, taking into account connection with public thoroughfares, weight of firefighting equipment, width of roadway, radius of curves, overhead clearance, location of fire hydrants, location of fire department connections and vehicular parking.

SECTION 9.11 SOUND CONTROL

SUBSECTION 9.11.1. SOUND TRANSMISSION CLASS RATING (AIRBORNE SOUND)

9.11.1.1. Sound transmission class ratings for construction shall be determined in accordance with ASTM E90-75, "Laboratory Measurement of Airborne-Sound Transmission Loss of Building Partitions" or with ASTM E336-77, "Measurement of Airborne Sound Insulation in Buildings."

Test method

SUBSECTION 9.11.2. REQUIRED SOUND CONTROL LOCATIONS (AIRBORNE SOUND)

9.11.2.1. Except as provided in Article 9.11.2.2., every *dwelling unit* shall be separated from every other space in a *building* in which noise may be generated by construction providing a sound transmission class rating of at least 45, or shall have a sound rating of I or II as described in Tables 9.11.2.A. and 9.11.2.B.

9.11.2.2. 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 50, or shall have a sound rating of I as described in Table 9.11.2.A.

9.11.2.3. *Building services* located in an assembly required to have a sound transmission class rating shall be installed in a manner that will not decrease the required rating of the assembly.

Table 9.11.2.A.
Forming Part of Articles 9.10.4.1., 9.11.2.1. and 9.11.2.2.

FIRE AND SOUND RESISTANCE OF WALLS					
Type of Wall	No.	Description	Finish on Each Side (1)	Fire-Resistance Rating, h	Sound Rating (3)
Solid brick	1	90 mm thick walls of shale, clay, concrete or sand-lime brick	None	1	II ⁽²⁾
	2	140 mm thick walls of shale, clay, concrete or sand-lime brick	None	2½	II ⁽²⁾
	3	190 mm thick walls of shale, clay, concrete or sand-lime brick	None	4	I ⁽²⁾
Hollow concrete block (normal weight aggregate)	4	90 mm	None	¾	III
	5	Same as 4	A or B	1½	III
	6	Same as 4	C or D	2	II
	7	140 mm	None	1	II ⁽²⁾
	8	Same as 7	A	1½	II
	9	Same as 7	B, C or D	2	II
	10	Same as 7 with mineral fibre between resilient channels on at least 1 side	A	1½	I
	11	190 mm	None	1½	II ⁽²⁾
	12	Same as 11	A or B	2	I
	13	Same as 11	C or D	3	I
Column 1	2	3	4	5	6

Table 9.11.2.A. (Cont'd)

Type of Wall	No.	Description	Finish on Each Side ⁽¹⁾	Fire-Resistance Rating, h	Sound Rating ⁽³⁾
Concrete	14	150 mm	None	3	I ⁽²⁾
	15	200 mm	None	4	I ⁽²⁾
Interior wood stud, single row	16	38 mm x 89 mm studs 400 mm o.c.	C or D	1	III
	17	38 mm x 89 mm studs 400 mm o.c., mineral fibre with a mass of at least 1.2 kg/m ² in cavity	A	¾	III
	18	Same as 17 with resilient metal channels on at least 1 side	A	¾	II
Interior stud, 2 rows staggered on 38 mm x 140 mm plate	19	Two rows 38 mm x 89 mm studs, each set 400 mm or 600 mm o.c. staggered on common 38 mm x 140 mm plate, mineral fibre on each side	C or D	1 ⁽⁴⁾	II
	20	Two rows 38 mm x 89 mm studs, each set 400 mm or 600 mm o.c. staggered on common 38 mm x 140 mm plate, mineral fibre with a mass of at least 1.2 kg/m ² on each side	A	¾	II
Interior wood, 2 rows on separate plates	21	Two rows 38 mm x 89 mm studs, each set 400 mm or 600 mm o.c. on 38 mm x 89 mm plates set 25 mm apart, mineral fibre on 1 side	C or D	1 ⁽⁴⁾	II
	22	Two rows 38 mm x 89 mm studs, each set 400 mm or 600 mm o.c. on 38 mm x 89 mm plates set 25 mm apart, mineral fibre with a mass of at least 1.2 kg/m ² on 1 side	A	¾	II
Exterior, wood stud	23	38 mm x 89 mm or 38 mm x 140 mm studs spaced up to 600 mm o.c., mineral fibre with a mass of at least 1.2 kg/m ² , wall sheathing and siding	A (interior side)	¾	—
	24	Same as 23	C or D (Interior side)	1	—
Column 1	2	3	4	5	6

Table 9.11.2.A. (Cont'd)

Type of Wall	No.	Description	Finish on Each Side (1)	Fire-Resistance Rating, h	Sound Rating (3)
Non-load-bearing steel stud	25	90 mm steel studs spaced up to 600 mm o.c.	C	¾	III
	26	Same as 25	D	1	III
	27	Same as 25 with mineral fibre filling cavity	C	1	II
	28	Same as 25 with mineral fibre filling cavity	D	1 ⁽⁴⁾	II
Column 1	2	3	4	5	6

Addendum to Table 9.11.2.A.:

(1) The finishes designated by letter refer to the following:

A = 12.7 mm gypsum board, taped joints,

B = 12.7 mm gypsum-sand plaster,

C = 15.9 mm special fire-resistant Type X gypsum board conforming to CSA A82.27-M1977, "Gypsum Board Products," and

D = 19 mm gypsum-sand plaster on 9.5 mm gypsum lath or metal lath.

(2) Sound ratings listed assume that walls have their surfaces sealed by at least 2 coats of paint or other surface finish described in Section 9.30 to prevent airborne sound leakage.

(3) Rating I signifies constructions with sound transmission class ratings of 50 or more.

Rating II signifies constructions with sound transmission class ratings of 45 to 50.

Rating III signifies constructions with sound transmission class ratings of less than 45.

(4) Mineral fibre is required for sound resistance only and need not be provided to achieve the fire-resistance rating. Mineral fibre includes fibre processed from rock, slag or glass.

Table 9.11.2.B.
Forming Part of Articles 9.10.4.1. and 9.11.2.1.

FIRE AND SOUND RESISTANCE OF FLOORS, CEILINGS AND ROOFS⁽²⁾					
Type of Assembly	No.	Description	Ceiling Finish ⁽¹⁾	Fire-Resistance Rating, h	Sound Rating ⁽³⁾
Concrete slabs	1	90 mm reinforced concrete with 19 mm minimum cover over reinforcing steel	None	1	II
	2	130 mm reinforced concrete with 25 mm minimum cover over reinforcing steel	None	2	I
Open web steel joists	3	Open web steel joists 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	C or D	1	I
Wood floor joists	4	19 mm T&G lumber or 15.5 mm plywood or wafer-board subfloor with mineral fibre between joists spaced 400 mm o.c. Ceiling finish attached to resilient channels	C	¾	II
	5	Same as 4	D	1	II
	6	19 mm T&G lumber or 15.5 mm plywood or wafer-board subfloor over joists spaced 400 mm o.c., 50 mm concrete topping	C	¾	II
	7	Same as 6	D	1	II
	8	Same as 6 with mineral fibre between joists and ceiling finish attached to resilient channels	C	¾	II
	9	Same as 6 with mineral fibre between joists and ceiling finish attached to resilient channels	D	1	I
Column 1	2	3	4	5	6

Table 9.11.2.B. (Cont'd)

Type of Assembly	No.	Description	Ceiling Finish (1)	Fire-Resistance Rating, h	Sound Rating (3)
Wood ceiling joists or roof trusses	10	38 mm thick framing members spaced not more than 600 mm o.c.	C	½	—
	11	Same as 10	C (two layers)	1	—
Column 1	2	3	4	5	6

Addendum to Table 9.11.2.B.:

(1) The finishes designated by letter refer to the following:

C = 15.9 mm special fire-resistant Type X gypsum board conforming to CSA A82.27-M1977, "Gypsum Board Products," and

D = 19 mm gypsum-sand plaster on 9.5 mm gypsum lath or metal lath.

(2) Fire-resistance ratings for floor assemblies may be applied to roof assemblies having the same ceiling finish provided that, where wood joists are used, the roof sheathing consists of not less than 12.5 mm plywood or waferboard or 19 mm lumber. Where steel joists are used, the ratings are based on the assumption that the roof deck is at least equivalent in fire resistance to 50 mm concrete.

(3) Rating I signifies constructions with sound transmission class ratings of 50 or more.

Rating II signifies constructions with sound transmission class ratings of 45 to 50.

Rating III signifies constructions with sound transmission class ratings of less than 45.

SECTION 9.12 EXCAVATION**SUBSECTION 9.12.1. GENERAL**

9.12.1.1. The top soil and vegetable matter in all unexcavated areas under a *building* shall be removed. In localities where termites are known to occur, all stumps, roots and other wood debris shall be removed from the soil to a minimum depth of 300 mm in unexcavated areas under a *building*.

Top soil

9.12.1.2. The bottom of every excavation shall be free of all organic material.

9.12.1.3. Excavations shall be kept free of standing water.

Water removed

9.12.1.4. The bottom of excavations shall be kept from freezing throughout the entire construction period.

Freezing

SUBSECTION 9.12.2. DEPTH

9.12.2.1. Excavations for foundations shall extend to undisturbed soil.

9.12.2.2. Except as provided in Articles 9.12.2.4. and 9.12.2.5., the minimum depth of foundations below finished ground level shall conform to Table 9.12.2.A.

9.12.2.3. The minimum depth of foundations for exterior concrete steps with more than 2 risers shall conform to Article 9.12.2.2. Concrete steps with 1 and 2 risers may be laid on ground level.

9.12.2.4. The foundation depths required in Article 9.12.2.2. may be decreased where experience with local soil conditions shows that lesser depths are satisfactory, or where the foundation is designed for lesser depths.

9.12.2.5. The foundation depths required in Article 9.12.2.2. do not apply to foundations for *buildings* whose superstructure will not be damaged by differential soil movement caused by *frost action*, or for accessory *buildings* of not more than 1 storey in building height and not more than 50 m² in building area.

Table 9.12.2.A.
Forming Part of Article 9.12.2.2.

MINIMUM DEPTHS OF FOUNDATIONS				
Type of Soil	Foundation Containing Heated Basement, Cellar, or Crawl Space		Foundation Containing No Heated Space	
	Good Soil Drainage to at Least the Depth of Frost Penetration	Poor Soil Drainage	Good Soil Drainage to at Least 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.

SUBSECTION 9.12.3. BACKFILL

Placing

9.12.3.1. Backfill shall be placed to avoid damaging the drainage tile or the waterproofing of walls.

Grading

9.12.3.2. Backfill shall be graded to prevent drainage towards the foundation after settling.

Boulders

9.12.3.3. Backfill within 600 mm of the foundation shall be free of deleterious debris and boulders larger than 250 mm diam.

SUBSECTION 9.12.4. TRENCHES BENEATH FOOTINGS

Trenches beneath footings

9.12.4.1. The soil in trenches beneath footings for sewers and watermain 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

SUBSECTION 9.13.1. GENERAL

- 9.13.1.1.** Where hydrostatic pressure occurs, floors on ground and exterior surfaces of walls below ground level shall be waterproofed. Waterproofing of walls
- 9.13.1.2.** 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. Dampproofing of walls
- 9.13.1.3.** Except as provided in Article 9.13.1.4., when hydrostatic pressure does not occur, slabs on ground in other than garages shall be dampproofed. Slabs in finished areas
- 9.13.1.4.** When hydrostatic pressure does not occur, floor slabs in unfinished basements or cellars need not be dampproofed when the slab is supported on a base of granular fill as described in Subsection 9.16.2. Basement slabs
- 9.13.1.5.** Roofs of underground structures shall be waterproofed to prevent the entry of water into the structure. Underground structures
- 9.13.1.6.** The method of application of all bituminous waterproofing and dampproofing materials shall conform to one of the following: Method of application
- CGSB 37-GP-3M(1976), "Application of Emulsified Asphalts for Dampproofing or Waterproofing,"
- CGSB 37-GP-12M(1976), "Application of Unfilled Cutback Asphalt for Dampproofing," or
- CGSB 37-GP-22M(1976), "Application of Unfilled Cutback Tar Foundation Coating for Dampproofing."

SUBSECTION 9.13.2. MATERIAL

- 9.13.2.1.** Bituminous materials used for dampproofing or waterproofing shall conform to one of the following: Dampproofing and waterproofing material specifications
- CGSB 37-GP-2M(1976), "Asphalt, Emulsified, Mineral Colloid Type, Unfilled, for Dampproofing and Waterproofing and for Roof Coatings,"
- CGSB 37-GP-6M(1976), "Asphalt, Cutback, Unfilled, for Dampproofing,"
- CGSB 37-GP-16M(1976), "Asphalt, Cutback, Filled, for Dampproofing and Waterproofing,"
- CGSB 37-GP-18M(1976), "Tar, Cutback, Unfilled, for Dampproofing," or
- * CSA A123.4-M1979, "Bitumen for Use in Construction of Built-Up Roof Coverings and Dampproofing and Waterproofing Systems."

SUBSECTION 9.13.3. WATERPROOFING OF WALLS

- 9.13.3.1.** 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. Concrete walls shall have all holes and recesses resulting from removal of form ties sealed with mortar or waterproofing material. Parging
- 9.13.3.2.** Concrete or unit masonry walls to be waterproofed shall be covered with not less than 2 layers of bitumen-saturated membrane, with each layer being cemented in place with bitumen and coated over-all with a heavy coating of bitumen. Waterproofing membranes for walls

SUBSECTION 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. The floor membrane shall be mopped to the wall membrane to form a complete seal.

SUBSECTION 9.13.5. DAMPPROOFING OF WALLS

- Parging** **9.13.5.1.** 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. Concrete walls shall have holes and recesses resulting from the removal of form ties sealed with cement mortar or dampproofing material.
- Bituminous coating** **9.13.5.2.** A heavy coat of bituminous or other dampproofing material shall be applied over the parging or concrete below ground level.
- Interior dampproofing of walls** **9.13.5.3.** Where a separate interior cladding is applied to a concrete or unit masonry wall which is in contact with the soil, or where wood members are applied to such walls for the installation of insulation or finish, the interior surface of the foundation wall below ground level shall be dampproofed. The dampproofing shall extend from the basement floor and shall terminate at ground level. No membrane shall be applied above ground level between the insulation and the foundation wall. Dampproofing shall consist of at least 0.05 mm polyethylene lapped 100 mm at the joints or a material providing equivalent performance.

SUBSECTION 9.13.6. DAMPPROOFING OF SLABS

- Dampproofing of slabs** **9.13.6.1.** 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.
- Dampproofing membranes** **9.13.6.2.** When installed below the slab, dampproofing shall consist of at least 0.15 mm polyethylene or Type S roll roofing. Dampproofing shall be lapped not less than 100 mm at the joints.
- Dampproof coatings** **9.13.6.3.** When installed above the slab, dampproofing shall consist of at least 2 mopped-on coats of bitumen, 0.05 mm polyethylene or other material providing equivalent performance.

SECTION 9.14 DRAINAGE**SUBSECTION 9.14.1. SCOPE**

- Drainage** **9.14.1.1.** This Section applies to subsurface drainage and to surface drainage.
- Drainage of crawl spaces** **9.14.1.2.** Drainage for crawl spaces shall conform to Section 9.18.
- Floor slabs** **9.14.1.3.** Drainage requirements beneath floor slabs shall conform to Section 9.16.

SUBSECTION 9.14.2. GENERAL

- 9.14.2.1.** 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.

SUBSECTION 9.14.3. DRAINAGE TILE AND PIPE

- Drainage material specifications** **9.14.3.1.** Drain tile and drain pipe used for foundation drainage shall conform to the following:
- ASTM A444-78, "Steel Sheet, Zinc-Coated, (Galvanized) by the Hot-Dip Process for Culverts and Underdrains,"
 - ASTM C4-62 (1975), "Clay Drain Tile,"
 - ASTM C700-78A, "Vitrified Clay Pipe, Extra Strength, Standard Strength and Perforated,"
 - ASTM C412-79E, "Concrete Drain Tile," *
 - ASTM C444-79E, "Perforated Concrete Pipe," *

CGSB 34-GP-22M(1976), "Pipe, Asbestos Cement, Drain,"
 CGSB 41-GP-29M(1976), "Tubing, Plastic, Corrugated, Drainage,"
 or
 CSA B182.1-M1977, "Plastic Drain and Sewer Pipe and Pipe Fittings."

9.14.3.2. Drain tile or pipe used for foundation drainage shall have at least a 100 mm diam.

9.14.3.3. 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.

9.14.3.4. Drain tile or pipe with butt joints shall be laid with 6 mm to 10 mm open joints. The top half of such joints shall be covered with sheathing paper, 0.10 mm polyethylene or No. 15 asphalt or tar-saturated felt. Tile joints

9.14.3.5. 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. Granular cover

SUBSECTION 9.14.4. GRANULAR DRAINAGE LAYER

9.14.4.1. Granular material used to drain the bottom of a foundation shall consist of a continuous layer of crushed stone or other coarse clean granular material containing not more than 10 per cent of material that will pass a 4 mm sieve.

9.14.4.2. Granular material in Article 9.14.4.1. shall be laid on undisturbed or compacted soil to a minimum depth of at least 125 mm beneath the *building* and extend at least 300 mm beyond the outside edge of the footings.

9.14.4.3. 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. 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.

SUBSECTION 9.14.5. DRAINAGE DISPOSAL

* **9.14.5.1.** *Foundation* drains shall drain to a *building* drain, storm drain, drainage ditch, dry well, or to the ground surface.

9.14.5.2. Where a sump pit is provided, it shall be at least 750 mm in depth and have an area of at least 0.25 m² and be provided with a cover. Where gravity drainage is not practical, an automatic sump pump shall be provided to discharge the water into a sewer, drainage ditch or dry well.

9.14.5.3. Dry wells may be used only when located in areas where the natural *groundwater level* is below the bottom of the dry well. Dry wells shall be not less than 5 m from the *building* foundation and located so that drainage is away from the *building*.

SUBSECTION 9.14.6. SURFACE DRAINAGE

9.14.6.1. The *building* shall be located or the *building* site graded so that water will not accumulate at or near the *building*. Surface drainage

9.14.6.2. Surface drainage shall be directed away from the location of a water supply well or septic tank disposal bed.

9.14.6.3. Where runoff water from a driveway is likely to accumulate or enter a garage, a catch basin shall be installed to provide adequate drainage. Interference with surface drainage

9.14.6.4. Where downspouts are provided and are not connected to a sewer, provisions shall be made to prevent soil erosion. Downspouts

SECTION 9.15 FOOTINGS AND FOUNDATIONS

SUBSECTION 9.15.1. SCOPE

- Scope** **9.15.1.1.** Except as provided in Subsection 9.15.7., this Section applies to foundations of cast-in-place concrete or unit masonry foundation walls and cast-in-place footings constructed on soils other than those described in Article 9.15.1.2. and where the *building* is of other than concrete or steel frame construction. Where the foundation consists of other materials such as precast concrete, steel or wood, the foundation shall be designed in conformance with the appropriate provisions of Part 4, except as provided in Article 9.36.3.3.
- Foundations erected on various soil types** **9.15.1.2.** Where a foundation is erected on soft clay, very soft clay, loose sand, very loose sand, loose sand and gravel or very loose sand and gravel, the footing sizes shall be designed in conformance with Subsection 9.4.7. Where a foundation is erected on filled ground or peat, the footing sizes shall be designed in conformance with Section 4.2.

SUBSECTION 9.15.2. GENERAL

- Concrete** **9.15.2.1.** Concrete shall conform to Section 9.3. Concrete for unreinforced footings and foundation walls shall have a minimum compressive strength of 14 MPa after 28 days.
- Concrete block** **9.15.2.2.** Concrete block shall be *loadbearing* type conforming to CSA A165.1-M1977, "Concrete Masonry Units" and shall have a compressive strength over the gross area of the block of at least 7.5 MPa for hollow units and 12.5 MPa for solid units.
- 9.15.2.3.** Mortar, mortar joints, corbelling and protection for unit masonry shall conform to Section 9.20.
- 9.15.2.4.** Where pier type foundations are used, the piers shall be designed to support the applied loads from the superstructure.
- 9.15.2.5.** 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. The height of such piers shall not exceed 3 times their least dimension at the base of the pier. Where concrete block piers are used, 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*.

SUBSECTION 9.15.3. FOOTINGS

9.15.3.1. 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.

Where
required

9.15.3.2. Footings shall rest on undisturbed soil, rock or compacted granular fill.

9.15.3.3. Footings shall be of a size to support adequately all superimposed loads. Except as provided in Articles 9.15.3.4. to 9.15.3.7., 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 kN/m² (Table 9.4.2.A.). Where the design *live load* exceeds 2.4 kN/m² or the length of the supported joists exceeds 4.9 m, footings shall be designed in accordance with Section 4.2.

Size of footings

9.15.3.4. 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.

9.15.3.5. 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.

9.15.3.6. 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.

9.15.3.7. 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.

Table 9.15.3.A.
Forming Part of Articles 9.15.3.3. to 9.15.3.7.

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 Article 9.15.3.7.

⁽²⁾ See Articles 9.15.3.4. and 9.15.3.5.

⁽³⁾ See Article 9.15.3.6.

9.15.3.8. 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.

9.15.3.9. Footings for non-loadbearing masonry *partitions* shall be at least 200 mm wide for *partitions* up to 5.5 m high and shall be increased by 100 mm for each additional 2.7 m of height.

Footings
projection

9.15.3.10. Footings shall be at least 100 mm in thickness except when greater thicknesses are required because of the projection of the footing beyond the supported element.

9.15.3.11. The projection of an unreinforced footing beyond the supported element shall be not greater than the thickness of the footing.

SUBSECTION 9.15.4. FOUNDATION WALLS

Foundation
wall thickness

9.15.4.1. 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 (14 MPa min. strength)	150	0.76	1.52
	200	1.22	2.13
	250	1.37	2.29
	300	1.52	2.29
Solid concrete (20 MPa min. strength)	150	0.76	1.83
	200	1.22	2.29
	250	1.37	2.29
	300	1.52	2.29
Unit masonry	140	0.61	0.61
	190	0.91	1.22
	240	1.22	1.83
	290	1.37	2.13
Column 1	2	3	4

Note to Table 9.15.4.A.:

⁽¹⁾ See Article 9.15.4.2.

9.15.4.2. 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. 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. When a foundation wall contains an opening more than 1.2 m in length 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. 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.

9.15.4.3. Exterior foundation walls shall extend not less than 150 mm above finished ground level.	Height above grade
9.15.4.4. Where the top of a foundation wall is reduced in thickness to permit the installation of floor joists, the reduced section shall be not higher than 350 mm and not less than 90 mm thick.	Reduction in thickness
9.15.4.5. 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 9.20.9.5. spaced not more than 200 mm o.c. vertically and 900 mm o.c. horizontally. The space between wall and facing shall be filled with mortar.	
9.15.4.6. Corbelling of foundation walls supporting cavity walls shall conform to Article 9.20.12.2.	Corbelling
9.15.4.7. Crack control joints shall be provided in foundation walls exceeding 25 m in length at intervals of not more than 15 m. Such joints shall be designed to resist moisture penetration and shall be keyed to prevent relative displacement of the wall portions adjacent to the joint.	Crack control joints
9.15.4.8. Interior masonry foundation walls not subject to lateral earth pressure shall conform to Section 9.20.	Walls not subject to earth pressure
SUBSECTION 9.15.5. JOIST AND BEAM SUPPORT	
9.15.5.1. Foundation walls of hollow unit masonry supporting floor joists shall be capped with at least 50 mm of solid masonry or concrete, or have the top course filled with mortar or concrete, except that such capping may 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.	Capping of walls
9.15.5.2. Not less than an 190 mm depth of solid masonry shall be provided beneath beams supported on masonry. Where the beam is supported below the top of the foundation walls, the ends of such beams shall be protected from the weather.	Beam support
9.15.5.3. Pilasters shall be provided under beams that frame into 140 mm unit masonry foundation walls. Pilasters shall be not less than 90 mm by 290 mm and shall be bonded or tied into the wall. The top 200 mm of pilasters shall be solid.	Pilasters
SUBSECTION 9.15.6. PARGING AND FINISHING	
9.15.6.1. Concrete block foundation walls shall be parged on the exterior face below ground level as required in Section 9.13.	Parging and finishing
9.15.6.2. All form ties shall be removed at least flush with the concrete surface.	Removal of form ties
9.15.6.3. Exterior surfaces of concrete block foundation walls above ground level shall have tooled joints, or shall be rendered, parged or otherwise suitably finished.	Exterior finish of block foundation
SUBSECTION 9.15.7. FOUNDATIONS ON PERMAFROST	
9.15.7.1. Where the permafrost condition of the supporting soil or rock is such that the material is unstable upon thawing, the foundation shall be designed in accordance with the requirements of this Subsection.	Design to prevent thawing
9.15.7.2. Foundations erected on permafrost, soil or rock shall be designed to maintain the permafrost in a frozen condition at and below the load carrying level, unless it can be shown that the design and the construction procedure are such that	

thawing of the permafrost will not result in settlement that will be detrimental to the *building*.

**Ventilating or
insulating
foundation**

9.15.7.3. Provision shall be made to maintain the permafrost beneath a foundation by a ventilated foundation space or by insulation between the underside of the *building* and the ground surface or by a combination of these. Where a vented foundation space is included to protect the permafrost, it shall provide at least 600 mm clear height under the entire *building* to ensure free air movement beneath the *building* to minimize heat transfer from the *building* to the permafrost.

**Special
conditions**

9.15.7.4. *Buildings* with unusual thermal or structural loading conditions shall have foundations designed by a designer competent in this field in accordance with the appropriate requirements of Part 4.

9.15.7.5. *Buildings* not more than one *storey* in height and 50 m² in area, without external plumbing or heating connections, may be supported directly on a layer of coarse granular material at least 150 mm thick.

9.15.7.6. *Buildings* with basements or cellars shall be permitted only where the design is such that detrimental settlement will not develop due to thawing of permafrost.

**Protection of
work area**

9.15.7.7. Prior to the start of construction, a layer of coarse granular fill at least 150 mm thick shall be placed over the entire working area, except that where such material is not available, alternative measures shall be taken to protect the permafrost during construction.

Grading

9.15.7.8. All low areas beneath or adjacent to the *building* shall be graded to ensure proper drainage. Grading for proper drainage shall be by fill only.

**Surface
foundations**

9.15.7.9. Except as provided in Article 9.15.7.5., surface foundations shall be placed on coarse granular fill having a maximum particle size of 75 mm, and shall be at least 600 mm above existing ground level, except that for *buildings* over 150 m² in *building area*, the fill shall be at least 1 m above ground level. The top surface of the fill shall extend a minimum of 1 m beyond the edge of the supporting footings and at least 300 mm from the exterior wall of the *building*. The fill shall be placed in compacted layers not exceeding 300 mm in thickness.

**Buried
foundations**

9.15.7.10. Every buried foundation shall be embedded in permafrost a sufficient depth to ensure firm anchorage or shall be otherwise protected from possible damage by frost action. Where embedment of the foundation in permafrost is required to resist frost action, the foundation shall not be loaded until sufficient *adfreezing* has occurred to develop adequate anchorage against frost heaving and sufficient strength to support the design load.

Piles

9.15.7.11. Piles used for the support of a *building* shall be embedded in the permafrost to a depth of at least twice the thickness of the depth of soil subject to seasonal thawing, or to a minimum of 3 m. Where such piles are placed with the use of heat, the heating shall be controlled to keep disturbance of the permafrost to a minimum.

9.15.7.12. Wood piles shall meet the requirements of CAN3-O56-M79, "Round Wood Piles." Wood piles shall be treated with an *acceptable* preservative applied to the portion of pile that may be exposed to soil that is subject to seasonal thawing to a point at least 300 mm above adjacent ground level.

Wood

9.15.7.13. Wood exposed to soil shall be at least 140 mm by 140 mm.

9.15.7.14. Untreated timber may be used for surface foundations described in Articles 9.15.7.5. and 9.15.7.9. providing the timber is exposed to free circulation of air.

SECTION 9.16 SLABS ON GROUND

SUBSECTION 9.16.1. SCOPE

9.16.1.1. This Section applies to basement and cellar slabs and to floor slabs-on-grade with perimeter foundation walls that support the superstructure.

Slabs-on-grade

9.16.1.2. Floor slabs-on-grade without foundation walls to support the superstructure shall be designed for the existing soil conditions in accordance with good engineering practice and past practice in the area in which the slab is to be built.

Design of floor
slabs-on-grade

SUBSECTION 9.16.2. SLAB SUPPORTS

9.16.2.1. When granular fill is used beneath basement and cellar slabs (see Article 9.13.1.4.), it shall consist of not less than 125 mm of coarse clean granular material containing not more than 15 per cent by weight of material passing a 2 mm sieve. Where dampproofing or waterproofing is provided, such fill is not required.

Granular fill

9.16.2.2. The soil beneath concrete slabs-on-grade shall be compacted. Not less than 125 mm of coarse clean granular material containing not more than 15 per cent by weight of material passing a 2 mm sieve shall be provided beneath the slab and shall be compacted.

Soil
compaction

SUBSECTION 9.16.3. DAMPPROOFING AND WATERPROOFING

9.16.3.1. Dampproofing and waterproofing of basement and cellar slabs and slabs-on-grade shall conform to Section 9.13.

SUBSECTION 9.16.4. DRAINAGE

9.16.4.1. Where *groundwater levels* may cause uplift pressures against the bottom of a slab-below-grade, lateral drains shall be installed under the slab, or the slab shall be designed to resist such uplift pressures.

Uplift
pressures

9.16.4.2. The accumulation of water underneath a slab-on-grade shall be prevented by grading, drainage or other method.

Drainage

9.16.4.3. When floor drains are installed (see Section 9.32) the floor surface shall be so sloped that no water will accumulate.

SUBSECTION 9.16.5. CONCRETE

9.16.5.1. Concrete for floor slabs shall conform to Section 9.3 and shall have a maximum slump of 75 mm.

Maximum
slump of
concrete

9.16.5.2. The finished surface of concrete floor slabs shall be trowelled smooth and even. Dry cement shall not be added to the floor surfaces to absorb surplus water.

Surface finish

9.16.5.3. When a topping course is provided for concrete floor slabs it shall consist of 1 part cement to 2½ parts clean, well-graded sand by volume with a water cement ratio approximately equal to that of the base slab.

Topping

SUBSECTION 9.16.6. THICKNESS AND HEIGHT

9.16.6.1. Concrete slabs-on-ground shall be not less than 75 mm thick exclusive of concrete topping. When concrete topping is provided it shall be not less than 20 mm thick.

Thickness

9.16.6.2. The top of every slab-on-grade shall be not less than 150 mm above exterior finished ground level.

Height above
ground level

SUBSECTION 9.16.7. PIPES AND DUCTS

- Corrosive fill** | **9.16.7.1.** Metal pipes in contact with cinders or other corrosive material shall be protected by a heavy coating of bitumen or other corrosion protection.
- Encasement of ducts** | **9.16.7.2.** Ducts in slabs shall be completely encased with not less than 50 mm of concrete, and installed so that water will not accumulate in the ducts (see also Section 9.34).

SUBSECTION 9.16.8. JOINTS

- 9.16.8.1.** In localities where termites are known to occur, joints between slabs-on-ground and foundation walls, and spaces around pipes, conduit or ducts that penetrate such slabs shall be filled with bitumen.

SECTION 9.17 COLUMNS**SUBSECTION 9.17.1. SCOPE**

- Scope** | **9.17.1.1.** This Section applies to columns used to support carport roofs (see Section 9.36), 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 kN/m². (See Table 9.4.2.A.)
- | **9.17.1.2.** Columns for applications other than as described in Article 9.17.1.1. shall be designed in accordance with Part 4.

SUBSECTION 9.17.2. GENERAL

- Column support** | **9.17.2.1.** Columns shall be centrally located on a footing conforming to Section 9.15.
- | **9.17.2.2.** Columns shall be securely fastened to the supported member to prevent lateral movement.

SUBSECTION 9.17.3. STEEL COLUMNS

- Size** | **9.17.3.1.** Except as permitted in Article 9.17.3.2., steel pipe columns shall have a minimum outside diameter of 73 mm and a minimum wall thickness of 4.76 mm.
- Exception** | **9.17.3.2.** Columns of sizes other than as specified in Article 9.17.3.1. may be used where the *loadbearing* capacities are shown to be adequate.
- Bearing plates** | **9.17.3.3.** Except as permitted in Article 9.17.3.4., 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.
- Exception** | **9.17.3.4.** The top plate required in Article 9.17.3.3. may be omitted where a column supports a steel beam and provision is made for the attachment of the column to the beam.
- Rust prevention** | **9.17.3.5.** Steel columns shall be treated on the outside surface with at least 1 coat of rust-inhibitive paint.
- | **9.17.3.6.** Adjustable steel columns shall conform to CGSB 115-GP-1(1974), "Columns, Adjustable, Metal."

SUBSECTION 9.17.4. WOOD COLUMNS

- Size** | **9.17.4.1.** The width or diameter of a wood column shall be not less than the width of the supported member. Except as provided in Article 9.36.5.2., 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. Wood columns shall be either solid, glued-laminated or built-up. 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. Glued-laminated columns shall conform to Section 4.3. Construction

9.17.4.3. Wood columns shall be separated from concrete in contact with the ground by 0.05 mm polyethylene film or Type S roll roofing. Dampproofing

SUBSECTION 9.17.5. UNIT MASONRY COLUMNS

9.17.5.1. Unit masonry columns shall be built of *loadbearing* masonry units. Material

9.17.5.2. Unit masonry columns shall be at least 290 mm by 290 mm or 240 mm by 380 mm in size. Size

SUBSECTION 9.17.6. SOLID CONCRETE COLUMNS

9.17.6.1. Concrete shall conform to Section 9.3. Material

9.17.6.2. Concrete columns shall be not less than 200 mm by 200 mm for rectangular columns and 230 mm diam for circular columns. Size

SECTION 9.18 CRAWL SPACES

SUBSECTION 9.18.1. GENERAL

9.18.1.1. 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. Crawl spaces

9.18.1.2. Foundations enclosing crawl spaces shall conform to Section 9.15. Foundation

9.18.1.3. Insulation shall conform to Section 9.26. Insulation

9.18.1.4. Heating of crawl spaces shall conform to Section 9.34. Heating

SUBSECTION 9.18.2. ACCESS

9.18.2.1. 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. Size

9.18.2.2. 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. Access hatch

SUBSECTION 9.18.3. VENTILATION

9.18.3.1. Crawl spaces shall be ventilated by natural or mechanical means.

9.18.3.2. 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. Size of vents

9.18.3.3. 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. Design of vents

9.18.3.4. Vents for crawl spaces shall be uniformly distributed on opposite sides of the *building*. Distribution of vents

Ventilation not required **9.18.3.5.** Ventilation to the outside air is not required if the crawl space is vented to an adjacent basement or cellar with an opening conforming to Article 9.18.3.2. *

SUBSECTION 9.18.4. CLEARANCE

Clearance in crawl space **9.18.4.1.** The ground level in a crawl space shall be not less than 300 mm below the level of all joists and beams, except that in localities where termites are known to occur, the clearance shall be not less than 450 mm, unless the joists are pressure treated with a chemical that is toxic to termites.

Service clearance **9.18.4.2.** Where equipment requiring service such as plumbing cleanouts, traps and burners is located in crawl spaces, an access way with a minimum height and width of 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.

SUBSECTION 9.18.5. DRAINAGE

Drainage **9.18.5.1.** 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.

9.18.5.2. Drains shall conform to Section 9.14.

SUBSECTION 9.18.6. GROUND COVER

Ground cover **9.18.6.1.** A ground cover consisting of not less than 50 mm of asphalt or 10 MPa portland cement concrete, of Type S roll roofing or 0.10 mm polyethylene shall be provided in every crawl space. Joints in sheet-type ground cover shall be lapped not less than 100 mm and weighted down.

*

SECTION 9.19 ROOF SPACES

SUBSECTION 9.19.1. VENTILATION

Area **9.19.1.1.** Except as provided in Articles 9.19.1.2. and 9.19.1.3., 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. Vents may be roof type, eave type, gable-end type or any combination thereof, and shall be uniformly distributed on opposite sides of the *building*. Vents shall be designed to prevent the entry of rain, snow and insects. The unobstructed vent area shall be determined in conformance with CSA A93-1965, "Vents for Buildings."

9.19.1.2. A roof space in a *building* containing not more than 1 *storey* need not be vented provided the vapour barrier protecting the ceiling insulation is Type I (see Article 9.26.3.4.), and is applied as a single continuous sheet without openings over the entire ceiling area. Openings such as for plumbing vents may be cut in

such vapour barrier provided the perimeters of such openings are sealed in a manner that will maintain the effectiveness of the vapour barrier.

9.19.1.3. Where insulation is placed below the roof sheathing, and the roof slope is less than 1 in 6 or the roof incorporates no attic space, the unobstructed vent area shall be not less than 1/150 of the insulated ceiling area, uniformly distributed on all sides of the *building*. Cross purlins at least 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 at least 25 mm below the top of the roof joists.

9.19.1.4. The lower portion of a mansard style roof need not be ventilated. The upper portion of such roofs shall be ventilated in conformance with the requirements in Articles 9.19.1.1. to 9.19.1.3., except that at least 50 per cent of the required vent opening shall be provided near the junction of the upper and lower portions.

SUBSECTION 9.19.2. ACCESS

9.19.2.1. Every attic space more than 600 mm in height at the highest point shall be provided with an access stair or shall have a hatchway of not less than 550 mm by 900 mm, except that where such hatchway serves not more than 1 *dwelling unit*, the hatchway may be reduced to 500 mm by 700 mm. Hatchways shall be fitted with doors or covers.

Access to attic

SECTION 9.20 ABOVE-GRADE MASONRY

SUBSECTION 9.20.1. SCOPE

9.20.1.1. 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.

Above-grade
masonry

9.20.1.2. For *buildings* other than those described in Article 9.20.1.1., or where the masonry is designed on the basis of design loads and allowable stresses, Section 4.4 shall apply.

9.20.1.3. In seismic Zone 3, *loadbearing* elements of masonry *buildings* more than 1 *storey* in height shall be reinforced with at least the minimum amount of reinforcement as required in Subsection 9.20.18.

9.20.1.4. In seismic Zone 2, *loadbearing* elements of 3 *storey* masonry *buildings* shall be reinforced with at least the minimum amount of reinforcement as required in Subsection 9.20.18.

SUBSECTION 9.20.2. MASONRY UNITS

9.20.2.1. Masonry units shall comply with one of the following:

- CSA A82.1-M1977, "Burned Clay Brick,"
- CSA A82.3-M1978, "Calcium Silicate (Sand-Lime) Building Brick,"
- CSA A82.4-M1978, "Structural Clay Load-Bearing Wall Tile,"
- CSA A82.5-M1978, "Structural Clay Non-Load-Bearing Tile,"
- CSA A165.1-M1977, "Concrete Masonry Units,"
- CSA A165.2-M1977, "Concrete Brick Masonry Units,"
- CSA A165.3-M1977, "Prefaced Concrete Masonry Units,"
- CSA A165.4-M1977, "Autoclaved Cellular Units,"
- ASTM C126-71(1976), "Ceramic Glazed Structural Clay Facing Tile, Facing Brick, and Solid Masonry Units," or
- ASTM C212-60(1975), "Structural Clay Facing Tile."

Material
specifications
for masonry
units

Used masonry

9.20.2.2. Used bricks shall be free of old mortar, soot or other surface coating and shall conform to Article 9.20.2.1.

Limitation on use of glass block, gypsum and foamed concrete

9.20.2.3. Glass blocks and gypsum masonry shall not be used as *loadbearing* units or in the construction of fireplaces or *chimneys*. Gypsum block shall not be exposed to soil, weather or dampness. Masonry made with foamed concrete shall not be used in contact with the soil or exposed to the weather.

Stone

9.20.2.4. Stone shall be sound and durable.

9.20.2.5. *Loadbearing* concrete units or non-*loadbearing* concrete units exposed to the weather shall have weight and water absorption characteristics conforming to Classes A, B or C, described in CSA A165.1-M1977, "Concrete Masonry Units." Where cellular concrete blocks are used, allowance shall be made in the design for the shrinkage characteristics of the units to be used.

9.20.2.6. Clay brick masonry units exposed to the weather shall have an average saturation coefficient not greater than 0.88 when measured in conformance with CAN3-A82.2-M78, "Methods of Sampling and Testing Brick."

9.20.2.7. 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 Masonry Unit	Minimum Compressive Strength over Gross Area, MPa	
	Masonry Unit Exposed to Weather	Masonry Unit not Exposed to Weather
Hollow <i>loadbearing</i> concrete units	7	5
Solid <i>loadbearing</i> concrete units	12.5	8
Hollow non- <i>loadbearing</i> concrete units	7	2.5
Solid non- <i>loadbearing</i> concrete units	12.5	8
Solid <i>loadbearing</i> cellular units	Not permitted	5
Solid non- <i>loadbearing</i> cellular units	Not permitted	2
Column 1	2	3

SUBSECTION 9.20.3. MORTAR

Materials specifications for mortar

9.20.3.1. Cementitious materials and aggregates for mortar shall comply with the following:

CAN3-A5-M77, "Portland Cements,"
CAN3-A8-M77, "Masonry Cement,"
CSA A82.22-M1977, "Gypsum Plasters,"
CSA A82.42-1950, "Quicklime for Structural Purposes,"
CSA A82.43-1950, "Hydrated Lime for Masonry Purposes," or
CSA A82.56-M1976, "Aggregate for Masonry Mortar."

9.20.3.2. Water and aggregate shall be clean and free of significant amounts of deleterious materials.

Water and
aggregate

9.20.3.3. Lime used in mortar shall be hydrated.

Lime

9.20.3.4. If lime putty is used in mortar, it shall be made by slaking quicklime in water for not less than 24 h (see Appendix to CSA Standard A82.42-1950, "Quicklime for Structural Purposes") or soaking hydrated lime in water for not less than 12 h.

Lime putty

9.20.3.5. Except as provided in Articles 9.20.3.6. to 9.20.3.8., mortar mixes shall conform to Table 9.20.3.A. Mortar containing portland cement shall not be used later than 2½ h after mixing.

Mortar mixes

Table 9.20.3.A.
Forming Part of Articles 9.20.3.5. and 9.20.3.6.

MORTAR MIX PROPORTIONS (by volume)				
Permissible Use of Mortar	Portland Cement	Masonry Cement (Type H)	Lime	Aggregate
All locations but not for use with sand-lime or concrete brick	½ to 1 1	1 —	— ¼ to ½	Not less than 2¼ and not more than 3 times the sum of the volumes of the cement and lime
All locations except foundation walls and piers, but not for use with sand-lime or concrete brick	— 1	1 —	— ½ to 1¼	
All locations except <i>loadbearing</i> walls of hollow units, parapet walls and <i>chimneys</i>	1	—	1¼ to 2½	
All non- <i>loadbearing</i> <i>partitions</i> and all <i>loadbearing</i> walls of solid units, except foundation walls, parapet walls and <i>chimneys</i>	1 —	— —	2¼ to 4 1	
Column 1	2	3	4	5

9.20.3.6. Mortar for sand-lime brick and concrete brick may consist of 1 part of masonry cement to not less than 3 parts of aggregate by volume in addition to those mixes permitted in Table 9.20.3.A.

9.20.3.7. Mortar for gypsum units shall consist of 1 part gypsum and not more than 3 parts aggregate by weight.

Mortar for
gypsum units

9.20.3.8. Mortar for glass block shall consist of 1 part portland cement, 1 part hydrated lime to not more than 4 parts aggregate by volume.

Mortar for
glass block

SUBSECTION 9.20.4. MORTAR JOINTS

9.20.4.1. Maximum average joint thickness shall be 12 mm. Maximum thickness of an individual joint shall be 20 mm.

Mortar joint
thickness

9.20.4.2. Solid masonry units shall be laid with full head and bed joints.

Solid masonry
joints

9.20.4.3. Hollow masonry units shall be laid with mortar applied to head and bed joints of both inner and outer face shells.

Hollow
masonry joints

SUBSECTION 9.20.5. MASONRY SUPPORTMasonry
support

9.20.5.1. All masonry shall be supported on masonry, concrete or steel, except as * permitted in Article 9.20.5.5.

Lintels

9.20.5.2. Masonry over openings shall be supported by steel, reinforced concrete or masonry lintels or arches designed to support the imposed load.

9.20.5.3. Steel angle lintels supporting masonry veneer above openings shall conform to Table 9.20.5.A.

Table 9.20.5.A.
Forming Part of Article 9.20.5.3.

MAXIMUM ALLOWABLE SPANS FOR STEEL LINTELS SUPPORTING MASONRY VENEER, m					
Minimum Angle Size, mm			75 mm Brick	90 mm Brick	100 mm Stone
Vert. Leg	Horiz. 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

Thickness of
supporting wall

9.20.5.4. Every masonry wall shall be at least as thick as the wall it supports, except as otherwise permitted in Article 9.20.12.2.

9.20.5.5. Masonry veneer, not more than 90 mm in thickness, may rest on wood frame * construction if all supporting material is pressure treated with preservatives in accordance with CSA O80.15-1974 "Preservative Treatment of Wood for Building Foundation Systems, Basement and Crawl Spaces by Pressure Processes", and designed to carry the superimposed load of the masonry veneer in addition to all other loads.

SUBSECTION 9.20.6. THICKNESS AND HEIGHTThickness of
solid exterior
walls

9.20.6.1. 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. 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. In walls composed of more than one wythe, each wythe shall be not less than 90 mm thick.

Thickness of
cavity walls

9.20.6.2. 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. Wythes shall be separated by a cavity of not less than 50 mm nor more than 75 mm, except that where the wythes are bonded together with masonry units, the cavity shall be not less than 75 mm and not more than 100 mm. 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.** The thickness of *loadbearing* interior walls shall be determined on the basis of Article 9.20.10.1. Thickness of interior walls
- 9.20.6.4.** Interior non-*loadbearing* partitions shall be not less than 65 mm thick (see Article 9.20.10.1.).
- 9.20.6.5.** 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. Such veneer over wood-frame walls shall have not less than a 25 mm air space behind the veneer. Masonry veneer less than 90 mm thick shall have unraked joints. Masonry veneer
- 9.20.6.6.** Masonry veneer individually supported by the back-up material shall conform to the appropriate requirements contained in Section 4.4. Individually supported veneer units
- 9.20.6.7.** The height of parapet walls above the adjacent roof surface shall be not more than 3 times the parapet wall thickness. Parapet walls shall be solid from the top of the parapet to not less than 300 mm below the adjacent roof level. Parapet walls
- 9.20.6.8.** Limestone slab facings and precast concrete panel facings shall conform to the appropriate requirements of Section 4.4. Limestone slab facings

SUBSECTION 9.20.7. CHASES AND RECESSES

- 9.20.7.1.** Except as permitted in Articles 9.20.7.3. and 9.20.7.5., the depth of any chase or recess shall not exceed $\frac{1}{3}$ the thickness of the wall, and the horizontal projection of the chase or recess shall not exceed 500 mm. Size of chases and recesses
- 9.20.7.2.** Except as permitted in Articles 9.20.7.3. and 9.20.7.5., no chase or recess shall be constructed in any wall 190 mm or less in thickness. Chases or recesses prohibited
- 9.20.7.3.** 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.
- 9.20.7.4.** 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. Location of chases and recesses
- 9.20.7.5.** Chases or recesses that do not conform to the limits specified in Articles 9.20.7.1. to 9.20.7.4. shall be considered as openings, and any masonry supported above such a chase or recess shall be supported by a lintel or arch. Oversized chases and recesses
- 9.20.7.6.** Chases and recesses shall not be cut into walls made with hollow units after the masonry units are in place.

SUBSECTION 9.20.8. SUPPORT OF LOADS

- 9.20.8.1.** *Loadbearing* walls of hollow masonry units supporting roof or floor framing members shall be capped with not less than 50 mm of solid masonry, or have the top course filled with concrete. Capping may be omitted where the roof framing is supported on a wood plate not less than 38 mm thick, the same width as the masonry wall. Capping of walls
- 9.20.8.2.** Floor joists supported on cavity walls shall be supported on solid units not less than 57 mm in height. Floor joists shall not project into the cavity. 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. Floor joist support
- 9.20.8.3.** The bearing area under beams and joists shall be sufficient to carry the supported load. In no case shall the minimum length of end bearing of beams supported on masonry be less than 90 mm. The length of end bearing of floor, roof or ceiling joists supported on masonry shall be not less than 40 mm. Bearing area

Pilasters **9.20.8.4.** 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. Not less than 190 mm depth of solid masonry or concrete shall be provided under the beam or column. Pilasters shall be bonded or tied to masonry walls. Concrete pilasters shall be not less than 50 mm by 300 mm; unit masonry pilasters shall be not less than 100 mm by 290 mm.

Shelf angles **9.20.8.5.** 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 Section 4.4.

SUBSECTION 9.20.9. BONDING AND TYING

Reinforcing **9.20.9.1.** Vertical joints in adjacent courses of walls and *partitions* shall be offset unless each wythe of masonry is reinforced with the equivalent of not fewer than 2 corrosion-resistant steel bars of 3.76 mm diam placed in the horizontal joints at vertical intervals not exceeding 460 mm. Where joints in the reinforcing occur, the bars shall be lapped not less than 150 mm.

9.20.9.2. 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 Articles 9.20.9.4. to 9.20.9.6.

9.20.9.3. Where wythes are bonded together with masonry units, the bonding units shall comprise not less than 4 per cent of the wall surface area. Bonding units 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. Such units shall extend not less than 90 mm into adjacent wythes.

9.20.9.4. Where 2 or more wythes are bonded together with metal ties of the individual rod type, the ties shall conform to the requirements in Articles 9.20.9.5. to 9.20.9.8. Other metal bonding ties may be used where it can be shown that such ties provide walls that are at least as strong and as durable as those made with the individual rod type.

9.20.9.5. Metal ties of the individual rod type shall be corrosion-resistant and shall have a minimum cross-sectional area of not less than 17.8 mm². Such ties shall have not less than a 50 mm portion bent at right angles at each end.

9.20.9.6. Metal ties of the individual rod type shall extend from within 25 mm of the outer face of the wall to within 25 mm of the inner face of the wall and shall be completely embedded in mortar except for the portion exposed in cavity walls. Such ties shall be staggered from course to course.

9.20.9.7. 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. Such ties shall be located within 300 mm of openings and spaced not more than 900 mm apart around openings. Ties at other locations shall be spaced not more than 900 mm apart horizontally and 460 mm apart vertically.

9.20.9.8. Where the inner and outer wythes of cavity walls are bonded together with metal ties of the individual rod type, the ties shall be shaped to provide a drip near their centres. Such ties shall be 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 and not more than 900 mm apart around openings within 300 mm of the openings. At other locations, the ties shall be spaced not more than 900 mm apart horizontally and 460 mm apart vertically.

9.20.9.9. 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 0.41 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.

Masonry
veneer
reinforcing

Table 9.20.9.A.
Forming Part of Article 9.20.9.9.

VENEER TIE SPACING	
Maximum Vertical Spacing, mm	Maximum Horizontal Spacing, mm
400	800
500	600
600	400
Column 1	2

9.20.9.10. Masonry veneer individually supported by masonry or wood-frame back-up shall be secured to the back-up in conformance with Section 4.4.

9.20.9.11. 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 not exceeding 600 mm for units 190 mm or less in height and in every horizontal joint for units higher than 190 mm. Reinforcement shall be lapped not less than 150 mm.

Glass block
reinforcing

SUBSECTION 9.20.10. LATERAL SUPPORT

9.20.10.1. Masonry walls and *partitions* shall be supported at right angles to the wall by floor or roof construction or by intersecting masonry walls or buttresses. The spacing of such supports shall conform to Table 9.20.10.A.

Lateral support
of masonry
walls

Table 9.20.10.A.
Forming Part of Article 9.20.10.1.

MAXIMUM DISTANCE BETWEEN LATERAL WALL SUPPORTS	
Type of Wall	Maximum Spacing of Supports
<i>Loadbearing</i> walls of solid units	20 times the wall thickness
<i>Loadbearing</i> walls of hollow units or cavity walls	18 times the wall thickness
<i>Non-Loadbearing</i> walls or <i>partitions</i>	36 times the wall thickness
Column 1	2

9.20.10.2. Floor and roof constructions providing required lateral support for walls as required in Article 9.20.10.1. shall be constructed to transfer lateral loads to walls or buttresses approximately at right angles to the laterally supported walls.

SUBSECTION 9.20.11. ANCHORAGE OF ROOFS, FLOORS AND INTERSECTING WALLS

Anchorage of
roofs, floors
and
intersecting
walls

9.20.11.1. 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. Ties shall be corrosion-resistant and be not less than the equivalent of 40 mm by 4.76 mm thick steel straps. Such anchors 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. When joists are parallel to the wall, such ties shall extend across at least 3 joists.

Tying of
intersecting
walls

9.20.11.2. Where required to provide lateral support, intersecting walls or *partitions* shall be bonded or tied together. Fifty per cent of the adjacent masonry units in the intersecting wall 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. Such ties 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 or *partitions* 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. The ties 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.

Tying of wood
frame roof
systems

9.20.11.4. 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. Alternatively the roof system may be anchored by nailing the wall furring strips to the side of the rafter plate.

Anchoring of
projecting
masonry

9.20.11.5. 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.

Bedding of
anchor bolts

9.20.11.6. 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.

SUBSECTION 9.20.12. CORBELLING

Corbelling

9.20.12.1. All corbelling shall consist of solid units. The units shall be corbelled so that the horizontal projection of any unit does not exceed 25 mm and the total projection does not exceed $\frac{1}{3}$ the total wall thickness.

9.20.12.2. Cavity walls of greater thickness than the foundation wall on which they rest shall not be corbelled but may project 25 mm over the outer face of the foundation wall disregarding parging. The unit masonry foundation wall may be corbelled to meet flush with the inner face of a cavity wall provided the individual corbel does not exceed $\frac{1}{2}$ the height or $\frac{1}{3}$ the width of the corbelled unit and the total corbel does not exceed $\frac{1}{3}$ the foundation wall thickness.

9.20.12.3. Masonry veneer resting on a bearing support shall not project more than 25 mm beyond the supporting base where the veneer is at least 90 mm thick, and 12 mm beyond the supporting base where the veneer is less than 90 mm thick. In the case of rough stone veneer, the projection, measured as the average projection of the stone units, shall not exceed $\frac{1}{3}$ the bed width beyond the supporting base.

SUBSECTION 9.20.13. FLASHING

9.20.13.1. 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. 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. 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 devices for flashing shall be corrosion-resistant and compatible with the flashing with respect to galvanic action.

Fastening
devices for
flashing

9.20.13.4. Flashing shall be installed in masonry and masonry veneer walls beneath jointed masonry window sills, over the back and top of parapet walls, over the heads of glass block panels, beneath weep holes and 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 $\frac{1}{4}$ of the horizontal eave overhang.

Flashing in
masonry and
masonry
veneer walls

9.20.13.5. 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 beneath weep holes in cavity walls shall be installed so that it is bedded in both wythes and slopes toward the outside wythe. Such flashing shall be bedded not less than 25 mm in the inside wythe and extend to the outside of the outer wythe.

9.20.13.7. Flashing beneath weep holes in masonry veneer over wood-frame walls shall be installed so that it extends from the front edge of the masonry to 150 mm up behind the sheathing paper.

SUBSECTION 9.20.14. WEEP HOLES

9.20.14.1. Weep holes spaced not more than 600 mm apart shall be provided at the bottom of the cavity in cavity wall and masonry veneer wall construction including the cavity above lintels over window and door openings required to be flashed in conformance with Article 9.20.13.4.

SUBSECTION 9.20.15. DAMPPROOFING

9.20.15.1. 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 parged on the interior surface and covered with No. 15 breather-type asphalt-saturated paper or felt conforming to CAN2-51.32-M77, "Sheathing, Membrane, Breather Type," lapped at least 100 mm at the joints. Where the insulation effectively limits the passage of water vapour and is applied by a waterproof adhesive or by mortar directly to the masonry, the requirements for sheathing paper do not apply.

Dampproofing

9.20.15.2. 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.

Prevention of
bridging in
cavity walls

9.20.15.3. The junction between door and window frames with masonry shall be caulked in conformance with Subsection 9.28.4.

Caulking

9.20.15.4. 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.

Sill drip

SUBSECTION 9.20.16. EXTERIOR FINISHConcrete block
exterior finish

9.20.16.1. Above-grade exterior walls of concrete block shall be stuccoed, painted or otherwise finished to provide breather-type water repellency.

SUBSECTION 9.20.17. PROTECTIONLaying
temperature of
mortar and
masonry

9.20.17.1. Mortar and masonry shall be maintained at a temperature of not less than 5°C during installation and for not less than 48 h after installation. No frozen material shall be used in the mix.

Protection
from the
elements

9.20.17.2. The top surface of uncompleted masonry exposed to the weather shall be completely covered with a waterproofing material when construction is not in progress.

SUBSECTION 9.20.18. REINFORCEMENT FOR EARTHQUAKE RESISTANCE

9.20.18.1. Where reinforcement is required in this Section, masonry walls shall be reinforced horizontally and vertically with steel having a total cross-sectional area of not less than 0.002 times the cross-sectional area of the wall, so that not less than 1/3 of the required steel area is installed either horizontally or vertically and the remainder in the other direction.

9.20.18.2. 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-S304-M1978, "Masonry Design and Construction for Buildings."

SECTION 9.21 CHIMNEYS AND FLUES**SUBSECTION 9.21.1. GENERAL**Chimney
design

9.21.1.1. Where a *chimney* exceeds 12 m in height or where the cross-sectional area of a *flue* exceeds 813 cm² or where the capacity of an *appliance* connected to a *flue* has a rated input exceeding 120 kW, the requirements in Part 6 shall apply.

9.21.1.2. *Metal chimneys* consisting of a single thickness of metal shall conform to the requirements in Part 6.

9.21.1.3. *Factory-built chimneys* shall conform to CAN4-S604-78, "Standard for Factory-Built, Type A Chimneys."

9.21.1.4. Where a metal *gas vent* is used for venting of gas-burning *appliances*, such *appliances* shall be vented in accordance with The Gas Protection Act and regulations made pursuant to that Act. *

Dampers and
draft regulators

9.21.1.5. Dampers and draft regulators in *flue pipes* serving oil-fired *appliances* shall conform to The Fire Prevention Act and regulations made pursuant to that Act. *

Gas vents

9.21.1.6. *Chimneys* or *gas vents* for gas *appliances* that are not suitable for solid- or liquid-fuel-fired *appliances* shall be plainly and permanently marked to that effect.

9.21.1.7. The walls of any *chimney*, *gas vent* or *flue pipe* shall be constructed to be gas-tight, smoke-tight and flame tight.

SUBSECTION 9.21.2. CHIMNEY FLUESChimney flue
limitation

9.21.2.1. A *chimney flue* serving a fireplace, incinerator or "slow burning" solid fuel fired *appliance* shall not serve any other *appliance*.

9.21.2.2. 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 at different elevations unless otherwise permitted by the installation requirements in Article 9.34.2.3.

9.21.2.3. *Chimney flues* shall not be inclined more than 45° to the vertical.

Angle of
chimney flue

9.21.2.4. The size of a *chimney flue* serving 1 or more *appliances* having a maximum rated input shall conform to Table 9.21.2.A. unless calculations are provided to show that smaller sizes can be justified.

Table 9.21.2.A.
Forming Part of Article 9.21.2.4.

FLUE SIZES		
Maximum Rated Input of One or More <i>Appliances</i> , kW	Minimum Size of <i>Flue</i> , mm	
	Round	Rectangular
30	150	200 x 200
50	175	200 x 200
80	200	200 x 200
120	225	200 x 300
Column 1	2	3

9.21.2.5. The minimum size of a *chimney flue* serving a masonry fireplace shall be 225 mm in diameter for round *flues* and 200 mm by 300 mm for rectangular *flues*.

9.21.2.6. Where a *chimney flue* serves only 1 *appliance*, the *flue* area shall be at least equal to that of the *flue* pipe connected to it.

9.21.2.7. The width of an oval *chimney flue* shall not be less than $\frac{2}{3}$ its breadth.

9.21.2.8. A *chimney flue* serving a factory-built fireplace, including the free-standing type, shall be designed to vent the fireplace in an *acceptable* manner.

SUBSECTION 9.21.3. CHIMNEY LINING

9.21.3.1. Every *masonry* or *concrete chimney* shall have a lining of clay, firebrick or asbestos-cement.

Chimney lining

9.21.3.2. Clay liners shall conform to ASTM C315-78c, "Clay Flue Linings." Such liners 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.

Clay liner
specifications

9.21.3.3. Firebrick liners shall conform to ASTM C64-72(1977), "Refractories for Incinerators and Boilers." Such firebrick shall be laid with high temperature cement mortar conforming to CGSB 10-GP-3M(1976), "Mortar, Refractory, Air Setting."

Firebrick liners
specifications

9.21.3.4. *Chimney liners* shall be installed when the surrounding masonry or concrete is placed. Spaces between the liner and surrounding masonry shall not be filled with mortar where the *chimney* walls are less than 190 mm in thickness.

Installation of
chimney liners

9.21.3.5. Every clay *chimney liner* shall be laid in a full bed of mortar consisting of 1 part portland cement to approximately 3 parts of sand by volume.

9.21.3.6. *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 above the *chimney* cap.

SUBSECTION 9.21.4. MASONRY AND CONCRETE CHIMNEY CONSTRUCTION

9.21.4.1. Unit masonry shall conform to Section 9.20.

Unit masonry
chimney

Concrete for chimneys

9.21.4.2. Concrete shall conform to Section 9.3.

Footings for chimneys

9.21.4.3. Footings for *masonry chimneys* and *concrete chimneys* shall conform to the requirements in Section 9.15.

Height of chimney flues

9.21.4.4. 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*. Not more than 200 mm of *chimney flue* above the top of the *chimney* cap may be considered in computing this height. *Chimneys* shall be braced when necessary to provide lateral stability. (See Appendix A for Sentence 6.3.1.1.(8).) *

Chimney caps

9.21.4.5. The top of a *chimney* shall have a waterproof cap of concrete, masonry or metal. The cap shall slope from the lining and be provided with a drip not less than 25 mm from the chimney wall. Jointed masonry *chimney* caps shall have flashing installed beneath the cap extending from the liner to the drip edge.

Chimney flue cleanout

9.21.4.6. A cleanout opening equipped with a metal frame and a tight-fitting metal door shall be installed near the base of the *chimney flue*.

Masonry chimney wall thickness

9.21.4.7. The walls of a *masonry chimney* shall be built of solid units not less than 75 mm thick.

Separation of chimney flues

9.21.4.8. *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. Such *flue* liners shall be installed to prevent significant lateral movement.

Junction flashing

9.21.4.9. Junctions with adjacent materials shall be adequately flashed to shed water.

SUBSECTION 9.21.5. FLUE PIPES

Flue pipe specification

9.21.5.1. *Flue pipes* connecting a solid fuel-burning *appliance* to a *chimney flue* shall be made of metal conforming to Table 9.21.5.A.

Table 9.21.5.A.
Forming Part of Article 9.21.5.1.

WALL THICKNESS OF FLUE PIPES		
Diameter of <i>Flue Pipe</i> , mm	Minimum Thickness of Metal, mm	
	Uncoated Steel	Galvanized Steel
Below 152	0.41	0.41
152 to 203	0.53	0.48
Over 203	0.69	0.61
Column 1	2	3

9.21.5.2.(1) *Flue pipes* connecting a gas-burning *appliance* to a *chimney flue* shall * conform to The Gas Protection Act and regulations made pursuant to that Act.

(2) *Flue pipes* connecting an oil-burning *appliance* to a *chimney flue* shall conform to * The Fire Prevention Act and regulations made pursuant to that Act.

9.21.5.3. *Flue pipes* shall be as short and as straight as possible.

9.21.5.4. The cross-sectional area of the *flue pipe* shall not be less than the area of the *flue* outlet of the *appliance*, except that a tapered reduction in the section of the *flue* adjacent to the *chimney* is permitted provided adequate draft is maintained.

9.21.5.5. The *flue pipe* connection with the *chimney* shall be made by a metal thimble or masonry *flue* ring. The connection shall be tight and made so that the *flue pipe* does not extend into the *chimney flue*.

Flue pipe
connection

9.21.5.6. A *flue pipe* shall be supported by metal or other *noncombustible* supports.

Flue pipe
support

9.21.5.7. No *flue pipe* shall pass through an attic, closet, concealed space or floor.

Restriction on
flue pipe
installation

SUBSECTION 9.21.6. CLEARANCE FROM COMBUSTIBLE CONSTRUCTION

9.21.6.1. 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*.

Clearance from
combustible
construction.

9.21.6.2. A clearance of not less than 150 mm shall be provided between a cleanout opening and *combustible* material.

Table 9.21.6.A.
Forming Part of Article 9.21.6.5.

CLEARANCE BETWEEN A FLUE PIPE AND PROTECTED COMBUSTIBLE MATERIAL	
Type of protection applied to the <i>combustible</i> material unless otherwise specified and covering all surfaces within 450 mm of the <i>flue pipe</i>	Clearance between <i>flue pipe</i> and <i>combustible</i> material, mm
6 mm asbestos millboard spaced out 25 mm by <i>noncombustible</i> material	300
0.33 mm sheet metal on 6 mm asbestos millboard	300
0.33 mm sheet metal spaced out 25 mm by <i>noncombustible</i> material	230
0.33 mm sheet metal on 3 mm asbestos millboard spaced out 25 mm by <i>noncombustible</i> material	230
40 mm asbestos-cement covering on <i>flue pipe</i>	230
0.68 mm sheet metal on 25 mm mineral wool batts reinforced with wire mesh or equivalent	75
Column 1	2

9.21.6.3. All spaces between *masonry or concrete chimneys* and *combustible* framing shall be sealed top or bottom with *noncombustible* material.

9.21.6.4. Flooring shall have not less than a 12 mm clearance from *masonry or concrete chimneys*.

Flooring
clearance

9.21.6.5. The clearance between *flue pipes* and unprotected *combustible* material shall be not less than 450 mm, except that where the flue gas temperature does not exceed 400°C, the clearance may be reduced to 230 mm. Where a 450 mm clearance is required, it may be reduced to the values shown in Table 9.21.6.A. where *combustible* material is protected.

Clearance from
unprotected
combustible
material

9.21.6.6. Joists or beams may be supported on masonry walls which enclose *chimney flues* provided the *combustible* members are separated from the *flue* by a minimum of 290 mm of solid masonry.

SECTION 9.22 FIREPLACES

SUBSECTION 9.22.1. GENERAL

- Fireplaces **9.22.1.1.** Except as otherwise stated in this Section, unit masonry shall conform to Section 9.20 and concrete to Section 9.3.
- Footings for fireplaces **9.22.1.2.** Footings for masonry and concrete fireplaces shall conform to Section 9.15.
- 9.22.1.3.** Except when otherwise specifically stated herein, this Section applies to masonry fireplaces constructed on-site.
- 9.22.1.4.** Combustion air for a fireplace shall be provided by an air intake other than a * door or window.

SUBSECTION 9.22.2. FIREPLACE LINERS

- Fireplace liners **9.22.2.1.** Except where a fireplace is equipped with an *acceptable* 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.
- High temperature mortar **9.22.2.2.** Firebrick liners shall be laid with high temperature cement mortar conforming to CGSB 10-GP-3M(1976), "Mortar, Refractory, Air Setting."

SUBSECTION 9.22.3. WALL THICKNESS

- Wall thickness **9.22.3.1.** Except as provided in Article 9.22.3.2., the back and sides of a fireplace shall be at least 190 mm thick where a metal liner or a 50 mm thick firebrick liner is used, including the thickness of the masonry liner. Portions of the back exposed to the outside may be 140 mm thick. Joints between a firebrick liner and the adjacent back up masonry shall be offset.
- 9.22.3.2.** 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.

SUBSECTION 9.22.4. OPENINGS

- Support for masonry openings **9.22.4.1.** Masonry above openings shall be supported by steel lintels conforming to Article 9.20.5.3., reinforced concrete or a masonry arch.

SUBSECTION 9.22.5. HEARTH

- Hearth construction **9.22.5.1.** 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.
- 9.22.5.2.** 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.

SUBSECTION 9.22.6. DAMPER

- Metal 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.

SUBSECTION 9.22.7. SMOKE CHAMBER

- Smoke chambers **9.22.7.1.** 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. The thickness of masonry walls surrounding the smoke chamber shall be at least 190 mm at the sides, front and back, except that the portions of the back exposed to the outside may be 140 mm thick.

SUBSECTION 9.22.8. FACTORY-BUILT FIREPLACES

- * **9.22.8.1.** Factory-built fireplaces shall conform to ULC S610-1979, "Standard for Factory-Built Fireplaces" or to ULC S611-1979, "Standard for Factory-Built Free-Standing Fireplaces."

Specifications
for factory-
built fireplaces

9.22.8.2. Unless otherwise *accepted*, the minimum clearance requirements around factory-built fireplaces shall conform to Article 9.34.9.2.

9.22.8.3. Unless otherwise *accepted*, *combustible* floor material beneath factory-built fireplaces shall be protected in conformance with Article 9.34.9.4.

SUBSECTION 9.22.9. CLEARANCE OF COMBUSTIBLE MATERIAL

9.22.9.1. *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 at least 300 mm above the top of the opening.

9.22.9.2. Metal exposed to the interior of a fireplace such as the damper control mechanism shall have at least 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. At least 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.

9.22.9.4. At least 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.

SECTION 9.23 WOOD-FRAME CONSTRUCTION

SUBSECTION 9.23.1. SCOPE

9.23.1.1. This Section applies to conventional wood-frame construction in which the framing members are spaced not more than 600 mm o.c.

Wood-frame
construction

9.23.1.2. 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 kN/m².

Design live
load

9.23.1.3. 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 kN/m² on any floor.

9.23.1.4. Where the conditions in Articles 9.23.1.2. or 9.23.1.3. are exceeded, the design of the framing and fastening shall conform to Section 4.3.

9.23.1.5. Post, beam and plank construction and plank frame wall construction shall conform to Section 9.24.

Post, beam and
plank
construction

SUBSECTION 9.23.2. GENERAL

9.23.2.1. All members shall be so framed, anchored, fastened, tied and braced to provide the necessary strength and rigidity.

Rigidity

Treatment of
end members

9.23.2.2. Ends of wood joists or 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.

9.23.2.3. 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 at least 0.05 mm polyethylene film or Type S roll roofing, except that such dampproofing material is not required where the wood member is at least 150 mm above the ground.

9.23.2.4. Lumber shall conform to the appropriate requirements in Subsection 9.3.2.

SUBSECTION 9.23.3. NAILS AND STAPLES

Nails and
staples
specification

9.23.3.1. Nails specified in this Section shall be common steel wire nails or common spiral nails, conforming to CSA B111-1974, "Wire Nails, Spikes and Staples" unless otherwise indicated.

Nail length

9.23.3.2. All nails shall be long enough so that not less than $\frac{1}{2}$ their length penetrates into the second member. 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.

9.23.3.3. Except as provided in Article 9.23.3.4., nailing of framing shall conform to Table 9.23.3.A.

9.23.3.4. 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 having plywood or waferboard sheathing extend down over floor framing and fastened to the floor framing by nails or staples conforming to Article 9.23.3.5., or by tying the wall framing to the floor framing by 50 mm wide galvanized-metal strips of at least 0.41 mm in thickness, spaced not more than 1.2 m apart, and fastened at each end with at least two 63 mm nails.

9.23.3.5. Fastening of sheathing and subflooring shall conform to Table 9.23.3.B. 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. Roofing nails for the attachment of fibreboard or gypsum sheathing shall not be less than 3.2 mm in diameter with a minimum head diameter of 11.1 mm.

Table 9.23.3.A.
Forming Part of Articles 9.23.3.3. and 9.23.3.4.

NAILING FOR FRAMING		
Construction Detail	Minimum Length 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 <i>partition</i> 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 <i>partitions</i> to framing or subflooring	82	600 mm (o.c.)
Horizontal member over openings in non-loadbearing <i>partitions</i> —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 bearing <i>partition</i> —toe nail	82	2
38 mm by 140 mm or less plank decking to support	82	2
Plank decking wider than 38 mm by 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 Article 9.23.3.4.

Table 9.23.3.B.
Forming Part of Article 9.23.3.5.

Element	Minimum Length of Fasteners for Sheathing and Subfloor Attachment, mm				Min. No. or Max. Spacing of Fasteners
	Common or Spiral Nails	Ring Thread Nails	Roofing Nails	Staples	
Plywood or waferboard 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 or waferboard from 10 mm to 20 mm thick	51	45	N/A	51	
Plywood or waferboard over 20 mm thick	57	45	N/A	N/A	
Fibreboard sheathing up to 13 mm thick	N/A	N/A	44	38	
Gypsum sheathing up to 13 mm thick	N/A	N/A	44	N/A	
Board lumber 184 mm or less wide	51	N/A	N/A	51	2 per support
Board lumber more than 184 mm wide	51	N/A	N/A	51	3 per support
Column 1	2	3	4	5	6

SUBSECTION 9.23.4. ALLOWABLE SPANS

9.23.4.1. Except as required in Article 9.23.4.3., the spans for wood joists, rafters and beams shall conform to the spans shown in Tables A-1 to A-11 for the uniform *live loads* shown in the tables. (See Appendix A.)

9.23.4.2. 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., and such beams shall be constructed of steel having a strength at least equal to Grade 300 W steel in CSA G40.21-M1978, "Structural Quality Steels." (See Appendix A.)

9.23.4.3. Where a floor is required to be designed to support a concentrated load as specified in Table 9.4.2.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 Section 4.3.

Table 9.23.4.A.
Forming Part of Article 9.23.4.2.

MAXIMUM SPANS FOR STEEL BEAMS SUPPORTING FLOORS IN DWELLINGS, m						
No. of Storeys Sup- ported	Beam Type	Supported Joist Length (Half the Sum of Joist Spans on Both Sides of the Beam)				
		2.4 m	3.0 m	3.6 m	4.2 m	4.8 m
1	S100 x 11	4.20	3.77	3.44	3.19	2.98
	S130 x 15	5.33	4.78	4.38	4.06	3.80
	S150 x 19	6.47	5.80	5.31	4.92	4.61
	W150 x 22	6.95	6.23	5.71	5.29	4.96
	W200 x 27	9.18	8.24	7.54	7.00	6.56
	S200 x 27	9.05	8.13	7.45	6.91	6.55
2	S100 x 11	3.18	2.84	2.60	2.41	2.25
	S130 x 15	4.04	3.62	3.31	3.06	2.87
	S150 x 19	4.91	4.40	4.02	3.72	3.49
	W150 x 22	5.27	4.73	4.32	4.00	3.75
	W200 x 27	6.97	6.25	5.72	5.30	4.96
	S200 x 27	6.88	6.17	5.65	5.23	4.90
Column 1	2	3	4	5	6	7

SUBSECTION 9.23.5. NOTCHING AND DRILLING

9.23.5.1. Holes drilled in roof, floor or ceiling framing members shall be not larger than $\frac{1}{4}$ 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.

Notches and
drilling

9.23.5.2. Floor, roof and ceiling framing members may be notched provided the notch is located on the top of the member within $\frac{1}{2}$ the joist depth from the edge of bearing and is not deeper than $\frac{1}{3}$ the joist depth, unless the depth of the member is increased by the size of the notch.

9.23.5.3. Wall studs shall not be notched, drilled or otherwise damaged so that the undamaged portion of the stud is less than $\frac{2}{3}$ 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. The top plates in *loadbearing* walls and *partitions* 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 truss members shall not be notched, drilled or otherwise weakened unless such notching or drilling is allowed for in the design of the truss.

SUBSECTION 9.23.6. ANCHORAGE

9.23.6.1. *Building* frames shall be anchored to the foundation unless a structural analysis of wind and earth pressures shows anchorage is not required.

Anchorage

9.23.6.2. Except as provided in Article 9.23.6.4., 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. Such anchor bolts shall be embedded not less than 100 mm in the foundation and so designed that they may be tightened without withdrawing them from the foundation.

9.23.6.3. Exterior columns and posts shall be anchored to resist uplift and lateral movement.

9.23.6.4. *Buildings* not more than 4.3 m in width and not more than 1 *storey* in *building height* may be anchored by means of corrosion-resistant steel rods or cables of at least 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. Each rod or cable shall be anchored to the ground by means of ground anchors having a withdrawal resistance of not less than 500 N/m length of the *building*.

SUBSECTION 9.23.7. SILL PLATES

Sill plates

9.23.7.1. Where sill plates provide bearing for the floor system they shall be not less than 38 mm by 89 mm material.

9.23.7.2. 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 foundation and sill plate is caulked or the sill plate is placed on a layer of mineral wool at least 25 mm thick before being compressed.

SUBSECTION 9.23.8. BEAMS TO SUPPORT FLOORS

Beams

9.23.8.1. Beams shall have even and level bearing. Beams shall have not less than 89 mm length of bearing at end supports.

Steel beams

9.23.8.2. Steel beams shall be shop primed.

Built-up wood beams

9.23.8.3. 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.

9.23.8.4. Where the individual members of a beam described in Article 9.23.8.3. are butted together to form a joint, each joint shall occur over a support, except that where beams are continuous over more than 1 span, the joints may be located at or within 150 mm of the end quarter points of the clear span of the beam.

9.23.8.5. Joints in individual members of beams that are located at or near the end quarter points described in Article 9.23.8.4. shall not occur in adjacent members at the same quarter point and shall not reduce the effective beam width by more than half. Members joined at quarter points shall be continuous over the adjacent supports.

9.23.8.6. Except as provided in Article 9.23.8.7., 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 at least 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.

9.23.8.7. Where 38 mm members in built-up wood beams are not nailed together as provided in Article 9.23.8.6., they shall be bolted together with at least 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.

SUBSECTION 9.23.9. FLOOR JOISTS

Floor joists, methods of support

9.23.9.1. Except when supported on ribbon boards, floor joists shall have not less than 38 mm length of end bearing. Ribbon boards shall be not less than 19 mm by 89 mm lumber let into the studs.

9.23.9.2. Floor joists may be supported on the top of beams or may be framed into the sides of beams.

9.23.9.3. When framed into the side of a wood beam, the joists shall be supported on joist hangers or other acceptable mechanical connectors or on 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 at least four 89 mm nails, in addition to the nailing for the ledger strip required in Table 9.23.3.A.

9.23.9.4. When framed into the side of steel beams, the joists 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. Such joists 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. Not less than a 12 mm space shall be provided between the splice and the beam to allow for shrinkage of the wood joists.

9.23.9.5. Unless ceiling furring or plywood cladding is installed on the underside of floor joists, floor joists shall be restrained from twisting at the end supports and at intervals between supports not exceeding 2.1 m. Such restraint may be provided at end supports by toe nailing to the support, or by end nailing the joists to the header joist. Restraint at the intermediate locations or at the ends may be provided by not less than 19 mm by 64 mm or 38 mm by 38 mm cross bridging, or 25 mm by 3.2 mm steel strapping or 19 mm by 89 mm continuous wood strapping nailed to each joist and fastened at each end to the header or sill to prevent overall movement. Blocking tightly fitted between joists and securely nailed in place is also acceptable for restraining joist twisting.

9.23.9.6. Header joists around floor openings shall be doubled when they exceed 1.2 m in length. The size of header joists exceeding 3.2 m in length shall be determined by calculations.

Double joists

9.23.9.7. Trimmer joists around floor openings shall be doubled when the length of the header joist exceeds 800 mm. When the header joist exceeds 2 m in length the size of the trimmer joists shall be determined by calculations.

9.23.9.8. When tail joists and header joists are supported by the floor framing, they shall be supported by suitable joist hangers or nailing.

Joist hangers

9.23.9.9. *Non-loadbearing partitions* parallel to floor joists shall be supported on beams, *loadbearing* walls or doubled joists where the *partition* is over 1.8 m in length and contains openings that are not full ceiling height. Where such *partitions* contain no openings or openings that are full ceiling height, the joists need not be doubled. *Non-loadbearing partitions* less than 1.8 m in length need not be supported on framing but may be supported by the subfloor. Doubled joists may be separated not more than 200 mm by blocking if the blocking is not less than 38 mm by 89 mm lumber spaced not more than 1.2 m apart.

Support of
non-load-
bearing
partitions

9.23.9.10. *Non-loadbearing partitions* at right angles to the floor joists are not restricted as to location.

9.23.9.11. *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.

Support of
loadbearing
partitions

9.23.9.12. *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 1 or more floors, unless the joist size is designed to support such loads.

Location of
loadbearing
interior walls

9.23.9.13. Floor joists supporting roof loads shall not be cantilevered more than 400 mm beyond their supports where 38 x 184 mm joists are used and not more than 600 mm beyond their supports where 38 x 235 mm or larger joists are used. The cantilevered portions shall not support floor loads from other *storeys* unless cal-

culations are provided to show that the allowable design stresses of the cantilevered joists are not exceeded.

9.23.9.14. Where cantilevered floor joists described in Article 9.23.9.13. 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 at least 6 times the length of the cantilever, and end nailed to an interior doubled header joist in conformance with Table 9.23.3.A.

SUBSECTION 9.23.10. WALL STUDS

Position of wall studs

9.23.10.1. The size and spacing of studs shall conform to Table 9.23.10.A.

9.23.10.2. Wall studs shall be placed at right angles to the wall face, except that studs on the flat may be used in gable ends of roofs that contain only unfinished space or in *non-loadbearing partitions* within the limits described in Article 9.23.10.1. Wall studs that support only a load from an attic not accessible by a stairway may also be placed on the flat within the limits permitted in Article 9.23.10.1. provided the studs are clad on at least 1 side with plywood or wafer-board sheathing fastened to the face of the studs with an *acceptable* adhesive and the portion of the roof supported by the studs does not exceed 2.1 m in width.

Wall studs

9.23.10.3. Wall studs shall be continuous for the full *storey* height except at openings and shall not be spliced, except by *acceptable* types of glued joints.

Design of corners and intersections

9.23.10.4. 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. Where the vertical edges of interior cladding at wall intersections are supported at vertical intervals by blocking or other acceptable method, the vertical distance between such supports shall not exceed the maximum distance between supports specified in Section 9.30.

Double studs

9.23.10.5. Except as provided in Article 9.23.10.6., 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.

9.23.10.6. Single studs may be used on either side of openings in *non-loadbearing partitions* not required to be *fire separations* with *fire-resistance ratings* provided the studs extend from the top wall plate to the bottom wall plate.

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 by 38 38 by 89 flat ⁽¹⁾	400 400	2.4 3.6
	Attic not accessible by a stairway	38 by 64 38 by 64 flat ⁽¹⁾	600 400	3.0 2.4
		38 by 89 38 by 89 flat ⁽¹⁾	600 400	3.6 2.4
	Attics accessible by a stairway plus 1 floor, Roof load plus 1 floor, Attic not accessible by stairway plus 2 floors	38 by 89	400	3.6
	Roof load, Attic accessible by a stairway, Attic not accessible by a stairway plus 1 floor	38 by 89 38 by 64	600 400	3.6 2.4
Exterior	Attic accessible by a stairway plus 2 floors, or roof load plus 2 floors	38 by 89 64 by 89 38 by 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 by 140	300	4.2
	Roof with or without attic storage	38 by 64 38 by 89	400 600	2.4 3.0
	Roof with or without attic storage plus 1 floor	38 by 89 38 by 140	400 600	3.0 3.0
	Roof with or without attic storage plus 2 floors	38 by 89 64 by 89 38 by 140	300 400 400	3.0 3.0 3.6
	Roof with or without attic storage plus 3 floors	38 by 140	300	1.8
Column 1	2	3	4	5

Note to Table 9.23.10.A:

⁽¹⁾ See Article 9.23.10.2.

SUBSECTION 9.23.11. WALL PLATES

Wall plates	9.23.11.1. 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 partitions and in loadbearing walls where the studs are located directly over framing members, the bottom wall plate may be 19 mm thick.
Bottom wall plates	9.23.11.2. A bottom wall plate shall be provided in all cases. The bottom plate in exterior walls shall not project more than $\frac{1}{3}$ the plate width over the support.
Top plates in loadbearing walls	9.23.11.3. Except as permitted in Articles 9.23.11.4. to 9.23.11.6., no fewer than 2 top plates shall be provided in loadbearing walls.
Single top plates	9.23.11.4. 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.
Single top plates in loadbearing walls	9.23.11.5. 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 partitions.
Exclusion of top plates	9.23.11.6. 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.
Joints in top plates	9.23.11.7. Joints in top plates of loadbearing walls shall be staggered at least 1 stud spacing.
Tying of top plates at corners	9.23.11.8. The top plates in loadbearing walls shall be lapped or otherwise suitably tied at corners and intersecting walls. Joints in single top plates used with loadbearing walls shall be suitably tied. Such ties shall be the equivalent of at least 75 mm by 150 mm by 0.91 mm thick galvanized steel nailed to each wall with at least the equivalent of three 63 mm nails.

SUBSECTION 9.23.12. FRAMING OVER OPENINGS

- 9.23.12.1. Except as provided in Article 9.23.12.2., 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.
- 9.23.12.2. Openings for doors in non-loadbearing walls required to be fire separations with a fire-resistance rating shall be framed with the equivalent of at least two 38 mm thick members that are the same width as the wall plates.
- 9.23.12.3. Openings in loadbearing walls shall be framed with lintels designed to carry the superimposed loads to adjacent studs. Except as provided in Article 9.23.12.5., 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. The lintel members may be separated by filler pieces.
- 9.23.12.4. 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. Such lintels shall consist of a single piece of lumber 89 mm thick or 2 pieces of 38 mm thick lumber on edge.
- 9.23.12.5. 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 securely nailed together. Such lintels shall be at least 38 mm greater in depth than those shown in Table 9.23.12.A. for the allowable spans, and shall not exceed 2.4 m in length.

Table 9.23.12.A.
Forming Part of Articles 9.23.12.4. and 9.23.12.5.

WOOD LINTEL SPANS			
Location of Lintels	Supported Loads Including Dead Loads 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 1 floor	89	0.61
		140	0.91
		184	1.22
		235	1.52
		286	1.83
	Full attic storage plus 1 floor or roof load plus 1 floor or limited attic storage plus 2 or 3 floors	89	—
		140	0.76
		184	0.91
		235	1.22
		286	1.52
	Full attic storage plus 2 or 3 floors or roof load plus 2 or 3 floors	89	—
		140	0.61
		184	0.91
		235	1.07
		286	1.22
Exterior walls	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 1 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

SUBSECTION 9.23.13. ROOF AND CEILING FRAMING

9.23.13.1. Roof rafters and joists and ceiling joists shall be continuous or shall be spliced over vertical supports that extend to suitable bearing.

Roof and ceiling framing members

Double roof and ceiling framing members	9.23.13.2. Roof and ceiling framing members shall be doubled on each side of openings greater than 2 rafter or joist spacings in width. 9.23.13.3. The length of end bearing of joists and rafters shall be not less than 38 mm.
Location of rafters	9.23.13.4. 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. Framing members shall be connected by gusset plates or nailing at the peak in conformance with Table 9.23.3.A., except that 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 at least 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 at least two 63 mm nails.
Slope of rafter at supports	9.23.13.5. Rafters shall be shaped at supports to provide even bearing surfaces and supported directly above the exterior walls.
Hip and valley rafters	9.23.13.6. 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.
Collar ties and ceiling joists	9.23.13.7. 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. Such collar ties more than 2.4 m in length 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.
Dwarf walls and struts	9.23.13.8. Dwarf walls and struts may be used to provide intermediate support to reduce the span for rafters and joists. When struts are used they shall be not less than 38 mm by 89 mm material extending from each rafter to a <i>loadbearing</i> wall at an angle of not less than 45° to the horizontal.
Framing of dwarf walls	9.23.13.9. When dwarf walls are used for rafter support, they shall be framed in the same manner as <i>loadbearing</i> walls and securely fastened top and bottom to the roof and ceiling framing to prevent over-all movement. Solid blocking shall be installed between floor joists beneath dwarf walls that enclose finished rooms.
Support of roof ridges	9.23.13.10. Except as provided in Article 9.23.13.11., the ridge of the roof shall be supported by a <i>loadbearing</i> wall extending from the ridge to suitable bearing or by a ridge beam of not less than 38 mm by 140 mm material. Such ridge beam 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.
Tying of rafter ends or ceiling joists	9.23.13.11. 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. These ties may consist of tie rods or ceiling joists forming a continuous tie for opposing rafters and nailed in accordance with Table 9.23.13.A. Ceiling joists shall be fastened together with at least 1 more nail per joist splice than required for the rafter to joist connection shown in the Table. Members may be fastened together either directly or through a gusset plate.
Roof joists	9.23.13.12. Roof joists supporting a finished ceiling other than plywood shall be restrained from twisting along the bottom edges by means of furring, blocking, cross bridging or strapping conforming to Article 9.23.9.5.
Ceiling joists	9.23.13.13. 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, except that when the roof slope is 1 in 4 or less, the ceiling joist sizes shall be determined from the span tables for roof joists. 9.23.13.14. Roof trusses shall be designed in accordance with the appropriate requirements in Part 4, except that where the span of a roof truss does not exceed 12.19 m and the roof truss spacing does not exceed 600 mm o.c., roof trusses are ac-

ceptable provided they conform to the requirements in Articles 9.23.13.15. or 9.23.13.18.

Table 9.23.13.A.
Forming Part of Article 9.23.13.11.

RAFTER-TO-JOIST NAILING (Minimum Number of Nails at least 76 mm long) (Unsupported Ridge)													
Roof Slope	Rafter 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, kN/m ²											
		1 or less	1.5	2.0 or more	1 or less	1.5	2.0 or more	1 or less	1.5	2.0 or more	1 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
Col. 1	2	3	4	5	6	7	8	9	10	11	12	13	14

9.23.13.15. 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-12 and A-13 provided such trusses conform to the requirements of Articles 9.23.13.16. and 9.23.13.17. The joint connections used in such trusses shall be designed in conformance with the requirements in Section 4.3. (See Appendix A.)

9.23.13.16. Where a roof truss in Article 9.23.13.15. 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 at least 38 mm by 114 mm in size. Where the unsupported length of the bottom chord exceeds 3.66 m between the panel points, the bottom chord shall be at least 38 mm by 140 mm in size.

9.23.13.17. Where the length of compression web members in roof trusses in Article 9.23.13.15. exceeds 1.83 m, such web members shall be provided with continuous bracing to prevent buckling. Such bracing 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. Web members shall be at least 38 mm by 89 mm lumber of not less than No. 2 grade.

9.23.13.18. Roof trusses that are not designed in conformance with Articles 9.23.13.14. or 9.23.13.15. shall be capable of supporting a load at least equal to the ceiling load plus $2\frac{2}{3}$ the design roof load for 24 h, and shall not exceed the deflections shown in Table 9.23.13.B. when loaded with the ceiling load plus $1\frac{1}{3}$ the design roof snow load for 1 h. Testing of lumber roof trusses shall be in conformance with CSA

* S307-M1980, "Load Test Procedure for Wood Roof Trusses for Houses and Small Buildings."

Table 9.23.13.B.
Forming Part of Article 9.23.13.18.

MAXIMUM ROOF TRUSS DEFLECTIONS		
Truss Span	Type of Ceiling	Maximum Deflection
4.3 m or less	Plaster or gypsum board	$\frac{1}{360}$ of the span
	Other than plaster of gypsum board	$\frac{1}{180}$ of the span
over 4.3 m	Plaster or gypsum board	$\frac{1}{360}$ of the span
	Other than plaster or gypsum board	$\frac{1}{240}$ of the span
Column 1	2	3

SUBSECTION 9.23.14. SUBFLOORING

Subflooring required

9.23.14.1. Subflooring shall be provided beneath finish flooring where the finish flooring does not have adequate strength to support the design loads (see Subsection 9.31.3.).

Plywood for subfloors

9.23.14.2. Plywood for subfloors shall be exterior type conforming to CSA O121-M1978, "Douglas Fir Plywood," CSA O151-M1978, "Canadian Softwood Plywood" or CSA O153-M1980, "Poplar Plywood." Waferboard subflooring shall * conform to CAN3-O188.2-M78, "Waferboard."

9.23.14.3. 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. Such subflooring shall conform to grade N-1 or N-2 in CAN3-O188.1-M78, "Interior Mat-Formed Wood Particleboard." Such subflooring 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.)

9.23.14.4. Where the edges of panel-type subflooring are required to be supported (see Article 9.31.2.2.), 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.

Installation of plywood subflooring

9.23.14.5. Plywood subflooring shall be installed with the surface grain at right angles to the joists and with joints parallel to floor joists staggered.

Subfloor thickness

9.23.14.6. Except as provided in Article 9.23.14.7., subfloors shall conform to Table 9.23.14.A.

9.23.14.7. Where the finished flooring consists of not less than 19 mm matched wood strip flooring laid at right angles to the joists, 12.5 mm thick plywood or 12.7 mm thick waferboard shall be permitted for joists up to 600 mm o.c. Where a separate panel-type underlay or concrete topping is applied to a subfloor, the subfloor may consist of 12.5 mm thick plywood for joists up to 400 mm o.c.

Table 9.23.14.A.
Forming Part of Articles 9.23.14.6. and 9.23.15.6.

THICKNESS OF SUBFLOORING			
Maximum Joist Spacing, mm	Minimum Plywood Thickness, mm	Minimum Wafer-board or Particleboard Thickness, mm	Minimum Lumber Thickness, mm
400	15.5	15.9	17.0
500	15.5	19.0	19.0
600	18.5	25.4	19.0
Column 1	2	3	4

9.23.14.8. When resilient flooring is applied directly to a waferboard, particleboard or plywood subfloor, the subfloor shall be fastened to the supports with annular grooved nails.

Nails in
plywood
subflooring

9.23.14.9. Lumber subflooring shall be laid at an angle of not less than 45° to the joists. Lumber subflooring shall be fully supported at the ends on solid bearing. Lumber shall be of uniform thickness and not more than 184 mm wide.

Laying angle of
subflooring

SUBSECTION 9.23.15. ROOF SHEATHING

9.23.15.1. Plywood used for roof sheathing shall be exterior type plywood conforming to CSA O121-M1978, "Douglas Fir Plywood", CSA O151-M1978, "Canadian Softwood Plywood" or CSA O153-M1980, "Poplar Plywood." Waferboard for roof sheathing shall conform to CAN3-0188.2-M78, "Waferboard."

Plywood and
waferboard
specifications

9.23.15.2. Plywood roof sheathing shall be installed with the surface grain at right angles to the roof framing.

Application

9.23.15.3. Waferboard and plywood roof sheathing shall be installed with at least a 2 mm gap between sheets.

9.23.15.4. Lumber roof sheathing shall not be more than 286 mm wide and shall be applied so that all ends are supported with end joists staggered.

Table 9.23.15.A.
Forming Part of Article 9.23.15.6.

THICKNESS OF ROOF SHEATHING					
Joist or Rafter Spacing, mm	Minimum Plywood Thickness, mm		Minimum Waferboard Thickness, mm		Minimum Lumber Thickness, mm
	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
500	9.5	12.5	11.1	12.7	19.0
600	9.5	12.5	11.1	12.7	19.0
Column 1	2	3	4	5	6

Support of edges **9.23.15.5.** 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.

Thickness of roof sheathing **9.23.15.6.** The thickness of roof sheathing on a flat roof used as a walking deck shall conform to the requirements in Table 9.23.14.A. for subfloors. The thickness of roof sheathing on a roof not used as a walking deck shall conform to Table 9.23.15.A.

9.23.15.7. Asphalt-coated or asphalt-impregnated fibreboard at least 11.1 mm thick conforming to CSA A247-M1978, "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 at least 0.33 mm in thickness or a continuous sheet of aluminum of at least 0.61 mm in thickness. All edges of such sheathing shall be supported by blocking or framing.

SUBSECTION 9.23.16. WALL SHEATHING

Wall sheathing **9.23.16.1.** Exterior walls and gable ends shall be sheathed when the *exterior cladding* requires intermediate fastening between supports or if the *exterior cladding* requires solid backing.

Wall sheathing thickness and specifications **9.23.16.2.** Where wall sheathing is required, it shall conform to Table 9.23.16.A.

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	17.5	17.5	See Table 9.3.3.A.
Fibreboard (insulating)	9.5	11.1	CSA A247-M1978
Gypsum board	9.5	12.7	CSA A82.27-M1977
Plywood (exterior type)	6.0	7.5	CSA O121-M1978 CSA O151-M1978 CSA O153-M1980
Waferboard	6.35	7.9	CAN3-O188.2-M78
Column 1	2	3	4

Note to Table 9.23.16.A.:

⁽¹⁾ See also Articles 9.28.5.4. to 9.28.5.6.

9.23.16.3. Gypsum board and fibreboard shall not be used for the attachment of siding materials. Nails used in attaching gypsum board or fibreboard shall be not less than 3.2 mm diam with a minimum head diameter of 11.1 mm.

Application of lumber and wall sheathing **9.23.16.4.** Lumber wall sheathing shall be applied so that all ends are supported with end joints staggered.

9.23.16.5. Panel-type sheathing board shall be applied so that vertical joints are staggered if the sheathing is applied horizontally. A gap of not less than 2 mm shall be left between sheets of plywood, waferboard or fibreboard.

*

SUBSECTION 9.23.17. WALL SHEATHING PAPER

9.23.17.1. Sheathing paper shall conform to CAN2-51.32-M77, "Sheathing, Membrane, Breather Type."

9.23.17.2. Sheathing paper beneath stucco shall be asphalt type.

Application

9.23.17.3. Except as provided in Articles 9.23.17.5. and 9.23.17.6., at least 1 layer of sheathing paper shall be applied beneath siding, stucco or masonry veneer.

9.23.17.4. Sheathing paper shall be applied so that joints are lapped at least 100 mm, and if applied horizontally, the upper sheets shall overlap the lower sheets.

9.23.17.5. Except as provided in Article 9.23.17.6., where no sheathing is used with masonry veneer or other siding, at least 2 layers of sheathing paper shall be applied beneath the veneer or siding. All joints in the sheathing paper 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. Wall sheathing may be used in lieu of 1 layer of sheathing paper, and the thickness need not conform to Table 9.23.16.A.

Where no sheathing is used

9.23.17.6. 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 Articles 9.23.17.7. or 9.23.17.8., as applicable.

Where sheathing paper is not required

9.23.17.7. Siding consisting of sheets of plywood, hardboard, waferboard or asbestos cement is considered to meet the requirements of Article 9.23.17.6. 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. Vertical joints between sheets shall be caulked.

9.23.17.8. Metal siding consisting of sheets of metal are considered to meet the requirements of Article 9.23.17.6. where the joints between sheets are of the locked seam type.

SUBSECTION 9.23.18. BRACING

9.23.18.1. Except as provided in Article 9.23.18.2., each exterior wall in each storey shall be braced with at least 1 diagonal brace conforming to Article 9.23.18.3.

9.23.18.2. Bracing is not required where walls have an interior finish conforming to the requirements in Section 9.30, or if the walls are clad with diagonal lumber, panel type sheathing or panel type siding.

9.23.18.3. Where bracing is required, it shall consist of at least 19 mm by 89 mm wood members applied diagonally to the studs at an angle of approximately 45° to the horizontal, extending the full height of the wall on each storey. Such bracing shall be nailed to each stud and wall plate by at least two 63 mm nails.

SECTION 9.24. POST, BEAM AND PLANK CONSTRUCTION**SUBSECTION 9.24.1. SCOPE**

9.24.1.1. This Section applies to wood-frame construction with the *loadbearing* framing members spaced more than 600 mm apart.

SUBSECTION 9.24.2. GENERAL

9.24.2.1. The size and spacing of posts and beams and the span and thickness of floor and roof decking shall be calculated in conformance with Section 4.3 except when specific dimensions are provided in this Subsection.

9.24.2.2. Requirements for nails, lumber, notching and drilling, anchorage and sill plates shall conform to Section 9.23.

Grades of
lumber

9.24.2.3. Lumber shall conform to the appropriate requirements in Subsection 9.3.2.

SUBSECTION 9.24.3. DECKING

Specifications
for floor and
roof decking

9.24.3.1. Floor and roof decking shall consist of not less than 38 mm lumber laid on the flat or on edge, or exterior type plywood conforming to CSA O121-M1978, "Douglas Fir Plywood," CSA O151-M1978, "Canadian Softwood Plywood", CSA O153-M1980, "Poplar Plywood" or waferboard conforming to CAN3-O188.2-M78, * "Waferboard."

Plank floor
decking

9.24.3.2. Plank floor decking laid on the flat shall be not more than 200 mm wide. Such decking shall be tongued-and-grooved or splined, unless a separate underlay is installed or the flooring consists of wood strips laid at right angles to the decking.

SUBSECTION 9.24.4. LOADBEARING BEAMS

9.24.4.1. *Loadbearing* beams shall be solid, built-up, glued-laminated or plywood web beams. Where glued assemblies extend to the exterior, waterproof glue shall be used, except that water-resistant glue may be used where the exposed portion is adequately protected against wetting.

9.24.4.2. *Loadbearing* roof beams shall be securely connected to the exterior wall framing and the centre *loadbearing* wall or centre beams to resist adequately the uplift forces due to wind.

9.24.4.3. The length of end bearings for *loadbearing* beams shall be determined on the basis of the allowable design stress of the wood but shall not be less than 38 mm.

9.24.4.4. When *loadbearing* beams are supported by mechanical connectors, the connectors shall be capable of supporting the design loads.

9.24.4.5. Where joints in *loadbearing* beams do not occur over solid supports, joints shall be designed in conformance with Part 4.

9.24.4.6. Opposing *loadbearing* beams shall be tied together at the joints by means of splices or suitable mechanical connectors.

9.24.4.7. Where secondary framing members span between floor beams, the members and connections shall be designed to support the required design loads.

9.24.4.8. Loads from *loadbearing* walls, columns or other concentrated loads shall be supported by members designed to carry such loads.

SUBSECTION 9.24.5. POSTS

Posts

9.24.5.1. Posts shall be solid, built-up or laminated.

Exterior wall
posts

9.24.5.2. Where wall sheathing does not provide suitable anchorage, exterior wall posts shall be anchored to the wall plate by not less than 1.19 mm thick steel angles.

Built-up posts

9.24.5.3. Solid posts and individual members in built-up posts shall extend in one piece the full height of the wall *storey*. Built-up members shall be fastened together with nails spaced not more than 300 mm o.c. and at least twice as long as the indi-

vidual member thickness, or with not less than 9.5 mm diam bolts fitted with washers and spaced not more than 450 mm o.c.

9.24.5.4. Intermediate studs or blocking shall be provided between posts in post and beam walls for the support of exterior and interior cladding. Intermediate studs shall conform to Section 9.23 for non-loadbearing stud walls.

Intermediate
studs

SUBSECTION 9.24.6. PLANK FRAME WALL CONSTRUCTION

9.24.6.1. Thickness of plank framing in plank frame walls shall conform to Table 9.24.6.A. The unsupported height of 38 mm vertical plank non-loadbearing partitions shall not exceed 3.6 m.

Table 9.24.6.A.
Forming Part of Article 9.24.6.1.

NOMINAL THICKNESS OF PLANK FRAMING	
Supported Load (Including <i>dead load</i> and ceiling)	Minimum Plank Thickness, mm
Roof with or without attic storage	38
Roof with or without attic storage plus 1 floor	38
Roof with or without attic storage plus 2 floors	64
Column 1	2

9.24.6.2. Vertical framing in plank frame walls shall consist of not less than 250 mm wide planks spaced not more than 2.4 m o.c.

9.24.6.3. Vertical framing in plank frame walls shall not bear on wood members with the grain at right angles to the vertical framing, except where bearing on sills.

9.24.6.4. Corners of plank frame walls shall be formed by butting and fastening together the face and edge of 2 planks.

9.24.6.5. Vertical framing in plank frame walls shall be provided on each side of every opening, except that a window opening not more than 750 mm in width may be supported on 1 side only by a vertical member. In such cases, the opposite jamb of the window or short upright to which it is attached shall bear on the filler wall plank immediately below, which in turn shall be notched into the vertical structural members on each side.

9.24.6.6. Where horizontal planks act as *loadbearing* lintels or headers, they shall be framed into the vertical members by dovetailing so that not less than a 40 mm length of bearing is provided.

9.24.6.7. Openings in *loadbearing* plank frame walls shall be bridged with lintels designed to carry superimposed loads to adjacent vertical members.

9.24.6.8. In *buildings* of *residential occupancy* 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 9.24.6.B. may be used for plank frame walls.

9.24.6.9. Non-loadbearing horizontal members (fillers) in plank frame walls shall be securely fastened to the vertical framing.

9.24.6.10. Sheathing paper for plank frame walls shall be installed over the exterior of the planks when no sheathing is provided, or over the sheathing when sheathing is provided.

9.24.6.11. Sheathing paper shall conform to Section 9.23.

Table 9.24.6.B.
Forming Part of Article 9.24.6.8.

LINTEL SPANS	
Lintel Size, mm	Maximum Span, m
38 by 184	1.55
38 by 235	1.96
38 by 286	2.23
64 by 184	1.96
64 by 235	2.23
Column 1	2

SECTION 9.25 SHEET STEEL STUD WALL FRAMING

SUBSECTION 9.25.1. GENERAL

9.25.1.1. This Section applies to sheet steel studs for use in non-loadbearing exterior walls and interior *partitions*.

9.25.1.2. Where *loadbearing* steel studs are used, they shall be designed in conformance with Part 4.

9.25.1.3. Steel studs and runners shall conform to ASTM C645-76, "Non-load (Axial) Bearing Steel Studs, Runners (Track), and Rigid Furring Channels for Screws."

9.25.1.4. Screws for the application of cladding materials to steel studs, runners and furring channels shall conform to ASTM C646-78a, "Steel Drill Screws for the Application of Gypsum Sheet Material to Light Gauge Steel Studs."

9.25.1.5. Steel stud framing shall be clad on both sides with lath and plaster or sheet-type material, fastened with screws or other *acceptable* fasteners at the appropriate spacing as described in Section 9.30 for interior finishes. Screws used for attaching wall finishes shall penetrate at least 10 mm through the metal.

SUBSECTION 9.25.2. SIZE OF FRAMING

9.25.2.1. Except as required in Articles 9.25.2.3. and 9.25.2.4., the size and spacing of steel studs for non-loadbearing *partitions* shall conform to Table 9.25.2.A.

9.25.2.2. Except as required in Article 9.25.2.4., steel studs in non-loadbearing *partitions* shall have a metal thickness of not less than 0.50 mm.

9.25.2.3. Runners for interior and exterior non-loadbearing walls shall have a thickness of at least 0.45 mm exclusive of coatings and shall have at least 25 mm flanges.

9.25.2.4. 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 at least 63 mm, and have a metal thickness of at least 0.50 mm. Where openings exceed 1 200 mm in width, the stud width shall be at least 91 mm, and shall have a metal thickness of at least 0.85 mm.

Framing
around doors
in *fire
separations*

Table 9.25.2.A.
Forming Part of Article 9.25.2.1.

STEEL STUDS FOR NON-LOADBEARING PARTITIONS		
Minimum Stud Size, mm	Maximum Stud Spacing, mm	Maximum Wall Height, m
31 x 40	400 600	3.0 2.7
31 x 63	400 600	4.0 3.6
31 x 91	400 600	5.2 4.9
Column 1	2	3

9.25.2.5. The distance to the first stud beyond the jamb of any door opening in a *fire separation* required to have a *fire-resistance rating* shall not exceed 400 mm. Where the distance between the framing over the opening 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.

9.25.2.6. The size and spacing of non-loadbearing steel studs for exterior walls shall conform to Table 9.25.2.B.

Table 9.25.2.B.
Forming Part of Article 9.25.2.6.

STEEL STUDS FOR NON-LOADBEARING EXTERIOR WALLS				
Minimum Stud Size, mm	Minimum Metal Thickness, mm (excluding coating)	Maximum Stud Length, m		
		Spacing of Studs		
		300 mm (o.c.)	400 mm (o.c.)	600 mm (o.c.)
31 x 91	0.53	3.0	2.4	—
31 x 91	0.69	3.3	2.7	2.4
31 x 91	0.85	3.6	3.0	2.7
31 x 91	1.0	4.0	3.3	3.0
Column 1	2	3	4	5

SUBSECTION 9.25.3. INSTALLATION

9.25.3.1. Runners shall be provided at the top and bottom of walls and *partitions*. Such runners shall be securely attached to the *building* at approximately 50 mm from the end of the runner, and at intervals of not more than 600 mm o.c. for interior studs and 300 mm o.c. for exterior studs. Such fasteners shall consist of the equivalent of 63 mm nails or 25 mm screws.

9.25.3.2. Studs at openings and which are not full wall height shall be supported by a runner at the ends of the studs, securely fastened to the full length studs at the sides of the opening.

9.25.3.3. Steel studs used in walls required to have a *fire-resistance rating* shall be installed so that there is at least 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. Except as provided in Article 9.25.3.8., studs in such walls shall not be attached to the runners in a manner that will prevent such expansion.

9.25.3.4. Door openings in non-loadbearing fire separations required to have a fire-resistance rating shall be framed with 2 runner sections placed back to back.

9.25.3.5. 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.

9.25.3.6. Corners and intersections of walls and partitions shall be constructed to provide support for the cladding materials.

9.25.3.7. Studs shall be doubled on each side of every opening where such openings involve more than 1 stud space, and shall be tripled where the openings in exterior walls exceed 2.4 m in width. Such studs shall be suitably tied together to act as a single structural unit in resisting transverse loads.

9.25.3.8. Studs shall be attached to runners by screws, crimping, welding or other suitable method around wall openings, and elsewhere where necessary to keep the studs in alignment during construction.

SECTION 9.26 THERMAL INSULATION AND VAPOUR BARRIERS

SUBSECTION 9.26.1. SCOPE

9.26.1.1. This Section applies to the thermal insulation of buildings of residential occupancy intended for use on a continuing basis during the winter months.

SUBSECTION 9.26.2. GENERAL

Prevention of
moisture
condensation

9.26.2.1. Buildings of residential occupancy shall be provided with sufficient thermal insulation to prevent moisture condensation on the interior surfaces of walls, ceilings and floors during the winter and to ensure comfortable conditions for the occupants.

9.26.2.2. Insulation of heating and ventilating ducts shall conform to Sections 9.33 and 9.34.

9.26.2.3. Where insulation is installed so that there is a space between the insulation and the roof, the roof space or attic shall be ventilated according to Section 9.19.

9.26.2.4. Thermal insulation conforming with Table 9.26.2.A. shall be included in buildings of residential occupancy and in garages serving buildings of residential occupancy, if the building or garage is to be heated.

Table 9.26.2.A.
Forming part of Article 9.26.2.4.

THERMAL INSULATION REQUIREMENTS		
LOCATION OF ASSEMBLY IN WHICH INSULATION IS PLACED		MINIMUM THERMAL RESISTANCE $m^2 \cdot ^\circ C/W$
Wall assembly (Except Basements)	<i>Building exterior</i>	2.1
	Between <i>building</i> and attached garage	2.1
	Exterior of heated garage	2.1
Basement and crawl space	Perimeter walls — top to 600 mm below <i>grade</i>	1.4
Floor assembly	Perimeter	2.1
	Exposed cantilevers	4.7
Roof — ceiling assembly	<i>Building</i> — general	6.0
	Heated garage	6.0
Column 1	2	3

SUBSECTION 9.26.3. MATERIALS

9.26.3.1. Insulation in contact with the ground shall be inert to the action of soil and water. The insulation properties shall not be significantly reduced by moisture.

Insulation
materials

9.26.3.2. Type I expanded polystyrene insulation as described in CGSB 51-GP-20M(1978), "Thermal Insulation, Expanded Polystyrene" shall not be used in contact with the ground or as roof insulation applied above the roofing membrane.

9.26.3.3. Insulating materials shall conform to the following:

Specifications

CSA A101-M1977, "Mineral Fibre Thermal Building Insulation,"
CSA A247-M1978, "Insulating Fibreboard,"
CGSB 51-GP-20M(1978), "Thermal Insulation, Expanded Polystyrene," or
CGSB 51-GP-21M(1978), "Thermal Insulation, Urethane and Isocyanurate, Unfaced."

9.26.3.4. Vapour barriers shall conform to CAN2-51.33-M77, "Vapor Barrier: Sheet, for Use in Above-Grade Building Construction." Type 1 vapour barriers shall be 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. Type 2 vapour barriers may be used in all other locations.

Vapour
barriers

SUBSECTION 9.26.4. INSTALLATION OF INSULATION

- 9.26.4.1.** Insulation shall be installed so that there is a reasonably uniform insulating value over the entire face of the insulated area. Installation of insulation
- 9.26.4.2.** Insulation shall be applied to the full width and length of the space between furring or framing. Application of insulation
- 9.26.4.3.** Batt-type insulation manufactured with no membrane on either face shall be installed so that at least 1 face is in full and continuous contact with cladding, sheathing or other membrane. Batt-type insulation
- 9.26.4.4.** Loose-fill insulation may be used on horizontal surfaces only, except that *acceptable* water-repellent types may be used between the outer and inner wythes of cavity walls and in insulating the walls of *existing buildings*. Where soffit venting is used, measures shall be taken to prevent loose-fill insulation from spilling over the top of the exterior wall and causing blockage of the soffit vents. Loose-fill insulation
- 9.26.4.5.** Insulation on the interior of foundation walls enclosing a crawl space shall be applied so that there is not less than a 50 mm clearance above the crawl space floor if the insulation is of a type that may be damaged by water. Insulation of foundation walls enclosing crawl space
- 9.26.4.6.** 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.
- 9.26.4.7.** 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, or 12 mm cement paring on wire lath applied to the exposed face and edge.
- 9.26.4.8.** Insulation between a garage and an adjacent *dwelling unit* shall be protected from mechanical damage by a covering of gypsum board, plywood, particle-board, waferboard or hardboard. Protection of insulation
- 9.26.4.9.** Thermal insulation in exterior steel stud walls shall be in contact with the *exterior cladding* or sheathing and the adjacent studs and runners. A space of at least 12 mm shall be provided between the insulation and the interior wall cladding where the *exterior cladding* or sheathing material has a thermal resistance of less than $0.18 \text{ m}^2\cdot\text{C}/\text{W}$.
- 9.26.4.10.** Insulation in factory-built *buildings* shall be installed so that it will not become dislodged during transportation.

SUBSECTION 9.26.5. MEASURES TO PREVENT CONDENSATION

- * 9.26.5.1.** Except as provided in Article 9.26.5.2. and Article 9.26.5.15., vapour barriers shall be installed on the warm side of insulation if the insulation is of a type which, when installed, has a vapour permeance greater than that required for vapour barriers in Article 9.26.3.4. Installation of vapour barriers
- 9.26.5.2.** Lightweight cellular plastic-type insulation may be used without additional vapour barrier protection provided such insulation has a permeance rating of not more than $6 \text{ ng}/\text{Pa}\cdot\text{s}\cdot\text{m}$ and is installed in continuous contact with masonry or concrete walls. Lightweight cellular plastic-type insulation
- 9.26.5.3.** Every vapour barrier shall be installed to protect the entire wall surface including framing members, except that the vapour barrier need not extend across the framing members provided the interior finish consists of panel-type material attached to all framing members with an adhesive in addition to the nails or staples required elsewhere in Section 9.30.
- 9.26.5.4.** Where an interior frame wall meets an exterior wall required to have vapour barrier protection, the vapour barrier protection shall extend between the exterior and interior walls to form continuous protection at the wall intersection.

9.26.5.5. Where an interior frame wall meets a ceiling required to have vapour barrier protection, the vapour barrier protection shall extend over the top of the wall or beneath the top wall plate to form continuous vapour protection for the ceiling.

9.26.5.6. Except as provided in Article 9.26.5.13., every vapour barrier joint shall lap not less than 25 mm when located over supporting members, and shall be covered with a strip of vapour barrier which shall extend not less than 100 mm on both sides of the joint where not located over supporting members.

Openings **9.26.5.7.** Openings such as for electrical boxes and registers shall be cut so that the vapour barrier fits snugly around them.

Access hatches **9.26.5.8.** Access hatches into attics shall be weather stripped around the perimeters of the hatches.

Prevention of leakage **9.26.5.9.** Ductwork in attic or roof spaces shall have all joints taped or be otherwise sealed to ensure that the ducts are airtight throughout their length.

9.26.5.10. Clearances between *chimneys* or *gas vents* and the surrounding construction which would permit air leakage from within the *building* into an attic or roof space shall be sealed by *noncombustible* material to prevent such leakage.

9.26.5.11. Masonry walls of hollow units which penetrate through the ceiling shall be capped with masonry units without voids or be sealed with flashing material extending across the full width of the masonry at or near the ceiling adjacent to the roof space to prevent moisture within the voids from entering the roof or attic space.

Roofs with no attic spaces **9.26.5.12.** Where insulation is placed below the roof sheathing, and the roof slope is less than 1 in 6, or the roof incorporates no attic space, the requirements in Articles 9.26.5.13. and 9.26.5.14. shall apply in addition to the other requirements in this Section.

9.26.5.13. Insulation installed in ceilings described in Article 9.26.5.12. shall be protected by Type I vapour barriers, installed so that all joints occur at framing members, furring or blocking, and lapped at least 100 mm at all joints.

9.26.5.14. Holes through vapour barriers installed in ceilings described in Article 9.26.5.12. for the installation of electrical wiring, electrical boxes, piping or ductwork shall be effectively sealed with caulking, tape or other *acceptable* material to maintain the integrity of the vapour barrier over the entire ceiling.

9.26.5.15. A vapour barrier may be placed within a wall assembly if the location of the * vapour barrier is always above the dew point.

SECTION 9.27 ROOFING

SUBSECTION 9.27.1. GENERAL

9.27.1.1. Roofs shall be protected with roofing, including flashing, installed to shed rain effectively and prevent water due to ice damming from entering the roof.

Roof
protection

SUBSECTION 9.27.2. ROOFING MATERIALS

9.27.2.1. Roofing materials shall conform to the following:

Materials
specifications

- CAN2-51.32-M77, "Sheathing, Membrane, Breather Type,"
- CGSB 37-GP-4M(1976), "Cement, Lap, Cutback, Asphalt, Fibrated, for Asphalt Roofing,"
- CGSB 37-GP-5M(1976), "Cement, Plastic, Cutback Asphalt,"
- CGSB 37-GP-8M(1976), "Asphalt, Cutback, Filled, for Roof Coating,"
- CGSB 37-GP-9M(1976), "Primer, Asphalt for Asphalt Roofing, Dampproofing and Waterproofing,"
- CGSB 37-GP-21M(1976), "Tar, Cutback, Fibrated, for Roof Coating,"
- CGSB 41-GP-6M(1976), "Sheets, Thermosetting Polyester Plastics, Glass Fiber Reinforced,"
- * CSA A123.1-M1979, "Asphalt Shingles Surfaced with Mineral Granules",
- * CSA A123.2-M1979, "Asphalt Coated Roofing Sheets",
- * CSA A123.3-M1979, "Asphalt or Tar Saturated Roofing Felt",
- * CSA A123.4-M1979, "Bitumen for Use in Construction of Built-Up Roof Coverings and Dampproofing and Waterproofing Systems",
- * CSA A123.17-1963, "Asphalt-Saturated Felted Glass-Fibre Mat for Use in Construction of Built-Up Roofs", or
- * CSA O118.1-M1980, "Western Red Cedar Shingles, Handsplit Western Red Cedar Shakes and Machine-Grooved Shakes".

9.27.2.2. Nails used for roofing shall be corrosion-resistant roofing or shingle nails conforming to CSA B111-1974, "Wire Nails, Spikes and Staples." Nails shall have sufficient length to penetrate through or 12 mm into roof sheathing. 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. 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.

Roofing nails

9.27.2.3. Staples used to apply asphalt or wood shingles shall be corrosion-resistant and shall be driven with the crown parallel to the eaves. 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 9.27.7.4. is increased by $\frac{1}{3}$. 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.

SUBSECTION 9.27.3. ROOF SLOPE

Roof slopes

9.27.3.1. Except as provided in Article 9.27.3.2., the roof slopes on which roof coverings may be applied shall conform to Table 9.27.3.A.

Table 9.27.3.A.
Forming Part of Article 9.27.3.1.

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
Asphalt base (surfaced with wide selvage asphalt roofing)	1 in 6	no limit
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 9.27.3.A.:

⁽¹⁾See Article 9.27.3.2.

9.27.3.2. Asphalt and gravel or coal tar and gravel roofs may be constructed with lower slopes than required in Article 9.27.3.1. when effective drainage is provided by roof drains located at the lowest points on the roofs.

SUBSECTION 9.27.4. FLASHING AT INTERSECTIONS

9.27.4.1. Sheet metal flashing shall consist of not less than 1.73 mm thick sheet lead, 0.33 mm thick galvanized steel, 0.36 mm thick copper, 0.46 mm thick zinc or 0.48 mm thick aluminum.

Valley flashing

9.27.4.2. Where sloping surfaces of shingled roofs intersect to form a valley, the valley shall be flashed. Closed valleys shall not be used with rigid shingles on slopes of less than 1 in 1.2.

Open valley flashing

9.27.4.3. Open valleys shall be flashed with not less than 1 layer of sheet metal not less than 600 mm wide, or 2 layers of roll roofing. The bottom layer shall con-

sist of not less than Type S smooth surface 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. The top layer 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.

9.27.4.4. The intersection of shingle roofs and masonry walls or *chimneys* shall be protected with flashing. Counter flashing embedded not less than 25 mm in the masonry shall extend not less than 150 mm down the masonry and lap the lower flashing not less than 100 mm. Flashing along the slopes of a roof shall be stepped so that there is not less than a 75 mm head lap in both the lower flashing and counter flashing. Where the roof slopes upwards from the masonry, the flashing shall extend up the roof slope to a point equal in height to the flashing on the masonry, but not less than 1½ times the shingle exposure.

Intersection
flashing

9.27.4.5. The intersection of shingle roofs and walls clad with other than masonry shall be protected with flashing. Flashing 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. Along the slope of the roof, the flashing shall be stepped with not less than a 75 mm head lap.

9.27.4.6. 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. Counter flashing installed over the intersection 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.

9.27.4.7. The intersection of built-up roofs with walls clad with other than masonry shall have a cant strip at the intersection. The roofing membrane shall be mopped over the cant strip. Flashing plies shall extend not less than 150 mm up the wall behind the sheathing paper.

9.27.4.8. Except as otherwise permitted in Article 9.27.4.9., *chimney* saddles shall be installed where the upper side of a *chimney* on a sloping roof is more than 750 mm wide. *Chimney* saddles shall be covered with sheet metal or roofing material of equivalent weight and quality as the roofing. Saddles shall be suitably flashed where they intersect the roof. The intersection of the saddle and the *chimney* shall be flashed and counterflashed as in Article 9.27.4.4.

Requirements
and installation
of chimney
saddles

9.27.4.9. 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 1/6 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 1½ times the shingle exposure. Such flashing at the *chimney* shall be counterflashed as required by Article 9.27.4.4.

SUBSECTION 9.27.5. EAVE PROTECTION FOR SHINGLES AND SHAKES

9.27.5.1. Except as provided in Article 9.27.5.3., eave protection shall be provided on shingle, shake or tile roofs, extending from the edge of the roof a minimum distance of 914 mm up the roof slope to a line not less than 300 mm inside the inner face of the exterior wall.

Required eave
protection

9.27.5.2. Eave protection shall be laid beneath the starter strip and shall consist of not less than 0.15 mm polyethylene laid as a continuous sheet without the use of cement, or No. 15 asphalt-saturated felt laid in two plies lapped 480 mm and cemented together with lap cement, or Type S smooth surface roll roofing. Roll

roofing shall be laid with not less than 100 mm head and end laps cemented together with lap cement.

Eave
protection not
required

9.27.5.3. Eave protection is not required over unheated garages, carports and porches, or 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, or where shingles for low slope roofs are used.

SUBSECTION 9.27.6. UNDERLAY BENEATH SHINGLES

Weight of
underlay

9.27.6.1. 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.

Installation of
underlay

9.27.6.2. When used with shingles, underlay shall be installed parallel to the eaves with head and end lap of not less than 50 mm. The top edge of each strip shall be fastened with sufficient roofing nails to hold it in place until the shingles are applied. The underlay shall overlap the eave protection by not less than 100 mm. (See Article 9.27.10.2. for underlay beneath wood shakes.)

SUBSECTION 9.27.7. ASPHALT SHINGLES ON SLOPES OF 1 IN 3 OR GREATER

Coverage

9.27.7.1. Coverage shall be not less than 2 thicknesses of shingle over the entire roof, disregarding cutouts.

Starter strip

9.27.7.2. 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. Such starter strips shall be not less than Type M mineral-surfaced roll roofing not less than 304 mm wide, or shingles of the same weight and quality as those used as a roof covering with tabs facing up the roof slope. Starter strips may be omitted where eave protection of not less than Type M mineral-surfaced roll roofing is provided.

Minimum head
lap

9.27.7.3. Shingles shall have a head lap of not less than 50 mm.

Fastening

9.27.7.4. Shingles shall be fastened with at least 4 nails or staples for 1 m wide shingles so that no nails or staples are exposed. Fasteners may be reduced for narrower shingles in proportion to the width of the shingle or when shingles incorporating *acceptable* interlocking devices are used.

Location of
fasteners

9.27.7.5. Fasteners shall be located 25 mm to 40 mm from each end of each strip shingle with the other fasteners equally spaced between them. Such fasteners shall be located not less than 12 mm above the tops of the cutouts.

Shingle tabs
fastening

9.27.7.6. Shingle tabs shall be secured by a 25 mm diam spot of plastic cement under the centre of each tab, or by *acceptable* interlocking devices or selfsealing strips.

Shingle
application on
hips and ridges

9.27.7.7. 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. Shingles 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.

Eave
protection

9.27.7.8. Eave protection shall conform to Subsection 9.27.5.

Flashing

9.27.7.9. Flashing shall conform to Subsection 9.27.4.

SUBSECTION 9.27.8. ASPHALT SHINGLES ON SLOPES OF LESS THAN 1 IN 3

9.27.8.1. Except for the first 2 courses, coverage shall be not less than 3 thicknesses of shingle over the entire roof, disregarding cutouts.

Coverage

9.27.8.2. A starter strip shall be installed as in Article 9.27.7.2. Such starter strip shall be laid in a continuous band of cement not less than 200 mm wide.

Starter strip

9.27.8.3. 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.

Tabs fastening

9.27.8.4. 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.

9.27.8.5. 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. Such band shall be located not less than 25 mm nor more than 50 mm above the butt of the overlying course of shingles.

Succeeding courses of shingles

9.27.8.6. Shingles on hips and ridges shall be not less than 300 mm wide applied to provide triple coverage. Such shingles 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.

Shingle application on hips and ridges

9.27.8.7. Flashing shall conform to Subsection 9.27.4.

Flashing

9.27.8.8. Shingles shall be fastened in accordance with Articles 9.27.7.4. and 9.27.7.5.

Fastening

SUBSECTION 9.27.9. WOOD ROOF SHINGLES

9.27.9.1. Decking for wood shingled roofs may be continuous or spaced.

Decking

9.27.9.2. Where underlayment is used beneath wood shingles it shall be the breather type.

9.27.9.3. Shingles shall be not less than No. 2 grade.

Grade

9.27.9.4. Wood shingles shall be not less than 400 mm long and not less than 75 mm nor more than 350 mm wide.

Size

Table 9.27.9.A.
Forming Part of Article 9.27.9.7.

EXPOSURE OF WOOD ROOF SHINGLES						
Roof Slope	Maximum Shingle Exposure, mm					
	No. 1 Grade			No. 2 Grade		
	Length of Shingle			Length of Shingle		
	400 mm	450 mm	600 mm	400 mm	450 mm	600 mm
1 in 3 or less	95	105	145	90	100	140
over 1 in 3	125	140	190	100	115	165
Column 1	2	3	4	5	6	7

Spacing	9.27.9.5. Shingles shall be spaced approximately 6 mm apart and offset at the joints in adjacent courses not less than 38 mm so that joints in alternate courses are staggered.
Fastening	9.27.9.6. Shingles shall be fastened with at least 2 nails or staples located approximately 19 mm from the sides of the shingle and 38 mm above the exposure line.
Exposure	9.27.9.7. The exposure of wood roof shingles shall conform to Table 9.27.9.A.
Flashing	9.27.9.8. Flashing shall conform to Subsection 9.27.4.
Eave protection	9.27.9.9. Eave protection shall conform to Subsection 9.27.5.

SUBSECTION 9.27.10. HANDSPLIT ROOF SHAKES

Size of shakes	9.27.10.1. 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.
Underlay	9.27.10.2. A breather-type underlay shall be provided beneath roof shakes. Underlay shall be laid as a strip not less than 900 mm wide along eaves and 300 mm wide along hips and ridges. Underlay shall be laid as a strip not less than 450 mm wide between each course of shakes with the bottom edge of the underlay positioned above the butt line, a distance equal to double the exposure of the shakes.
Spacing of shakes	9.27.10.3. Shakes 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.
Fastening of shakes	9.27.10.4. Shakes shall be fastened with nails located approximately 20 mm from the sides of the shakes and 40 mm above the exposure line.
	9.27.10.5. The exposure of wood shakes shall not exceed 190 mm for shakes at least 450 mm long and 250 mm for shakes at least 600 mm long.
Flashing	9.27.10.6. Flashing shall conform to Subsection 9.27.4.
Eave protection	9.27.10.7. Eave protection shall conform to Subsection 9.27.5.

SUBSECTION 9.27.11. BUILT-UP ROOFS

9.27.11.1. The quantities of bituminous materials used on built-up roofs shall conform to Table 9.27.11.A.

Table 9.27.11.A.
Forming Part of Article 9.27.11.1.

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

9.27.11.2. Coal-tar products and asphalt products shall not be used together in built-up roof construction.

Built-up roof
construction

9.27.11.3. Bitumen roofing felts shall be not less than No. 15 felt.

Roofing felts

9.27.11.4. 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.

9.27.11.5. Flashing shall conform to Subsection 9.27.4.

Flashing

9.27.11.6. 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.

9.27.11.7. Built-up roofing shall consist of at least 3 mopped-down layers of roofing felt flood coated with bitumen.

9.27.11.8. 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. The full width under each lap shall be coated with bitumen so that in no place does felt touch felt. 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.

9.27.11.9. Except as permitted in Article 9.27.11.10., built-up roofing applied over wood, plywood or waferboard roof sheathing shall be laid over an additional base layer of felt laid dry over the entire roof deck with at least a 50 mm headlap and a 50 mm sidelap between each sheet.

9.27.11.10. Where plywood or waferboard roof sheathing is used, the dry layer of felt required in Article 9.27.11.9. may be omitted when the joints are taped and the sheathing is primed with asphalt.

9.27.11.11. 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.

9.27.11.12. Except as permitted in Article 9.27.11.13., a cant strip shall be provided at the edges of roofs. At least 2 plies of the roofing membrane shall be carried over the top of the cant strip. Flashing shall extend over the top of the cant strip and shaped to form a drip.

9.27.11.13. The cant strip required in Article 9.27.11.12. may be omitted where a gravel stop is provided at the edge of roofs. 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 before the flood coat is applied. The gravel stop 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.

SUBSECTION 9.27.12. SELVAGE ROOFING

9.27.12.1. Wide selvage asphalt roofing shall provide double coverage over the entire roof surface.

Selvage asphalt
roofing

9.27.12.2. Plies of selvage roofing shall be cemented together to ensure a water tight joint.

SUBSECTION 9.27.13. SHEET METAL ROOFING

9.27.13.1. Sheet metal roofing shall be not less than 0.33 mm thick galvanized steel, 0.35 mm thick copper, 0.46 mm thick zinc or 0.48 mm thick aluminum.

SUBSECTION 9.27.14. GLASS REINFORCED POLYESTER ROOFING

9.27.14.1. 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.

SUBSECTION 9.27.15. DOWNSPOUTS AND ROOF DRAINS

Downspouts
and roof drains

9.27.15.1. Where downspouts are provided and are not connected to a sewer, extensions shall be provided to carry rainwater away from the *building* in a manner which will prevent soil erosion.

9.27.15.2. If eave troughs are required, eave troughs and downspouts shall conform to * Articles 9.27.15.3. to 9.27.15.5.

9.27.15.3.(1) Except as provided in Sentence (2), the hydraulic load in litres from a roof * or paved surface is the maximum 15 min rainfall given in Part 11 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) Flow control drains 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) they are located not more than 15 m from the edge of the roof and not more than 30 m from adjacent drains, and
- (e) there is at least one drain for each 900 m² of roof area.

9.27.15.4. The hydraulic load that drains to an eave trough shall conform to Table * 9.27.15.A.

Table 9.27.15.A.
Forming Part of Article 9.27.15.4.

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	2 100	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

9.27.15.5. The hydraulic load that drains to a downspout shall conform to Table 9.27.15.B.

Table 9.27.15.B.
Forming Part of Article 9.27.15.5.

Circular Downspout Diameter, mm	Maximum Hydraulic Load, L	Non-Circular Downspout 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

SECTION 9.28 SIDING

SUBSECTION 9.28.1. SCOPE

9.28.1.1. This Section applies to exterior wall coverings of lumber, wood shingles, shakes, asbestos-cement shingles and sheets, plywood, waferboard, hardpressed fibreboard, asphalt shingles, vinyl, aluminum and steel including trim, soffits and flashing.

Exterior wall
coverings

9.28.1.2. Requirements for stucco shall conform to Section 9.29 and requirements for masonry veneer shall conform to Section 9.20.

9.28.1.3. Where asphalt shingles are used as siding, they shall conform to the requirements in Section 9.27 for asphalt roof shingles.

SUBSECTION 9.28.2. GENERAL

9.28.2.1. Exterior walls shall be protected with siding, including flashing, trim and other special purpose accessory pieces required for the siding system being used, to restrict the entry of rain and snow into the wall assembly.

Protection

9.28.2.2. 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 and hardboard.

Clearance from
finished grade

9.28.2.3. 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 hardboard.

9.28.2.4. Insulating asphalt siding shall be ventilated by not less than a 10 mm air space behind the siding. (See Article 9.26.3.4.)

SUBSECTION 9.28.3. FLASHING

9.28.3.1. Flashing shall consist of not less than 1.73 mm thick sheet lead, 0.33 mm thick galvanized steel, 0.35 mm thick copper, 0.46 mm thick zinc, 0.48 mm thick aluminum, or 1.02 mm thick vinyl.

9.28.3.2. Flashing shall be installed at every horizontal junction between 2 different exterior finishes, except where the upper finish overlaps the lower finish.

Flashing
installation

9.28.3.3. Except as provided in Article 9.28.3.5., 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 $\frac{1}{4}$ of the horizontal overhang of the eave.

Flashing over
exterior wall
openings

9.28.3.4. 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.

9.28.3.5. Where a window or exterior door is designed to be installed without head flashing, the exterior flange of the window or door frame shall be bedded into a non-hardening type caulking material and the exterior flange screwed down over the caulking material to the wall framing to form a waterproof joint.

SUBSECTION 9.28.4. CAULKING

9.28.4.1. Caulking shall be provided where required to prevent the entry of water into the structure.

Caulking

9.28.4.2. 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. Caulking shall also 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 9.7.5.2., 9.20.15.3. and 9.29.1.5.)

9.28.4.3. Caulking shall conform to one of the following:

Specifications

- CGSB 19-GP-5M(1976), "Sealing Compound, One Component, Acrylic Base, Solvent Curing,"
- CGSB 19-GP-9Ma(1976), "Sealing Compound, One Component, Silicone Base, Chemical Curing,"
- CGSB 19-GP-13M(1976), "Sealing Compound, One Component, Polysulphide Base, Chemical Curing,"
- CGSB 19-GP-14M(1976), "Sealing Compound, One Component, Butyl-Polyisobutylene Polymer Base, Solvent Curing,"
- CGSB 19-GP-16M(1977), "Sealing Compound, One Component, Polyurethane Base, Chemical Curing," or
- CGSB 19-GP-24M(1977), "Sealing Compound, Multi-Component, Chemical Curing."

SUBSECTION 9.28.5. ATTACHMENT OF SIDING

9.28.5.1. Except as permitted in Articles 9.28.5.4. to 9.28.5.8., siding shall be nailed to the framing members, furring members or to blocking between the framing members.

Nailing of siding

9.28.5.2. 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.

Blocking of siding

9.28.5.3. Except as permitted in Articles 9.28.5.7. and 9.28.5.8., furring for the attachment of siding shall be not less than 19 mm by 38 mm lumber when applied over sheathing. When applied without sheathing such furring 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. Such furring shall be securely fastened to the framing and shall be spaced not more than 600 mm o.c.

Furring for siding

9.28.5.4. Vertical lumber and stucco lath or reinforcing may be attached to sheathing only where the sheathing consists of not less than 14.3 mm lumber, 12.5 mm plywood or 15.9 mm waferboard.

9.28.5.5. Vertically applied metal siding and wood shingles and shakes may be attached to the sheathing only where the sheathing consists of not less than 14.3 mm lumber, 7.5 mm plywood or 7.9 mm waferboard.

Vertical metal siding attachment

9.28.5.6. Asbestos-cement shingles may be attached to the sheathing only when the sheathing consists of not less than 14.3 mm lumber, 9.5 mm plywood or 11.1 mm waferboard.

Asbestos-cement shingles siding attachment

Wood shingles
and shakes
siding
attachment

9.28.5.7. 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 9.28.7.5.

9.28.5.8. 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. Such lath shall be applied so that it overlaps the preceding shingle course by not less than 20 mm.

9.28.5.9. Nail or staple size and spacing for the attachment of siding and trim shall conform to Table 9.28.5.A.

Table 9.28.5.A.
Forming Part of Article 9.28.5.9.

ATTACHMENT OF SIDING			
Type of Siding	Min. Nail or Staple Length, mm	Min. No. 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 greater than 7 mm thickness	51	—	300 mm (o.c.) along intermediate supports
Column 1	2	3	4

9.28.5.10. Nails or staples for the attachment of sidings and wood trim shall be corrosion-resistant and shall be compatible with the siding material. Fasteners for metal or vinyl siding shall be positioned to permit expansion and contraction of the siding.

9.28.5.11. Fasteners for shakes and shingles shall penetrate through the nail-holding base or not less than 19 mm into the framing. Fasteners for other types of siding shall penetrate through the nail-holding base or not less than 25 mm into the framing.

SUBSECTION 9.28.6. LUMBER SIDING

9.28.6.1. Lumber siding shall be sound, free of knot holes, loose knots, through checks or splits.

Quality

9.28.6.2. 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.

Thickness

9.28.6.3. 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. Bevel siding shall be not more than 286 mm wide.

Bevel siding

9.28.6.4. Lumber siding shall prevent water from entering at the joints by the use of lapped or matched joints or by vertical wood battens. 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.

Prevention of water penetration

SUBSECTION 9.28.7. WOOD SHINGLES AND MACHINE GROOVED SHAKES

*** 9.28.7.1.** Shingles and shakes shall conform to CSA-O118.1-M1980, "Western Red Cedar Shingles, Handsplit Western Red Cedar Shakes and Machine-Grooved Shakes." 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.

Grading

9.28.7.2. Shingles and shakes shall be not less than 65 mm nor more than 350 mm wide.

Shingles and shakes width

9.28.7.3. Shingles or shakes shall be fastened with nails located approximately 20 mm from each edge and not less than 25 mm above the exposure line for single-course applications, or approximately 50 mm above the butt for double-course applications.

Fastenings for shingles and shakes

9.28.7.4. In single-course application, joints in succeeding courses shall be offset at least 40 mm so that joints in any 2 of 3 consecutive courses are staggered. 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.

Single and double shingle application

Table 9.28.7.A.
Forming Part of Article 9.28.7.6.

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

Shingles and shakes application

9.28.7.5. When lath is used with double-course application (see Article 9.28.5.7.), it shall be spaced according to the exposure and securely fastened to the framing. The butts of the under-course shall rest on the top edge of the lath. The outer course shall be fastened to the lath with nails of sufficient length to penetrate through the lath. 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. If wood lath is not used, the butts of the under-course shingles or shakes shall be located 12 mm above the butts of the outer course.

Exposure and butt thickness

9.28.7.6. The exposure and butt thickness of shingles and shakes shall conform to Table 9.28.7.A.

SUBSECTION 9.28.8. ASBESTOS-CEMENT SHINGLES AND SHEETS

Asbestos-cement shingles and sheets specifications

9.28.8.1. Asbestos-cement shingles and sheets shall conform to one of the following:

CGSB 34-GP-4M(1977), "Siding, Asbestos Cement, Shingles and Clapboards,"

CGSB 34-GP-5M(1977), "Sheets, Asbestos Cement, Corrugated,"

CGSB 34-GP-14M(1977), "Sheets, Asbestos Cement, Decorative,"

CAN2-34.16-M77, "Sheets, Asbestos Cement, Flat, Fully Compressed,"

CGSB 34-GP-17M(1977), "Sheets, Asbestos Cement, Flat, Semi-compressed," or

CGSB 34-GP-21M(1979), "Panels, Sandwich Asbestos, Cement and * Insulating Cores."

Asbestos-cement shingles and sheets thickness

9.28.8.2. Asbestos-cement shingles shall weigh not less than 8.06 kg/m². 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. Where applied over sheathing, thickness shall be not less than 3.15 mm.

Fastening

9.28.8.3. Asbestos-cement shingles shall be fastened with nails located not less than 25 mm above the exposure line.

Installation

9.28.8.4. Asbestos-cement shingles shall be installed so that vertical joints in succeeding courses are staggered. Asphalt-coated backer strips shall be installed behind each vertical joint. Shingles shall have not less than 25 mm head lap.

Vertical joints

9.28.8.5. Vertical joints of asbestos-cement panels shall be protected with batten strips, caulking or other suitable method.

Horizontal joints

9.28.8.6. Horizontal joints shall be lapped, flashed, caulked or otherwise suitably protected.

SUBSECTION 9.28.9. PLYWOOD

Plywood specification

9.28.9.1. Plywood siding shall be exterior type conforming to CSA O115-1967, "Hardwood Plywood," CSA O121-M1978, "Douglas Fir Plywood," CSA O151-M1978, "Canadian Softwood Plywood" or CSA O153-M1980, "Poplar Plywood." *

Plywood siding thickness

9.28.9.2. Plywood siding shall be not less than 6 mm thick when applied directly to sheathing. When applied directly to framing or over furring strips, plywood thickness shall conform to Table 9.28.9.A. The thickness of grooved or textured plywood shall be measured at the point of least thickness.

9.28.9.3. The edges of plywood siding shall be treated with a suitable paint or sealer.

Edge support

9.28.9.4. Plywood applied in panels shall have all edges supported. Not less than a 2 mm gap shall be provided between sheets. Vertical joints in such siding shall be

protected with batten strips or caulking when the plywood joints are not matched. Horizontal joints shall be lapped not less than 25 mm or shall be suitably flashed.

9.28.9.5. Plywood applied in horizontal lapped strips shall have not less than a 2 mm gap provided at the butted ends, which shall be caulked. The horizontal joints shall be lapped not less than 25 mm. Wedges shall be inserted under all vertical butt joints and at all corners when horizontal lapped plywood is applied without sheathing.

Lapping

Table 9.28.9.A.
Forming Part of Article 9.28.9.2.

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

SUBSECTION 9.28.10. HARDBOARD

9.28.10.1. Factory-finished hardboard siding shall conform to CGSB 11-GP-5Ma(1978), "Hardboard, for Exterior Cladding." Hard-pressed fibreboard siding which is not factory finished shall conform to Types 1, 2 or 5 in CGSB 11-GP-3M(1976), "Hardboard."

Hardboard specification

9.28.10.2. Type 1 or 2 hardboard siding shall be at least 6.0 mm thick when applied over sheathing that provides continuous support and at least 7.5 mm thick when applied to furring or framing members not more than 400 mm o.c. Type 5 hardboard siding shall be at least 9.0 mm thick when applied over sheathing that provides continuous support, and at least 10.5 mm thick when applied to furring or framing members not more than 400 mm o.c. Where hardboard siding is grooved, the grooves shall not extend more than 1.5 mm into the required thickness.

9.28.10.3. Hardboard siding applied in panels shall have all edges supported. Not less than a 5 mm gap shall be provided between sheets. Vertical joints in such siding shall be protected with batten strips or caulking when the joints are not matched. Horizontal joints shall be lapped not less than 25 mm or shall be suitably flashed.

Edge support

9.28.10.4. 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. The horizontal joints shall be lapped not less than 25 mm.

Horizontal lapped strips

9.28.10.5. At least 3 mm clearance shall be provided between hardboard siding and door or window frames.

SUBSECTION 9.28.11. WAFERBOARD

9.28.11.1. Waferboard siding shall conform to CAN3-O188.2-M78, "Waferboard."

9.28.11.2. Waferboard shall be not less than 7.9 mm thick where applied directly to sheathing. Where applied directly to framing or over furring strips, waferboard 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.

Thickness

Edge support

9.28.11.3. Waferboard applied in panels shall have all edges supported and treated with a primer or sealer. Not less than a 3 mm gap shall be provided between sheets. Vertical joints in such siding shall be protected with batten strips or caulking when the waferboard joints are not matched. Horizontal joints shall be lapped not less than 25 mm or shall be suitably flashed.

9.28.11.4. At least a 3 mm clearance shall be provided between waferboard siding and door or window frames.

SUBSECTION 9.28.12. METAL SIDING**Steel siding**

9.28.12.1. Except as provided in Article 9.28.12.2., steel siding, including flashing and trim accessories, shall conform to CGSB 93-GP-4M(1978), "Siding, Soffits and Fascia, Steel, Galvanized, Prefinished, Residential."

9.28.12.2 Steel siding which does not conform to Article 9.28.12.1. shall have a minimum thickness of 0.33 mm and conform to CGSB 93-GP-3M(1978), "Sheet, Steel, Galvanized, Prefinished, Residential."

Aluminum siding

9.28.12.3. Except as provided in Article 9.28.12.4., aluminum siding, including flashing and trim accessories, shall conform to CGSB 93-GP-2M(1978), "Siding, Soffits and Fascia, Aluminum, Prefinished, Residential."

9.28.12.4. Aluminum siding which does not conform to Article 9.28.12.3. shall conform to CGSB 93-GP-1M(1978), "Sheet, Aluminum Alloy, Prefinished, Residential" and shall have a minimum thickness of 0.58 mm, except that siding supported by backing or sheathing shall have a minimum thickness of 0.46 mm.

Aluminum siding over masonry or concrete

9.28.12.5. Aluminum siding in contact with masonry or concrete shall be effectively coated or separated from the masonry or concrete by an impervious membrane.

SUBSECTION 9.28.13. VINYL SIDING

9.28.13.1. Vinyl siding, including flashing and trim accessories, shall conform to CGSB 41-GP-24M(1976), "Siding, Soffits and Fascia, Rigid Vinyl."

9.28.13.2. The attachment of vinyl siding shall conform to the requirements in Subsection 9.28.5. for metal siding.

9.28.13.3. Vinyl siding shall be applied over sheathing or other backing that will provide continuous support for the siding.

SECTION 9.29 STUCCO**SUBSECTION 9.29.1. GENERAL**

9.29.1.1. Sheathing shall be provided beneath stucco applied over wood-frame walls except as permitted in Article 9.29.4.2. Where applied beneath stucco, sheathing shall conform to Subsection 9.23.16.

9.29.1.2. Stucco lath or reinforcing shall be used to attach stucco to wood-frame construction. Such lath or reinforcing shall also 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. Stucco applied over *masonry chimneys* shall be reinforced.

Stucco finish

9.29.1.3. Stucco finish shall not be applied over concrete masonry units less than 1 month old unless the units have been cured by the autoclave process.

9.29.1.4. Stucco shall be not less than 200 mm above finished ground level except when it is applied over concrete or masonry.

9.29.1.5. Flashing and caulking used with stucco shall conform to Subsections 9.28.3. and 9.28.4., except that if aluminum flashing is used, it shall be separated from the stucco by an impervious membrane or coating. (See Article 9.7.5.2. for caulking around window frames.)

SUBSECTION 9.29.2. STUCCO MATERIALS

9.29.2.1. Portland cement shall conform to CAN3-A5-M77, "Portland Cements."

Specification

9.29.2.2. 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. Aggregate grading shall conform to Table 9.29.2.A.

Aggregate

Table 9.29.2.A.
Forming Part of Article 9.29.2.2.

AGGREGATING 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

9.29.2.3. Hydrated lime shall conform to CSA A82.44-1950, "Normal Finishing Hydrated Lime."

Hydrated lime
specification

9.29.2.4. Water shall be clean and free of significant amounts of deleterious material.

Water for
stucco

SUBSECTION 9.29.3. FASTENERS

9.29.3.1. Fasteners for stucco lath or reinforcing shall be corrosion-resistant and of a material other than aluminum.

Stucco
fasteners

9.29.3.2. 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. Staples shall be not less than 1.98 mm diam or thickness.

Nails for stucco
lath

9.29.3.3. 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. On horizontal surfaces nails shall be not less than 38 mm long.

Staples for
stucco lath

SUBSECTION 9.29.4. STUCCO LATH

9.29.4.1. Rib lath or expanded metal stucco mesh shall be copper-alloy steel coated with rust-inhibitive paint after fabrication or shall be galvanized. Woven or welded wire mesh shall be galvanized.

Stucco lath

9.29.4.2. 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 in-

Stucco
sheathing

tervals not exceeding 150 mm, or where *acceptable* paper-backed welded wire metal lath is used.

9.29.4.3. Stucco lath shall conform to Table 9.29.4.A.

Table 9.29.4.A.
Forming Part of Article 9.29.4.3.

STUCCO LATH				
Location	Type of Lath	Min. Diam of Wire, mm	Max. Mesh Opening	Min. Mass, kg/m ²
Vertical surfaces	Welded or woven wire	1.19 1.35 1.60	25 mm 38 mm 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 9.29.4.A.:

⁽¹⁾ See Appendix A.

Furring for stucco lath

9.29.4.4. Stucco lath shall be held not less than 6 mm away from the backing by means of suitable self-furring devices.

Application

9.29.4.5. Stucco lath shall be applied with the long dimension horizontal. Horizontal and vertical joints shall be lapped not less than 50 mm. End joints shall be staggered and shall occur over framing members. External corners shall be reinforced with a vertical strip of lath or reinforcing extending not less than 150 mm on both sides of the corner, or the lath or reinforcing shall extend around corners not less than 150 mm.

Fastening

9.29.4.6. Stucco lath shall be fastened in conformance with Subsection 9.28.5.

Spacing of fasteners on vertical surface

9.29.4.7. 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. Other nailing patterns may be used provided there are not fewer than 20 fasteners/m² of wall surface.

Spacing of fasteners on horizontal surface

9.29.4.8. 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.

SUBSECTION 9.29.5. STUCCO MIXES

Stucco mixes

9.29.5.1. Stucco mixes shall conform to Table 9.29.5.A.

Pigment for stucco

9.29.5.2. Pigment if used shall consist of pure mineral oxides inert to the action of sun, lime and cement. Pigment shall not exceed 6 per cent of the portland cement by weight.

Mixing

9.29.5.3. Materials shall be thoroughly mixed before and after water is added. Stucco shall be applied not later than 3 h after the initial mixing.

Table 9.29.5.A.
Forming Part of Article 9.29.5.1.

STUCCO MIXES (by volume)			
Portland Cement	Masonry Cement Type H	Lime	Aggregate
1 1	— 1	¼ to 1 —	¾ to 4 parts per part of cementitious material
Column 1	2	3	4

SUBSECTION 9.29.6. STUCCO APPLICATION

9.29.6.1. The base for stucco shall be maintained above freezing. Stucco shall be maintained at a temperature of not less than 10°C during application, and for not less than 48 h afterwards.

Stucco application temperature

9.29.6.2. Stucco shall be applied with not less than 2 base coats and 1 finish coat, providing a total thickness of at least 15 mm, measured from the face of the lath or face of the masonry where no lath is used.

Application

9.29.6.3. The first coat shall be not less than 6 mm thick, measured from the face of the lath or masonry, fully embedding the lath. The surface shall be scored to provide a key with the second coat.

Stucco (1st coat)

9.29.6.4. The second coat shall be not less than 6 mm thick. The surface shall be lightly roughened to provide a key with the finish coat if the finish coat is other than stone dash.

Stucco (2nd coat)

9.29.6.5. When the finish coat is other than stone dash, the base shall be dampened but not saturated before the finish coat is applied. The thickness of the finish coat shall be not less than 3 mm.

Stucco (finish coat)

9.29.6.6. 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.

Stone dash finish

SECTION 9.30 INTERIOR WALL AND CEILING FINISHES

SUBSECTION 9.30.1. GENERAL

9.30.1.1. The requirements for plastering in this Section apply to the application of plaster to gypsum or metal lath attached to wood furring or framing. Plastering applications and plaster mixes not described in this Section and requirements for metal framing and metal furring shall conform to CSA A82.30-M1980, "Interior Furring, Lathing and Gypsum Plastering." Flame-spread requirements are contained in Subsection 9.10.17.

Interior wall and ceiling finishes

* **9.30.1.2.** Foamed plastic materials shall be protected in accordance with Part 3.

9.30.1.4. The requirements for wall and ceiling finishes in this Section are basic requirements. Where a wall or ceiling assembly is required to provide a certain fire-resistance rating, a flame-spread rating or a sound transmission class rating, the wall or ceiling finish shall be subject to the appropriate requirements in Sections 9.10 and 9.11 in addition to the requirements in this Section.

SUBSECTION 9.30.2. WATERPROOF WALL FINISH

Waterproofing
of interior
finishes

9.30.2.1. 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.

Waterproof
finish

9.30.2.2. Waterproof finish shall consist of ceramic, plastic or metal tile, sheet vinyl, tempered hardboard, laminated thermosetting decorative sheets or linoleum.

SUBSECTION 9.30.3. WOOD FURRING

Wood furring

9.30.3.1. Wood furring for the attachment of wall and ceiling finishes shall conform to Table 9.30.3.A.

Table 9.30.3.A.
Forming Part of Article 9.30.3.1.

Maximum Spacing of Furring, mm	Minimum Size of Furring, mm		
	Maximum Spacing of Furring Supports		
	Continuous Support	400 mm (o.c.)	600 mm (o.c.)
300	19 by 38	19 by 38	19 by 64
400	19 by 38	19 by 38	19 by 64
600	19 by 38	19 by 64	19 by 89
Column 1	2	3	4

Nails for
furring

9.30.3.2. Furring shall be fastened to the framing or to wood blocks with not less than 51 mm nails.

SUBSECTION 9.30.4. GYPSUM LATH

Specification

9.30.4.1. Gypsum lath shall conform to CSA A82.27-M1977, "Gypsum Board Products."

Thickness

9.30.4.2. Gypsum lath shall be not less than 9.5 mm thick on supports not more than 400 mm o.c. and 12.7 mm thick on supports not more than 600 mm o.c.

9.30.4.3. Gypsum lath shall be applied so that vertical joints do not occur at jamb studs above or below openings.

Fastening
method

9.30.4.4. Gypsum lath shall be fastened at each support with no fewer than 4 uniformly spaced fasteners where 406 mm wide lath is used on vertical supports spaced not more than 400 mm o.c. Such lath shall be fastened with no fewer than 5 fasteners per support for all other conditions. Lath 610 mm wide shall be fastened with no fewer than 6 fasteners per support. Lath need not be nailed to the framing at inside corners.

Nails for
gypsum lath

9.30.4.5. Nails for fastening gypsum lath shall be blued steel wire-nails not less than 32 mm long, with at least 2.29 mm shank diam and 7.5 mm head diam.

Staples for
gypsum lath

9.30.4.6. Staples for fastening gypsum lath shall be not less than 25 mm long for 9.5 mm thick lath and 28 mm long for 12.7 mm lath. Staples shall be not less than 1.6 mm diam or thickness with not less than a 19 mm crown.

SUBSECTION 9.30.5. METAL LATH

9.30.5.1. Metal lath shall consist of galvanized metal or copper-bearing steel treated with a suitable rust-inhibitive coating after manufacture.

Metal lath

9.30.5.2. The weight of metal lath shall conform to Table 9.30.5.A.

Weight of metal lath

Table 9.30.5.A.
Forming Part of Article 9.30.5.2.

MINIMUM MASS OF METAL LATH			
Type of Lath	Min. Mass, kg/m ²	Max. Spacing of Wood Supports, mm	
		Walls	Ceilings
Diamond mesh	1.36	300	300
	1.63	400	300
Flat rib	1.36	400	300
	1.63	400	400
9.5 mm rib	1.36	400	400
	1.63	500	500
	1.90	600	600
Paper-backed welded wire	0.76	400	400
	1.06	600	600
Column 1	2	3	4

9.30.5.3. Paper backed welded wire lath shall consist of wire not less than 1.6 mm in diameter, except that when applied to supports spaced more than 400 mm o.c., every third wire at right angles to the supports shall be not less than 2.9 mm in diameter.

9.30.5.4. Nails for the attachment of metal lath shall be not less than 3.2 mm diam large-head roofing nails not less than 38 mm long for ceiling supports and 25 mm long for wall supports. Such nails shall be spaced not more than 150 mm o.c.

Nails for metal lath

9.30.5.5. Staples for the attachment of metal lath shall be not less than 2 mm diam or thickness nor less than 38 mm long with a 19 mm crown. Such staples shall be spaced not more than 150 mm o.c.

Staples for metal lath

9.30.5.6. Metal lath shall be applied at right angles to the supports. End joints shall be lapped not less than 25 mm. Side joints of diamond mesh lath shall be lapped not less than 12 mm. Side joints of rib lath shall be lapped so that the adjacent side ribs nest. End joints shall be staggered. End laps that occur between supports shall be tied.

Application

9.30.5.7. When metal lath is applied over a continuous surface, it shall be held not less than 6 mm from the back-up by means of furring strips, self-furring nails or self-furring lath.

Furring for metal lath

SUBSECTION 9.30.6. CORNER REINFORCEMENT FOR PLASTER

9.30.6.1. Material for corner reinforcement shall have at least the same corrosion resistance as metal plaster lath.

Corner reinforcement

9.30.6.2. All internal corners of walls and ceilings shall be reinforced with metal lath or wire fabric having not less than 50 mm wide legs. Corner beads shall be installed at all external corners.

Corner reinforcement for openings

9.30.6.3. Corners of openings shall be reinforced with a strip of metal lath not less than 150 mm by 450 mm long installed at an angle of 45° to the horizontal.

Fastening of plaster reinforcement

9.30.6.4. All plaster reinforcement shall be fastened to the lath and not to the framing.

SUBSECTION 9.30.7. PLASTERING

Plastering material specifications

9.30.7.1. Materials used in plastering shall conform to the following:
 CSA A82.21-M1978, "Gypsum and Terms Relating to Gypsum Products,"
 CSA A82.22-M1977, "Gypsum Plasters,"
 CSA A82.42-1950, "Quicklime for Structural Purposes,"
 CSA A82.44-1950, "Normal Finishing Hydrated Lime,"
 CSA A82.46-1962, "Special Finishing Hydrated Lime," or
 CSA A82.57-M1977, "Inorganic Aggregates for Use in Interior Plaster."

Grounds

9.30.7.2. Grounds shall be installed to ensure even and uniform plaster thickness.

Plaster thickness

9.30.7.3. Plaster shall be not less than 10 mm thick at any point, measured from the face of the lath. Where electric cables for heating are embedded in the plaster, there shall be not less than 10 mm of plaster covering the cables.

9.30.7.4. Plaster shall be applied in 3 coats consisting of a scratch coat, brown coat and finish coat, except that where the base consists of gypsum lath or unit masonry other than concrete masonry, a 2-coat application may be used in which a brown coat is doubled back over the scratch coat.

Plaster over concrete or masonry

9.30.7.5. When plaster is applied over concrete or concrete masonry, a special bond coat shall be used as the first coat or a liquid bonding agent conforming to CSA A261-1970, "Liquid Bonding Agents for Interior Plasters" shall be applied before application of the first coat of plaster. Normal finishing hydrated lime shall not be used in plaster applied to exterior masonry or concrete walls.

Plaster for electric heating

9.30.7.6. Plaster to embed cables used for electric heating shall not incorporate lightweight aggregate.

Plaster mixes

9.30.7.7. When 3-coat plaster is used, the first or scratch coat shall consist of 1 part gypsum plaster to 2 parts sand by weight. The second or brown coat shall consist of 1 part gypsum plaster to 3 parts sand by weight. The finish coat shall consist of 1 part gypsum plaster to 3 parts lime by volume.

9.30.7.8. When 2-coat plaster is used, the first coat shall consist of 1 part gypsum plaster to 2½ parts sand by weight. The finish coat shall consist of 1 part gypsum plaster to 3 parts lime by volume.

9.30.7.9. The finish coat shall be trowelled to a smooth hard finish unless a special decorative finish is used conforming to CSA A82.22-M1977, "Gypsum Plasters."

9.30.7.10. In cold weather plaster shall be applied at from 10°C to 20°C and maintained at this temperature range for not less than 96 h, and above freezing thereafter. Ventilation shall be provided for the proper drying of the plaster.

SUBSECTION 9.30.8. GYPSUM BOARD FINISH (TAPED JOINTS)

Gypsum board specification

9.30.8.1. Gypsum board shall conform to CSA A82.27-M1977, "Gypsum Board Products."

Application

9.30.8.2. Gypsum board applied as a single layer shall be not less than 9.5 mm thick on supports not more than 400 mm o.c., and 12.7 mm thick on supports not

more than 600 mm o.c. When applied as 2 layers, each layer shall be not less than 9.5 mm thick on supports not more than 600 mm o.c.

9.30.8.3. The length of fasteners for gypsum board shall conform to Table 9.30.8. A., 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.

Fasteners

Table 9.30.8.A.
Forming Part of Article 9.30.8.3.

FASTENER PENETRATION INTO WOOD SUPPORTS				
Required <i>Fire-Resistance Rating</i> of Assembly, h	Min. Fastener Penetration Into Wood Supports, mm			
	Walls		Ceilings	
	Nails	Screws	Nails	Screws
<i>Fire-resistance not required</i>	20	15	20	15
$\frac{3}{4}$	20	20	30	30
1	20	20	45	45
$1\frac{1}{2}$	20	20	60	60
Column 1	2	3	4	5

9.30.8.4. Nails for fastening gypsum board to wood supports shall be not less than 2.3 mm shank diam annular grooved nails with a head diameter of 5.5 mm.

9.30.8.5. 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. Where the ceiling sheets are supported by the wall sheets around the perimeter of the ceiling, this support may be considered as equivalent to nailing at this location. The uppermost wall nails shall be not more than 200 mm below the ceiling. Nails shall be located not less than 10 mm from the side or edge of the board. Nails shall be driven so that the heads are below the plane of the board surface but do not puncture the paper.

Gypsum board
single-layer
application

9.30.8.6. For double-layer applications the first layer shall be fastened as in Article 9.30.8.5. The joints in the second layer shall be offset from the joints in the first layer, and the second layer shall be fastened so that the nails penetrate into wood supports the same depth as is required for the first layer. *Acceptable* systems of adhesive fastened gypsum board may also be used.

Gypsum board
double-layer
application

9.30.8.7. Where strip laminated method of application is used, strips of gypsum board not less than 9.5 mm thick and 150 mm wide shall be nailed to the framing members with nailing conforming to Article 9.30.8.5. The finish layer of gypsum board shall be attached by means of a suitable adhesive to these strips as described in Article 9.30.8.6.

Strip laminated
application
method

9.30.8.8. 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.

Drywall screws

9.30.8.9. In cold weather the taping and finishing of gypsum board shall be carried out at a temperature of not less than 10°C.

Temperature
for finishing
gypsum board

SUBSECTION 9.30.9. PLYWOOD FINISHPlywood finish
thickness

9.30.9.1. The minimum thickness of plywood interior finish shall conform to Table 9.30.9.A., except that no minimum thickness is required when the plywood is applied over solid backing. Thicknesses listed in Table 9.30.9.A. shall permit a manufacturing tolerance of ± 0.4 mm.

Table 9.30.9.A.
Forming Part of Articles 9.30.9.1. and 9.30.9.2.

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

9.30.9.2. 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, or if the grain of the face ply is at right angles to the supporting members, unless the thickness of the plywood exceeds the value shown in Table 9.30.9.A. by an amount equal to at least the depth of penetration of the grooves into the plies below the face ply.

Nails for
plywood finish

9.30.9.3. Nails for attaching plywood finishes 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, except that staples providing equivalent lateral resistance may also be used.

Edges

9.30.9.4. All plywood edges shall be supported by furring, blocking or framing.

SUBSECTION 9.30.10. HARDBOARD FINISHHardboard
specification

9.30.10.1. Hardboard shall conform to CGSB 11-GP-3M(1976), "Hardboard."

Thickness

9.30.10.2. Hardboard shall be not less than 3.2 mm thick where applied over continuous back-up, 6 mm thick where applied to supports spaced not more than 400 mm o.c. and 9 mm thick where applied to supports spaced not more than 600 mm o.c.

Nails

9.30.10.3. 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.

Edges

9.30.10.4. All hardboard edges shall be supported by furring, blocking or framing where the back-up is not continuous.

SUBSECTION 9.30.11. INSULATING FIBREBOARD FINISHInsulating
fibreboard

9.30.11.1. Insulating fibreboard shall conform to CSA A247-M1978, "Insulating Fibreboard."

Thickness

9.30.11.2. Insulating fibreboard sheets shall be not less than 11.1 mm thick on supports not more than 400 mm o.c. Insulating fibreboard tile shall be not less than 12.7 mm thick on supports spaced not more than 400 mm o.c.

9.30.11.3. Nails for fastening fibreboard sheets shall be not less than 2.6 mm shank diameter casing or finishing nails of sufficient length to penetrate at least 20 mm into the supports. Nails shall be spaced not more than 100 mm o.c. along edge supports and 200 mm o.c. along intermediate supports.

Nails and nail spacing

9.30.11.4. All fibreboard edges shall be supported by blocking, furring or framing.

Edge support

SUBSECTION 9.30.12. PARTICLEBOARD OR WAFERBOARD FINISH

9.30.12.1. Particleboard finish shall conform to CAN3-O188.1-M78, "Interior Mat-Formed Wood Particleboard." Waferboard finish shall conform to CAN3-O188.2-M78, "Waferboard."

9.30.12.2. Particleboard or waferboard shall be not less than 6.35 mm thick on supports not more than 400 mm o.c., and not less than 9.5 mm thick on supports not more than 600 mm o.c., except that in walls where blocking is provided at midwall height, particleboard or waferboard shall have a thickness of not less than 6.35 mm on supports not more than 600 mm o.c.

Thickness

9.30.12.3. Nails for fastening particleboard or waferboard shall be not less than 38 mm casing or finishing nails spaced not more than 150 mm o.c. along edge supports and 300 mm o.c. along intermediate supports.

Nails and nail spacing

9.30.12.4. All particleboard or waferboard edges shall be supported by furring, blocking or framing.

Edge support

SUBSECTION 9.30.13. WALL TILE FINISH

9.30.13.1. Ceramic tile shall be set in a mortar base or applied with an adhesive. Plastic tile shall be applied with an adhesive.

Wall tile base and adhesive

9.30.13.2. When ceramic tile is applied to a mortar base the cementitious material shall consist of 1 part portland cement to not more than $\frac{1}{4}$ part lime by volume. This shall be mixed with not less than 3 nor more than 5 parts of aggregate per part of cementitious material by volume. Mortar shall be applied over metal lath or masonry. 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.

Mortar for ceramic tile

9.30.13.3. Adhesives to attach ceramic or 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.

Adhesive for ceramic tile

9.30.13.4. The joints between wall tiles and a bathtub shall be suitably caulked with material conforming to CGSB 19-GP-9Ma(1978), "Sealing Compound, One Component, Silicone Base, Chemical Curing."

Caulking compounds for wall tiles

SECTION 9.31 FLOORING

SUBSECTION 9.31.1. GENERAL

9.31.1.1. Finished flooring shall be provided in all *residential occupancies*.

Flooring

9.31.1.2. 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.

Finished flooring materials

9.31.1.3. Wood sleepers supporting finished flooring over a concrete base on ground shall be not less than 19 mm by 38 mm and shall be treated with a soaking coat of *acceptable* wood preservative.

Wood sleepers

9.31.1.4. Finished flooring shall have a surface that is smooth, even and free from roughness or open defects.

SUBSECTION 9.31.2. PANEL-TYPE UNDERLAY

Panel-type underlay

9.31.2.1. 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 Article 9.31.3.3.)

9.31.2.2. A panel-type underlay shall be provided under resilient flooring, parquet flooring, felted-synthetic-fibre floor coverings, carpeting or ceramic tile on panel-type subflooring whose edges are unsupported. (See Article 9.23.14.4.)

Panel-type underlay specifications

9.31.2.3. Panel-type underlay shall be not less than 6 mm thick and shall conform to one of the following:

CSA O115-1967, "Hardwood Plywood,"
 CSA O121-M1978, "Douglas Fir Plywood,"
 CSA O151-M1978, "Canadian Softwood Plywood,"
 CSA O153-M1980, "Poplar Plywood," *
 CAN3-O188.1-M78, "Interior Mat-Formed Wood Particleboard,"
 CAN3-O188.2-M78, "Waferboard," or
 CGSB 11-GP-3M(1976), "Hardboard."

Fastening

9.31.2.4. Panel-type underlay shall be fastened to the subfloor with staples or annular grooved flooring nails, spaced not more than 150 mm o.c. along the edges and 200 mm o.c. both ways at other locations.

Nails for underlay

9.31.2.5. 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. 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.

9.31.2.6. Where panel-type underlay is required to be installed over plywood or waferboard, the joints in the underlay shall be offset at least 200 mm from the joints in the underlying subfloor.

Underlay for resilient or ceramic floors

9.31.2.7. 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.

SUBSECTION 9.31.3. WOOD STRIP FLOORING

Dimensions

9.31.3.1. The thickness of wood strip flooring shall conform to Table 9.31.3.A.

Underlay

9.31.3.2. Wood strip flooring shall not be laid parallel to lumber subflooring unless a separate underlay is provided.

Laying of wood strip flooring

9.31.3.3. 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. 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.

Nailing

9.31.3.4. When nails are used wood strip flooring shall be toe nailed or face nailed with at least 1 nail per strip at the spacings shown in Table 9.31.3.B., except that face nailed strips of more than 25 mm in width shall have no fewer than 2 nails per strip. Face nails shall be countersunk and the holes filled with suitable filler.

Table 9.31.3.A.
Forming Part of Article 9.31.3.1.

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

Table 9.31.3.B.
Forming Part of Article 9.31.3.4.

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 9.31.3.B.:

⁽¹⁾ See Article 9.31.3.5.

9.31.3.5. 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.

SUBSECTION 9.31.4. PARQUET FLOORING

9.31.4.1. Adhesive used to attach parquet block flooring shall be suitable for bonding wood to the applicable subfloor material.

Adhesive for
parquet
flooring

SUBSECTION 9.31.5. RESILIENT FLOORING

9.31.5.1. 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. Such flooring shall be attached to the base with a suitable waterproof and alkali-resistant adhesive.

Type of
resilient
flooring

SUBSECTION 9.31.6. CERAMIC TILE

9.31.6.1. Ceramic tile shall be set in a mortar bed or applied to a sound smooth base with a suitable adhesive.

Ceramic tile

SECTION 9.32 PLUMBING FACILITIES

SUBSECTION 9.32.1. SCOPE

Plumbing **9.32.1.1.** This Section applies to the facilities required in *plumbing systems* within *dwelling units*.

9.32.1.2. Facilities in *plumbing systems* other than those required in *dwelling units* shall conform to Part 3.

SUBSECTION 9.32.2. GENERAL

9.32.2.1. The construction, extension, alteration, renewal or repair of *plumbing systems* and sewage disposal systems shall conform to Part 7.

SUBSECTION 9.32.3. WATER SUPPLY AND DISTRIBUTION

Potable water **9.32.3.1.** Every *dwelling unit* shall be supplied with potable water.

Piping to facilities **9.32.3.2.** Where a piped water supply is available, piping for hot and cold water shall be connected to every kitchen sink, lavatory, bathtub, shower, slop sink and laundry area. Piping for cold water shall be run to every water closet and hose bib.

SUBSECTION 9.32.4. REQUIRED FACILITIES

Required facilities **9.32.4.1.** A kitchen sink, lavatory, bathtub and water closet shall be provided for every *dwelling unit* where a piped water supply is available.

Laundry space **9.32.4.2.** Laundry facilities or a space for laundry facilities shall be provided in every *dwelling unit*, or grouped elsewhere in the *building* in a location conveniently accessible to occupants of every *dwelling unit*.

Hot water supply **9.32.4.3.** Where a piped water supply is available a hot water supply shall be provided in every *dwelling unit*.

Floor drain **9.32.4.4.** Where gravity drainage to a sewer, drainage ditch or dry well is possible, a floor drain shall be installed in a basement or cellar forming part of a *dwelling unit*.

9.32.4.5. A floor drain shall be provided in a garbage room, incinerator room or boiler room serving more than 1 *dwelling unit*.

9.32.4.6. If the *plumbing system* of a *building* is connected to a municipal sewer system, * roughed-in plumbing for automatic washer drains shall be provided in every single family *dwelling unit*.

9.32.4.7. No water closet or urinal shall be installed in any room used for sleeping unless * *accepted*.

9.32.4.8. No water closet or urinal shall be placed in a basement unless light is provided * in accordance with Table 9.7.2.A. and ventilation is provided in accordance with Section 9.33.

SUBSECTION 9.32.5. SEWAGE DISPOSAL

9.32.5.1. Except as provided in Article 9.32.5.2., wastes from every plumbing fixture shall be piped to the *plumbing system*. *

9.32.5.2. Where there is no piped water supply available, an alternate *acceptable* means of waste disposal shall be provided for every *dwelling unit*.

9.32.5.3. *Building* sewers shall discharge into a public sewage system where such system is available.

9.32.5.4. Where a public sewage system is not available, the *building* sewer shall discharge into a *private sewage disposal system*.

SUBSECTION 9.32.6. SERVICE WATER HEATING FACILITIES

- 9.32.6.1.** Where a hot water supply is required by Article 9.32.4.3., equipment shall be installed to provide to every *dwelling unit* an adequate supply of service hot water with a temperature range from 60°C to 75°C. Service water heating facilities
- 9.32.6.2.** Service hot water may be distributed from a centrally located heater to supply the entire *building* or may be supplied by an individual *service water heater* for each *dwelling unit*. Distribution of service hot water
- 9.32.6.3.** Every *service water heater* and its installation shall conform to Part 6. Installation
- 9.32.6.4.** 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. Storage tanks
- 9.32.6.5.** Fuel-burning *service water heaters* shall be connected to a *chimney flue* conforming to Section 9.21. Fuel-burning service water heaters
- 9.32.6.6.** Heating coils of *service water heaters* shall not be installed in a *flue* or in a combustion chamber of a *building heating boiler* or *furnace* unless *acceptable* for such installations. Heating coils

SECTION 9.33 VENTILATION

SUBSECTION 9.33.1. SCOPE

- 9.33.1.1.** This Section applies to the ventilation of rooms and spaces in *residential occupancies* by natural ventilation and mechanical ventilation where the rated fan capacity does not exceed 2 m³/s. Ventilation
- 9.33.1.2.** Where the rated fan capacity exceeds 2 m³/s, mechanical ventilation shall conform to Part 6. Mechanical ventilation
- 9.33.1.3.** Ventilation of rooms and spaces in other than *residential occupancies* shall be in accordance with good engineering practice such as the procedures described in the ASHRAE Guide and Data Books and the ASHRAE Handbooks. Ventilation of rooms and spaces
- 9.33.1.4.** A garage for parking more than 5 cars shall be ventilated in accordance with Part 6. Ventilation of garages
- * **9.33.1.5.** If roughed-in plumbing is installed for the future installation of a water closet or urinal, provision shall be made for the required ventilation.

SUBSECTION 9.33.2. GENERAL

- 9.33.2.1.** Rooms and spaces in *buildings* of *residential occupancy* shall be ventilated by natural means in accordance with Subsection 9.33.3. or by mechanical means in conformance with Subsection 9.33.4., except that where a *dwelling unit* is heated with other than fuel-fired equipment within the *dwelling unit*, a mechanical exhaust system of 1 or more fans or blowers having a total capacity of at least 0.05 m³/s at a pressure differential of 2.5 mm of water shall be provided for each *dwelling unit*. Ventilation of residential occupancies
- 9.33.2.2.** A space that contains a fuel-fired heating *appliance* shall have natural or mechanical means of supplying the required combustion air.
- 9.33.2.3.** Where the ventilation system forms part of the heating system, Section 9.34 shall also apply.
- 9.33.2.4.** 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. Air contaminants

Exhaust
ventilation
system

9.33.2.5. Every *building* in which dust, fumes, gases, vapour or other contaminants tend to create a fire or explosion hazard shall be provided with an exhaust ventilation system designed to conform with Part 6, and shall be provided with explosion relief devices and vents or other protective measures to conform with Part 3.

9.33.2.6. On-site constructed fireplaces or factory-built fireplaces shall be considered * fuel-fired *appliances*.

9.33.2.7. A supply of fresh air shall be provided for *residential occupancies* and, if the * *building* is heated by a forced air system, may be introduced at the return air duct upstream from the *furnace* fan.

9.33.2.8.(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 more than 0.033 m² in area into a return air system * shall be equipped with an automatic damper.

SUBSECTION 9.33.3. NATURAL VENTILATION

Minimum
natural
ventilation area

9.33.3.1. The unobstructed ventilation area to the outdoors for rooms and spaces in residential *buildings* ventilated by natural means shall conform to Table 9.33.3.A. Where a vestibule opens directly off a living or dining room within a *dwelling unit* ventilation to the outdoors for such rooms may be through the vestibule.

Table 9.33.3.A.
Forming Part of Article 9.33.3.1.

NATURAL VENTILATION		
Location		Minimum Unobstructed Area
Within <i>dwelling unit</i>	Bathrooms or water-closet rooms	0.09 m ²
	Unfinished basement space	0.2 per cent of the floor area
	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 <i>dwelling unit</i>	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 floor area
	Corridors, storage rooms and other similar public rooms or spaces	2 per cent of the floor area
	Unfinished basement space not used on a shared basis	0.2 per cent of the floor area
Column 1	2	3

Protection of
openings
supplying
natural
ventilation

9.33.3.2. Openings for natural ventilation other than windows shall be constructed to provide protection from the weather and insects. Screening shall be of rust-proof material.

SUBSECTION 9.33.4. MECHANICAL VENTILATION

9.33.4.1. Where rooms or spaces are mechanically ventilated, the system shall be capable of providing at least 1 air change per hour. Where a kitchen space is combined with a living area, natural or mechanical ventilation shall be provided in the kitchen area.

Mechanical
ventilation

9.33.4.2. No air from any *dwelling unit* shall be circulated directly or indirectly to any other *dwelling unit*, *public corridor* or public stairway.

Air from
dwelling unit

9.33.4.3. Except for self-contained systems that serve individual *dwelling units*, *exhaust ducts* from rooms containing water closets, urinals, lavatories, showers or slop sinks, and *exhaust ducts* serving rooms containing cooking equipment, shall not be interconnected, and shall not be connected to duct systems serving other areas of the *building*, except at the inlet of the exhaust fan. Where such a connection is made, devices shall be installed to prevent the circulation of exhaust air through the *building* when the fan is not operating.

Exhaust ducts
from toilet
room and
kitchen

9.33.4.4. Where a *vertical service space* contains an *exhaust duct* that serves more than 1 *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*.

9.33.4.5. Air intakes shall be located so as to avoid contamination from exhaust outlets or other sources in concentrations greater than normal in the locality in which the *building* is located.

Contamination
from exhaust
outlets

9.33.4.6. *Exhaust ducts* shall discharge directly to the outdoors. Where the *exhaust duct* passes through or is adjacent to unheated space, the duct shall be insulated to prevent moisture condensation in the duct.

Exhaust
discharge

9.33.4.7. Ventilation equipment shall be accessible for inspection, maintenance, repair and cleaning. 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.

Access to
ventilation
equipment

9.33.4.8. Outdoor air intake and exhaust outlets shall be shielded from weather and insects. Screening shall be of rust-proof material.

Air intake
shield

9.33.4.9. Outdoor air intake openings into the cold air return system shall be provided with a manually operated or automatic damper. Air intake openings larger than 127 mm diam shall be equipped with a manually operated closure if the system is gravity type, or an automatic closure if the system is mechanically operated.

Automatic
damper

9.33.4.10. Except as provided in Article 9.33.4.11., every ventilating duct shall conform to the requirements of Section 9.34 for *supply ducts*.

9.33.4.11. An *exhaust duct* that serves only a bathroom or water-closet room and that is contained entirely within a *dwelling unit* or space that is common to no other *dwelling unit*, may be of *combustible* material provided the duct is reasonably air tight and constructed of a material impervious to water.

9.33.4.12. Underground ventilating ducts shall be adequately drained. Such ducts shall have no sewer connections and shall be provided with access for inspection and cleaning.

* **9.33.4.13.(1)** In *residential occupancies* 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 positioned upstream from all outlets to positively exhaust all moisture and lint.

* **(2)** Screens are not permitted on clothes dryer vents.

* **(3)** Suitable access doors shall be installed in clothes dryer vents for cleaning purposes.

* **(4)** A clothes dryer vent shall not be connected to any other exhaust system, *gas vent* or *chimney*.

SECTION 9.34 HEATING AND AIR-CONDITIONING

SUBSECTION 9.34.1. SCOPE

9.34.1.1. This Section applies to the design and installation of cooking appliances and heating systems in which the heat input does not exceed 120 kW and to air-conditioning systems in which the rated fan capacity does not exceed 2 m³/s.

Heat input
exceeding
120 kW

9.34.1.2. Where the heat input of a heating system exceeds 120 kW or the rated fan capacity of an air-conditioning system exceeds 2 m³/s, Part 6 shall apply.

SUBSECTION 9.34.2. GENERAL

Design

9.34.2.1. The design, including heat loss and heat gain calculations, for the construction and installation of heating and air-conditioning systems, shall conform to good engineering practice such as the procedures described in the ASHRAE Guide and Data Books, the ASHRAE Handbooks, the HRA Digest and the Hydronics Institute Manuals.

Access to
equipment

9.34.2.2. Equipment forming part of a heating or air-conditioning system except for concealed or embedded pipes or ducts shall have easy access for inspection, maintenance and cleaning.

9.34.2.3.(1) Oil-burning, gas-burning and electrical 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,
- (c) The Electrical Protection Act and regulations made pursuant to that Act,
- (d) The Fire Prevention Act and regulations made pursuant to that Act, and
- (e) CSA B52-M1977, "Mechanical Refrigeration Code".

9.34.2.4. Except as provided in Subsection 9.34.9., the installation of solid-fuel-burning *appliances*, including mounting, clearances and requirements for safety devices, shall conform to Part 6.

9.34.2.5. Heating systems using solid fuel shall not be connected to heating systems incorporating oil or gas-burning *appliances* or electrical heating *appliances* unless the total system is *acceptable* and is designed so that unsafe temperatures will not occur with the operation of all or part of the combined system.

Temperature in
residential
buildings

9.34.2.6. Residential *buildings* intended for use in the winter months on a continuing basis shall be equipped with heating facilities capable of maintaining an indoor air temperature of 22°C at the outside winter design temperature except as provided in Article 9.34.2.7. All other *buildings* 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. Winter design temperatures shall be determined on the basis of the January 1% design temperature given in Part 11.

Temperature in
other buildings

Temperature in
basement or
cellar

9.34.2.7. Heating facilities shall be provided which shall be capable of maintaining a temperature not less than 18°C in an unfinished basement or cellar in *buildings of residential occupancy*. Where crawl spaces are required to be heated, the heating facilities shall be capable of maintaining a temperature of not less than 15°C.

9.34.2.8. Crawl spaces beneath *mobile homes* need not be heated if the floor assembly * of the *mobile home* has been designed and insulated for the design interior temperature required by Article 9.34.2.6. and if *building services* and *foundations* are protected against frost damage.

9.34.2.9. Coverings, linings and associated adhesives, and insulation of air ducts, * *plenums* and other parts of air duct systems shall conform to Article 6.2.3.6.

9.34.2.10. 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 efficiency of the exhaust system is not adversely affected.

- * **9.34.2.11.** An enclosed *exit* stairway that serves more than one *storey* shall not be heated, ventilated or air-conditioned using an air system that serves others parts of the *building*.

SUBSECTION 9.34.3. HEATING SUPPLY DUCTS

- * **9.34.3.1.(1)** Ducts in or under slabs-on-ground shall be of metal and gauges recommended by ASHRAE or SMACNA and they shall be surrounded by concrete with a minimum thickness of 50 mm.
- * **(2)** If perimeter warm air ducts are installed in or under slabs 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 $0.04 \text{ W} \cdot \text{m}^{-1} \cdot ^\circ\text{C}^{-1}$ shall be installed between the duct and the outside edge of the *building*.
- * **9.34.3.2.** Galvanized steel or aluminum *supply ducts* shall conform to Table 9.34.3.A. Other metals shall have equivalent strength and durability. Rectangular panels in *plenums* and ducts greater than 300 mm wide shall be shaped to provide sufficient stiffness.

Table 9.34.3.A.

Forming Part of Articles 9.34.3.2. and 9.34.5.1.

MINIMUM METAL THICKNESS OF DUCTS, mm			
Shape and Location of Duct	Size of Duct, mm	Galvanized Steel	Aluminum
All round ducts 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 <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

9.34.3.3. Where the installation of heating *supply ducts* in walls, floors and *partitions* creates a space between the duct and construction material, the space shall be sealed with *noncombustible* material at each end.

- * **9.34.3.4.** Vertical *supply ducts* located in closets or rooms shall be covered with *noncombustible* insulation.

Vertical ducts in closets or rooms

9.34.3.5. Ducts shall be securely supported by metal hangers, straps, lugs or brackets, except that where zero clearance is permitted as described in Articles 9.34.3.7. and 9.34.3.8., wooden brackets may be used.

Duct supports

- * **9.34.3.6.(1)** The clearance of *furnace plenums* from *combustible* material shall conform to the appropriate requirements of

Minimum clearance of furnace plenums

- The Fire Prevention Act and regulations made pursuant to that Act,
- The Gas Protection Act and regulations made pursuant to that Act, and
- Part 6.

9.34.3.7. *Supply ducts* from warm-air *furnaces* having a required *plenum* clearance of 75 mm or less shall maintain this clearance from *combustible* material where the duct leaves the main *plenum*. This may be gradually reduced to 12 mm clearance at a distance of not less than 450 mm from the *furnace plenum*, and to zero beyond a bend or offset in the duct sufficiently large to shield the remainder of the duct from direct

Clearance of supply ducts

radiation from the *furnace* heat exchanger. (See Appendix A for Article 6.2.3.8.) *

9.34.3.8. *Supply ducts* from warm-air *furnaces* having a required *furnace plenum* clearance of over 75 mm but not more than 150 mm shall maintain this clearance from *combustible* material at the main *furnace plenum* and for a horizontal distance of 1.8 m from the *furnace plenum*. This may be reduced to 12 mm clearance beyond this point and to zero clearance 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 for Article 6.2.3.8.) *

9.34.3.9. *Supply ducts* from warm-air *furnaces* having a required *plenum* clearance of more than 150 mm shall have a clearance from *combustible* material equal to that specified for the *furnace plenum*. This clearance shall be maintained for a horizontal distance of not less than 1 m from the *furnace plenum*. This may be reduced to 150 mm clearance beyond this point and to 25 mm clearance at a horizontal distance of 1.8 m from the *furnace plenum*. This may be further reduced to 8 mm clearance 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 for Article 6.2.3.8.) *

Clearance for
boots and
register boxes

9.34.3.10. Clearances for boots and register boxes shall be as described for *supply ducts* when the boot or box is not separated from *combustible* material, except that no clearance is required when not less than 6 mm of cellular-asbestos insulation is provided.

Register over
pipeless
furnace

9.34.3.11. 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 Articles 9.34.3.7. to 9.34.3.9.

Pipe joints

9.34.3.12. All round pipe joints shall be lapped not less than 25 mm and shall have a snug fit without undue crimping or distortion. Such joints need not be screw fastened or taped.

Rectangular
duct
connections

9.34.3.13. Rectangular duct connections shall be made with S and drive cleats, or equivalent mechanical connection. Such connections need not be taped if reasonably airtight.

Trunk ducts

9.34.3.14. Trunk ducts shall be securely supported by metal hangers, straps, lugs or brackets. The ducts shall not be nailed directly to wood members. Branch pipes shall be supported at suitable spacing to maintain alignment and prevent sagging.

SUBSECTION 9.34.4. SUPPLY OUTLETS FOR WARM-AIR DUCTS

Supply outlet
required

9.34.4.1. A warm-air supply outlet shall be provided in each finished room in a *dwelling unit*. When rooms are located adjacent to exterior walls, such outlets shall be located so as to bathe at least 1 exterior wall with warm air, except in bathrooms, utility rooms or kitchens where this may not be practical.

Supply outlet
in basement

9.34.4.2. A warm-air supply outlet per 40 m² shall be provided in unfinished basements serving *dwelling units*, located so as to provide adequate distribution of warm air.

Supply outlet
in crawl space

9.34.4.3.(1) Air *supply ducts* shall be complete from the *furnace* to the room supply outlet. *

(2) A crawl space shall not be used as a supply air *plenum*. *

Furnace
capacity

9.34.4.4. 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. In basements and heated crawl spaces, the calculated heat gain from the *supply ducts* and *plenum* surfaces may be considered in the calculations.

Registers in
garages

9.34.4.5. Registers for warm-air supply outlets in garages shall be located not less than 1.2 m above the floor, and be fitted with an automatic damper to prevent garage vapours entering the heating system.

- 9.34.4.6.** The temperature of supply air at the warm-air supply outlets shall not exceed 70°C. Temperature of supply air
- 9.34.4.7.** Warm-air supply systems for residential *buildings* built on concrete slabs-on-grade shall be installed in the slab. Such systems shall be of the perimeter loop type or radial perimeter type. Slab installation of supply systems

SUBSECTION 9.34.5. REGISTERS, DIFFUSERS, GRILLES AND FITTINGS FOR WARM-AIR HEATING

- 9.34.5.1.** The design of fittings for ducts shall conform to CSA B228.1-1968, "Pipes, Ducts, and Fittings for Residential Type Air Conditioning Systems," except that metal thickness requirements shall conform to those in Table 9.34.3.A. Design of fittings for ducts
- 9.34.5.2.** Warm-air supply outlets located in finished areas or on the *furnace plenum* or extended *plenum* shall be provided with a diffuser and adjustable opening. Diffusers for supply outlets
- 9.34.5.3.** All branch *supply ducts* which are not fitted with diffusers with an adjustable balance stop shall be supplied with an adjustable damper, and fitted with a device to indicate the position of the damper. Adjustable damper
- 9.34.5.4.** Return-air inlets in finished areas shall be supplied with grilles. Grilles

SUBSECTION 9.34.6. RETURN-AIR SYSTEMS

- 9.34.6.1.** The return-air system shall be designed to handle the entire air supply. Return air system
- 9.34.6.2.** Where any part of a return-air duct will be exposed to radiation from the furnace heat exchanger or other heat radiating part within the furnace, parts of *return ducts* directly above or within 600 mm of the outside *furnace* casing shall be *noncombustible*. *Return ducts* in other locations shall be constructed of material having a surface *flame-spread rating* of not more than 150. Fire resistance of return ducts
- 9.34.6.3.** *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. Lining of return ducts
- 9.34.6.4.** 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. Spaces used as return ducts
- 9.34.6.5.** A vertical *return duct* shall have openings to return air on not more than 1 floor. Vertical return ducts
- 9.34.6.6.** A *public corridor* or public stairway shall not be used as a return-air *plenum*. Return air plenum
- 9.34.6.7.** 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*. Negative pressure
- 9.34.6.8.** Return-air inlets shall not be located in a garage or an enclosed furnace room or in a crawl space where the *furnace* is installed in the crawl space. Return air inlets
- 9.34.6.9.** Where warm air is exhausted into a garage, special provision shall be made for make-up air from the outside to compensate for this air. Warm air exhaust
- 9.34.6.10.** Return air from a *dwelling unit* shall not be recirculated to any other *dwelling unit*. Recirculation of return air
- 9.34.6.11.** At least 1 return-air inlet shall be provided per *dwelling unit*. Each return shall serve an area having a design heat loss of not more than 18 kW. Return air inlets required
- 9.34.6.12.** Provision shall be made for the return of air from all rooms by leaving a gap beneath doors, using louvred doors or installing a *return duct* inlet. Provisions for the return of air

Ceiling
assembly used
as plenum

9.34.6.13. Except for return-air *plenums* located within a *dwelling unit*, where a ceiling assembly is used as a *plenum*, the requirements of Part 6 shall apply for such systems.

SUBSECTION 9.34.7. STEAM AND HOT WATER HEATING SYSTEMS

Steam and hot
water heating
system

9.34.7.1. Every steam and hot water pipe shall be constructed of *noncombustible* material having adequate strength and durability.

Insulation of
pipes

9.34.7.2. Insulation or other covering for steam or hot water pipes shall be *noncombustible*, except that *combustible* insulation may be used provided such insulation conforms to the requirements in Part 6 for *combustible* pipe insulation.

Clearance for
steam and hot
water pipes

9.34.7.3. Clearance between steam or hot water pipes and *combustible* construction shall be at least 15 mm for steam or water temperatures greater than 90°C, but not more * than 120°C, and at least 25 mm for temperatures over 120°C.

Fire stopping
of pipe spaces

9.34.7.4. The space around pipes passing through a wall or floor construction shall be *fire stopped* with *noncombustible* material.

Fire-resistance
rating of pipe
shafts

9.34.7.5. When pipes are run in a vertical shaft, the *fire-resistance rating* of the shaft shall conform to the requirements contained in Subsection 9.10.12. Such shafts shall have a *noncombustible* lining where the pipes are not insulated.

Design for
expansion and
contraction

9.34.7.6. Steam and hot water pipes shall be designed to allow for expansion and contraction with changes in temperature.

SUBSECTION 9.34.8. RADIATORS, CONVECTORS AND HEAT EXCHANGERS

Heat
exchangers

9.34.8.1. Every heat exchanger or *unit heater* using hot water or low pressure steam shall be installed with sufficient clearance to ensure that the temperature of any *combustible* material will not exceed its safe limit.

Protection
from
hot water and
steam
appliances

9.34.8.2. Every steam or hot water radiator or convector attached to a wall or located in a recess or concealed space containing *combustible* material shall be provided with a *noncombustible* backing.

SUBSECTION 9.34.9. STOVES, RANGES AND SPACE HEATERS BURNING SOLID FUEL

Clearances

9.34.9.1. *Stoves, ranges* and *space heaters* using solid fuel shall be installed in a room or space sufficiently large to permit accessibility to the *appliance*.

9.34.9.2. The minimum clearance between *stoves, ranges* or *space heaters* using solid fuel and *combustible* material, whether or not such material is covered with *noncombustible* material such as plaster, shall conform to Table 9.34.9.A., except that where protection is provided as described in Table 6.2.6.B. of Part 6, the clearance may be reduced in conformance to that Table.

Mounting

9.34.9.3. Except as provided in Article 9.34.9.5., a solid-fuel-fired *stove, range* or *space heater* supported on a *combustible* floor shall be mounted on legs that provide a clear space of at least 100 mm in height, and shall be of a type in which flame or hot gases do not come in contact with its base.

9.34.9.4. A floor surface of *combustible* material beneath a solid-fuel-fired *stove, range* or *space heater* shall be protected by a layer of sheet metal of at least 0.56 mm in thickness over a layer of *acceptable* resilient *noncombustible* insulation for a distance of * at least 450 mm beyond the *appliance* on the firing side and the side where ashes are removed, and extending at least 150 mm beyond the *appliance* on the other sides.

9.34.9.5. Solid-fuel-fired *appliances* other than those described in Article 9.34.9.3. shall be mounted in conformance with Part 6.

Table 9.34.9.A.
Forming Part of Article 9.34.9.2.

MINIMUM CLEARANCES TO COMBUSTIBLE MATERIAL FOR STOVES, RANGES AND SPACE HEATERS USING SOLID FUEL				
Appliances	Minimum Clearance, mm			
	Top	Sides	Rear	Front
<i>Stoves and ranges</i> without refractory lining	750	—	900	1 200
	—	900	—	—
	—	450	—	—
<i>Stoves and ranges</i> with refractory lining	750	—	600	1 200
	—	600	—	—
	—	450	—	—
<i>Space heaters</i> with an air space between the outside of the fire chamber and the external casing to allow air circulation	900	300	300	1 200
<i>Space heaters</i> other than above	900	900	900	1 200
Column 1	2	3	4	5

SUBSECTION 9.34.10. FIRE PROTECTION FOR GAS AND ELECTRIC RANGES

9.34.10.1. Except as provided in Article 9.34.10.2., a vertical clearance of at least 750 mm shall be provided above the elements or burners of electric- and gas-fired domestic ranges.

9.34.10.2. Where cabinets located above the elements or burners referred to in Article 9.34.10.1. are *noncombustible* or are protected with asbestos millboard at least 6 mm thick covered with sheet metal not less than 0.33 mm, or a metal hood with a 125 mm projection beyond the upper cabinets, the vertical clearance may be reduced to 600 mm.

9.34.10.3. *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 at least equivalent to 9.5 mm thickness of gypsum board.

SECTION 9.35 ELECTRICAL FACILITIES

SUBSECTION 9.35.1. GENERAL

- * **9.35.1.1.** Electrical installations shall conform to The Electrical Protection Act and regulations made pursuant to that Act.

Electrical
installation
requirements

9.35.1.2. Unless otherwise *accepted*, electrical facilities shall be provided for every *building* and every *dwelling unit* and public shared space in *buildings* containing *dwelling units*.

Electrical
services
required

9.35.1.3. 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.

Protection of
electrical
equipment

9.35.1.4. Recessed lighting fixtures shall not be located in insulated ceilings unless the fixtures are *accepted* for such installation.

SUBSECTION 9.35.2. LIGHTING OUTLETS

Exterior lighting

9.35.2.1. 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*.

Requirements for lighting outlets

9.35.2.2. Except as provided in Article 9.35.2.3., 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*.

9.35.2.3. Where a receptacle controlled by a wall switch is provided in bedrooms or living rooms, such rooms need not conform to the requirements in Article 9.35.2.2.

Lights in stairways

9.35.2.4. Every stairway shall be lighted. Except as provided in Article 9.35.2.5., 3-way wall switches located at the head and foot of every stairway shall be provided to control at least 1 lighting outlet with fixture for stairways with 4 or more risers in *dwelling units*.

Switch at head of stairs

9.35.2.5. The stairway lighting for basements or cellars that do not contain finished space nor lead to an outside entrance or built-in garage and which serve not more than 1 *dwelling unit* may be controlled by a single switch located at the head of the stairs.

Table 9.35.2.A.
Forming Part of Article 9.35.2.9.

MINIMUM LIGHTING FOR PUBLIC AREAS		
Room or Space	lx	W/m ² of floor area (Incandescent Lighting)
Storage rooms	50	5
<i>Service rooms</i> and laundry areas	200	20
Garages	50	5
Public water-closet rooms	100	10
<i>Public corridors</i> and stairways	50	—
Service hallways and stairways	50	—
Recreation rooms	100	10
Column 1	2	3

9.35.2.6. A lighting outlet with fixture shall be provided for each 30 m² or fraction thereof of floor area in unfinished basements or cellars. The outlet nearest the stairs shall be controlled by a wall switch located at the head of the stairs.

Storage room

9.35.2.7. A lighting outlet with fixture shall be provided in storage rooms.

Lighting of garages and carports

9.35.2.8. A lighting outlet with fixture shall be provided for an attached, built-in or detached garage or carport. Such outlet 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. Where a carport is lighted by a light at the entrance to a *dwelling unit*, additional carport lighting is not required.

Lighting in public areas

9.35.2.9. 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. When provided by incandescent lighting, illumination shall conform to Table 9.35.2.A. When other type of lighting is used, illumination equivalent to that shown in Table 9.35.2.A. shall be provided.

SUBSECTION 9.35.3. RECEPTACLES

- * **9.35.3.1.** Receptacles shall be installed in accordance with The Electrical Protection Act and regulations made pursuant to that Act. General requirements for receptacles
- * **9.35.3.2.** *Public corridors* and public stairs shall have at least 1 duplex receptacle for each 10 m length or fraction thereof. Receptacles in public hallways

SUBSECTION 9.35.4. EMERGENCY LIGHTING

- 9.35.4.1.** Emergency lighting shall conform to Subsection 9.9.11. Emergency lighting

SECTION 9.36 GARAGES AND CARPORTS**SUBSECTION 9.36.1. SCOPE**

- 9.36.1.1.** This Section applies to garages and carports serving not more than 1 *dwelling unit*. Garages and carports
- 9.36.1.2.** The construction of a garage or carport shall conform to the requirements for other *buildings* in this Part except as provided in this Section.

SUBSECTION 9.36.2. GENERAL

- 9.36.2.1.** 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. Roofed enclosures used as parking for cars

SUBSECTION 9.36.3. FOUNDATIONS

- 9.36.3.1.** Except as permitted in this Subsection, foundations conforming to Sections 9.12 and 9.15 shall be provided for the support of carport and garage superstructures, including that portion beneath garage doors. Foundations for carports and garages
- 9.36.3.2.** In clay-type soils subject to significant movement with a change in soil moisture content, the foundation depth of carports or garages connected to a *dwelling unit* by a breezeway shall be approximately the same depth as the main *building* foundation. 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. Except as provided in Section 9.12, foundations for attached unheated garages or carports shall be below frost level. Foundation in clay soils
- 9.36.3.3.** 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. Wood supports for detached garages
- 9.36.3.4.** Piers for the support of carport columns shall extend not less than 150 mm above ground level. Such piers 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. Piers used as supports

SUBSECTION 9.36.4. FLOORS

- 9.36.4.1.** Garage floors shall conform to Article 9.10.2.9. Garage floors

SUBSECTION 9.36.5. WALLS AND COLUMNS

- 9.36.5.1.** Interior finish need not be applied to garage and carport walls. Walls and columns in garages

- Wood columns **9.36.5.2.** Columns for garages and carports shall conform to Section 9.17, except that 89 mm by 89 mm wood columns may be used.
- Anchoring garages and carports to foundations **9.36.5.3.** 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 9.37 LOG CONSTRUCTION

SUBSECTION 9.37.1. GENERAL

9.37.1.1. Logs which are sound and free of fractures may be used for *foundations*, * 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.

9.37.1.2. 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.

9.37.1.3. All exterior joints between logs shall be made watertight. *

9.37.1.4. Logs shall be seasoned to a moisture content not exceeding 19% before * installation.

SUBSECTION 9.37.2. WALLS

9.37.2.1. 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.

9.37.2.2. 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.

9.37.2.3. Each log in a wall built of vertical logs shall be scribed to fit as closely as * possible to the adjacent logs.

9.37.2.4. 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.

SECTION 9.38 MEDICAL GAS PIPING SYSTEMS

SUBSECTION 9.38.1. GENERAL

9.38.1.1. Non-flammable medical gas piping systems in *buildings* regulated by Part 9 * shall meet the requirements of Subsection 3.6.5.

Table A-1
Forming Part of Article 9.23.4.1.

CEILING JOISTS — ATTIC NOT ACCESSIBLE BY A STAIRWAY (LIVE LOAD 0.5 kN/m²)								
Commercial Designation	Grade	Nominal Size, <i>mm</i>	LIVE LOAD 0.5 kN/m ²					
			Gypsum Board or Plastered Ceiling			Other Ceilings		
			Joist Spacing			Joist Spacing		
			300 mm	400 mm	600 mm	300 mm	400 mm	600 mm
			<i>m</i>	<i>m</i>	<i>m</i>	<i>m</i>	<i>m</i>	<i>m</i>
Douglas Fir-Larch (includes Douglas Fir and Western Larch)	Select structural	38 x 89	3.40	3.09	2.69	3.89	3.53	3.09
		38 x 140	5.34	4.85	4.24	6.11	5.55	4.85
		38 x 184	7.04	6.40	5.59	8.06	7.32	6.40
		38 x 235	8.98	8.16	7.13	10.28	9.34	8.16
		38 x 286	10.93	9.93	8.67	12.51	11.36	9.93
	No. 1	38 x 89	3.40	3.09	2.69	3.89	3.53	3.09
		38 x 140	5.34	4.85	4.24	6.11	5.55	4.85
		38 x 184	7.04	6.40	5.59	8.06	7.32	6.40
		38 x 235	8.98	8.16	7.13	10.28	9.34	8.16
		38 x 286	10.93	9.93	8.67	12.51	11.36	9.93
	No. 2	38 x 89	3.28	2.98	2.60	3.76	3.41	2.98
		38 x 140	5.16	4.69	4.10	5.91	5.37	4.49
		38 x 184	6.81	6.18	5.40	7.79	7.08	5.92
		38 x 235	8.68	7.89	6.89	9.94	9.03	7.56
		38 x 286	10.56	9.60	8.38	12.09	10.99	9.19
	No. 3	38 x 89	3.15	2.82	2.31	3.26	2.82	2.31
		38 x 140	4.81	4.16	3.40	4.81	4.16	3.40
		38 x 184	6.34	5.49	4.48	6.34	5.49	4.48
		38 x 235	8.09	7.01	5.72	8.09	7.01	5.72
		38 x 286	9.84	8.52	6.96	9.84	8.52	6.96
	Construction	38 x 89	3.15	2.86	2.50	3.61	3.23	2.64
	Standard	38 x 89	2.81	2.43	1.98	2.81	2.43	1.98
	Utility	38 x 89	1.91	1.66	1.35	1.91	1.66	1.35
Hem-Fir (includes Western Hemlock and Amabilis Fir)	Select structural	38 x 89	3.27	2.97	2.60	3.75	3.40	2.97
		38 x 140	5.15	4.67	4.08	5.89	5.35	4.64
		38 x 184	6.78	6.16	5.38	7.77	7.06	6.12
		38 x 235	8.66	7.87	6.87	9.91	9.00	7.81
		38 x 286	10.53	9.57	8.36	12.06	10.95	9.50
	No. 1	38 x 89	3.27	2.97	2.60	3.75	3.40	2.95
		38 x 140	5.15	4.67	4.08	5.89	5.28	4.31
		38 x 184	6.78	6.16	5.38	7.77	6.96	5.68
		38 x 235	8.66	7.87	6.87	9.91	8.89	7.25
		38 x 286	10.53	9.57	8.36	12.06	10.81	8.82
	No. 2	38 x 89	3.16	2.87	2.51	3.62	3.28	2.67
		38 x 140	4.97	4.51	3.87	5.47	4.74	3.87
		38 x 184	6.55	5.95	5.10	7.21	6.25	5.10
		38 x 235	8.36	7.60	6.51	9.21	7.97	6.51
		38 x 286	10.17	9.24	7.92	11.20	9.70	7.92
	No. 3	38 x 89	2.81	2.43	1.98	2.81	2.43	1.98
		38 x 140	4.15	3.59	2.93	4.15	3.59	2.93
		38 x 184	5.47	4.74	3.87	5.47	4.74	3.87
		38 x 235	6.98	6.05	4.94	6.98	6.05	4.94
		38 x 286	8.49	7.36	6.01	8.49	7.36	6.01
	Construction	38 x 89	3.04	2.76	2.29	3.23	2.80	2.29
	Standard	38 x 89	2.42	2.10	1.71	2.42	2.10	1.71
	Utility	38 x 89	1.66	1.43	1.17	1.66	1.43	1.17

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Table A-1 (Cont'd)

CEILING JOISTS — ATTIC NOT ACCESSIBLE BY A STAIRWAY (LIVE LOAD 0.5 kN/m ²)								
Commercial Designation	Grade	Nominal Size, mm	LIVE LOAD 0.5 kN/m ²					
			Gypsum Board or Plastered Ceiling			Other Ceilings		
			Joist Spacing			Joist Spacing		
			300 mm	400 mm	600 mm	300 mm	400 mm	600 mm
			m	m	m	m	m	m
Eastern Hemlock-Tamarack (includes Eastern Hemlock and Tamarack)	Select structural	38 x 89	3.12	2.83	2.47	3.57	3.24	2.83
		38 x 140	4.90	4.45	3.89	5.61	5.10	4.45
		38 x 184	6.46	5.87	5.13	7.40	6.72	5.87
		38 x 235	8.25	7.49	6.55	9.44	8.58	7.49
		38 x 286	10.03	9.12	7.96	11.49	10.43	9.12
	No. 1	38 x 89	3.12	2.83	2.47	3.57	3.24	2.83
		38 x 140	4.90	4.45	3.89	5.61	5.10	4.45
		38 x 184	6.46	5.87	5.13	7.40	6.72	5.87
		38 x 235	8.25	7.49	6.55	9.44	8.58	7.49
		38 x 286	10.03	9.12	7.96	11.49	10.43	9.12
	No. 2	38 x 89	3.01	2.73	2.38	3.44	3.13	2.73
		38 x 140	4.73	4.29	3.75	5.41	4.92	4.29
		38 x 184	6.23	5.66	4.94	7.13	6.48	5.66
		38 x 235	7.95	7.22	6.31	9.10	8.27	7.22
		38 x 286	9.67	8.79	7.68	11.07	10.06	8.79
	No. 3	38 x 89	2.90	2.63	2.22	3.15	2.72	2.22
		38 x 140	4.55	4.00	3.26	4.62	4.00	3.26
		38 x 184	6.01	5.27	4.30	6.09	5.27	4.30
		38 x 235	7.66	6.73	5.49	7.77	6.73	5.49
		38 x 286	9.32	8.18	6.68	9.45	8.18	6.68
	Construction	38 x 89	2.90	2.63	2.30	3.32	3.01	2.55
	Standard	38 x 89	2.67	2.31	1.89	2.67	2.31	1.89
	Utility	38 x 89	1.86	1.61	1.32	1.86	1.61	1.32
Coast Species (includes Douglas Fir, Western Larch, Western Hemlock, Amabilis Fir, and Coast Sitka Spruce)	Select structural	38 x 89	3.27	2.97	2.60	3.75	3.40	2.97
		38 x 140	5.15	4.67	4.08	5.89	5.35	4.59
		38 x 184	6.78	6.16	5.38	7.77	7.06	6.05
		38 x 235	8.66	7.87	6.87	9.91	9.00	7.73
		38 x 286	10.53	9.57	8.36	12.06	10.95	9.40
	No. 1	38 x 89	3.27	2.97	2.60	3.75	3.40	2.92
		38 x 140	5.15	4.67	4.08	5.89	5.22	4.26
		38 x 184	6.78	6.16	5.38	7.77	6.88	5.61
		38 x 235	8.66	7.87	6.87	9.91	8.78	7.17
		38 x 286	10.53	9.57	8.36	12.06	10.68	8.72
	No. 2	38 x 89	3.16	2.87	2.51	3.62	3.23	2.64
		38 x 140	4.97	4.51	3.81	5.39	4.67	3.81
		38 x 184	6.55	5.95	5.02	7.10	6.15	5.02
		38 x 235	8.36	7.60	6.41	9.06	7.85	6.41
		38 x 286	10.17	9.24	7.79	11.03	9.55	7.79
	No. 3	38 x 89	2.78	2.40	1.96	2.78	2.40	1.96
		38 x 140	4.10	3.55	2.89	4.10	3.55	2.89
		38 x 184	5.40	4.68	3.82	5.40	4.68	3.82
		38 x 235	6.89	5.97	4.87	6.89	5.97	4.87
		38 x 286	8.38	7.26	5.93	8.38	7.26	5.93
	Construction	38 x 89	3.04	2.75	2.24	3.18	2.75	2.24
	Standard	38 x 89	2.38	2.06	1.68	2.38	2.06	1.68
	Utility	38 x 89	1.66	1.43	1.17	1.66	1.43	1.17

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Table A-1 (Cont'd)

CEILING JOISTS — ATTIC NOT ACCESSIBLE BY A STAIRWAY (LIVE LOAD 0.5 kN/m ²)								
Commercial Designation	Grade	Nominal Size, mm	LIVE LOAD 0.5 kN/m ²					
			Gypsum Board or Plastered Ceiling			Other Ceilings		
			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 x 89	3.09	2.80	2.45	3.53	3.21	2.80
		38 x 140	4.85	4.41	3.85	5.55	5.05	4.41
		38 x 184	6.40	5.81	5.08	7.32	6.65	5.81
		38 x 235	8.16	7.41	6.48	9.34	8.49	7.41
		38 x 286	9.93	9.02	7.88	11.36	10.33	9.02
	No. 1	38 x 89	3.09	2.80	2.45	3.53	3.21	2.80
		38 x 140	4.85	4.41	3.85	5.55	5.05	4.41
		38 x 184	6.40	5.81	5.08	7.32	6.65	5.51
		38 x 235	8.16	7.41	6.48	9.34	8.49	7.03
		38 x 286	9.93	9.02	7.88	11.36	10.33	8.55
	No. 2	38 x 89	2.98	2.71	2.37	3.41	3.10	2.59
		38 x 140	4.69	4.26	3.72	5.30	4.59	3.75
		38 x 184	6.18	5.62	4.91	6.99	6.05	4.94
		38 x 235	7.89	7.17	6.26	8.92	7.73	6.31
		38 x 286	9.60	8.72	7.62	10.85	9.40	7.67
	No. 3	38 x 89	2.74	2.37	1.94	2.74	2.37	1.94
		38 x 140	4.04	3.50	2.85	4.04	3.50	2.85
		38 x 184	5.33	4.61	3.76	5.33	4.61	3.76
		38 x 235	6.80	5.89	4.80	6.80	5.89	4.80
		38 x 286	8.27	7.16	5.84	8.27	7.16	5.84
	Construction	38 x 89	2.87	2.61	2.20	3.12	2.70	2.20
	Standard	38 x 89	2.34	2.03	1.66	2.34	2.03	1.66
	Utility	38 x 89	1.60	1.39	1.13	1.60	1.39	1.13
Western Cedars (includes Western Red Cedar and Pacific Coast Yellow Cedar)	Select structural	38 x 89	2.97	2.70	2.36	3.40	3.09	2.70
		38 x 140	4.67	4.24	3.71	5.35	4.86	4.24
		38 x 184	6.16	5.59	4.89	7.05	6.40	5.59
		38 x 235	7.86	7.14	6.24	9.00	8.17	7.14
		38 x 286	9.56	8.68	7.58	10.94	9.94	8.68
	No. 1	38 x 89	2.97	2.70	2.36	3.40	3.09	2.70
		38 x 140	4.67	4.24	3.71	5.35	4.86	4.23
		38 x 184	6.16	5.59	4.89	7.05	6.40	5.58
		38 x 235	7.86	7.14	6.24	9.00	8.17	7.12
		38 x 286	9.56	8.68	7.58	10.94	9.94	8.66
	No. 2	38 x 89	2.87	2.61	2.28	3.29	2.99	2.61
		38 x 140	4.51	4.10	3.58	5.17	4.63	3.73
		38 x 184	5.95	5.41	4.72	6.82	6.10	4.98
		38 x 235	7.60	6.90	6.03	8.70	7.79	6.36
		38 x 286	9.24	8.39	7.33	10.58	9.47	7.73
	No. 3	38 x 89	2.74	2.37	1.94	2.74	2.37	1.94
		38 x 140	4.04	3.50	2.85	4.04	3.50	2.85
		38 x 184	5.33	4.61	3.76	5.33	4.61	3.76
		38 x 235	6.80	5.89	4.80	6.80	5.89	4.80
		38 x 286	8.27	7.16	5.84	8.27	7.16	5.84
	Construction	38 x 89	2.77	2.51	2.19	3.15	2.72	2.22
	Standard	38 x 89	2.34	2.03	1.66	2.34	2.03	1.66
	Utility	38 x 89	1.60	1.39	1.13	1.60	1.39	1.13

Continued on next page

Table A-1 (Cont'd)

CEILING JOISTS — ATTIC NOT ACCESSIBLE BY A STAIRWAY (LIVE LOAD 0.5 kN/m ²)								
Commercial Designation	Grade	Nominal Size, <i>mm</i>	LIVE LOAD 0.5 kN/m ²					
			Gypsum Board or Plastered Ceiling			Other Ceilings		
			Joist Spacing			Joist Spacing		
			300 mm <i>m</i>	400 mm <i>m</i>	600 mm <i>m</i>	300 mm <i>m</i>	400 mm <i>m</i>	600 mm <i>m</i>
Northern Species (includes any Canadian soft-wood covered by the NLGA Standard Grading Rules)	Select structural	38 x 89	2.97	2.70	2.36	3.40	3.09	2.70
		38 x 140	4.67	4.24	3.71	5.35	4.86	4.24
		38 x 184	6.16	5.59	4.89	7.05	6.40	5.59
		38 x 235	7.86	7.14	6.24	9.00	8.17	7.14
		38 x 286	9.56	8.68	7.58	10.94	9.94	8.68
	No. 1	38 x 89	2.97	2.70	2.36	3.40	3.09	2.70
		38 x 140	4.67	4.24	3.71	5.35	4.86	4.04
		38 x 184	6.16	5.59	4.89	7.05	6.40	5.33
		38 x 235	7.86	7.14	6.24	9.00	8.17	6.80
		38 x 286	9.56	8.68	7.58	10.94	9.94	8.27
	No. 2	38 x 89	2.87	2.61	2.28	3.29	2.99	2.51
		38 x 140	4.51	4.10	3.58	5.13	4.44	3.63
		38 x 184	5.95	5.41	4.72	6.76	5.86	4.78
		38 x 235	7.60	6.90	6.03	8.63	7.47	6.10
		38 x 286	9.24	8.39	7.33	10.50	9.09	7.42
	No. 3	38 x 89	2.64	2.29	1.86	2.64	2.29	1.86
		38 x 140	3.87	3.35	2.73	3.87	3.35	2.73
		38 x 184	5.10	4.42	3.60	5.10	4.42	3.60
		38 x 235	6.51	5.64	4.60	6.51	5.64	4.60
		38 x 286	7.92	6.85	5.60	7.92	6.85	5.60
	Construction	38 x 89	2.77	2.51	2.14	3.03	2.62	2.14
	Standard	38 x 89	2.26	1.96	1.60	2.26	1.96	1.60
	Utility	38 x 89	1.54	1.33	1.09	1.54	1.33	1.09
Northern Aspen (includes Aspen Poplar, Large Tooth Aspen and Balsam Poplar)	Select structural	38 x 89	3.02	2.74	2.39	3.45	3.14	2.74
		38 x 140	4.74	4.31	3.76	5.43	4.93	4.31
		38 x 184	6.26	5.68	4.96	7.16	6.51	5.68
		38 x 235	7.98	7.25	6.33	9.14	8.30	7.25
		38 x 286	9.71	8.82	7.70	11.11	10.10	8.82
	No. 1	38 x 89	3.02	2.74	2.39	3.45	3.14	2.74
		38 x 140	4.74	4.31	3.76	5.43	4.93	4.18
		38 x 184	6.26	5.68	4.96	7.16	6.51	5.51
		38 x 235	7.98	7.25	6.33	9.14	8.30	7.03
		38 x 286	9.71	8.82	7.70	11.11	10.10	8.55
	No. 2	38 x 89	2.91	2.64	2.31	3.33	3.03	2.60
		38 x 140	4.57	4.16	3.63	5.24	4.59	3.75
		38 x 184	6.03	5.48	4.79	6.90	6.05	4.94
		38 x 235	7.70	6.99	6.11	8.81	7.73	6.31
		38 x 286	9.36	8.51	7.43	10.72	9.40	7.67
	No. 3	38 x 89	2.74	2.37	1.94	2.74	2.37	1.94
		38 x 140	4.04	3.50	2.85	4.04	3.50	2.85
		38 x 184	5.33	4.61	3.76	5.33	4.61	3.76
		38 x 235	6.80	5.89	4.80	6.80	5.89	4.80
		38 x 286	8.27	7.16	5.84	8.27	7.16	5.84
	Construction	38 x 89	2.79	2.54	2.20	3.12	2.70	2.20
	Standard	38 x 89	2.34	2.03	1.66	2.34	2.03	1.66
	Utility	38 x 89	1.60	1.39	1.13	1.60	1.39	1.13

Table A-2
Forming Part of Article 9.23.4.1.

FLOOR JOISTS — LIVING QUARTERS (LIVE LOAD 1.9 kN/m²)					
Commercial Designation	Grade	Nominal Size, <i>mm</i>	LIVE LOAD 1.9 kN/m ²		
			All Ceilings		
			Joist Spacing		
			300 mm <i>m</i>	400 mm <i>m</i>	600 mm <i>m</i>
Douglas Fir-Larch (includes Douglas Fir and Western Larch)	Select structural	38 x 89	2.17	1.98	1.72
		38 x 140	3.42	3.11	2.71
		38 x 184	4.51	4.10	3.58
		38 x 235	5.76	5.23	4.57
		38 x 286	7.00	6.36	5.56
	No. 1	38 x 89	2.17	1.98	1.72
		38 x 140	3.42	3.11	2.71
		38 x 184	4.51	4.10	3.58
		38 x 235	5.76	5.23	4.57
		38 x 286	7.00	6.36	5.56
	No. 2	38 x 89	2.10	1.91	1.67
		38 x 140	3.31	3.00	2.59
		38 x 184	4.36	3.96	3.42
		38 x 235	5.56	5.05	4.36
		38 x 286	6.77	6.15	5.31
Hem-Fir (includes Western Hemlock and Amabilis Fir)	Select structural	38 x 89	1.88	1.63	1.33
		38 x 140	2.77	2.40	1.96
		38 x 184	3.66	3.17	2.59
		38 x 235	4.67	4.04	3.30
		38 x 286	5.68	4.92	4.01
	Construction	38 x 89	2.02	1.83	1.52
	Standard	38 x 89	1.62	1.40	1.14
	Utility	38 x 89	1.10	0.95	0.78
	No. 3	38 x 89	2.10	1.90	1.66
		38 x 140	3.30	2.99	2.61
		38 x 184	4.35	3.95	3.45
		38 x 235	5.55	5.04	4.40
		38 x 286	6.75	6.13	5.35
	No. 1	38 x 89	2.10	1.90	1.66
		38 x 140	3.30	2.99	2.49
		38 x 184	4.35	3.95	3.28
		38 x 235	5.55	5.04	4.19
		38 x 286	6.75	6.13	5.09
	No. 2	38 x 89	2.02	1.84	1.54
		38 x 140	3.16	2.73	2.23
		38 x 184	4.16	3.60	2.94
		38 x 235	5.31	4.60	3.76
		38 x 286	6.46	5.60	4.57
	No. 3	38 x 89	1.62	1.40	1.14
		38 x 140	2.39	2.07	1.69
		38 x 184	3.16	2.73	2.23
		38 x 235	4.03	3.49	2.85
		38 x 286	4.90	4.24	3.46
	Construction	38 x 89	1.86	1.61	1.32
	Standard	38 x 89	1.40	1.21	0.99
	Utility	38 x 89	0.95	0.83	0.67

Continued on next page

Table A-2 (Cont'd)

FLOOR JOISTS — LIVING QUARTERS (LIVE LOAD 1.9 kN/m ²)					
Commercial Designation	Grade	Nominal Size, <i>mm</i>	LIVE LOAD 1.9 kN/m ²		
			All Ceilings		
			Joist Spacing		
			300 mm <i>m</i>	400 mm <i>m</i>	600 mm <i>m</i>
Eastern Hemlock-Tamarack (includes Eastern Hemlock and Tamarack)	Select structural	38 x 89	2.00	1.81	1.58
		38 x 140	3.14	2.85	2.49
		38 x 184	4.14	3.76	3.29
		38 x 235	5.28	4.80	4.19
		38 x 286	6.43	5.84	5.10
	No. 1	38 x 89	2.00	1.81	1.58
		38 x 140	3.14	2.85	2.49
		38 x 184	4.14	3.76	3.29
		38 x 235	5.28	4.80	4.19
		38 x 286	6.43	5.84	5.10
	No. 2	38 x 89	1.92	1.75	1.53
		38 x 140	3.03	2.75	2.40
		38 x 184	3.99	3.63	3.17
		38 x 235	5.09	4.63	4.04
		38 x 286	6.20	5.63	4.92
	No. 3	38 x 89	1.81	1.57	1.28
		38 x 140	2.66	2.31	1.88
		38 x 184	3.51	3.04	2.48
		38 x 235	4.48	3.88	3.17
		38 x 286	5.45	4.72	3.85
	Construction	38 x 89	1.85	1.68	1.47
	Standard	38 x 89	1.54	1.33	1.09
	Utility	38 x 89	1.07	0.93	0.76
Coast Species (includes Douglas Fir, Western Larch, Western Hemlock, Amabilis Fir and Coast Sitka Spruce)	Select structural	38 x 89	2.10	1.90	1.66
		38 x 140	3.30	2.99	2.61
		38 x 184	4.35	3.95	3.45
		38 x 235	5.55	5.04	4.40
		38 x 286	6.75	6.13	5.35
	No. 1	38 x 89	2.10	1.90	1.66
		38 x 140	3.30	2.99	2.46
		38 x 184	4.35	3.95	3.24
		38 x 235	5.55	5.04	4.13
		38 x 286	6.75	6.13	5.03
	No. 2	38 x 89	2.02	1.84	1.52
		38 x 140	3.11	2.69	2.20
		38 x 184	4.10	3.55	2.90
		38 x 235	5.23	4.53	3.70
		38 x 286	6.36	5.51	4.50
	No. 3	38 x 89	1.60	1.39	1.13
		38 x 140	2.36	2.05	1.67
		38 x 184	3.12	2.70	2.20
		38 x 235	3.98	3.44	2.81
		38 x 286	4.84	4.19	3.42
	Construction	38 x 89	1.83	1.59	1.29
	Standard	38 x 89	1.37	1.19	0.97
	Utility	38 x 89	0.95	0.83	0.67

Continued on next page

Table A-2 (Cont'd)

FLOOR JOISTS — LIVING QUARTERS (LIVE LOAD 1.9 kN/m ²)					
Commercial Designation	Grade	Nominal Size, <i>mm</i>	LIVE LOAD 1.9 kN/m ²		
			All Ceilings		
			Joist Spacing		
			300 mm <i>m</i>	400 mm <i>m</i>	600 mm <i>m</i>
Spruce-Pine-Fir (includes Spruce (all species except Coast Sitka Spruce), Jack Pine, Lodgepole Pine, Balsam Fir and Alpine Fir)	Select structural	38 x 89	1.98	1.79	1.57
		38 x 140	3.11	2.82	2.46
		38 x 184	4.10	3.72	3.25
		38 x 235	5.23	4.75	4.15
		38 x 286	6.36	5.78	5.05
	No. 1	38 x 89	1.98	1.79	1.57
		38 x 140	3.11	2.82	2.41
		38 x 184	4.10	3.72	3.18
		38 x 235	5.23	4.75	4.06
		38 x 286	6.36	5.78	4.93
	No. 2	38 x 89	1.91	1.73	1.49
		38 x 140	3.00	2.65	2.16
		38 x 184	3.96	3.49	2.85
		38 x 235	5.05	4.46	3.64
		38 x 286	6.15	5.42	4.43
	No. 3	38 x 89	1.58	1.37	1.12
		38 x 140	2.33	2.02	1.65
		38 x 184	3.07	2.66	2.17
		38 x 235	3.92	3.40	2.77
		38 x 286	4.77	4.13	3.37
	Construction	38 x 89	1.80	1.56	1.27
	Standard	38 x 89	1.35	1.17	0.95
	Utility	38 x 89	0.92	0.80	0.65
Western Cedars (includes Western Red Cedar and Pacific Coast Yellow Cedar)	Select structural	38 x 89	1.90	1.73	1.51
		38 x 140	2.99	2.72	2.37
		38 x 184	3.94	3.58	3.13
		38 x 235	5.03	4.57	3.99
		38 x 286	6.12	5.56	4.86
	No. 1	38 x 89	1.90	1.73	1.51
		38 x 140	2.99	2.72	2.37
		38 x 184	3.94	3.58	3.13
		38 x 235	5.03	4.57	3.99
		38 x 286	6.12	5.56	4.86
	No. 2	38 x 89	1.84	1.67	1.46
		38 x 140	2.89	2.63	2.18
		38 x 184	3.81	3.46	2.87
		38 x 235	4.87	4.42	3.67
		38 x 286	5.92	5.38	4.46
	No. 3	38 x 89	1.58	1.37	1.12
		38 x 140	2.33	2.02	1.65
		38 x 184	3.07	2.66	2.17
		38 x 235	3.92	3.40	2.77
		38 x 286	4.77	4.13	3.37
	Construction	38 x 89	1.77	1.57	1.28
	Standard	38 x 89	1.35	1.17	0.95
	Utility	38 x 89	0.92	0.80	0.65

Continued on next page

Table A-2 (Cont'd)

FLOOR JOISTS — LIVING QUARTERS (LIVE LOAD 1.9 kN/m ²)					
Commercial Designation	Grade	Nominal Size, mm	LIVE LOAD 1.9 kN/m ²		
			All Ceilings		
			Joist Spacing		
			300 mm m	400 mm m	600 mm m
Northern Species (includes any Canadian soft- wood covered by the NLGA Standard Grading Rules)	Select structural	38 x 89	1.90	1.73	1.51
		38 x 140	2.99	2.72	2.37
		38 x 184	3.94	3.58	3.13
		38 x 235	5.03	4.57	3.99
		38 x 286	6.12	5.56	4.86
	No. 1	38 x 89	1.90	1.73	1.51
		38 x 140	2.99	2.72	2.33
		38 x 184	3.94	3.58	3.07
		38 x 235	5.03	4.57	3.92
		38 x 286	6.12	5.56	4.77
	No. 2	38 x 89	1.84	1.67	1.45
		38 x 140	2.89	2.56	2.09
		38 x 184	3.81	3.38	2.76
		38 x 235	4.87	4.31	3.52
		38 x 286	5.92	5.25	4.28
Northern Aspen (includes Aspen Poplar, Large Tooth Aspen and Balsam Poplar)	Select structural	38 x 89	1.93	1.75	1.53
		38 x 140	3.04	2.76	2.41
		38 x 184	4.01	3.64	3.18
		38 x 235	5.11	4.65	4.06
		38 x 286	6.22	5.65	4.94
	No. 1	38 x 89	1.93	1.75	1.53
		38 x 140	3.04	2.76	2.41
		38 x 184	4.01	3.64	3.18
		38 x 235	5.11	4.65	4.06
		38 x 286	6.22	5.65	4.93
	No. 2	38 x 89	1.86	1.69	1.48
		38 x 140	2.93	2.65	2.16
		38 x 184	3.86	3.49	2.85
		38 x 235	4.93	4.46	3.64
		38 x 286	6.00	5.42	4.43
	No. 3	38 x 89	1.58	1.37	1.12
		38 x 140	2.33	2.02	1.65
		38 x 184	3.07	2.66	2.17
		38 x 235	3.92	3.40	2.77
		38 x 286	4.77	4.13	3.37
	Construction	38 x 89	1.79	1.56	1.27
	Standard	38 x 89	1.35	1.17	0.95
	Utility	38 x 89	0.92	0.80	0.65

Table A-3
Forming Part of Article 9.23.4.1.

FLOOR JOISTS — BEDROOMS AND ATTICS ACCESSIBLE BY A STAIRWAY (LIVE LOAD 1.4 kN/m²)								
Commercial Designation	Grade	Nominal Size, mm	LIVE LOAD 1.4 kN/m ²					
			Gypsum Board or Plastered Ceiling			Other Ceilings		
			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 x 89	2.41	2.19	1.91	2.76	2.50	2.19
		38 x 140	3.79	3.44	3.00	4.34	3.94	3.44
		38 x 184	4.99	4.54	3.96	5.72	5.19	4.54
		38 x 235	6.37	5.79	5.06	7.30	6.63	5.79
		38 x 286	7.75	7.04	6.15	8.87	8.06	7.04
	No. 1	38 x 89	2.41	2.19	1.91	2.76	2.50	2.19
		38 x 140	3.79	3.44	3.00	4.34	3.94	3.28
		38 x 184	4.99	4.54	3.96	5.72	5.19	4.33
		38 x 235	6.37	5.79	5.06	7.30	6.63	5.52
		38 x 286	7.75	7.04	6.15	8.87	8.06	6.72
	No. 2	38 x 89	2.33	2.11	1.85	2.67	2.42	2.05
		38 x 140	3.66	3.33	2.90	4.18	3.62	2.95
		38 x 184	4.83	4.38	3.83	5.51	4.77	3.89
		38 x 235	6.16	5.60	4.89	7.03	6.09	4.97
		38 x 286	7.49	6.81	5.95	8.55	7.40	6.04
	No. 3	38 x 89	2.14	1.86	1.51	2.14	1.86	1.51
		38 x 140	3.16	2.74	2.23	3.16	2.74	2.23
		38 x 184	4.17	3.61	2.95	4.17	3.61	2.95
		38 x 235	5.32	4.61	3.76	5.32	4.61	3.76
		38 x 286	6.47	5.60	4.57	6.47	5.60	4.57
	Construction	38 x 89	2.23	2.03	1.73	2.45	2.12	1.73
	Standard	38 x 89	1.84	1.60	1.30	1.84	1.60	1.30
	Utility	38 x 89	1.26	1.09	0.89	1.26	1.09	0.89
Hem-Fir (includes Western Hemlock and Amabilis Fir)	Select structural	38 x 89	2.32	2.11	1.84	2.66	2.41	2.11
		38 x 140	3.65	3.32	2.90	4.18	3.74	3.05
		38 x 184	4.81	4.37	3.82	5.51	4.93	4.02
		38 x 235	6.14	5.58	4.87	7.03	6.29	5.13
		38 x 286	7.47	6.79	5.93	8.55	7.65	6.24
	No. 1	38 x 89	2.32	2.11	1.84	2.66	2.38	1.94
		38 x 140	3.65	3.32	2.83	4.01	3.47	2.83
		38 x 184	4.81	4.37	3.74	5.29	4.58	3.74
		38 x 235	6.14	5.58	4.77	6.75	5.84	4.77
		38 x 286	7.47	6.79	5.80	8.21	7.11	5.80
	No. 2	38 x 89	2.24	2.04	1.76	2.49	2.15	1.76
		38 x 140	3.52	3.11	2.54	3.60	3.11	2.54
		38 x 184	4.65	4.11	3.35	4.74	4.11	3.35
		38 x 235	5.93	5.24	4.28	6.05	5.24	4.28
		38 x 286	7.21	6.37	5.20	7.36	6.37	5.20
	No. 3	38 x 89	1.84	1.60	1.30	1.84	1.60	1.30
		38 x 140	2.73	2.36	1.93	2.73	2.36	1.93
		38 x 184	3.60	3.11	2.54	3.60	3.11	2.54
		38 x 235	4.59	3.97	3.24	4.59	3.97	3.24
		38 x 286	5.58	4.84	3.95	5.58	4.84	3.95
	Construction	38 x 89	2.12	1.84	1.50	2.12	1.84	1.50
	Standard	38 x 89	1.59	1.38	1.12	1.59	1.38	1.12
	Utility	38 x 89	1.09	0.94	0.77	1.09	0.94	0.77

Continued on next page

Table A-3 (Cont'd)

FLOOR JOISTS — BEDROOMS AND ATTICS ACCESSIBLE BY A STAIRWAY (LIVE LOAD 1.4 kN/m ²)								
Commercial Designation	Grade	Nominal Size, mm	LIVE LOAD 1.4 kN/m ²					
			Gypsum Board or Plastered Ceiling			Other Ceilings		
			Joist Spacing			Joist Spacing		
			300 mm	400 mm	600 mm	300 mm	400 mm	600 mm
			m	m	m	m	m	m
Eastern Hemlock-Tamarack (includes Eastern Hemlock and Tamarack)	Select structural	38 x 89	2.21	2.01	1.75	2.53	2.30	2.01
		38 x 140	3.48	3.16	2.76	3.98	3.62	3.16
		38 x 184	4.58	4.16	3.64	5.25	4.77	4.16
		38 x 235	5.85	5.32	4.64	6.70	6.09	5.32
		38 x 286	7.12	6.47	5.65	8.15	7.40	6.47
	No. 1	38 x 89	2.21	2.01	1.75	2.53	2.30	2.01
		38 x 140	3.48	3.16	2.76	3.98	3.62	3.16
		38 x 184	4.58	4.16	3.64	5.25	4.77	4.16
		38 x 235	5.85	5.32	4.64	6.70	6.09	5.32
		38 x 286	7.12	6.47	5.65	8.15	7.40	6.47
	No. 2	38 x 89	2.13	1.94	1.69	2.44	2.22	1.94
		38 x 140	3.35	3.04	2.66	3.84	3.47	2.83
		38 x 184	4.42	4.01	3.51	5.06	4.58	3.74
		38 x 235	5.64	5.12	4.48	6.46	5.84	4.77
		38 x 286	6.86	6.23	5.44	7.85	7.11	5.80
	No. 3	38 x 89	2.05	1.79	1.46	2.07	1.79	1.46
		38 x 140	3.03	2.63	2.14	3.03	2.63	2.14
		38 x 184	4.00	3.46	2.83	4.00	3.46	2.83
		38 x 235	5.11	4.42	3.61	5.11	4.42	3.61
		38 x 286	6.21	5.38	4.39	6.21	5.38	4.39
	Construction	38 x 89	2.05	1.87	1.63	2.35	2.05	1.68
	Standard	38 x 89	1.76	1.52	1.24	1.76	1.52	1.24
	Utility	38 x 89	1.22	1.06	0.86	1.22	1.06	0.86
Coast Species (includes Douglas Fir, Western Larch, Western Hemlock, Amabilis Fir, and Coast Sitka Spruce)	Select structural	38 x 89	2.32	2.11	1.84	2.66	2.41	2.08
		38 x 140	3.65	3.32	2.90	4.18	3.70	3.02
		38 x 184	4.81	4.37	3.82	5.51	4.88	3.98
		38 x 235	6.14	5.58	4.87	7.03	6.22	5.08
		38 x 286	7.47	6.79	5.93	8.55	7.57	6.18
	No. 1	38 x 89	2.32	2.11	1.84	2.66	2.35	1.92
		38 x 140	3.65	3.32	2.80	3.96	3.43	2.80
		38 x 184	4.81	4.37	3.69	5.22	4.52	3.69
		38 x 235	6.14	5.58	4.71	6.66	5.77	4.71
		38 x 286	7.47	6.79	5.73	8.10	7.02	5.73
	No. 2	38 x 89	2.24	2.04	1.73	2.45	2.12	1.73
		38 x 140	3.52	3.07	2.50	3.54	3.07	2.50
		38 x 184	4.65	4.04	3.30	4.67	4.04	3.30
		38 x 235	5.93	5.16	4.21	5.96	5.16	4.21
		38 x 286	7.21	6.28	5.12	7.25	6.28	5.12
	No. 3	38 x 89	1.82	1.58	1.29	1.82	1.58	1.29
		38 x 140	2.69	2.33	1.90	2.69	2.33	1.90
		38 x 184	3.55	3.07	2.51	3.55	3.07	2.51
		38 x 235	4.53	3.92	3.20	4.53	3.92	3.20
		38 x 286	5.51	4.77	3.89	5.51	4.77	3.89
	Construction	38 x 89	2.09	1.81	1.47	2.09	1.81	1.47
	Standard	38 x 89	1.57	1.36	1.11	1.57	1.36	1.11
	Utility	38 x 89	1.09	0.94	0.77	1.09	0.94	0.77

Continued on next page

Table A-3 (Cont'd)

FLOOR JOISTS — BEDROOMS AND ATTICS ACCESSIBLE BY A STAIRWAY (LIVE LOAD 1.4 kN/m ²)								
Commercial Designation	Grade	Nominal Size, mm	LIVE LOAD 1.4 kN/m ²					
			Gypsum Board or Plastered Ceiling			Other Ceilings		
			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 x 89	2.19	1.99	1.74	2.50	2.28	1.99
		38 x 140	3.44	3.13	2.73	3.94	3.58	2.95
		38 x 184	4.54	4.12	3.60	5.19	4.72	3.89
		38 x 235	5.79	5.26	4.59	6.63	6.02	4.97
		38 x 286	7.04	6.40	5.59	8.06	7.32	6.04
	No. 1	38 x 89	2.19	1.99	1.74	2.50	2.28	1.88
		38 x 140	3.44	3.13	2.73	3.88	3.36	2.75
		38 x 184	4.54	4.12	3.60	5.12	4.44	3.62
		38 x 235	5.79	5.26	4.59	6.54	5.66	4.62
		38 x 286	7.04	6.40	5.59	7.95	6.89	5.62
	No. 2	38 x 89	2.11	1.92	1.68	2.41	2.08	1.70
		38 x 140	3.33	3.02	2.46	3.49	3.02	2.46
		38 x 184	4.38	3.98	3.25	4.60	3.98	4.35
		38 x 235	5.60	5.08	4.15	5.87	5.08	4.15
		38 x 286	6.81	6.18	5.04	7.13	6.18	5.04
	No. 3	38 x 89	1.80	1.56	1.27	1.80	1.56	1.27
		38 x 140	2.65	2.30	1.88	2.65	2.30	1.88
		38 x 184	3.50	3.03	2.47	3.50	3.03	2.47
		38 x 235	4.47	3.87	3.16	4.47	3.87	3.16
		38 x 286	5.44	4.71	3.84	5.44	4.71	3.84
	Construction	38 x 89	2.04	1.77	1.45	2.05	1.77	1.45
	Standard	38 x 89	1.54	1.33	1.09	1.54	1.33	1.09
	Utility	38 x 89	1.05	0.91	0.74	1.05	0.91	0.74
Western Cedars (includes Western Red Cedar and Pacific Coast Yellow Cedar)	Select structural	38 x 89	2.11	1.91	1.67	2.41	2.19	1.91
		38 x 140	3.31	3.01	2.63	3.79	3.44	2.99
		38 x 184	4.37	3.97	3.47	5.00	4.54	3.94
		38 x 235	5.57	5.06	4.42	6.38	5.80	5.02
		38 x 286	6.78	6.16	5.38	7.76	7.05	6.11
	No. 1	38 x 89	2.11	1.91	1.67	2.41	2.19	1.90
		38 x 140	3.31	3.01	2.63	3.79	3.41	2.78
		38 x 184	4.37	3.97	3.47	5.00	4.49	3.67
		38 x 235	5.57	5.06	4.42	6.38	5.73	4.68
		38 x 286	6.78	6.16	5.38	7.76	6.97	5.69
	No. 2	38 x 89	2.04	1.85	1.61	2.33	2.11	1.72
		38 x 140	3.20	2.91	2.48	3.51	3.04	2.48
		38 x 184	4.22	3.84	3.27	4.63	4.01	3.27
		38 x 235	5.39	4.90	4.18	5.91	5.12	4.18
		38 x 286	6.55	5.95	5.08	7.19	6.23	5.08
	No. 3	38 x 89	1.80	1.56	1.27	1.80	1.56	1.27
		38 x 140	2.65	2.30	1.88	2.65	2.30	1.88
		38 x 184	3.50	3.03	2.47	3.50	3.03	2.47
		38 x 235	4.47	3.87	3.16	4.47	3.87	3.16
		38 x 286	5.44	4.71	3.84	5.44	4.71	3.84
	Construction	38 x 89	1.96	1.78	1.46	2.07	1.79	1.46
	Standard	38 x 89	1.54	1.33	1.09	1.54	1.33	1.09
	Utility	38 x 89	1.05	0.91	0.74	1.05	0.91	0.74

Continued on next page

Table A-3 (Cont'd)

FLOOR JOISTS — BEDROOMS AND ATTICS ACCESSIBLE BY A STAIRWAY (LIVE LOAD 1.4 kN/m ²)								
Commercial Designation	Grade	Nominal Size, mm	LIVE LOAD 1.4 kN/m ²					
			Gypsum Board or Plastered Ceiling			Other Ceilings		
			Joist Spacing			Joist Spacing		
			300 mm	400 mm	600 mm	300 mm	400 mm	600 mm
			m	m	m	m	m	m
Northern Species (includes any Canadian softwood covered by the NLGA Standard Grading Rules)	Select structural	38 x 89	2.11	1.91	1.67	2.41	2.19	1.91
		38 x 140	3.31	3.01	2.63	3.79	3.44	2.87
		38 x 184	4.37	3.97	3.47	5.00	4.54	3.78
		38 x 235	5.57	5.06	4.42	6.38	5.80	4.83
		38 x 286	6.78	6.16	5.38	7.76	7.05	5.87
	No. 1	38 x 89	2.11	1.91	1.67	2.41	2.19	1.82
		38 x 140	3.31	3.01	2.63	3.76	3.25	2.65
		38 x 184	4.37	3.97	3.47	4.95	4.29	3.50
		38 x 235	5.57	5.06	4.42	6.32	5.47	4.47
		38 x 286	6.78	6.16	5.38	7.69	6.66	5.44
	No. 2	38 x 89	2.04	1.85	1.61	2.33	2.02	1.65
		38 x 140	3.20	2.91	2.38	3.37	2.92	2.38
		38 x 184	4.22	3.84	3.14	4.45	3.85	3.14
		38 x 235	5.39	4.90	4.01	5.67	4.91	4.01
		38 x 286	6.55	5.95	4.88	6.90	5.98	4.88
	No. 3	38 x 89	1.73	1.50	1.22	1.73	1.50	1.22
		38 x 140	2.54	2.20	1.80	2.54	2.20	1.80
		38 x 184	3.35	2.90	2.37	3.35	2.90	2.37
		38 x 235	4.28	3.70	3.02	4.28	3.70	3.02
		38 x 286	5.20	4.51	3.68	5.20	4.51	3.68
	Construction	38 x 89	1.96	1.72	1.41	1.99	1.72	1.41
	Standard	38 x 89	1.49	1.29	1.05	1.49	1.29	1.05
	Utility	38 x 89	1.01	0.88	0.71	1.01	0.88	0.71
Northern Aspen (includes Aspen Poplar, Large Tooth Aspen and Balsam Poplar)	Select structural	38 x 89	2.14	1.94	1.70	2.45	2.23	1.94
		38 x 140	3.36	3.06	2.67	3.85	3.50	2.95
		38 x 184	4.44	4.03	3.52	5.08	4.61	3.89
		38 x 235	5.66	5.14	4.49	6.48	5.89	4.97
		38 x 286	6.89	6.26	5.47	7.88	7.16	6.04
	No. 1	38 x 89	2.14	1.94	1.70	2.45	2.23	1.88
		38 x 140	3.36	3.06	2.67	3.85	3.36	2.75
		38 x 184	4.44	4.03	3.52	5.08	4.44	3.62
		38 x 235	5.66	5.14	4.49	6.48	5.66	4.62
		38 x 286	6.89	6.26	5.47	7.88	6.89	5.62
	No. 2	38 x 89	2.06	1.87	1.64	2.36	2.10	1.71
		38 x 140	3.24	2.95	2.46	3.49	3.02	2.46
		38 x 184	4.28	3.89	3.25	4.60	3.98	3.25
		38 x 235	5.46	4.96	4.15	5.87	5.08	4.15
		38 x 286	6.64	6.03	5.04	7.13	6.18	5.04
	No. 3	38 x 89	1.80	1.56	1.27	1.80	1.56	1.27
		38 x 140	2.65	2.30	1.88	2.65	2.30	1.88
		38 x 184	3.50	3.03	2.47	3.50	3.03	2.47
		38 x 235	4.47	3.87	3.16	4.47	3.87	3.16
		38 x 286	5.44	4.71	3.84	5.44	4.71	3.84
	Construction	38 x 89	1.98	1.77	1.45	2.05	1.77	1.45
	Standard	38 x 89	1.54	1.33	1.09	1.54	1.33	1.09
	Utility	38 x 89	1.05	0.91	0.74	1.05	0.91	0.74

Table A-4
Forming Part of Article 9.23.4.1.

ROOF JOISTS — SUPPORTING CEILING (LIVE LOAD 2.5 kN/m²)								
Commercial Designation	Grade	Nominal Size, mm	LIVE LOAD 2.5 kN/m ²					
			Gypsum Board or Plastered Ceiling			Other Ceilings		
			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 x 89	1.98	1.80	1.57	2.27	2.06	1.80
		38 x 140	3.12	2.83	2.48	3.57	3.25	2.83
		38 x 184	4.11	3.74	3.27	4.71	4.28	3.74
		38 x 235	5.25	4.77	4.17	6.01	5.46	4.77
		38 x 286	6.39	5.80	5.07	7.31	6.64	5.80
	No. 1	38 x 89	1.98	1.80	1.57	2.27	2.06	1.80
		38 x 140	3.12	2.83	2.48	3.57	3.25	2.76
		38 x 184	4.11	3.74	3.27	4.71	4.28	3.64
		38 x 235	5.25	4.77	4.17	6.01	5.46	4.65
		38 x 286	6.39	5.80	5.07	7.31	6.64	5.66
	No. 2	38 x 89	1.92	1.74	1.52	2.20	1.99	1.72
		38 x 140	3.02	2.74	2.39	3.45	3.04	2.49
		38 x 184	3.98	3.61	3.16	4.55	4.02	3.28
		38 x 235	5.08	4.61	4.03	5.81	5.12	4.18
		38 x 286	6.17	5.61	4.90	7.07	6.23	5.09
	No. 3	38 x 89	1.80	1.56	1.27	1.80	1.56	1.27
		38 x 140	2.66	2.30	1.88	2.66	2.30	1.88
		38 x 184	3.51	3.04	2.48	3.51	3.04	2.48
		38 x 235	4.48	3.88	3.17	4.48	3.88	3.17
		38 x 286	5.45	4.72	3.85	5.45	4.72	3.85
	Construction	38 x 89	1.84	1.67	1.46	2.07	1.79	1.46
	Standard	38 x 89	1.55	1.34	1.10	1.55	1.34	1.10
	Utility	38 x 89	1.06	0.92	0.75	1.06	0.92	0.75
Hem-Fir (includes Western Hemlock and Amabilis Fir)	Select structural	38 x 89	1.91	1.74	1.52	2.19	1.99	1.74
		38 x 140	3.01	2.73	2.39	3.44	3.13	2.57
		38 x 184	3.97	3.60	3.15	4.54	4.12	3.39
		38 x 235	5.06	4.60	4.02	5.79	5.26	4.32
		38 x 286	6.16	5.59	4.89	7.05	6.40	5.26
	No. 1	38 x 89	1.91	1.74	1.52	2.19	1.99	1.63
		38 x 140	3.01	2.73	2.39	3.38	2.92	2.39
		38 x 184	3.97	3.60	3.15	4.45	3.85	3.15
		38 x 235	5.06	4.60	4.01	5.68	4.92	4.01
		38 x 286	6.16	5.59	4.88	6.91	5.98	4.88
	No. 2	38 x 89	1.85	1.68	1.46	2.09	1.81	1.48
		38 x 140	2.90	2.62	2.14	3.03	2.62	2.14
		38 x 184	3.83	3.46	2.82	3.99	3.46	2.82
		38 x 235	4.89	4.41	3.60	5.10	4.41	3.60
		38 x 286	5.95	5.37	4.38	6.20	5.37	4.38
	No. 3	38 x 89	1.55	1.34	1.10	1.55	1.34	1.10
		38 x 140	2.30	1.99	1.62	2.30	1.99	1.62
		38 x 184	3.03	2.62	2.14	3.03	2.62	2.14
		38 x 235	3.87	3.35	2.73	3.87	3.35	2.73
		38 x 286	4.70	4.07	3.32	4.70	4.07	3.32
	Construction	38 x 89	1.78	1.55	1.26	1.79	1.55	1.26
	Standard	38 x 89	1.34	1.16	0.95	1.34	1.16	0.95
	Utility	38 x 89	0.92	0.79	0.65	0.92	0.79	0.65

Continued on next page

Table A-4 (Cont'd)

ROOF JOISTS — SUPPORTING CEILING (LIVE LOAD 2.5 kN/m ²)								
Commercial Designation	Grade	Nominal Size, mm	LIVE LOAD 2.5 kN/m ²					
			Gypsum Board or Plastered Ceiling			Other Ceilings		
			Joist Spacing			Joist Spacing		
			300 mm	400 mm	600 mm	300 mm	400 mm	600 mm
			m	m	m	m	m	m
Eastern Hemlock-Tamarack (includes Eastern Hemlock and Tamarack)	Select structural	38 x 89	1.82	1.65	1.44	2.09	1.89	1.65
		38 x 140	2.86	2.60	2.27	3.28	2.98	2.60
		38 x 184	3.78	3.43	3.00	4.33	3.93	3.43
		38 x 235	4.82	4.38	3.83	5.52	5.01	4.38
		38 x 286	5.87	5.33	4.65	6.71	6.10	5.33
	No. 1	38 x 89	1.82	1.65	1.44	2.09	1.89	1.65
		38 x 140	2.86	2.60	2.27	3.28	2.98	2.60
		38 x 184	3.78	3.43	3.00	4.33	3.93	3.43
		38 x 235	4.82	4.38	3.83	5.52	5.01	4.38
		38 x 286	5.87	5.33	4.65	6.71	6.10	5.33
	No. 2	38 x 89	1.76	1.59	1.39	2.01	1.83	1.59
		38 x 140	2.76	2.51	2.19	3.16	2.87	2.39
		38 x 184	3.64	3.31	2.89	4.17	3.79	3.15
		38 x 235	4.65	4.22	3.69	5.32	4.83	4.01
		38 x 286	5.65	5.14	4.49	6.47	5.88	4.88
	No. 3	38 x 89	1.69	1.51	1.23	1.74	1.51	1.23
		38 x 140	2.55	2.21	1.80	2.55	2.21	1.80
		38 x 184	3.37	2.92	2.38	3.37	2.92	2.38
		38 x 235	4.30	3.72	3.04	4.30	3.72	3.04
		38 x 286	5.23	4.53	3.70	5.23	4.53	3.70
	Construction	38 x 89	1.69	1.54	1.34	1.94	1.73	1.41
	Standard	38 x 89	1.48	1.28	1.04	1.48	1.28	1.04
	Utility	38 x 89	1.03	0.89	0.73	1.03	0.89	0.73
Coast Species (includes Douglas Fir, Western Larch, Western Hemlock, Amabilis Fir, and Coast Sitka Spruce)	Select structural	38 x 89	1.91	1.74	1.52	2.19	1.99	1.74
		38 x 140	3.01	2.73	2.39	3.44	3.11	2.54
		38 x 184	3.97	3.60	3.15	4.54	4.10	3.35
		38 x 235	5.06	4.60	4.02	5.79	5.24	4.28
		38 x 286	6.16	5.59	4.89	7.05	6.37	5.20
	No. 1	38 x 89	1.91	1.74	1.52	2.19	1.98	1.61
		38 x 140	3.01	2.73	2.36	3.33	2.89	2.36
		38 x 184	3.97	3.60	3.11	4.40	3.81	3.11
		38 x 235	5.06	4.60	3.97	5.61	4.86	3.97
		38 x 286	6.16	5.59	4.82	6.82	5.91	4.82
	No. 2	38 x 89	1.85	1.68	1.46	2.07	1.79	1.46
		38 x 140	2.90	2.58	2.11	2.93	2.58	2.11
		38 x 184	3.83	3.40	2.78	3.93	3.40	2.78
		38 x 235	4.89	4.34	3.55	5.02	4.34	3.55
		38 x 286	5.95	5.29	4.31	6.10	5.29	4.31
	No. 3	38 x 89	1.53	1.33	1.08	1.53	1.33	1.08
		38 x 140	2.27	1.96	1.60	2.27	1.96	1.60
		38 x 184	2.99	2.59	2.11	2.99	2.59	2.11
		38 x 235	3.81	3.30	2.70	3.81	3.30	2.70
		38 x 286	4.64	4.02	3.28	4.64	4.02	3.28
	Construction	38 x 89	1.76	1.52	1.24	1.76	1.52	1.24
	Standard	38 x 89	1.32	1.14	0.93	1.32	1.14	0.93
	Utility	38 x 89	0.92	0.79	0.65	0.92	0.79	0.65

Continued on next page

Table A-4 (Cont'd)

ROOF JOISTS — SUPPORTING CEILING (LIVE LOAD 2.5 kN/m ²)								
Commercial Designation	Grade	Nominal Size, mm	LIVE LOAD 2.5 kN/m ²					
			Gypsum Board or Plastered Ceiling			Other Ceilings		
			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 x 89	1.80	1.64	1.43	2.06	1.87	1.64
		38 x 140	2.83	2.58	2.25	3.25	2.95	2.49
		38 x 184	3.74	3.40	2.97	4.28	3.89	3.28
		38 x 235	4.77	4.33	3.79	5.46	4.96	4.18
		38 x 286	5.80	5.27	4.61	6.64	6.04	5.09
	No. 1	38 x 89	1.80	1.64	1.43	2.06	1.87	1.58
		38 x 140	2.83	2.58	2.25	3.25	2.83	2.31
		38 x 184	3.74	3.40	2.97	4.28	3.73	3.05
		38 x 235	4.77	4.33	3.79	5.46	4.77	3.89
		38 x 286	5.80	5.27	4.61	6.64	5.80	4.73
	No. 2	38 x 89	1.74	1.58	1.38	1.99	1.75	1.43
		38 x 140	2.74	2.49	2.07	2.93	2.54	2.07
		38 x 184	3.61	3.28	2.73	3.87	3.35	2.73
		38 x 235	4.61	4.19	3.49	4.94	4.28	3.49
		38 x 286	5.61	5.10	4.25	6.01	5.20	4.25
	No. 3	38 x 89	1.52	1.31	1.07	1.52	1.31	1.07
		38 x 140	2.23	1.93	1.58	2.23	1.93	1.58
		38 x 184	2.95	2.55	2.08	2.95	2.55	2.08
		38 x 235	3.76	3.26	2.66	3.76	3.26	2.66
		38 x 286	4.58	3.96	3.23	4.58	3.96	3.23
	Construction	38 x 89	1.68	1.49	1.22	1.72	1.49	1.22
	Standard	38 x 89	1.30	1.12	0.92	1.30	1.12	0.92
	Utility	38 x 89	0.88	0.76	0.62	0.88	0.76	0.62
Western Cedars (includes Western Red Cedar and Pacific Coast Yellow Cedar)	Select structural	38 x 89	1.73	1.58	1.38	1.99	1.80	1.58
		38 x 140	2.73	2.48	2.16	3.12	2.84	2.48
		38 x 184	3.60	3.27	2.86	4.12	3.74	3.27
		38 x 235	4.59	4.17	3.64	5.26	4.78	4.17
		38 x 286	5.59	5.08	4.43	6.40	5.81	5.08
	No. 1	38 x 89	1.73	1.58	1.38	1.99	1.80	1.58
		38 x 140	2.73	2.48	2.16	3.12	2.84	2.34
		38 x 184	3.60	3.27	2.86	4.12	3.74	3.09
		38 x 235	4.59	4.17	3.64	5.26	4.78	3.94
		38 x 286	5.59	5.08	4.43	6.40	5.81	4.79
	No. 2	38 x 89	1.68	1.52	1.33	1.92	1.74	1.45
		38 x 140	2.64	2.40	2.09	2.96	2.56	2.09
		38 x 184	3.48	3.16	2.76	3.90	3.38	2.76
		38 x 235	4.44	4.03	3.52	4.98	4.31	3.52
		38 x 286	5.40	4.91	4.28	6.06	5.24	4.28
	No. 3	38 x 89	1.52	1.31	1.07	1.52	1.31	1.07
		38 x 140	2.23	1.93	1.58	2.23	1.93	1.58
		38 x 184	2.95	2.55	2.08	2.95	2.55	2.08
		38 x 235	3.76	3.26	2.66	3.76	3.26	2.66
		38 x 286	4.58	3.96	3.23	4.58	3.96	3.23
	Construction	38 x 89	1.61	1.47	1.23	1.74	1.51	1.23
	Standard	38 x 89	1.30	1.12	0.92	1.30	1.12	0.92
	Utility	38 x 89	0.88	0.76	0.62	0.88	0.76	0.62

Continued on next page

Table A-4 (Cont'd)

ROOF JOISTS — SUPPORTING CEILING (LIVE LOAD 2.5 kN/m ²)								
Commercial Designation	Grade	Nominal Size, <i>mm</i>	LIVE LOAD 2.5 kN/m ²					
			Gypsum Board or Plastered Ceiling			Other Ceilings		
			Joist Spacing			Joist Spacing		
			300 mm	400 mm	600 mm	300 mm	400 mm	600 mm
			<i>m</i>	<i>m</i>	<i>m</i>	<i>m</i>	<i>m</i>	<i>m</i>
Northern Species (includes any Canadian soft-wood covered by the NLGA Standard Grading Rules)	Select structural	38 x 89	1.73	1.58	1.38	1.99	1.80	1.58
		38 x 140	2.73	2.48	2.16	3.12	2.84	2.41
		38 x 184	3.60	3.27	2.86	4.12	3.74	3.18
		38 x 235	4.59	4.17	3.64	5.26	4.78	4.06
		38 x 286	5.59	5.08	4.43	6.40	5.81	4.94
	No. 1	38 x 89	1.73	1.58	1.38	1.99	1.80	1.53
		38 x 140	2.73	2.48	2.16	3.12	2.74	2.23
		38 x 184	3.60	3.27	2.86	4.12	3.61	2.95
		38 x 235	4.59	4.17	3.64	5.26	4.61	3.76
		38 x 286	5.59	5.08	4.43	6.40	5.61	4.58
	No. 2	38 x 89	1.68	1.52	1.33	1.92	1.70	1.39
		38 x 140	2.64	2.40	2.01	2.84	2.46	2.01
		38 x 184	3.48	3.16	2.64	3.74	3.24	2.64
		38 x 235	4.44	4.03	3.38	4.78	4.14	3.38
		38 x 286	5.40	4.91	4.11	5.81	5.03	4.11
	No. 3	38 x 89	1.46	1.26	1.03	1.46	1.26	1.03
		38 x 140	2.14	1.85	1.51	2.14	1.85	1.51
		38 x 184	2.82	2.44	1.99	2.82	2.44	1.99
		38 x 235	3.60	3.12	2.55	3.60	3.12	2.55
		38 x 286	4.38	3.79	3.10	4.38	3.79	3.10
	Construction	38 x 89	1.61	1.45	1.18	1.67	1.45	1.18
	Standard	38 x 89	1.25	1.08	0.88	1.25	1.08	0.88
	Utility	38 x 89	0.85	0.74	0.60	0.85	0.74	0.60
Northern Aspen (includes Aspen Poplar, Large Tooth Aspen and Balsam Poplar)	Select structural	38 x 89	1.76	1.60	1.40	2.02	1.83	1.60
		38 x 140	2.77	2.52	2.20	3.17	2.88	2.49
		38 x 184	3.66	3.32	2.90	4.19	3.80	3.28
		38 x 235	4.67	4.24	3.70	5.34	4.85	4.18
		38 x 286	5.68	5.16	4.50	6.50	5.90	5.09
	No. 1	38 x 89	1.76	1.60	1.40	2.02	1.83	1.58
		38 x 140	2.77	2.52	2.20	3.17	2.83	2.31
		38 x 184	3.66	3.32	2.90	4.19	3.73	3.05
		38 x 235	4.67	4.24	3.70	5.34	4.77	3.89
		38 x 286	5.68	5.16	4.50	6.50	5.80	4.73
	No. 2	38 x 89	1.70	1.54	1.35	1.95	1.76	1.44
		38 x 140	2.67	2.43	2.07	2.93	2.54	2.07
		38 x 184	3.53	3.20	2.73	3.87	3.35	2.73
		38 x 235	4.50	4.09	3.49	4.94	4.28	3.49
		38 x 286	5.47	4.97	4.25	6.01	5.20	4.25
	No. 3	38 x 89	1.52	1.31	1.07	1.52	1.31	1.07
		38 x 140	2.23	1.93	1.58	2.23	1.93	1.58
		38 x 184	2.95	2.55	2.08	2.95	2.55	2.08
		38 x 235	3.76	3.26	2.66	3.76	3.26	2.66
		38 x 286	4.58	3.96	3.23	4.58	3.96	3.23
	Construction	38 x 89	1.63	1.48	1.22	1.72	1.49	1.22
	Standard	38 x 89	1.30	1.12	0.92	1.30	1.12	0.92
	Utility	38 x 89	0.88	0.76	0.62	0.88	0.76	0.62

Table A-5
Forming Part of Article 9.23.4.1.

ROOF JOISTS — SUPPORTING CEILING (LIVE LOAD 2.0 kN/m²)								
Commercial Designation	Grade	Nominal Size, <i>mm</i>	LIVE LOAD 2.0 kN/m ²					
			Gypsum Board or Plastered Ceiling			Other Ceilings		
			Joist Spacing			Joist Spacing		
			300 mm	400 mm	600 mm	300 mm	400 mm	600 mm
			<i>m</i>	<i>m</i>	<i>m</i>	<i>m</i>	<i>m</i>	<i>m</i>
Douglas Fir-Larch (includes Douglas Fir and Western Larch)	Select structural	38 x 89	2.14	1.94	1.70	2.45	2.22	1.94
		38 x 140	3.36	3.05	2.67	3.85	3.50	3.05
		38 x 184	4.43	4.03	3.52	5.08	4.61	4.03
		38 x 235	5.66	5.14	4.49	6.48	5.88	5.14
		38 x 286	6.88	6.25	5.46	7.88	7.16	6.25
	No. 1	38 x 89	2.14	1.94	1.70	2.45	2.22	1.94
		38 x 140	3.36	3.05	2.67	3.85	3.50	3.03
		38 x 184	4.43	4.03	3.52	5.08	4.61	3.99
		38 x 235	5.66	5.14	4.49	6.48	5.88	5.10
		38 x 286	6.88	6.25	5.46	7.88	7.16	6.20
	No. 2	38 x 89	2.07	1.88	1.64	2.37	2.15	1.88
		38 x 140	3.25	2.95	2.58	3.72	3.34	2.72
		38 x 184	4.29	3.89	3.40	4.91	4.40	3.59
		38 x 235	5.47	4.97	4.34	6.26	5.61	4.58
		38 x 286	6.65	6.04	5.28	7.62	6.83	5.57
	No. 3	38 x 89	1.98	1.71	1.40	1.98	1.71	1.40
		38 x 140	2.92	2.52	2.06	2.92	2.52	2.06
		38 x 184	3.84	3.33	2.72	3.84	3.33	2.72
		38 x 235	4.91	4.25	3.47	4.91	4.25	3.47
		38 x 286	5.97	5.17	4.22	5.97	5.17	4.22
	Construction	38 x 89	1.98	1.80	1.57	2.26	1.96	1.60
	Standard	38 x 89	1.70	1.47	1.20	1.70	1.47	1.20
	Utility	38 x 89	1.16	1.00	0.82	1.16	1.00	0.82
Hem-Fir (includes Western Hemlock and Amabilis Fir)	Select structural	38 x 89	2.06	1.87	1.63	2.36	2.14	1.87
		38 x 140	3.24	2.94	2.57	3.71	3.37	2.81
		38 x 184	4.27	3.88	3.39	4.89	4.44	3.71
		38 x 235	5.45	4.95	4.33	6.24	5.67	4.73
		38 x 286	6.63	6.03	5.26	7.59	6.90	5.76
	No. 1	38 x 89	2.06	1.87	1.63	2.36	2.14	1.79
		38 x 140	3.24	2.94	2.57	3.70	3.20	2.61
		38 x 184	4.27	3.88	3.39	4.88	4.22	3.45
		38 x 235	5.45	4.95	4.33	6.22	5.39	4.40
		38 x 286	6.63	6.03	5.26	7.57	6.55	5.35
	No. 2	38 x 89	1.99	1.81	1.58	2.28	1.99	1.62
		38 x 140	3.13	2.84	2.34	3.32	2.87	2.34
		38 x 184	4.13	3.75	3.09	4.37	3.79	3.09
		38 x 235	5.27	4.78	3.95	5.58	4.83	3.95
		38 x 286	6.41	5.82	4.80	6.79	5.88	4.80
	No. 3	38 x 89	1.70	1.47	1.20	1.70	1.47	1.20
		38 x 140	2.52	2.18	1.78	2.52	2.18	1.78
		38 x 184	3.32	2.87	2.34	3.32	2.87	2.34
		38 x 235	4.23	3.67	2.99	4.23	3.67	2.99
		38 x 286	5.15	4.46	3.64	5.15	4.46	3.64
	Construction	38 x 89	1.91	1.70	1.38	1.96	1.70	1.38
	Standard	38 x 89	1.47	1.27	1.04	1.47	1.27	1.04
	Utility	38 x 89	1.00	0.87	0.71	1.00	0.87	0.71

Continued on next page

Table A-5 (Cont'd)

ROOF JOISTS — SUPPORTING CEILING (LIVE LOAD 2.0 kN/m ²)								
Commercial Designation	Grade	Nominal Size, mm	LIVE LOAD 2.0 kN/m ²					
			Gypsum Board or Plastered Ceiling			Other Ceilings		
			Joist Spacing			Joist Spacing		
			300 mm	400 mm	600 mm	300 mm	400 mm	600 mm
			m	m	m	m	m	m
Eastern Hemlock-Tamarack (includes Eastern Hemlock and Tamarack)	Select structural	38 x 89	1.96	1.78	1.56	2.25	2.04	1.78
		38 x 140	3.09	2.80	2.45	3.53	3.21	2.80
		38 x 184	4.07	3.70	3.23	4.66	4.23	3.70
		38 x 235	5.19	4.72	4.12	5.95	5.40	4.72
		38 x 286	6.32	5.74	5.01	7.23	6.57	5.74
	No. 1	38 x 89	1.96	1.78	1.56	2.25	2.04	1.78
		38 x 140	3.09	2.80	2.45	3.53	3.21	2.80
		38 x 184	4.07	3.70	3.23	4.66	4.23	3.70
		38 x 235	5.19	4.72	4.12	5.95	5.40	4.72
		38 x 286	6.32	5.74	5.01	7.23	6.57	5.74
	No. 2	38 x 89	1.89	1.72	1.50	2.17	1.97	1.72
		38 x 140	2.98	2.70	2.36	3.41	3.09	2.61
		38 x 184	3.92	3.56	3.11	4.49	4.08	3.45
		38 x 235	5.01	4.55	3.97	5.73	5.21	4.40
		38 x 286	6.09	5.53	4.83	6.97	6.33	5.35
	No. 3	38 x 89	1.82	1.65	1.35	1.91	1.65	1.35
		38 x 140	2.80	2.42	1.98	2.80	2.42	1.98
		38 x 184	3.69	3.20	2.61	3.69	3.20	2.61
		38 x 235	4.71	4.08	3.33	4.71	4.08	3.33
		38 x 286	5.73	4.96	4.05	5.73	4.96	4.05
	Construction	38 x 89	1.82	1.66	1.45	2.09	1.89	1.55
	Standard	38 x 89	1.62	1.40	1.14	1.62	1.40	1.14
	Utility	38 x 89	1.13	0.98	0.80	1.13	0.98	0.80
Coast Species (includes Douglas Fir, Western Larch, Western Hemlock, Amabilis Fir, and Coast Sitka Spruce)	Select structural	38 x 89	2.06	1.87	1.63	2.36	2.14	1.87
		38 x 140	3.24	2.94	2.57	3.71	3.37	2.78
		38 x 184	4.27	3.88	3.39	4.89	4.44	3.67
		38 x 235	5.45	4.95	4.33	6.24	5.67	4.68
		38 x 286	6.63	6.03	5.26	7.59	6.90	5.70
	No. 1	38 x 89	2.06	1.87	1.63	2.36	2.14	1.77
		38 x 140	3.24	2.94	2.57	3.65	3.16	2.58
		38 x 184	4.27	3.88	3.39	4.82	4.17	3.40
		38 x 235	5.45	4.95	4.33	6.15	5.32	4.34
		38 x 286	6.63	6.03	5.26	7.48	6.47	5.29
	No. 2	38 x 89	1.99	1.81	1.58	2.26	1.96	1.60
		38 x 140	3.13	2.83	2.31	3.27	2.83	2.31
		38 x 184	4.13	3.73	3.04	4.31	3.73	3.04
		38 x 235	5.27	4.76	3.89	5.50	4.76	3.89
		38 x 286	6.41	5.79	4.73	6.69	5.79	4.73
	No. 3	38 x 89	1.68	1.46	1.19	1.68	1.46	1.19
		38 x 140	2.48	2.15	1.75	2.48	2.15	1.75
		38 x 184	3.27	2.83	2.31	3.27	2.83	2.31
		38 x 235	4.18	3.62	2.95	4.18	3.62	2.95
		38 x 286	5.08	4.40	3.59	5.08	4.40	3.59
	Construction	38 x 89	1.91	1.67	1.36	1.92	1.67	1.36
	Standard	38 x 89	1.44	1.25	1.02	1.44	1.25	1.02
	Utility	38 x 89	1.00	0.87	0.71	1.00	0.87	0.71

Continued on next page

Table A-5 (Cont'd)

ROOF JOISTS — SUPPORTING CEILING (LIVE LOAD 2.0 kN/m ²)								
Commercial Designation	Grade	Nominal Size, <i>mm</i>	LIVE LOAD 2.0 kN/m ²					
			Gypsum Board or Plastered Ceiling			Other Ceilings		
			Joist Spacing			Joist Spacing		
			300 mm	400 mm	600 mm	300 mm	400 mm	600 mm
			<i>m</i>	<i>m</i>	<i>m</i>	<i>m</i>	<i>m</i>	<i>m</i>
Spruce-Pine-Fir (includes Spruce (all species except Coast Sitka Spruce), Jack Pine, Lodgepole Pine, Balsam Fir and Alpine Fir)	Select structural	38 x 89	1.94	1.76	1.54	2.22	2.02	1.76
		38 x 140	3.05	2.77	2.42	3.50	3.18	2.72
		38 x 184	4.03	3.66	3.20	4.61	4.19	3.59
		38 x 235	5.14	4.67	4.08	5.88	5.35	4.58
		38 x 286	6.25	5.68	4.96	7.16	6.50	5.57
	No. 1	38 x 89	1.94	1.76	1.54	2.22	2.02	1.73
		38 x 140	3.05	2.77	2.42	3.50	3.10	2.53
		38 x 184	4.03	3.66	3.20	4.61	4.09	3.34
		38 x 235	5.14	4.67	4.08	5.88	5.22	4.26
		38 x 286	6.25	5.68	4.96	7.16	6.35	5.18
	No. 2	38 x 89	1.88	1.70	1.49	2.15	1.92	1.57
		38 x 140	2.95	2.68	2.27	3.21	2.78	2.27
		38 x 184	3.89	3.54	3.00	4.24	3.67	3.00
		38 x 235	4.97	4.51	3.82	5.41	4.68	3.82
		38 x 286	6.04	5.49	4.65	6.58	5.70	4.65
	No. 3	38 x 89	1.66	1.44	1.17	1.66	1.44	1.17
		38 x 140	2.45	2.12	1.73	2.45	2.12	1.73
		38 x 184	3.23	2.80	2.28	3.23	2.80	2.28
		38 x 235	4.12	3.57	2.91	4.12	3.57	2.91
		38 x 286	5.01	4.34	3.54	5.01	4.34	3.54
	Construction	38 x 89	1.81	1.64	1.33	1.89	1.64	1.33
	Standard	38 x 89	1.42	1.23	1.00	1.42	1.23	1.00
	Utility	38 x 89	0.97	0.84	0.68	0.97	0.84	0.68
Western Cedars (includes Western Red Cedar and Pacific Coast Yellow Cedar)	Select structural	38 x 89	1.87	1.70	1.48	2.14	1.94	1.70
		38 x 140	2.94	2.67	2.33	3.37	3.06	2.67
		38 x 184	3.88	3.52	3.08	4.44	4.03	3.52
		38 x 235	4.95	4.50	3.93	5.66	5.15	4.50
		38 x 286	6.02	5.47	4.78	6.89	6.26	5.47
	No. 1	38 x 89	1.87	1.70	1.48	2.14	1.94	1.70
		38 x 140	2.94	2.67	2.33	3.37	3.06	2.57
		38 x 184	3.88	3.52	3.08	4.44	4.03	3.38
		38 x 235	4.95	4.50	3.93	5.66	5.15	4.32
		38 x 286	6.02	5.47	4.78	6.89	6.26	5.25
	No. 2	38 x 89	1.81	1.64	1.43	2.07	1.88	1.59
		38 x 140	2.84	2.58	2.25	3.24	2.81	2.29
		38 x 184	3.75	3.41	2.97	4.27	3.70	3.02
		38 x 235	4.78	4.35	3.80	5.45	4.72	3.85
		38 x 286	5.82	5.29	4.62	6.63	5.74	4.69
	No. 3	38 x 89	1.66	1.44	1.17	1.66	1.44	1.17
		38 x 140	2.45	2.12	1.73	2.45	2.12	1.73
		38 x 184	3.23	2.80	2.28	3.23	2.80	2.28
		38 x 235	4.12	3.57	2.91	4.12	3.57	2.91
		38 x 286	5.01	4.34	3.54	5.01	4.34	3.54
	Construction	38 x 89	1.74	1.58	1.35	1.91	1.65	1.35
	Standard	38 x 89	1.42	1.23	1.00	1.42	1.23	1.00
	Utility	38 x 89	0.97	0.84	0.68	0.97	0.84	0.68

Continued on next page

Table A-5 (Cont'd)

ROOF JOISTS — SUPPORTING CEILING (LIVE LOAD 2.0 kN/m ²)								
Commercial Designation	Grade	Nominal Size, mm	LIVE LOAD 2.0 kN/m ²					
			Gypsum Board or Plastered Ceiling			Other Ceilings		
			Joist Spacing			Joist Spacing		
			300 mm	400 mm	600 mm	300 mm	400 mm	600 mm
			m	m	m	m	m	m
Northern Species (includes any Canadian soft-wood covered by the NLGA Standard Grading Rules)	Select structural	38 x 89	1.87	1.70	1.48	2.14	1.94	1.70
		38 x 140	2.94	2.67	2.33	3.37	3.06	2.65
		38 x 184	3.88	3.52	3.08	4.44	4.03	3.49
		38 x 235	4.95	4.50	3.93	5.66	5.15	4.45
		38 x 286	6.02	5.47	4.78	6.89	6.26	5.42
	No. 1	38 x 89	1.87	1.70	1.48	2.14	1.94	1.68
		38 x 140	2.94	2.67	2.33	3.37	3.00	2.45
		38 x 184	3.88	3.52	3.08	4.44	3.96	3.23
		38 x 235	4.95	4.50	3.93	5.66	5.05	4.12
		38 x 286	6.02	5.47	4.78	6.89	6.14	5.01
	No. 2	38 x 89	1.81	1.64	1.43	2.07	1.87	1.52
		38 x 140	2.84	2.58	2.20	3.11	2.69	2.20
		38 x 184	3.75	3.41	2.90	4.10	3.55	2.90
		38 x 235	4.78	4.35	3.70	5.23	4.53	3.70
		38 x 286	5.82	5.29	4.50	6.37	5.51	4.50
	No. 3	38 x 89	1.60	1.38	1.13	1.60	1.38	1.13
		38 x 140	2.34	2.03	1.66	2.34	2.03	1.66
		38 x 184	3.09	2.68	2.18	3.09	2.68	2.18
		38 x 235	3.95	3.42	2.79	3.95	3.42	2.79
		38 x 286	4.80	4.16	3.39	4.80	4.16	3.39
	Construction	38 x 89	1.74	1.58	1.30	1.84	1.59	1.30
	Standard	38 x 89	1.37	1.19	0.97	1.37	1.19	0.97
	Utility	38 x 89	0.93	0.81	0.66	0.93	0.81	0.66
Northern Aspen (includes Aspen Poplar, Large Tooth Aspen and Balsam Poplar)	Select structural	38 x 89	1.90	1.72	1.51	2.17	1.98	1.72
		38 x 140	2.99	2.71	2.37	3.42	3.11	2.71
		38 x 184	3.94	3.58	3.13	4.51	4.10	3.58
		38 x 235	5.03	4.57	3.99	5.75	5.23	4.57
		38 x 286	6.11	5.55	4.85	7.00	6.36	5.55
	No. 1	38 x 89	1.90	1.72	1.51	2.17	1.98	1.72
		38 x 140	2.99	2.71	2.37	3.42	3.10	2.53
		38 x 184	3.94	3.58	3.13	4.51	4.09	3.34
		38 x 235	5.03	4.57	3.99	5.75	5.22	4.26
		38 x 286	6.11	5.55	4.85	7.00	6.35	5.18
	No. 2	38 x 89	1.83	1.66	1.45	2.10	1.90	1.58
		38 x 140	2.88	2.62	2.27	3.21	2.78	2.27
		38 x 184	3.80	3.45	3.00	4.24	3.67	3.00
		38 x 235	4.85	4.40	3.82	5.41	4.68	3.82
		38 x 286	5.90	5.36	4.65	6.58	5.70	4.65
	No. 3	38 x 89	1.66	1.44	1.17	1.66	1.44	1.17
		38 x 140	2.45	2.12	1.73	2.45	2.12	1.73
		38 x 184	3.23	2.80	2.28	3.23	2.80	2.28
		38 x 235	4.12	3.57	2.91	4.12	3.57	2.91
		38 x 286	5.01	4.34	3.54	5.01	4.34	3.54
	Construction	38 x 89	1.76	1.60	1.33	1.89	1.64	1.33
	Standard	38 x 89	1.42	1.23	1.00	1.42	1.23	1.00
	Utility	38 x 89	0.97	0.84	0.68	0.97	0.84	0.68

Table A-6
Forming Part of Article 9.23.4.1.

ROOF JOISTS — SUPPORTING CEILING (LIVE LOAD 1.5 kN/m²)								
Commercial Designation	Grade	Nominal Size, mm	LIVE LOAD 1.5 kN/m ²					
			Gypsum Board or Plastered Ceiling			Other Ceilings		
			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 x 89	2.35	2.14	1.87	2.69	2.45	2.14
		38 x 140	3.70	3.36	2.94	4.24	3.85	3.36
		38 x 184	4.88	4.43	3.87	5.59	5.08	4.43
		38 x 235	6.23	5.66	4.94	7.13	6.48	5.66
		38 x 286	7.57	6.88	6.01	8.67	7.88	6.88
	No. 1	38 x 89	2.35	2.14	1.87	2.69	2.45	2.14
		38 x 140	3.70	3.36	2.94	4.24	3.85	3.36
		38 x 184	4.88	4.43	3.87	5.59	5.08	4.43
		38 x 235	6.23	5.66	4.94	7.13	6.48	5.66
		38 x 286	7.57	6.88	6.01	8.67	7.88	6.88
	No. 2	38 x 89	2.27	2.07	1.80	2.60	2.37	2.07
		38 x 140	3.58	3.25	2.84	4.10	3.72	3.04
		38 x 184	4.72	4.29	3.74	5.40	4.91	4.02
		38 x 235	6.02	5.47	4.78	6.89	6.26	5.12
		38 x 286	7.32	6.65	5.81	8.38	7.62	6.23
	No. 3	38 x 89	2.18	1.91	1.56	2.21	1.91	1.56
		38 x 140	3.26	2.82	2.30	3.26	2.82	2.30
		38 x 184	4.30	3.72	3.04	4.30	3.72	3.04
		38 x 235	5.49	4.75	3.88	5.49	4.75	3.88
		38 x 286	6.67	5.78	4.72	6.67	5.78	4.72
	Construction	38 x 89	2.18	1.98	1.73	2.50	2.19	1.79
	Standard	38 x 89	1.90	1.65	1.34	1.90	1.65	1.34
	Utility	38 x 89	1.30	1.12	0.92	1.30	1.12	0.92
Hem-Fir (includes Western Hemlock and Amabilis Fir)	Select structural	38 x 89	2.27	2.06	1.80	2.60	2.36	2.06
		38 x 140	3.57	3.24	2.83	4.08	3.71	3.15
		38 x 184	4.70	4.27	3.73	5.38	4.89	4.15
		38 x 235	6.00	5.45	4.76	6.87	6.24	5.29
		38 x 286	7.30	6.63	5.79	8.36	7.59	6.44
	No. 1	38 x 89	2.27	2.06	1.80	2.60	2.36	2.00
		38 x 140	3.57	3.24	2.83	4.08	3.58	2.92
		38 x 184	4.70	4.27	3.73	5.38	4.72	3.85
		38 x 235	6.00	5.45	4.76	6.87	6.02	4.92
		38 x 286	7.30	6.63	5.79	8.36	7.33	5.98
	No. 2	38 x 89	2.19	1.99	1.74	2.51	2.22	1.81
		38 x 140	3.44	3.13	2.62	3.71	3.21	2.62
		38 x 184	4.54	4.13	3.46	4.89	4.24	3.46
		38 x 235	5.80	5.27	4.41	6.24	5.40	4.41
		38 x 286	7.05	6.41	5.37	7.59	6.57	5.37
	No. 3	38 x 89	1.90	1.65	1.34	1.90	1.65	1.34
		38 x 140	2.81	2.44	1.99	2.81	2.44	1.99
		38 x 184	3.71	3.21	2.62	3.71	3.21	2.62
		38 x 235	4.73	4.10	3.35	4.73	4.10	3.35
		38 x 286	5.76	4.99	4.07	5.76	4.99	4.07
	Construction	38 x 89	2.11	1.90	1.55	2.19	1.90	1.55
	Standard	38 x 89	1.64	1.42	1.16	1.64	1.42	1.16
	Utility	38 x 89	1.12	0.97	0.79	1.12	0.97	0.79

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Table A-6 (Cont'd)

ROOF JOISTS — SUPPORTING CEILING (LIVE LOAD 1.5 kN/m ²)								
Commercial Designation	Grade	Nominal Size, mm	LIVE LOAD 1.5 kN/m ²					
			Gypsum Board or Plastered Ceiling			Other Ceilings		
			Joist Spacing			Joist Spacing		
			300 mm m	400 mm m	600 mm m	300 mm m	400 mm m	600 mm m
Eastern Hemlock-Tamarack (includes Eastern Hemlock and Tamarack)	Select structural	38 x 89	2.16	1.96	1.71	2.47	2.25	1.96
		38 x 140	3.40	3.09	2.70	3.89	3.53	3.09
		38 x 184	4.48	4.07	3.55	5.13	4.66	4.07
		38 x 235	5.72	5.19	4.54	6.55	5.95	5.19
		38 x 286	6.95	6.32	5.52	7.96	7.23	6.32
	No. 1	38 x 89	2.16	1.96	1.71	2.47	2.25	1.96
		38 x 140	3.40	3.09	2.70	3.89	3.53	3.09
		38 x 184	4.48	4.07	3.55	5.13	4.66	4.07
		38 x 235	5.72	5.19	4.54	6.55	5.95	5.19
		38 x 286	6.95	6.32	5.52	7.96	7.23	6.32
	No. 2	38 x 89	2.08	1.89	1.65	2.38	2.17	1.89
		38 x 140	3.28	2.98	2.60	3.75	3.41	2.92
		38 x 184	4.32	3.92	3.43	4.94	4.49	3.85
		38 x 235	5.51	5.01	4.37	6.31	5.73	4.92
		38 x 286	6.70	6.09	5.32	7.68	6.97	5.98
	No. 3	38 x 89	2.01	1.82	1.51	2.13	1.85	1.51
		38 x 140	3.13	2.71	2.21	3.13	2.71	2.21
		38 x 184	4.13	3.57	2.92	4.13	3.57	2.92
		38 x 235	5.27	4.56	3.72	5.27	4.56	3.72
		38 x 286	6.41	5.55	4.53	6.41	5.55	4.53
	Construction	38 x 89	2.01	1.82	1.59	2.30	2.09	1.73
	Standard	38 x 89	1.81	1.57	1.28	1.81	1.57	1.28
	Utility	38 x 89	1.26	1.09	0.89	1.26	1.09	0.89
Coast Species (includes Douglas Fir, Western Larch, Western Hemlock, Amabilis Fir, and Coast Sitka Spruce)	Select structural	38 x 89	2.27	2.06	1.80	2.60	2.36	2.06
		38 x 140	3.57	3.24	2.83	4.08	3.71	3.11
		38 x 184	4.70	4.27	3.73	5.38	4.89	4.10
		38 x 235	6.00	5.45	4.76	6.87	6.24	5.24
		38 x 286	7.30	6.63	5.79	8.36	7.59	6.37
	No. 1	38 x 89	2.27	2.06	1.80	2.60	2.36	1.98
		38 x 140	3.57	3.24	2.83	4.08	3.54	2.89
		38 x 184	4.70	4.27	3.73	5.38	4.66	3.81
		38 x 235	6.00	5.45	4.76	6.87	5.95	4.86
		38 x 286	7.30	6.63	5.79	8.36	7.24	5.91
	No. 2	38 x 89	2.19	1.99	1.74	2.51	2.19	1.79
		38 x 140	3.44	3.13	2.58	3.65	3.16	2.58
		38 x 184	4.54	4.13	3.40	4.82	4.17	3.40
		38 x 235	5.80	5.27	4.34	6.15	5.32	4.34
		38 x 286	7.05	6.41	5.29	7.48	6.47	5.29
	No. 3	38 x 89	1.88	1.63	1.33	1.88	1.63	1.33
		38 x 140	2.78	2.40	1.96	2.78	2.40	1.96
		38 x 184	3.66	3.17	2.59	3.66	3.17	2.59
		38 x 235	4.67	4.05	3.30	4.67	4.05	3.30
		38 x 286	5.68	4.92	4.02	5.68	4.92	4.02
	Construction	38 x 89	2.11	1.86	1.52	2.15	1.86	1.52
	Standard	38 x 89	1.61	1.40	1.14	1.61	1.40	1.14
	Utility	38 x 89	1.12	0.97	0.79	1.12	0.97	0.79

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Table A-6 (Cont'd)

ROOF JOISTS — SUPPORTING CEILING (LIVE LOAD 1.5 kN/m ²)								
Commercial Designation	Grade	Nominal Size, mm	LIVE LOAD 1.5 kN/m ²					
			Gypsum Board or Plastered Ceiling			Other Ceilings		
			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 x 89	2.14	1.94	1.70	2.45	2.22	1.94
		38 x 140	3.36	3.05	2.67	3.85	3.50	3.04
		38 x 184	4.43	4.03	3.52	5.08	4.61	4.02
		38 x 235	5.66	5.14	4.49	6.48	5.88	5.12
		38 x 286	6.88	6.25	5.46	7.88	7.16	6.23
	No. 1	38 x 89	2.14	1.94	1.70	2.45	2.22	1.94
		38 x 140	3.36	3.05	2.67	3.85	3.47	2.83
		38 x 184	4.43	4.03	3.52	5.08	4.57	3.73
		38 x 235	5.66	5.14	4.49	6.48	5.84	4.77
		38 x 286	6.88	6.25	5.46	7.88	7.10	5.80
	No. 2	38 x 89	2.07	1.88	1.64	2.37	2.15	1.75
		38 x 140	3.25	2.95	2.54	3.59	3.11	2.54
		38 x 184	4.29	3.89	3.35	4.74	4.10	3.35
		38 x 235	5.47	4.97	4.28	6.05	5.24	4.28
		38 x 286	6.65	6.04	5.20	7.36	6.37	5.20
	No. 3	38 x 89	1.86	1.61	1.31	1.86	1.61	1.31
		38 x 140	2.74	2.37	1.93	2.74	2.37	1.93
		38 x 184	3.61	3.13	2.55	3.61	3.13	2.55
		38 x 235	4.61	3.99	3.26	4.61	3.99	3.26
		38 x 286	5.61	4.85	3.96	5.61	4.85	3.96
	Construction	38 x 89	1.99	1.81	1.49	2.11	1.83	1.49
	Standard	38 x 89	1.59	1.38	1.12	1.59	1.38	1.12
	Utility	38 x 89	1.08	0.94	0.76	1.08	0.94	0.76
Western Cedars (includes Western Red Cedar and Pacific Coast Yellow Cedar)	Select structural	38 x 89	2.06	1.87	1.63	2.36	2.14	1.87
		38 x 140	3.24	2.94	2.57	3.71	3.37	2.94
		38 x 184	4.27	3.88	3.39	4.89	4.44	3.88
		38 x 235	5.45	4.95	4.32	6.24	5.66	4.95
		38 x 286	6.63	6.02	5.26	7.58	6.89	6.02
	No. 1	38 x 89	2.06	1.87	1.63	2.36	2.14	1.87
		38 x 140	3.24	2.94	2.57	3.71	3.37	2.87
		38 x 184	4.27	3.88	3.39	4.89	4.44	3.78
		38 x 235	5.45	4.95	4.32	6.24	5.66	4.83
		38 x 286	6.63	6.02	5.26	7.58	6.89	5.87
	No. 2	38 x 89	1.99	1.81	1.58	2.28	2.07	1.78
		38 x 140	3.13	2.84	2.48	3.58	3.14	2.56
		38 x 184	4.13	3.75	3.27	4.72	4.14	3.38
		38 x 235	5.27	4.78	4.18	6.03	5.28	4.31
		38 x 286	6.41	5.82	5.08	7.33	6.42	5.24
	No. 3	38 x 89	1.86	1.61	1.31	1.86	1.61	1.31
		38 x 140	2.74	2.37	1.93	2.74	2.37	1.93
		38 x 184	3.61	3.13	2.55	3.61	3.13	2.55
		38 x 235	4.61	3.99	3.26	4.61	3.99	3.26
		38 x 286	5.61	4.85	3.96	5.61	4.85	3.96
	Construction	38 x 89	1.92	1.74	1.51	2.13	1.85	1.51
	Standard	38 x 89	1.59	1.38	1.12	1.59	1.38	1.12
	Utility	38 x 89	1.08	0.94	0.76	1.08	0.94	0.76

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Table A-6 (Cont'd)

ROOF JOISTS — SUPPORTING CEILING (LIVE LOAD 1.5 kN/m ²)								
Commercial Designation	Grade	Nominal Size, mm	LIVE LOAD 1.5 kN/m ²					
			Gypsum Board or Plastered Ceiling			Other Ceilings		
			Joist Spacing			Joist Spacing		
			300 mm	400 mm	600 mm	300 mm	400 mm	600 mm
			m	m	m	m	m	m
Northern Species (includes any Canadian softwood covered by the NLGA Standard Grading Rules)	Select structural	38 x 89	2.06	1.87	1.63	2.36	2.14	1.87
		38 x 140	3.24	2.94	2.57	3.71	3.37	2.94
		38 x 184	4.27	3.88	3.39	4.89	4.44	3.88
		38 x 235	5.45	4.95	4.32	6.24	5.66	4.95
		38 x 286	6.63	6.02	5.26	7.58	6.89	6.02
	No. 1	38 x 89	2.06	1.87	1.63	2.36	2.14	1.87
		38 x 140	3.24	2.94	2.57	3.71	3.35	2.74
		38 x 184	4.27	3.88	3.39	4.89	4.42	3.61
		38 x 235	5.45	4.95	4.32	6.24	5.65	4.61
		38 x 286	6.63	6.02	5.26	7.58	6.87	5.61
	No. 2	38 x 89	1.99	1.81	1.58	2.28	2.07	1.70
		38 x 140	3.13	2.84	2.46	3.48	3.01	2.46
		38 x 184	4.13	3.75	3.24	4.58	3.97	3.24
		38 x 235	5.27	4.78	4.14	5.85	5.07	4.14
		38 x 286	6.41	5.82	5.03	7.12	6.16	5.03
	No. 3	38 x 89	1.79	1.55	1.26	1.79	1.55	1.26
		38 x 140	2.62	2.27	1.85	2.62	2.27	1.85
		38 x 184	3.46	2.99	2.44	3.46	2.99	2.44
		38 x 235	4.41	3.82	3.12	4.41	3.82	3.12
		38 x 286	5.37	4.65	3.79	5.37	4.65	3.79
	Construction	38 x 89	1.92	1.74	1.45	2.05	1.78	1.45
	Standard	38 x 89	1.53	1.33	1.08	1.53	1.33	1.08
	Utility	38 x 89	1.04	0.90	0.74	1.04	0.90	0.74
Northern Aspen (includes Aspen Poplar, Large Tooth Aspen and Balsam Poplar)	Select structural	38 x 89	2.09	1.90	1.66	2.39	2.17	1.90
		38 x 140	3.29	2.99	2.61	3.76	3.42	2.99
		38 x 184	4.34	3.94	3.44	4.96	4.51	3.94
		38 x 235	5.53	5.03	4.39	6.33	5.75	5.03
		38 x 286	6.73	6.11	5.34	7.70	7.00	6.11
	No. 1	38 x 89	2.09	1.90	1.66	2.39	2.17	1.90
		38 x 140	3.29	2.99	2.61	3.76	3.42	2.83
		38 x 184	4.34	3.94	3.44	4.96	4.51	3.73
		38 x 235	5.53	5.03	4.39	6.33	5.75	4.77
		38 x 286	6.73	6.11	5.34	7.70	7.00	5.80
	No. 2	38 x 89	2.02	1.83	1.60	2.31	2.10	1.76
		38 x 140	3.17	2.88	2.52	3.59	3.11	2.54
		38 x 184	4.18	3.80	3.32	4.74	4.10	3.35
		38 x 235	5.33	4.85	4.23	6.05	5.24	4.28
		38 x 286	6.49	5.90	5.15	7.36	6.37	5.20
	No. 3	38 x 89	1.86	1.61	1.31	1.86	1.61	1.31
		38 x 140	2.74	2.37	1.93	2.74	2.37	1.93
		38 x 184	3.61	3.13	2.55	3.61	3.13	2.55
		38 x 235	4.61	3.99	3.26	4.61	3.99	3.26
		38 x 286	5.61	4.85	3.96	5.61	4.85	3.96
	Construction	38 x 89	1.93	1.76	1.49	2.11	1.83	1.49
	Standard	38 x 89	1.59	1.38	1.12	1.59	1.38	1.12
	Utility	38 x 89	1.08	0.94	0.76	1.08	0.94	0.76

Table A-7
Forming Part of Article 9.23.4.1.

ROOF JOISTS — SUPPORTING CEILING (LIVE LOAD 1.0 kN/m²)								
Commercial Designation	Grade	Nominal Size, mm	LIVE LOAD 1.0 kN/m ²					
			Gypsum Board or Plastered Ceiling			Other Ceilings		
			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 x 89	2.69	2.45	2.14	3.09	2.80	2.45
		38 x 140	4.24	3.85	3.36	4.85	4.41	3.85
		38 x 184	5.59	5.08	4.43	6.40	5.81	5.08
		38 x 235	7.13	6.48	5.66	8.16	7.41	6.48
		38 x 286	8.67	7.88	6.88	9.93	9.02	7.88
	No. 1	38 x 89	2.69	2.45	2.14	3.09	2.80	2.45
		38 x 140	4.24	3.85	3.36	4.85	4.41	3.85
		38 x 184	5.59	5.08	4.43	6.40	5.81	5.08
		38 x 235	7.13	6.48	5.66	8.16	7.41	6.48
		38 x 286	8.67	7.88	6.88	9.93	9.02	7.88
	No. 2	38 x 89	2.60	2.37	2.07	2.98	2.71	2.37
		38 x 140	4.10	3.72	3.25	4.69	4.26	3.52
		38 x 184	5.40	4.91	4.29	6.18	5.62	4.64
		38 x 235	6.89	6.26	5.47	7.89	7.17	5.92
		38 x 286	8.38	7.62	6.65	9.60	8.72	7.20
	No. 3	38 x 89	2.50	2.21	1.80	2.55	2.21	1.80
		38 x 140	3.77	3.26	2.66	3.77	3.26	2.66
		38 x 184	4.96	4.30	3.51	4.96	4.30	3.51
		38 x 235	6.34	5.49	4.48	6.34	5.49	4.48
		38 x 286	7.71	6.67	5.45	7.71	6.67	5.45
	Construction	38 x 89	2.50	2.27	1.98	2.86	2.53	2.07
	Standard	38 x 89	2.20	1.90	1.55	2.20	1.90	1.55
	Utility	38 x 89	1.50	1.30	1.06	1.50	1.30	1.06
Hem-Fir (includes Western Hemlock and Amabilis Fir)	Select structural	38 x 89	2.60	2.36	2.06	2.97	2.70	2.36
		38 x 140	4.08	3.71	3.24	4.67	4.25	3.63
		38 x 184	5.38	4.89	4.27	6.16	5.60	4.79
		38 x 235	6.87	6.24	5.45	7.87	7.15	6.11
		38 x 286	8.36	7.59	6.63	9.57	8.69	7.44
	No. 1	38 x 89	2.60	2.36	2.06	2.97	2.70	2.31
		38 x 140	4.08	3.71	3.24	4.67	4.14	3.38
		38 x 184	5.38	4.89	4.27	6.16	5.45	4.45
		38 x 235	6.87	6.24	5.45	7.87	6.96	5.68
		38 x 286	8.36	7.59	6.63	9.57	8.46	6.91
	No. 2	38 x 89	2.51	2.28	1.99	2.87	2.56	2.09
		38 x 140	3.94	3.58	3.03	4.28	3.71	3.03
		38 x 184	5.20	4.72	3.99	5.65	4.89	3.99
		38 x 235	6.64	6.03	5.10	7.21	6.24	5.10
		38 x 286	8.07	7.33	6.20	8.77	7.59	6.20
	No. 3	38 x 89	2.20	1.90	1.55	2.20	1.90	1.55
		38 x 140	3.25	2.81	2.30	3.25	2.81	2.30
		38 x 184	4.28	3.71	3.03	4.28	3.71	3.03
		38 x 235	5.47	4.73	3.87	5.47	4.73	3.87
		38 x 286	6.65	5.76	4.70	6.65	5.76	4.70
	Construction	38 x 89	2.41	2.19	1.79	2.53	2.19	1.79
	Standard	38 x 89	1.90	1.64	1.34	1.90	1.64	1.34
	Utility	38 x 89	1.30	1.12	0.92	1.30	1.12	0.92

Continued on next page

Table A-7 (Cont'd)

ROOF JOISTS — SUPPORTING CEILING (LIVE LOAD 1.0 kN/m ²)								
Commercial Designation	Grade	Nominal Size, mm	LIVE LOAD 1.0 kN/m ²					
			Gypsum Board or Plastered Ceiling			Other Ceilings		
			Joist Spacing			Joist Spacing		
			300 mm	400 mm	600 mm	300 mm	400 mm	600 mm
			m	m	m	m	m	m
Eastern Hemlock-Tamarack (includes Eastern Hemlock and Tamarack)	Select structural	38 x 89	2.47	2.25	1.96	2.83	2.57	2.25
		38 x 140	3.89	3.53	3.09	4.45	4.05	3.53
		38 x 184	5.13	4.66	4.07	5.87	5.33	4.66
		38 x 235	6.55	5.95	5.19	7.49	6.81	5.95
		38 x 286	7.96	7.23	6.32	9.12	8.28	7.23
	No. 1	38 x 89	2.47	2.25	1.96	2.83	2.57	2.25
		38 x 140	3.89	3.53	3.09	4.45	4.05	3.53
		38 x 184	5.13	4.66	4.07	5.87	5.33	4.66
		38 x 235	6.55	5.95	5.19	7.49	6.81	5.95
		38 x 286	7.96	7.23	6.32	9.12	8.28	7.23
	No. 2	38 x 89	2.38	2.17	1.89	2.73	2.48	2.17
		38 x 140	3.75	3.41	2.98	4.29	3.90	3.38
		38 x 184	4.94	4.49	3.92	5.66	5.14	4.45
		38 x 235	6.31	5.73	5.01	7.22	6.56	5.68
		38 x 286	7.68	6.97	6.09	8.79	7.98	6.91
	No. 3	38 x 89	2.30	2.09	1.74	2.46	2.13	1.74
		38 x 140	3.61	3.13	2.55	3.61	3.13	2.55
		38 x 184	4.77	4.13	3.37	4.77	4.13	3.37
		38 x 235	6.08	5.27	4.30	6.08	5.27	4.30
		38 x 286	7.40	6.41	5.23	7.40	6.41	5.23
	Construction	38 x 89	2.30	2.09	1.82	2.63	2.39	2.00
	Standard	38 x 89	2.09	1.81	1.48	2.09	1.81	1.48
	Utility	38 x 89	1.46	1.26	1.03	1.46	1.26	1.03
Coast Species (includes Douglas Fir, Western Larch, Western Hemlock, Amabilis Fir, and Coast Sitka Spruce)	Select structural	38 x 89	2.60	2.36	2.06	2.97	2.70	2.36
		38 x 140	4.08	3.71	3.24	4.67	4.25	3.59
		38 x 184	5.38	4.89	4.27	6.16	5.60	4.74
		38 x 235	6.87	6.24	5.45	7.87	7.15	6.05
		38 x 286	8.36	7.59	6.63	9.57	8.69	7.36
	No. 1	38 x 89	2.60	2.36	2.06	2.97	2.70	2.29
		38 x 140	4.08	3.71	3.24	4.67	4.08	3.33
		38 x 184	5.38	4.89	4.27	6.16	5.39	4.40
		38 x 235	6.87	6.24	5.45	7.87	6.87	5.61
		38 x 286	8.36	7.59	6.63	9.57	8.36	6.82
	No. 2	38 x 89	2.51	2.28	1.99	2.87	2.53	2.07
		38 x 140	3.94	3.58	2.98	4.22	3.65	2.98
		38 x 184	5.20	4.72	3.93	5.56	4.82	3.93
		38 x 235	6.64	6.03	5.02	7.10	6.15	5.02
		38 x 286	8.07	7.33	6.10	8.63	7.48	6.10
	No. 3	38 x 89	2.17	1.88	1.53	2.17	1.88	1.53
		38 x 140	3.21	2.78	2.27	3.21	2.78	2.27
		38 x 184	4.23	3.66	2.99	4.23	3.66	2.99
		38 x 235	5.40	4.67	3.81	5.40	4.67	3.81
		38 x 286	6.56	5.68	4.64	6.56	5.68	4.64
	Construction	38 x 89	2.41	2.15	1.76	2.49	2.15	1.76
	Standard	38 x 89	1.87	1.61	1.32	1.87	1.61	1.32
	Utility	38 x 89	1.30	1.12	0.92	1.30	1.12	0.92

Continued on next page

Table A-7 (Cont'd)

ROOF JOISTS — SUPPORTING CEILING (LIVE LOAD 1.0 kN/m ²)								
Commercial Designation	Grade	Nominal Size, mm	LIVE LOAD 1.0 kN/m ²					
			Gypsum Board or Plastered Ceiling			Other Ceilings		
			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 x 89	2.45	2.22	1.94	2.80	2.55	2.22
		38 x 140	3.85	3.50	3.05	4.41	4.00	3.50
		38 x 184	5.08	4.61	4.03	5.81	5.28	4.61
		38 x 235	6.48	5.88	5.14	7.41	6.74	5.88
		38 x 286	7.88	7.16	6.25	9.02	8.19	7.16
	No. 1	38 x 89	2.45	2.22	1.94	2.80	2.55	2.22
		38 x 140	3.85	3.50	3.05	4.41	4.00	3.27
		38 x 184	5.08	4.61	4.03	5.81	5.28	4.31
		38 x 235	6.48	5.88	5.14	7.41	6.74	5.50
		38 x 286	7.88	7.16	6.25	9.02	8.19	6.70
	No. 2	38 x 89	2.37	2.15	1.88	2.71	2.46	2.02
		38 x 140	3.72	3.38	2.93	4.15	3.59	2.93
		38 x 184	4.91	4.46	3.87	5.47	4.74	3.87
		38 x 235	6.26	5.69	4.94	6.99	6.05	4.94
		38 x 286	7.62	6.92	6.01	8.50	7.36	6.01
	No. 3	38 x 89	2.15	1.86	1.52	2.15	1.86	1.52
		38 x 140	3.16	2.74	2.23	3.16	2.74	2.23
		38 x 184	4.17	3.61	2.95	4.17	3.61	2.95
		38 x 235	5.32	4.61	3.76	5.32	4.61	3.76
		38 x 286	6.47	5.61	4.58	6.47	5.61	4.58
	Construction	38 x 89	2.28	2.07	1.72	2.44	2.11	1.72
	Standard	38 x 89	1.84	1.59	1.30	1.84	1.59	1.30
	Utility	38 x 89	1.25	1.08	0.88	1.25	1.08	0.88
Western Cedars (includes Western Red Cedar and Pacific Coast Yellow Cedar)	Select structural	38 x 89	2.36	2.14	1.87	2.70	2.45	2.14
		38 x 140	3.71	3.37	2.94	4.24	3.85	3.37
		38 x 184	4.89	4.44	3.88	5.59	5.08	4.44
		38 x 235	6.24	5.66	4.95	7.14	6.49	5.66
		38 x 286	7.58	6.89	6.02	8.68	7.89	6.89
	No. 1	38 x 89	2.36	2.14	1.87	2.70	2.45	2.14
		38 x 140	3.71	3.37	2.94	4.24	3.85	3.31
		38 x 184	4.89	4.44	3.88	5.59	5.08	4.37
		38 x 235	6.24	5.66	4.95	7.14	6.49	5.58
		38 x 286	7.58	6.89	6.02	8.68	7.89	6.78
	No. 2	38 x 89	2.28	2.07	1.81	2.61	2.37	2.05
		38 x 140	3.58	3.25	2.84	4.10	3.62	2.96
		38 x 184	4.72	4.29	3.75	5.41	4.78	3.90
		38 x 235	6.03	5.48	4.78	6.90	6.10	4.98
		38 x 286	7.33	6.66	5.82	8.39	7.42	6.06
	No. 3	38 x 89	2.15	1.86	1.52	2.15	1.86	1.52
		38 x 140	3.16	2.74	2.23	3.16	2.74	2.23
		38 x 184	4.17	3.61	2.95	4.17	3.61	2.95
		38 x 235	5.32	4.61	3.76	5.32	4.61	3.76
		38 x 286	6.47	5.61	4.58	6.47	5.61	4.58
	Construction	38 x 89	2.19	1.99	1.74	2.46	2.13	1.74
	Standard	38 x 89	1.84	1.59	1.30	1.84	1.59	1.30
	Utility	38 x 89	1.25	1.08	0.88	1.25	1.08	0.88

Continued on next page

Table A-7 (Cont'd)

ROOF JOISTS — SUPPORTING CEILING (LIVE LOAD 1.0 kN/m ²)								
Commercial Designation	Grade	Nominal Size, mm	LIVE LOAD 1.0 kN/m ²					
			Gypsum Board or Plastered Ceiling			Other Ceilings		
			Joist Spacing			Joist Spacing		
			300 mm	400 mm	600 mm	300 mm	400 mm	600 mm
			m	m	m	m	m	m
Northern Species (includes any Canadian softwood covered by the NLGA Standard Grading Rules)	Select structural	38 x 89	2.36	2.14	1.87	2.70	2.45	2.14
		38 x 140	3.71	3.37	2.94	4.24	3.85	3.37
		38 x 184	4.89	4.44	3.88	5.59	5.08	4.44
		38 x 235	6.24	5.66	4.95	7.14	6.49	5.66
		38 x 286	7.58	6.89	6.02	8.68	7.89	6.89
	No. 1	38 x 89	2.36	2.14	1.87	2.70	2.45	2.14
		38 x 140	3.71	3.37	2.94	4.24	3.85	3.16
		38 x 184	4.89	4.44	3.88	5.59	5.08	4.17
		38 x 235	6.24	5.66	4.95	7.14	6.49	5.32
		38 x 286	7.58	6.89	6.02	8.68	7.89	6.47
	No. 2	38 x 89	2.28	2.07	1.81	2.61	2.37	1.97
		38 x 140	3.58	3.25	2.84	4.02	3.48	2.84
		38 x 184	4.72	4.29	3.74	5.29	4.58	3.74
		38 x 235	6.03	5.48	4.78	6.76	5.85	4.78
		38 x 286	7.33	6.66	5.81	8.22	7.12	5.81
	No. 3	38 x 89	2.07	1.79	1.46	2.07	1.79	1.46
		38 x 140	3.03	2.62	2.14	3.03	2.62	2.14
		38 x 184	3.99	3.46	2.82	3.99	3.46	2.82
		38 x 235	5.10	4.41	3.60	5.10	4.41	3.60
		38 x 286	6.20	5.37	4.38	6.20	5.37	4.38
	Construction	38 x 89	2.19	1.99	1.67	2.37	2.05	1.67
	Standard	38 x 89	1.77	1.53	1.25	1.77	1.53	1.25
	Utility	38 x 89	1.21	1.04	0.85	1.21	1.04	0.85
Northern Aspen (includes Aspen Poplar, Large Tooth Aspen and Balsam Poplar)	Select structural	38 x 89	2.39	2.17	1.90	2.74	2.49	2.17
		38 x 140	3.76	3.42	2.99	4.31	3.92	3.42
		38 x 184	4.96	4.51	3.94	5.68	5.16	4.51
		38 x 235	6.33	5.75	5.03	7.25	6.59	5.75
		38 x 286	7.70	7.00	6.11	8.82	8.01	7.00
	No. 1	38 x 89	2.39	2.17	1.90	2.74	2.49	2.17
		38 x 140	3.76	3.42	2.99	4.31	3.92	3.27
		38 x 184	4.96	4.51	3.94	5.68	5.16	4.31
		38 x 235	6.33	5.75	5.03	7.25	6.59	5.50
		38 x 286	7.70	7.00	6.11	8.82	8.01	6.70
	No. 2	38 x 89	2.31	2.10	1.83	2.64	2.40	2.04
		38 x 140	3.63	3.30	2.88	4.15	3.59	2.93
		38 x 184	4.79	4.35	3.80	5.47	4.74	3.87
		38 x 235	6.11	5.55	4.85	6.99	6.05	4.94
		38 x 286	7.43	6.75	5.90	8.50	7.36	6.01
	No. 3	38 x 89	2.15	1.86	1.52	2.15	1.86	1.52
		38 x 140	3.16	2.74	2.23	3.16	2.74	2.23
		38 x 184	4.17	3.61	2.95	4.17	3.61	2.95
		38 x 235	5.32	4.61	3.76	5.32	4.61	3.76
		38 x 286	6.47	5.61	4.58	6.47	5.61	4.58
	Construction	38 x 89	2.22	2.01	1.72	2.44	2.11	1.72
	Standard	38 x 89	1.84	1.59	1.30	1.84	1.59	1.30
	Utility	38 x 89	1.25	1.08	0.88	1.25	1.08	0.88

Table A-8
Forming Part of Article 9.23.4.1.

RAFTERS — NOT SUPPORTING CEILING (LIVE LOADS 2.5 AND 2.0 kN/m²)								
Commercial Designation	Grade	Nominal Size, <i>mm</i>	LIVE LOAD 2.5 kN/m ²			LIVE LOAD 2.0 kN/m ²		
			Rafter Spacing			Rafter Spacing		
			300 mm	400 mm	600 mm	300 mm	400 mm	600 mm
			<i>m</i>	<i>m</i>	<i>m</i>	<i>m</i>	<i>m</i>	<i>m</i>
Douglas Fir-Larch (includes Douglas Fir and Western Larch)	Select structural	38 x 89	2.50	2.27	1.98	2.69	2.45	2.14
		38 x 140	3.93	3.57	3.09	4.24	3.85	3.36
		38 x 184	5.19	4.71	4.07	5.59	5.08	4.43
		38 x 235	6.62	6.01	5.19	7.13	6.48	5.66
		38 x 286	8.05	7.31	6.32	8.67	7.88	6.88
	No. 1	38 x 89	2.50	2.27	1.96	2.69	2.45	2.14
		38 x 140	3.93	3.50	2.86	4.24	3.85	3.16
		38 x 184	5.19	4.62	3.77	5.59	5.08	4.16
		38 x 235	6.62	5.90	4.81	7.13	6.48	5.31
		38 x 286	8.05	7.17	5.86	8.67	7.88	6.46
	No. 2	38 x 89	2.42	2.19	1.79	2.60	2.37	1.97
		38 x 140	3.64	3.15	2.57	4.02	3.48	2.84
		38 x 184	4.80	4.16	3.39	5.30	4.59	3.74
		38 x 235	6.13	5.30	4.33	6.76	5.85	4.78
		38 x 286	7.45	6.45	5.27	8.22	7.12	5.81
	No. 3	38 x 89	1.87	1.62	1.32	2.06	1.78	1.46
		38 x 140	2.75	2.38	1.95	3.04	2.63	2.15
		38 x 184	3.63	3.15	2.57	4.01	3.47	2.83
		38 x 235	4.64	4.01	3.28	5.12	4.43	3.62
		38 x 286	5.64	4.88	3.99	6.22	5.39	4.40
	Construction	38 x 89	2.14	1.85	1.51	2.36	2.04	1.67
	Standard	38 x 89	1.61	1.39	1.14	1.77	1.54	1.25
	Utility	38 x 89	1.09	0.95	0.77	1.21	1.05	0.85
Hem-Fir (includes Western Hemlock and Amabilis Fir)	Select structural	38 x 89	2.41	2.19	1.84	2.60	2.36	2.03
		38 x 140	3.76	3.26	2.66	4.08	3.59	2.93
		38 x 184	4.96	4.29	3.51	5.38	4.74	3.87
		38 x 235	6.33	5.48	4.47	6.87	6.05	4.94
		38 x 286	7.70	6.67	5.44	8.36	7.36	6.01
	No. 1	38 x 89	2.39	2.07	1.69	2.60	2.29	1.86
		38 x 140	3.49	3.03	2.47	3.86	3.34	2.72
		38 x 184	4.61	3.99	3.26	5.08	4.40	3.59
		38 x 235	5.88	5.09	4.16	6.49	5.62	4.59
		38 x 286	7.15	6.19	5.06	7.89	6.83	5.58
	No. 2	38 x 89	2.17	1.88	1.53	2.39	2.07	1.69
		38 x 140	3.13	2.71	2.21	3.46	2.99	2.44
		38 x 184	4.13	3.58	2.92	4.56	3.95	3.22
		38 x 235	5.27	4.57	3.73	5.82	5.04	4.11
		38 x 286	6.42	5.56	4.54	7.08	6.13	5.00
	No. 3	38 x 89	1.61	1.39	1.14	1.77	1.54	1.25
		38 x 140	2.38	2.06	1.68	2.62	2.27	1.85
		38 x 184	3.13	2.71	2.22	3.46	3.00	2.44
		38 x 235	4.00	3.46	2.83	4.41	3.82	3.12
		38 x 286	4.87	4.21	3.44	5.37	4.65	3.80
	Construction	38 x 89	1.85	1.60	1.31	2.04	1.77	1.44
	Standard	38 x 89	1.39	1.20	0.98	1.53	1.32	1.08
	Utility	38 x 89	0.95	0.82	0.67	1.05	0.90	0.74

Continued on next page

Table A-8 (Cont'd)

RAFTERS — NOT SUPPORTING CEILING (LIVE LOADS 2.5 AND 2.0 kN/m ²)								
Commercial Designation	Grade	Nominal Size, mm	LIVE LOAD 2.5 kN/m ²			LIVE LOAD 2.0 kN/m ²		
			Rafter Spacing			Rafter Spacing		
			300 mm	400 mm	600 mm	300 mm	400 mm	600 mm
			m	m	m	m	m	m
Eastern Hemlock-Tamarack (includes Eastern Hemlock and Tamarack)	Select structural	38 x 89	2.30	2.09	1.82	2.47	2.25	1.96
		38 x 140	3.61	3.28	2.86	3.89	3.53	3.09
		38 x 184	4.76	4.33	3.78	5.13	4.66	4.07
		38 x 235	6.08	5.52	4.82	6.55	5.95	5.19
		38 x 286	7.39	6.71	5.87	7.96	7.23	6.32
	No. 1	38 x 89	2.30	2.09	1.82	2.47	2.25	1.96
		38 x 140	3.61	3.28	2.75	3.89	3.53	3.04
		38 x 184	4.76	4.33	3.63	5.13	4.66	4.01
		38 x 235	6.08	5.52	4.64	6.55	5.95	5.12
		38 x 286	7.39	6.71	5.64	7.96	7.23	6.22
	No. 2	38 x 89	2.21	2.01	1.72	2.38	2.17	1.89
		38 x 140	3.48	3.03	2.47	3.75	3.34	2.72
		38 x 184	4.59	3.99	3.26	4.94	4.40	3.59
		38 x 235	5.86	5.09	4.16	6.31	5.62	4.59
		38 x 286	7.12	6.19	5.06	7.68	6.83	5.58
	No. 3	38 x 89	1.80	1.56	1.27	1.99	1.72	1.40
		38 x 140	2.64	2.29	1.87	2.92	2.53	2.06
		38 x 184	3.49	3.02	2.46	3.85	3.33	2.72
		38 x 235	4.45	3.85	3.15	4.91	4.25	3.47
		38 x 286	5.41	4.69	3.83	5.97	5.17	4.22
	Construction	38 x 89	2.07	1.79	1.46	2.28	1.97	1.61
	Standard	38 x 89	1.53	1.32	1.08	1.69	1.46	1.19
	Utility	38 x 89	1.07	0.92	0.75	1.18	1.02	0.83
Coast Species (includes Douglas Fir, Western Larch, Western Hemlock, Amabilis Fir, and Coast Sitka Spruce)	Select structural	38 x 89	2.41	2.19	1.81	2.60	2.36	2.00
		38 x 140	3.72	3.22	2.63	4.08	3.56	2.90
		38 x 184	4.91	4.25	3.47	5.38	4.69	3.83
		38 x 235	6.26	5.42	4.43	6.87	5.98	4.88
		38 x 286	7.62	6.60	5.38	8.36	7.28	5.94
	No. 1	38 x 89	2.37	2.05	1.67	2.60	2.26	1.85
		38 x 140	3.45	2.99	2.44	3.81	3.30	2.69
		38 x 184	4.55	3.94	3.22	5.02	4.35	3.55
		38 x 235	5.81	5.03	4.11	6.41	5.55	4.53
		38 x 286	7.06	6.12	4.99	7.79	6.75	5.51
	No. 2	38 x 89	2.14	1.85	1.51	2.36	2.04	1.67
		38 x 140	3.09	2.67	2.18	3.41	2.95	2.41
		38 x 184	4.07	3.52	2.88	4.49	3.89	3.17
		38 x 235	5.19	4.50	3.67	5.73	4.96	4.05
		38 x 286	6.32	5.47	4.47	6.97	6.04	4.93
	No. 3	38 x 89	1.59	1.38	1.12	1.75	1.52	1.24
		38 x 140	2.35	2.03	1.66	2.59	2.24	1.83
		38 x 184	3.09	2.68	2.19	3.41	2.96	2.41
		38 x 235	3.95	3.42	2.79	4.36	3.77	3.08
		38 x 286	4.80	4.16	3.39	5.30	4.59	3.75
	Construction	38 x 89	1.82	1.57	1.28	2.01	1.74	1.42
	Standard	38 x 89	1.36	1.18	0.96	1.51	1.30	1.06
	Utility	38 x 89	0.95	0.82	0.67	1.05	0.90	0.74

Continued on next page

Table A-8 (Cont'd)

RAFTERS — NOT SUPPORTING CEILING (LIVE LOADS 2.5 AND 2.0 kN/m ²)								
Commercial Designation	Grade	Nominal Size, mm	LIVE LOAD 2.5 kN/m ²			LIVE LOAD 2.0 kN/m ²		
			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 x 89	2.27	2.06	1.78	2.45	2.22	1.94
		38 x 140	3.57	3.15	2.57	3.85	3.48	2.84
		38 x 184	4.71	4.16	3.39	5.08	4.59	3.74
		38 x 235	6.01	5.30	4.33	6.48	5.85	4.78
		38 x 286	7.31	6.45	5.27	7.88	7.12	5.81
	No. 1	38 x 89	2.27	2.00	1.64	2.45	2.21	1.80
		38 x 140	3.39	2.93	2.39	3.74	3.23	2.64
		38 x 184	4.46	3.87	3.16	4.93	4.27	3.48
		38 x 235	5.70	4.93	4.03	6.29	5.44	4.44
		38 x 286	6.93	6.00	4.90	7.65	6.62	5.41
	No. 2	38 x 89	2.10	1.81	1.48	2.31	2.00	1.63
		38 x 140	3.04	2.63	2.15	3.35	2.90	2.37
		38 x 184	4.01	3.47	2.83	4.42	3.83	3.12
		38 x 235	5.11	4.43	3.61	5.64	4.88	3.99
		38 x 286	6.22	5.38	4.40	6.86	5.94	4.85
	No. 3	38 x 89	1.57	1.36	1.11	1.73	1.50	1.22
		38 x 140	2.31	2.00	1.63	2.55	2.21	1.80
		38 x 184	3.05	2.64	2.16	3.37	2.92	2.38
		38 x 235	3.89	3.37	2.75	4.30	3.72	3.04
		38 x 286	4.74	4.10	3.35	5.23	4.53	3.69
	Construction	38 x 89	1.79	1.55	1.26	1.97	1.71	1.39
	Standard	38 x 89	1.34	1.16	0.95	1.48	1.28	1.05
	Utility	38 x 89	0.92	0.79	0.65	1.01	0.87	0.71
Western Cedars (includes Western Red Cedar and Pacific Coast Yellow Cedar)	Select structural	38 x 89	2.19	1.99	1.73	2.36	2.14	1.87
		38 x 140	3.44	3.12	2.60	3.71	3.37	2.87
		38 x 184	4.54	4.12	3.43	4.89	4.44	3.79
		38 x 235	5.79	5.26	4.38	6.24	5.66	4.83
		38 x 286	7.04	6.40	5.33	7.58	6.89	5.88
	No. 1	38 x 89	2.19	1.99	1.65	2.36	2.14	1.83
		38 x 140	3.43	2.97	2.42	3.71	3.28	2.67
		38 x 184	4.52	3.92	3.20	4.89	4.32	3.53
		38 x 235	5.77	5.00	4.08	6.24	5.51	4.50
		38 x 286	7.02	6.08	4.96	7.58	6.71	5.48
	No. 2	38 x 89	2.11	1.84	1.50	2.28	2.03	1.66
		38 x 140	3.06	2.65	2.16	3.38	2.93	2.39
		38 x 184	4.04	3.50	2.85	4.46	3.86	3.15
		38 x 235	5.15	4.46	3.64	5.69	4.92	4.02
		38 x 286	6.27	5.43	4.43	6.92	5.99	4.89
	No. 3	38 x 89	1.57	1.36	1.11	1.73	1.50	1.22
		38 x 140	2.31	2.00	1.63	2.55	2.21	1.80
		38 x 184	3.05	2.64	2.16	3.37	2.92	2.38
		38 x 235	3.89	3.37	2.75	4.30	3.72	3.04
		38 x 286	4.74	4.10	3.35	5.23	4.53	3.69
	Construction	38 x 89	1.80	1.56	1.27	1.99	1.72	1.40
	Standard	38 x 89	1.34	1.16	0.95	1.48	1.28	1.05
	Utility	38 x 89	0.92	0.79	0.65	1.01	0.87	0.71

Continued on next page

Table A-8 (Cont'd)

RAFTERS — NOT SUPPORTING CEILING (LIVE LOADS 2.5 AND 2.0 kN/m ²)								
Commercial Designation	Grade	Nominal Size, mm	LIVE LOAD 2.5 kN/m ²			LIVE LOAD 2.0 kN/m ²		
			Rafter Spacing			Rafter Spacing		
			300 mm	400 mm	600 mm	300 mm	400 mm	600 mm
			m	m	m	m	m	m
Northern Species (includes any Canadian softwood covered by the NLGA Standard Grading Rules)	Select structural	38 x 89	2.19	1.99	1.72	2.36	2.14	1.87
		38 x 140	3.44	3.06	2.50	3.71	3.37	2.76
		38 x 184	4.54	4.04	3.30	4.89	4.44	3.64
		38 x 235	5.79	5.15	4.21	6.24	5.66	4.64
		38 x 286	7.04	6.27	5.12	7.58	6.89	5.65
	No. 1	38 x 89	2.19	1.95	1.59	2.36	2.14	1.75
		38 x 140	3.27	2.83	2.31	3.61	3.13	2.55
		38 x 184	4.32	3.74	3.05	4.76	4.12	3.37
		38 x 235	5.51	4.77	3.89	6.08	5.26	4.30
		38 x 286	6.70	5.80	4.74	7.39	6.40	5.23
	No. 2	38 x 89	2.04	1.76	1.44	2.25	1.95	1.59
		38 x 140	2.94	2.54	2.08	3.24	2.81	2.29
		38 x 184	3.87	3.35	2.74	4.27	3.70	3.02
		38 x 235	4.94	4.28	3.49	5.46	4.72	3.86
		38 x 286	6.01	5.21	4.25	6.64	5.75	4.69
	No. 3	38 x 89	1.51	1.31	1.07	1.67	1.44	1.18
		38 x 140	2.21	1.92	1.56	2.44	2.12	1.73
		38 x 184	2.92	2.53	2.06	3.22	2.79	2.28
		38 x 235	3.73	3.23	2.63	4.11	3.56	2.91
		38 x 286	4.54	3.93	3.21	5.00	4.33	3.54
	Construction	38 x 89	1.73	1.50	1.22	1.91	1.66	1.35
	Standard	38 x 89	1.30	1.12	0.92	1.43	1.24	1.01
	Utility	38 x 89	0.88	0.76	0.62	0.97	0.84	0.69
Northern Aspen (includes Aspen Poplar, Large Tooth Aspen and Balsam Poplar)	Select structural	38 x 89	2.22	2.02	1.76	2.39	2.17	1.90
		38 x 140	3.49	3.15	2.57	3.76	3.42	2.84
		38 x 184	4.61	4.16	3.39	4.96	4.51	3.74
		38 x 235	5.88	5.30	4.33	6.33	5.75	4.78
		38 x 286	7.15	6.45	5.27	7.70	7.00	5.81
	No. 1	38 x 89	2.22	2.00	1.64	2.39	2.17	1.80
		38 x 140	3.39	2.93	2.39	3.74	3.23	2.64
		38 x 184	4.46	3.87	3.16	4.93	4.27	3.48
		38 x 235	5.70	4.93	4.03	6.29	5.44	4.44
		38 x 286	6.93	6.00	4.90	7.65	6.62	5.41
	No. 2	38 x 89	2.11	1.83	1.49	2.31	2.02	1.65
		38 x 140	3.04	2.63	2.15	3.35	2.90	2.37
		38 x 184	4.01	3.47	2.83	4.42	3.83	3.12
		38 x 235	5.11	4.43	3.61	5.64	4.88	3.99
		38 x 286	6.22	5.38	4.40	6.86	5.94	4.85
	No. 3	38 x 89	1.57	1.36	1.11	1.73	1.50	1.22
		38 x 140	2.31	2.00	1.63	2.55	2.21	1.80
		38 x 184	3.05	2.64	2.16	3.37	2.92	2.38
		38 x 235	3.89	3.37	2.75	4.30	3.72	3.04
		38 x 286	4.74	4.10	3.35	5.23	4.53	3.69
	Construction	38 x 89	1.79	1.55	1.26	1.97	1.71	1.39
	Standard	38 x 89	1.34	1.16	0.95	1.48	1.28	1.05
	Utility	38 x 89	0.92	0.79	0.65	1.01	0.87	0.71

Table A-9
Forming Part of Article 9.23.4.1.

RAFTERS — NOT SUPPORTING CEILING (LIVE LOADS 1.5 AND 1.0 kN/m²)								
Commercial Designation	Grade	Nominal Size, mm	LIVE LOAD 1.5 kN/m ²			LIVE LOAD 1.0 kN/m ²		
			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 x 89	2.97	2.69	2.35	3.40	3.09	2.69
		38 x 140	4.66	4.24	3.70	5.34	4.85	4.24
		38 x 184	6.15	5.59	4.88	7.04	6.40	5.59
		38 x 235	7.85	7.13	6.23	8.98	8.16	7.13
		38 x 286	9.54	8.67	7.57	10.93	9.93	8.67
	No. 1	38 x 89	2.97	2.69	2.35	3.40	3.09	2.69
		38 x 140	4.66	4.24	3.57	5.34	4.85	4.20
		38 x 184	6.15	5.59	4.71	7.04	6.40	5.54
		38 x 235	7.85	7.13	6.01	8.98	8.16	7.07
		38 x 286	9.54	8.67	7.31	10.93	9.93	8.60
	No. 2	38 x 89	2.87	2.60	2.23	3.28	2.98	2.60
		38 x 140	4.51	3.93	3.21	5.16	4.63	3.78
		38 x 184	5.94	5.19	4.23	6.81	6.10	4.98
		38 x 235	7.59	6.62	5.40	8.68	7.79	6.36
		38 x 286	9.23	8.05	6.57	10.56	9.47	7.73
	No. 3	38 x 89	2.33	2.02	1.65	2.74	2.38	1.94
		38 x 140	3.44	2.98	2.43	4.04	3.50	2.86
		38 x 184	4.53	3.92	3.20	5.33	4.62	3.77
		38 x 235	5.78	5.01	4.09	6.81	5.89	4.81
		38 x 286	7.03	6.09	4.97	8.28	7.17	5.85
	Construction	38 x 89	2.67	2.31	1.89	3.14	2.72	2.22
	Standard	38 x 89	2.01	1.74	1.42	2.36	2.04	1.67
	Utility	38 x 89	1.37	1.18	0.96	1.61	1.39	1.14
Hem-Fir (includes Western Hemlock and Amabilis Fir)	Select structural	38 x 89	2.86	2.60	2.27	3.27	2.97	2.60
		38 x 140	4.49	4.06	3.32	5.15	4.67	3.90
		38 x 184	5.93	5.36	4.37	6.78	6.16	5.15
		38 x 235	7.56	6.84	5.58	8.66	7.87	6.57
		38 x 286	9.20	8.32	6.79	10.53	9.57	7.99
	No. 1	38 x 89	2.86	2.58	2.11	3.27	2.97	2.48
		38 x 140	4.36	3.77	3.08	5.13	4.44	3.63
		38 x 184	5.75	4.98	4.06	6.76	5.86	4.78
		38 x 235	7.33	6.35	5.18	8.63	7.47	6.10
		38 x 286	8.92	7.73	6.31	10.50	9.09	7.42
	No. 2	38 x 89	2.70	2.34	1.91	3.16	2.76	2.25
		38 x 140	3.91	3.39	2.76	4.60	3.98	3.25
		38 x 184	5.16	4.46	3.64	6.07	5.25	4.29
		38 x 235	6.58	5.70	4.65	7.74	6.71	5.47
		38 x 286	8.00	6.93	5.66	9.42	8.16	6.66
	No. 3	38 x 89	2.01	1.74	1.42	2.36	2.04	1.67
		38 x 140	2.97	2.57	2.10	3.49	3.02	2.47
		38 x 184	3.91	3.39	2.76	4.60	3.99	3.25
		38 x 235	4.99	4.32	3.53	5.87	5.09	4.15
		38 x 286	6.07	5.26	4.29	7.15	6.19	5.05
	Construction	38 x 89	2.31	2.00	1.63	2.72	2.35	1.92
	Standard	38 x 89	1.73	1.50	1.22	2.04	1.76	1.44
	Utility	38 x 89	1.18	1.02	0.83	1.39	1.21	0.98

Continued on next page

Table A-9 (Cont'd)

RAFTERS — NOT SUPPORTING CEILING (LIVE LOADS 1.5 AND 1.0 kN/m ²)								
Commercial Designation	Grade	Nominal Size, mm	LIVE LOAD 1.5 kN/m ²			LIVE LOAD 1.0 kN/m ²		
			Rafter Spacing			Rafter Spacing		
			300 mm	400 mm	600 mm	300 mm	400 mm	600 mm
			m	m	m	m	m	m
Eastern Hemlock-Tamarack (includes Eastern Hemlock and Tamarack)	Select structural	38 x 89	2.72	2.47	2.16	3.12	2.83	2.47
		38 x 140	4.28	3.89	3.40	4.90	4.45	3.89
		38 x 184	5.65	5.13	4.48	6.46	5.87	5.13
		38 x 235	7.21	6.55	5.72	8.25	7.49	6.55
		38 x 286	8.76	7.96	6.95	10.03	9.12	7.96
	No. 1	38 x 89	2.72	2.47	2.16	3.12	2.83	2.47
		38 x 140	4.28	3.89	3.40	4.90	4.45	3.89
		38 x 184	5.65	5.13	4.48	6.46	5.87	5.13
		38 x 235	7.21	6.55	5.72	8.25	7.49	6.55
		38 x 286	8.76	7.96	6.95	10.03	9.12	7.96
	No. 2	38 x 89	2.62	2.38	2.08	3.01	2.73	2.38
		38 x 140	4.13	3.75	3.08	4.73	4.29	3.63
		38 x 184	5.44	4.94	4.06	6.23	5.66	4.78
		38 x 235	6.95	6.31	5.18	7.95	7.22	6.10
		38 x 286	8.45	7.68	6.31	9.67	8.79	7.42
	No. 3	38 x 89	2.25	1.95	1.59	2.65	2.29	1.87
		38 x 140	3.30	2.86	2.33	3.88	3.36	2.74
		38 x 184	4.35	3.77	3.07	5.12	4.43	3.62
		38 x 235	5.55	4.81	3.92	6.53	5.66	4.62
		38 x 286	6.75	5.85	4.77	7.95	6.88	5.62
	Construction	38 x 89	2.53	2.23	1.82	2.90	2.63	2.15
	Standard	38 x 89	1.91	1.65	1.35	2.25	1.95	1.59
	Utility	38 x 89	1.33	1.15	0.94	1.57	1.36	1.11
Coast Species (includes Douglas Fir, Western Larch, Western Hemlock, Amabilis Fir, and Coast Sitka Spruce)	Select structural	38 x 89	2.86	2.60	2.26	3.27	2.97	2.60
		38 x 140	4.49	4.02	3.28	5.15	4.67	3.86
		38 x 184	5.93	5.30	4.33	6.78	6.16	5.09
		38 x 235	7.56	6.76	5.52	8.66	7.87	6.50
		38 x 286	9.20	8.23	6.72	10.53	9.57	7.90
	No. 1	38 x 89	2.86	2.56	2.09	3.27	2.97	2.46
		38 x 140	4.31	3.73	3.04	5.07	4.39	3.58
		38 x 184	5.68	4.92	4.01	6.68	5.79	4.72
		38 x 235	7.24	6.27	5.12	8.53	7.38	6.03
		38 x 286	8.81	7.63	6.23	10.37	8.98	7.33
	No. 2	38 x 89	2.67	2.31	1.89	3.14	2.72	2.22
		38 x 140	3.85	3.33	2.72	4.53	3.92	3.20
		38 x 184	5.08	4.40	3.59	5.98	5.17	4.22
		38 x 235	6.48	5.61	4.58	7.62	6.60	5.39
		38 x 286	7.88	6.82	5.57	9.27	8.03	6.56
	No. 3	38 x 89	1.98	1.72	1.40	2.33	2.02	1.65
		38 x 140	2.93	2.53	2.07	3.44	2.98	2.43
		38 x 184	3.86	3.34	2.73	4.54	3.93	3.21
		38 x 235	4.93	4.26	3.48	5.80	5.02	4.10
		38 x 286	5.99	5.19	4.23	7.05	6.11	4.98
	Construction	38 x 89	2.27	1.96	1.60	2.67	2.31	1.89
	Standard	38 x 89	1.70	1.47	1.20	2.00	1.74	1.42
	Utility	38 x 89	1.18	1.02	0.83	1.39	1.21	0.98

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Table A-9 (Cont'd)

RAFTERS — NOT SUPPORTING CEILING (LIVE LOADS 1.5 AND 1.0 kN/m ²)								
Commercial Designation	Grade	Nominal Size, mm	LIVE LOAD 1.5 kN/m ²			LIVE LOAD 1.0 kN/m ²		
			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 x 89	2.69	2.45	2.14	3.09	2.80	2.45
		38 x 140	4.24	3.85	3.21	4.85	4.41	3.78
		38 x 184	5.59	5.08	4.23	6.40	5.81	4.98
		38 x 235	7.13	6.48	5.40	8.16	7.41	6.36
		38 x 286	8.67	7.88	6.57	9.93	9.02	7.73
	No. 1	38 x 89	2.69	2.45	2.04	3.09	2.80	2.40
		38 x 140	4.22	3.66	2.99	4.85	4.30	3.51
		38 x 184	5.57	4.82	3.94	6.40	5.68	4.63
		38 x 235	7.11	6.15	5.02	8.16	7.24	5.91
		38 x 286	8.64	7.49	6.11	9.93	8.81	7.19
	No. 2	38 x 89	2.60	2.26	1.85	2.98	2.67	2.18
		38 x 140	3.79	3.28	2.68	4.46	3.86	3.15
		38 x 184	5.00	4.33	3.53	5.88	5.09	4.16
		38 x 235	6.38	5.52	4.51	7.50	6.50	5.31
		38 x 286	7.76	6.72	5.48	9.13	7.90	6.45
	No. 3	38 x 89	1.96	1.70	1.38	2.31	2.00	1.63
		38 x 140	2.89	2.50	2.04	3.40	2.94	2.40
		38 x 184	3.81	3.30	2.69	4.48	3.88	3.17
		38 x 235	4.86	4.21	3.43	5.72	4.95	4.04
		38 x 286	5.91	5.12	4.18	6.95	6.02	4.92
	Construction	38 x 89	2.23	1.93	1.57	2.62	2.27	1.85
	Standard	38 x 89	1.67	1.45	1.18	1.97	1.71	1.39
	Utility	38 x 89	1.14	0.99	0.81	1.35	1.16	0.95
Western Cedars (includes Western Red Cedar and Pacific Coast Yellow Cedar)	Select structural	38 x 89	2.59	2.36	2.06	2.97	2.70	2.36
		38 x 140	4.08	3.71	3.24	4.67	4.24	3.71
		38 x 184	5.38	4.89	4.27	6.16	5.59	4.89
		38 x 235	6.86	6.24	5.45	7.86	7.14	6.24
		38 x 286	8.35	7.58	6.63	9.56	8.68	7.58
	No. 1	38 x 89	2.59	2.36	2.06	2.97	2.70	2.36
		38 x 140	4.08	3.70	3.02	4.67	4.24	3.56
		38 x 184	5.38	4.88	3.99	6.16	5.59	4.69
		38 x 235	6.86	6.23	5.09	7.86	7.14	5.99
		38 x 286	8.35	7.58	6.19	9.56	8.68	7.29
	No. 2	38 x 89	2.51	2.28	1.87	2.87	2.61	2.20
		38 x 140	3.82	3.31	2.70	4.50	3.89	3.18
		38 x 184	5.04	4.36	3.56	5.93	5.13	4.19
		38 x 235	6.43	5.57	4.54	7.56	6.55	5.35
		38 x 286	7.82	6.77	5.53	9.20	7.97	6.51
	No. 3	38 x 89	1.96	1.70	1.38	2.31	2.00	1.63
		38 x 140	2.89	2.50	2.04	3.40	2.94	2.40
		38 x 184	3.81	3.30	2.69	4.48	3.88	3.17
		38 x 235	4.86	4.21	3.43	5.72	4.95	4.04
		38 x 286	5.91	5.12	4.18	6.95	6.02	4.92
	Construction	38 x 89	2.25	1.95	1.59	2.65	2.29	1.87
	Standard	38 x 89	1.67	1.45	1.18	1.97	1.71	1.39
	Utility	38 x 89	1.14	0.99	0.81	1.35	1.16	0.95

Continued on next page

Table A-9 (Cont'd)

RAFTERS — NOT SUPPORTING CEILING (LIVE LOADS 1.5 AND 1.0 kN/m ²)								
Commercial Designation	Grade	Nominal Size, mm	LIVE LOAD 1.5 kN/m ²			LIVE LOAD 1.0 kN/m ²		
			Rafter Spacing			Rafter Spacing		
			300 mm	400 mm	600 mm	300 mm	400 mm	600 mm
			m	m	m	m	m	m
Northern Species (includes any Canadian softwood covered by the NLGA Standard Grading Rules)	Select structural	38 x 89	2.59	2.36	2.06	2.97	2.70	2.36
		38 x 140	4.08	3.71	3.12	4.67	4.24	3.67
		38 x 184	5.38	4.89	4.11	6.16	5.59	4.84
		38 x 235	6.86	6.24	5.25	7.86	7.14	6.18
		38 x 286	8.35	7.58	6.38	9.56	8.68	7.51
	No. 1	38 x 89	2.59	2.36	1.98	2.97	2.70	2.33
		38 x 140	4.08	3.54	2.89	4.67	4.16	3.40
		38 x 184	5.38	4.66	3.81	6.16	5.49	4.48
		38 x 235	6.86	5.95	4.86	7.86	7.00	5.72
		38 x 286	8.35	7.24	5.91	9.56	8.52	6.95
	No. 2	38 x 89	2.51	2.20	1.80	2.87	2.59	2.11
		38 x 140	3.67	3.17	2.59	4.31	3.74	3.05
		38 x 184	4.83	4.18	3.42	5.69	4.93	4.02
		38 x 235	6.17	5.34	4.36	7.26	6.29	5.13
		38 x 286	7.50	6.50	5.30	8.83	7.65	6.24
	No. 3	38 x 89	1.89	1.63	1.33	2.22	1.92	1.57
		38 x 140	2.76	2.39	1.95	3.25	2.82	2.30
		38 x 184	3.64	3.16	2.58	4.29	3.71	3.03
		38 x 235	4.65	4.03	3.29	5.47	4.74	3.87
		38 x 286	5.66	4.90	4.00	6.66	5.77	4.71
	Construction	38 x 89	2.16	1.87	1.53	2.55	2.20	1.80
	Standard	38 x 89	1.62	1.40	1.14	1.90	1.65	1.35
	Utility	38 x 89	1.10	0.95	0.78	1.30	1.12	0.92
Northern Aspen (includes Aspen Poplar, Large Tooth Aspen and Balsam Poplar)	Select structural	38 x 89	2.64	2.39	2.09	3.02	2.74	2.39
		38 x 140	4.14	3.76	3.21	4.74	4.31	3.76
		38 x 184	5.46	4.96	4.23	6.26	5.68	4.96
		38 x 235	6.97	6.33	5.40	7.98	7.25	6.33
		38 x 286	8.48	7.70	6.57	9.71	8.82	7.70
	No. 1	38 x 89	2.64	2.39	2.04	3.02	2.74	2.39
		38 x 140	4.14	3.66	2.99	4.74	4.30	3.51
		38 x 184	5.46	4.82	3.94	6.26	5.68	4.63
		38 x 235	6.97	6.15	5.02	7.98	7.24	5.91
		38 x 286	8.48	7.49	6.11	9.71	8.81	7.19
	No. 2	38 x 89	2.54	2.28	1.86	2.91	2.64	2.19
		38 x 140	3.79	3.28	2.68	4.46	3.86	3.15
		38 x 184	5.00	4.33	3.53	5.88	5.09	4.16
		38 x 235	6.38	5.52	4.51	7.50	6.50	5.31
		38 x 286	7.76	6.72	5.48	9.13	7.90	6.45
	No. 3	38 x 89	1.96	1.70	1.38	2.31	2.00	1.63
		38 x 140	2.89	2.50	2.04	3.40	2.94	2.40
		38 x 184	3.81	3.30	2.69	4.48	3.88	3.17
		38 x 235	4.86	4.21	3.43	5.72	4.95	4.04
		38 x 286	5.91	5.12	4.18	6.95	6.02	4.92
	Construction	38 x 89	2.23	1.93	1.57	2.62	2.27	1.85
	Standard	38 x 89	1.67	1.45	1.18	1.97	1.71	1.39
	Utility	38 x 89	1.14	0.99	0.81	1.35	1.16	0.95

Table A-10
Forming Part of Article 9.23.4.1.

MAXIMUM SPANS⁽¹⁾ FOR BUILT-UP WOOD BEAMS SUPPORTING NOT MORE THAN ONE FLOOR IN HOUSES								
Commercial Designation	Grade	Supported Joist Length, (1) 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
			m	m	m	m	m	m
Douglas Fir-Larch (includes Douglas Fir and Western Larch)	No. 1	2.4	3.70	4.27	4.72	5.45	5.74	6.63
		3.0	3.31	3.82	4.22	4.87	5.13	5.93
		3.6	3.02	3.49	3.85	4.45	4.69	5.41
		4.2	2.76	3.23	3.53	4.12	4.29	5.01
		4.8	2.46	3.02	3.14	3.85	3.82	4.69
	No. 2	2.4	3.33	3.84	4.24	4.90	5.16	5.96
		3.0	2.97	3.44	3.79	4.38	4.62	5.33
		3.6	2.71	3.14	3.46	4.00	4.22	4.87
		4.2	2.51	2.90	3.20	3.70	3.90	4.51
		4.8	2.35	2.71	3.00	3.46	3.65	4.22
Hem-Fir (includes Western Hemlock and Amabilis Fir)	No. 1	2.4	3.19	3.69	4.10	4.71	4.96	5.72
		3.0	2.85	3.30	3.64	4.21	4.43	5.12
		3.6	2.61	3.01	3.33	3.84	4.05	4.67
		4.2	2.30	2.79	2.93	3.56	3.57	4.33
		4.8	2.06	2.61	2.62	3.33	3.19	4.05
	No. 2	2.4	2.86	3.31	3.65	4.22	4.45	5.13
		3.0	2.56	2.96	3.27	3.77	3.98	4.59
		3.6	2.34	2.70	2.98	3.45	3.63	4.19
		4.2	2.16	2.50	2.76	3.19	3.36	3.88
		4.8	2.02	2.34	2.58	2.98	3.14	3.63
Eastern Hemlock-Tamarack (includes Eastern Hemlock and Tamarack)	No. 1	2.4	3.56	4.11	4.54	5.25	5.53	6.38
		3.0	3.18	3.68	4.06	4.69	4.94	5.71
		3.6	2.91	3.36	3.71	4.28	4.51	5.21
		4.2	2.69	3.11	3.43	3.97	4.18	4.82
		4.8	2.46	2.91	3.14	3.71	3.82	4.51
	No. 2	2.4	3.19	3.69	4.07	4.71	4.96	5.72
		3.0	2.85	3.30	3.64	4.21	4.43	5.12
		3.6	2.61	3.01	3.33	3.84	4.05	4.67
		4.2	2.41	2.79	3.08	3.56	3.75	4.33
		4.8	2.26	2.61	2.88	3.33	3.50	4.05
Coast Species (includes Douglas Fir, Western Larch, Western Hemlock, Amabilis Fir and Coast Sitka Spruce)	No. 1	2.4	3.15	3.64	4.02	4.65	4.90	5.65
		3.0	2.64	3.26	3.37	4.16	4.10	5.06
		3.6	2.26	2.89	2.88	3.69	3.51	4.49
		4.2	1.99	2.53	2.54	3.23	3.09	3.93
		4.8	1.79	2.26	2.28	2.88	2.77	3.51
	No. 2	2.4	2.82	3.26	3.60	4.16	4.38	5.06
		3.0	2.52	2.91	3.22	3.72	3.92	4.52
		3.6	2.26	2.66	2.88	3.39	3.51	4.13
		4.2	1.99	2.46	2.54	3.14	3.09	3.82
		4.8	1.79	2.26	2.28	2.88	2.77	3.51
Spruce-Pine-Fir (includes Spruce (all species except Coast Sitka Spruce), Jack Pine, Lodgepole Pine, Balsam Fir and Alpine Fir)	No. 1	2.4	3.09	3.57	3.95	4.56	4.80	5.55
		3.0	2.77	3.19	3.53	4.08	4.30	4.96
		3.6	2.44	2.92	3.11	3.72	3.79	4.53
		4.2	2.14	2.70	2.74	3.45	3.33	4.19
		4.8	1.92	2.44	2.45	3.11	2.98	3.79
	No. 2	2.4	2.78	3.21	3.54	4.09	4.31	4.98
		3.0	2.48	2.87	3.17	3.66	3.85	4.45
		3.6	2.26	2.62	2.89	3.34	3.52	4.06
		4.2	2.10	2.42	2.68	3.09	3.26	3.76
		4.8	1.92	2.26	2.45	2.89	2.98	3.52
Western Cedars (includes Western Red Cedar and Pacific Coast Yellow Cedar)	No. 1	2.4	3.13	3.62	4.00	4.62	4.86	5.62
		3.0	2.80	3.24	3.58	4.13	4.35	5.02
		3.6	2.56	2.95	3.26	3.77	3.97	4.59
		4.2	2.26	2.73	2.88	3.49	3.51	4.25
		4.8	2.02	2.56	2.58	3.26	3.14	3.97
	No. 2	2.4	2.80	3.23	3.57	4.12	4.34	5.02
		3.0	2.50	2.89	3.19	3.69	3.88	4.49
		3.6	2.28	2.64	2.91	3.37	3.55	4.10
		4.2	2.11	2.44	2.70	3.12	3.28	3.79
		4.8	1.98	2.27	2.52	2.91	3.07	3.55

Continued on next page

Table A-10 (Cont'd)

MAXIMUM SPANS ⁽¹⁾ FOR BUILT-UP WOOD BEAMS SUPPORTING NOT MORE THAN ONE FLOOR IN HOUSES								
Commercial Designation	Grade	Supported Joist Length, ⁽¹⁾ 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
			m	m	m	m	m	m
Northern Species (includes any Canadian softwood covered by the NLGA Standard Grading Rules)	No. 1	2.4	2.99	3.45	3.82	4.41	4.64	5.36
		3.0	2.64	3.09	3.37	3.94	4.10	4.80
		3.6	2.26	2.82	2.88	3.60	3.51	4.38
		4.2	1.99	2.53	2.54	3.23	3.09	3.93
		4.8	1.79	2.26	2.28	2.88	2.77	3.51
	No. 2	2.4	2.68	3.10	3.43	3.96	4.17	4.81
		3.0	2.40	2.77	3.07	3.54	3.73	4.30
		3.6	2.19	2.53	2.80	3.23	3.40	3.93
		4.2	1.99	2.34	2.54	2.99	3.09	3.64
		4.8	1.79	2.19	2.28	2.80	2.77	3.40
Northern Aspen (includes Aspen Poplar, Large Tooth Aspen and Balsam Poplar)	No. 1	2.4	3.09	3.57	3.95	4.56	4.80	5.55
		3.0	2.69	3.19	3.44	4.08	4.18	4.96
		3.6	2.30	2.92	2.94	3.72	3.58	4.53
		4.2	2.03	2.58	2.59	3.29	3.15	4.01
		4.8	1.82	2.30	2.32	2.94	2.83	3.58
	No. 2	2.4	2.78	3.21	3.54	4.09	4.31	4.98
		3.0	2.48	2.87	3.17	3.66	3.85	4.45
		3.6	2.26	2.62	2.89	3.34	3.52	4.06
		4.2	2.03	2.42	2.59	3.09	3.15	3.76
		4.8	1.82	2.26	2.32	2.89	2.83	3.52

Note to Table A-10:

⁽¹⁾ See Appendix A.

Table A-11
Forming Part of Article 9.23.4.1.

MAXIMUM SPANS ⁽¹⁾ FOR BUILT-UP WOOD BEAMS SUPPORTING NOT MORE THAN TWO FLOORS IN HOUSES								
Commercial Designation	Grade	Supported Joist Length, ⁽¹⁾ 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
			m	m	m	m	m	m
Douglas Fir-Larch (includes Douglas Fir and Western Larch)	No. 1	2.4	2.78	3.24	3.55	4.13	4.32	5.03
		3.0	2.30	2.90	2.93	3.70	3.57	4.50
		3.6	1.97	2.51	2.52	3.21	3.07	3.90
		4.2	1.74	2.20	2.23	2.81	2.71	3.42
	No. 2	4.8	1.57	1.97	2.01	2.52	2.44	3.07
		2.4	2.52	2.91	3.21	3.72	3.92	4.52
		3.0	2.26	2.61	2.87	3.33	3.50	4.05
		3.6	1.97	2.38	2.52	3.04	3.07	3.69
Hem-Fir (includes Western Hemlock and Amabilis Fir)	No. 1	4.2	1.74	2.20	2.23	2.81	2.71	3.42
		4.8	1.57	1.97	2.01	2.52	2.44	3.07
		2.4	2.17	2.51	2.77	3.20	3.37	3.89
		3.0	1.92	2.24	2.45	2.86	2.99	3.48
	No. 2	3.6	1.66	2.05	2.12	2.62	2.58	3.18
		4.2	1.48	1.85	1.89	2.36	2.29	2.87
		4.8	1.34	1.66	1.71	2.12	2.08	2.58
		Eastern Hemlock-Tamarack (includes Eastern Hemlock and Tamarack)	No. 1	2.4	2.70	3.12	3.45	3.98
3.0	2.30			2.79	2.93	3.56	3.57	4.33
3.6	1.97			2.51	2.52	3.21	3.07	3.90
4.2	1.74			2.20	2.23	2.81	2.71	3.42
No. 2	4.8		1.57	1.97	2.01	2.52	2.44	3.07
	2.4		2.42	2.80	3.09	3.56	3.76	4.34
	3.0		2.16	2.51	2.76	3.19	3.36	3.88
	3.6		1.97	2.28	2.52	2.91	3.07	3.54
Coast Species (includes Douglas Fir, Western Larch, Western Hemlock, Amabilis Fir and Coast Sitka Spruce)	No. 1	4.2	1.74	2.11	2.23	2.70	2.71	3.28
		4.8	1.57	1.97	2.01	2.52	2.44	3.07
		2.4	2.00	2.47	2.55	3.15	3.11	3.84
		3.0	1.67	2.11	2.14	2.69	2.60	3.28
	No. 2	3.6	1.45	1.82	1.86	2.32	2.26	2.82
		4.2	1.30	1.61	1.66	2.06	2.02	2.50
		4.8	1.18	1.45	1.51	1.86	1.84	2.26
		Spruce-Pine-Fir (includes Spruce (all species except Coast Sitka Spruce), Jack Pine, Lodgepole Pine, Balsam Fir and Alpine Fir)	No. 1	2.4	2.16	2.71	2.75	3.46
3.0	1.80			2.28	2.30	2.91	2.79	3.53
3.6	1.56			1.96	1.99	2.50	2.42	3.04
4.2	1.39			1.73	1.77	2.21	2.16	2.69
No. 2	4.8		1.26	1.56	1.61	1.99	1.96	2.42
	2.4		2.10	2.43	2.69	3.10	3.27	3.77
	3.0		1.80	2.17	2.30	2.77	2.79	3.38
	3.6		1.56	1.96	1.99	2.50	2.42	3.04
Western Cedars (includes Western Red Cedar and Pacific Coast Yellow Cedar)	No. 1	4.2	1.39	1.73	1.77	2.21	2.16	2.69
		4.8	1.26	1.56	1.61	1.99	1.96	2.42
		2.4	2.27	2.74	2.90	3.50	3.53	4.26
		3.0	1.89	2.40	2.41	3.06	2.94	3.73
	No. 2	3.6	1.64	2.06	2.09	2.63	2.54	3.20
		4.2	1.45	1.82	1.86	2.32	2.26	2.82
		4.8	1.32	1.64	1.68	2.09	2.05	2.54
		2.4	2.12	2.45	2.71	3.13	3.29	3.81
	3.0	1.89	2.19	2.41	2.80	2.94	3.40	
	3.6	1.64	2.00	2.09	2.55	2.54	3.11	
	4.2	1.45	1.82	1.86	2.32	2.26	2.82	
	4.8	1.32	1.64	1.68	2.09	2.05	2.42	

Continued on next page

Table A-11 (Cont'd)

MAXIMUM SPANS ⁽¹⁾ FOR BUILT-UP WOOD BEAMS SUPPORTING NOT MORE THAN TWO FLOORS IN HOUSES								
Commercial Designation	Grade	Supported Joist Length, ⁽¹⁾ 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
			m	m	m	m	m	m
Northern Species (includes any Canadian softwood covered by the NLGA Standard Grading Rules)	No. 1	2.4	2.00	2.55	2.55	3.25	3.11	3.95
		3.0	1.67	2.11	2.14	2.69	2.60	3.28
		3.6	1.45	1.82	1.86	2.32	2.26	2.82
		4.2	1.30	1.61	1.66	2.06	2.02	2.50
		4.8	1.18	1.45	1.51	1.86	1.84	2.26
	No. 2	2.4	2.00	2.35	2.55	3.00	3.11	3.65
		3.0	1.67	2.10	2.14	2.68	2.60	3.26
		3.6	1.45	1.82	1.86	2.32	2.26	2.82
		4.2	1.30	1.61	1.66	2.06	2.02	2.50
		4.8	1.18	1.45	1.51	1.86	1.84	2.26
Northern Aspen (includes Aspen Poplar, Large Tooth Aspen and Balsam Poplar)	No. 1	2.4	2.04	2.60	2.60	3.32	3.17	4.03
		3.0	1.70	2.15	2.18	2.75	2.65	3.34
		3.6	1.48	1.85	1.89	2.37	2.30	2.88
		4.2	1.32	1.64	1.69	2.09	2.05	2.55
		4.8	1.20	1.48	1.53	1.89	1.87	2.30
	No. 2	2.4	2.04	2.43	2.60	3.10	3.17	3.77
		3.0	1.70	2.15	2.18	2.75	2.65	3.34
		3.6	1.48	1.85	1.89	2.37	2.30	2.88
		4.2	1.32	1.64	1.69	2.09	2.05	2.55
		4.8	1.20	1.48	1.53	1.89	1.87	2.30

Note to Table A-11:

⁽¹⁾ See Appendix A.

Table A-12
Forming Part of Article 9.23.13.15.

MAXIMUM CLEAR SPANS BETWEEN END SUPPORTS FOR FINK TRUSSES, m										
Top Member Size, mm	Bottom Member Size, mm	Roof Slope	No. 1 Grade Lumber				No. 2 Grade Lumber			
			Roof Snow Load, kN/m ²				Roof Snow Load, kN/m ²			
			1.0	1.5	2.0	2.5	1.0	1.5	2.0	2.5
38 x 89	38 x 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 x 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 x 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 x 114	38 x 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 x 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 x 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 x 140	38 x 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 x 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 x 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
Column 1	2	3	4	5	6	7	8	9	10	11

Table A-13
Forming Part of Article 9.23.13.15.

MAXIMUM CLEAR SPANS BETWEEN END SUPPORTS FOR HOWE TRUSSES, m										
Top Member Size, mm	Bottom Member Size, mm	Roof Slope	No. 1 Grade Lumber				No. 2 Grade Lumber			
			Roof Snow Load, kN/m ²				Roof Snow Load, kN/m ²			
			1.0	1.5	2.0	2.5	1.0	1.5	2.0	2.5
38 x 89	38 x 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 x 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 x 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 x 114	38 x 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 x 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 x 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 x 140	38 x 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 x 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 x 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
Column 1	2	3	4	5	6	7	8	9	10	11

PART 10**RELOCATABLE
INDUSTRIAL
ACCOMMODATION****TABLE OF CONTENTS**

Section 10.1	Application	390.3
Section 10.2	Structural Requirements	390.3
Section 10.3	Heights and Areas	390.4
Section 10.4	Fire Safety	390.4
Section 10.5	Health Requirements	390.6
Section 10.6	General Safety	390.7
Section 10.7	Identification	390.9

PART 10 RELOCATABLE INDUSTRIAL ACCOMMODATION

SECTION 10.1 APPLICATION

SUBSECTION 10.1.1. GENERAL

10.1.1.1. This Part applies to *buildings* 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*.

10.1.1.2. *Buildings* to which this Part applies shall not stay at one site for more than 5 years, except as permitted by the *authority having jurisdiction*.

10.1.1.3. This Part applies to one *storey buildings*

- (a) without sleeping accommodation, that do not exceed 1 200 m² in *building area*, and
- (b) with sleeping accommodation, that do not exceed 600 m² in *building area*.

10.1.1.4. A *building* containing sleeping accommodation may include spaces for other uses not exceeding 100 m² each in area if each space is separated from the remainder of the *building* by a wall conforming to Sentence 10.4.1.5.(1).

10.1.1.5. Requirements for *buildings* with 2 *storeys* may be established by the Director.

10.1.1.6. A *building* may consist of one or more transportable modules specifically designed to be readily relocatable and usable without permanent *foundations*.

10.1.1.7. Except as specifically varied in this Part, Parts 1 to 9 and 11 apply to *buildings* regulated by this Part.

10.1.1.8. Except for Section 10.6, this Code does not apply to *buildings* regulated by this Part which were constructed before May 31, 1981.

10.1.1.9.(1) This Part does not apply to relocatable industrial housing units that are permanently mounted on running gear, or sled runners, or skids, and are fully self-contained if

- (a) the *building area* does not exceed 75 m², and
- (b) the *building* conforms to the appropriate standards in the CSA Z 240 Series.

SECTION 10.2 STRUCTURAL REQUIREMENTS

SUBSECTION 10.2.1. GENERAL

10.2.1.1. 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.

10.2.1.2. Structural design of *loadbearing* assemblies shall be done by a *professional engineer* who is normally engaged in the practice of structural design.

SUBSECTION 10.2.2. DESIGN LOADS

10.2.2.1.(1) Roof *live load* shall be ground snow load with no modification by any coefficient of reduction, but not less than 2 kPa.

- (2) Roof design shall allow for the effects of drifting snow.

10.2.2.2. Design *live load* due to wind shall be based on a wind pressure not less than 0.7 kPa.

SUBSECTION 10.2.3. STABILITY

10.2.3.1. 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 upon the *building*, provision for the attachment of tie down devices shall be made in the construction of the modules.

10.2.3.2.(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 printed on a permanent label and affixed to the module in a visible location.

SECTION 10.3 HEIGHTS AND AREAS**SUBSECTION 10.3.1.**

10.3.1.1. Except as permitted by Article 10.3.1.2., the clear ceiling height shall be at least 2.1 m.

10.3.1.2. In modules specifically produced to be transported by aircraft the clear ceiling height shall be at least 2 m over at least 90% of the *floor area* and shall be at least 1.9 m over the remaining *floor area*.

10.3.1.3.(1) The area, calculated wall finish to wall finish, in sleeping rooms shall be not less than

- (a) 7.4 m² for each occupant in singly occupied rooms, and
- (b) 4.7 m² for each occupant in other than singly occupied rooms.

SECTION 10.4 FIRE SAFETY**SUBSECTION 10.4.1. FIRE SEPARATIONS**

10.4.1.1.(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 10.4.1.4. to 10.4.1.9.

- (a) when rated in accordance with Chapter 2, "Fire Performance Ratings", of The Supplement to the NBC 1980, or
- (b) when tested in accordance with Section 15 of ULC-S101-1977, "Standard Methods of Fire Endurance Tests of Building Construction and Materials".

10.4.1.2. The values of membrane protection in Articles 10.4.1.4. to 10.4.1.9. apply only if the wall is framed with wood studs not less than 38 X 64 mm spaced not greater than 400 mm o.c.

10.4.1.3. If framing systems with stud dimensions less than specified in Article 10.4.1.2. are used the required membrane value in Articles 10.4.1.4. to 10.4.1.8. shall be increased by 10 min.

10.4.1.4. Each face of a wall separating a sleeping room from another room shall have not less than a 5 min membrane protection.

10.4.1.5.(1) Except as permitted by Sentence (2), 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 10.1.1.4., shall have not less than a 10 min membrane protection.

(2) If a 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,
- (b) compressed to 75% of its nominal thickness, and

(c) completely filling the cavity
the rating of the membrane protection required by Sentence (1) need not exceed 5 min.

(3) Each face of a wall separating a corridor from any other part of a *building*, except a sleeping room, shall have not less than a 5 min membrane protection.

10.4.1.6. Wall faces in *service rooms* shall have not less than a 30 min membrane protection.

10.4.1.7.(1) Except as permitted by Sentence (2), exterior walls shall have not less than a 5 min membrane protection on the inner face and shall have *noncombustible* exterior cladding.

(2) The membrane requirements of Sentence (1) do not apply in single modules if the *occupant load* is less than 10, the area is less than 80 m² and the module is placed at least 10 m from any other *building*.

10.4.1.8. Ceilings of *service rooms* shall have not less than a 30 min membrane protection.

SUBSECTION 10.4.2. SERVICE SPACES

10.4.2.1. If a fuel fired *appliance* is placed in a module containing sleeping accommodation, the fuel fired *appliance* shall be placed in a *service room*.

10.4.2.2. 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*.

SUBSECTION 10.4.3. FLAME SPREAD RATING

10.4.3.1.(1) *Flame-spread rating* in a corridor shall not exceed 25 on
(a) 90% of the ceiling surface area, and
(b) 90% of the wall surface area.

10.4.3.2.(1) *Flame-spread rating* for floor coverings shall not exceed 300.

(2) *Flame-spread rating* for floor coverings shall be determined on the basis of the results of at least 3 tests conducted in accordance with the provisions of CAN4-S102.2-79, "Standard Method of Test for Surface Burning Characteristics of Flooring, Floor Covering and Miscellaneous Materials".

10.4.3.3. *Flame-spread rating* of any *building material* shall not exceed 150 for 90% of the surface area of cupboards and built-in furniture.

SUBSECTION 10.4.4. MEANS OF EGRESS

10.4.4.1. For each sleeping room a window capable of serving as an emergency *means of egress* shall be provided, shall have an unobstructed openable area not less than 0.5 m² with no dimension less than 560 mm, and shall have a sill height not more than 1 m above the inside floor.

10.4.4.2. Windows using non-breakable glazing or which are not openable shall not be used in sleeping areas unless the windows are designed and permanently marked as being of a knock out type.

SUBSECTION 10.4.5. DOORS

10.4.5.1.(1) Doors, listed and labelled, having not less than a 20 min *fire-protection rating* or conforming to CAN4-S113-79, "Standard Specification for Wood Core Doors Meeting the Performance Required by CAN4-S104-77 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, or
 - (ii) a *service room*.

10.4.5.2.(1) Doors equipped with automatic closers shall be used between any part of a *building* and

- (a) a *service room*, or
- (b) a washroom facility.

10.4.5.3. Smoke doors shall be equipped with automatic closers actuated by *smoke detectors*, and shall be designed and installed to retard the passage of smoke.

SUBSECTION 10.4.6. EXITS

10.4.6.1. Every *floor area* shall be served by not less than 2 *exits* and *exits* shall be located so that the travel distance from any part of the *building* to at least one *exit* is not more than 25 m.

10.4.6.2. Every corridor more than 50 m in length shall be subdivided by smoke doors.

SUBSECTION 10.4.7. STANDPIPE AND HOSE SYSTEMS

10.4.7.1.(1) Every *building* containing sleeping accommodation for more than 30 persons shall be provided with a standpipe and hose system

- (a) having a fire fighting water supply storage volume not less than 4.5 m³.
- (b) capable of supplying 0.005 m³/s at a gauge pressure not less than 300 kPa, and
- (c) installed in conformance with NFPA 14-1978, "Standard for the Installation of Standpipe and Hose Systems".

(2) The water supply for fire fighting shall be independent of the domestic water supply.

(3) The standpipe and hose system required by Sentence (1) shall be capable of connection to an external water supply and suitable for adaptation to a local delivery system.

(4) If a central water system, capable of supplying all fire fighting requirements, is provided, the individual tanks required by Sentence (1) need not be provided.

SUBSECTION 10.4.8. ELECTRICAL

10.4.8.1. Not less than 2 duplex receptacles shall be installed in each sleeping room.

SUBSECTION 10.4.9. FOAMED PLASTICS

10.4.9.1.(1) *Foamed plastic* shall not be exposed in any part of a *building*.

(2) Sentence (1) applies to crawl spaces and roof spaces in addition to other parts of the *building*.

10.4.9.2. If *foamed plastic* is used, the *foamed plastic* shall have a flame spread classification not more than 25.

10.4.9.3. If *foamed plastic* is used, the surface must be covered by 12.7 mm gypsum board or by a *thermal barrier* complying with ULC-S124-1976, "Standard Method of Test for the Evaluation of Protective Coverings for Foamed Plastic", Classification A.

SECTION 10.5 HEALTH REQUIREMENTS

SUBSECTION 10.5.1. HEATING AND VENTILATION

10.5.1.1. Heating equipment shall be capable of maintaining a temperature of 20°C within the *building* when the outside temperature is -45°C and the wind velocity is 25 km/h.

10.5.1.2. Floors shall be insulated.

10.5.1.3. Ventilation requirements shall be in accordance with ASHRAE Standard 62-73, "Standards for Natural and Mechanical Ventilation".

10.5.1.4.(1) In *buildings* 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. All ducts for heating systems and ventilation systems shall be constructed of galvanized steel or aluminum.

10.5.1.6. If vapour barriers are cut 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.

10.5.1.7. Installation and fastening of insulation shall ensure that it cannot be displaced during transportation.

SUBSECTION 10.5.2. PLUMBING FACILITIES

10.5.2.1. The fixtures in each washroom shall be based on the number of persons using that washroom, shall conform to Articles 10.5.2.2. and 10.5.2.3. and, if persons of each sex are to be accommodated, separate washrooms shall be provided for each sex.

10.5.2.2.(1) In *buildings* 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, and
- (d) urinals shall be provided in washrooms for males on the basis of 1 unit for every 25 persons or part thereof.

10.5.2.3. In *buildings* not covered by Sentence 10.5.2.2.(1) water closets and lavatories shall conform to Part 3 unless variations have been *accepted*.

10.5.2.4. Piping in corridor walls and in walls separating sleeping rooms shall be *noncombustible*.

10.5.2.5. If heat tape is used, it shall not be placed in direct contact with *combustible piping* and shall be installed in accordance with the tape manufacturer's instructions but not closer than 50 mm to any *combustible* material.

SECTION 10.6 GENERAL SAFETY

SUBSECTION 10.6.1. SCOPE

10.6.1.1.(1) Section 10.6 applies to

- (a) all *buildings* constructed on or after May 31, 1981, and
- (b) all *buildings* constructed before May 31, 1981, at the time of relocation.

SUBSECTION 10.6.2. SPATIAL SEPARATION

10.6.2.1. The spatial separation between *buildings* shall be not less than 10 m.

10.6.2.2. A *building* shall be located not closer than 15 m to any bushes, trees or similar vegetation.

SUBSECTION 10.6.3. FIRE ALARM AND DETECTION

10.6.3.1.(1) A fire alarm system shall be installed in accordance with ULC-S524-M1980, "Standard for The Installation of Fire Alarm Systems", in all *buildings*

- (a) providing sleeping accommodation for 10 or more persons,

- (b) providing dining facilities for 100 or more persons,
- (c) providing recreational facilities for 150 or more persons, or
- (d) if required by other Parts of this Code, except as varied by Clauses (a), (b) and (c).

10.6.3.2. Manual pull stations conforming to ULC-S528-1978, "Standard for Manually Actuated Signalling Boxes for Fire Alarm Systems", shall be located adjacent to *exits* within every *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 actuated fire detectors conforming to ULC-S530-1978, "Standard for Heat Actuated Fire Detectors for Fire Alarm Systems", shall be placed in each *service room*, storage room and clothes drying area in a *building* requiring a fire alarm system.

10.6.3.4.(1) A *smoke alarm*

(a) conforming to ULC-S531-1978, "Standard for Smoke Alarms", and
 (b) equipped to show that it is in operating condition
 shall be installed on the ceiling of every room providing sleeping accommodation and may be tied into the *building* fire alarm system.

(2) *Smoke alarms* shall be installed by permanent connection to an electrical circuit and shall have no disconnect switches between the overcurrent device and any *smoke alarm*.

10.6.3.5.(1) If a fire alarm system is required by Sentence 10.6.3.1.(1), *smoke detectors* conforming to ULC-S529-1978, "Standard for Smoke Detectors for Fire Alarm Systems" shall be installed in every

- (a) circulating air handling system and shall activate devices to shut down fans in the system in the event of a fire, and
- (b) corridor serving rooms containing sleeping accommodation.

10.6.3.6. Portable fire extinguishers shall be provided conforming to NFPA No. 10-1978, "Standard for Portable Fire Extinguishers".

SUBSECTION 10.6.4. KITCHEN VENTILATION

10.6.4.1. Every kitchen containing commercial cooking equipment used in processes producing smoke or grease laden vapours, shall be equipped with a mechanical exhaust and fire suppression system conforming to NFPA 96-1978, "Standard for the Installation of Equipment for the Removal of Smoke and Grease-Laden Vapors from Commercial Cooking Equipment".

10.6.4.2. *Acceptable* dismountable exhaust extensions may be used.

SUBSECTION 10.6.5. LIGHTING

10.6.5.1. Emergency lighting installations shall be installed in all corridors and in areas serving as *access to exit* from areas having an *occupant load* of more than 20 persons.

10.6.5.2. Emergency lighting installations shall conform to The Electrical Protection Act and regulations made pursuant to that Act.

10.6.5.3. Illuminated *exit* signs shall be installed at each *exit* location serving an *occupant load* of more than 20 persons.

SUBSECTION 10.6.6. DOORS

10.6.6.1. Every *exit* door from a *building* containing sleeping, dining or recreational facilities shall be equipped with fasteners, listed and labelled, or *accepted* by the Director, 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

SUBSECTION 10.7.1. LABELLING

10.7.1.1.(1) Each *building* module conforming to this Part shall be clearly and permanently identified, at the time of construction, 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.

10.7.1.2. The identification plate shall be affixed to the module in a visible location.

PART 11

CLIMATIC DATA FOR BUILDING DESIGN IN ALBERTA

TABLE OF CONTENTS

Section 11.1	General	390.13
Chart 11.1.2.A.	January Design Temperature	390.15
Chart 11.1.2.B.	July Design Dry-Bulb Temperature	390.17
Chart 11.1.2.C.	July Design Wet-Bulb Temperature	390.19
Chart 11.1.2.D.	Degree Days below 18°C	390.21
Chart 11.1.2.E.	Fifteen Minute Rainfall	390.23
Chart 11.1.2.F.	Snow Load	390.25
Chart 11.1.2.G.	Wind Pressure 1 in 10	390.27
Chart 11.1.2.H.	Wind Pressure 1 in 30	390.29
Chart 11.1.2.I.	Wind Pressure 1 in 100	390.31
Table 11.1.3.A.	Selected Municipalities	390.33

PART 11 CLIMATIC DATA FOR BUILDING DESIGN IN ALBERTA

SECTION 11.1 GENERAL

SUBSECTION 11.1.1. SCOPE

11.1.1.1.(1) The values in Charts 11.1.2.A. to 11.1.2.I. shall not be considered as providing a complete picture of the variability of local climatic conditions.

(2) In mountainous areas the values in Charts 11.1.2.A. to 11.1.2.I. represent typical values for populated communities 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.

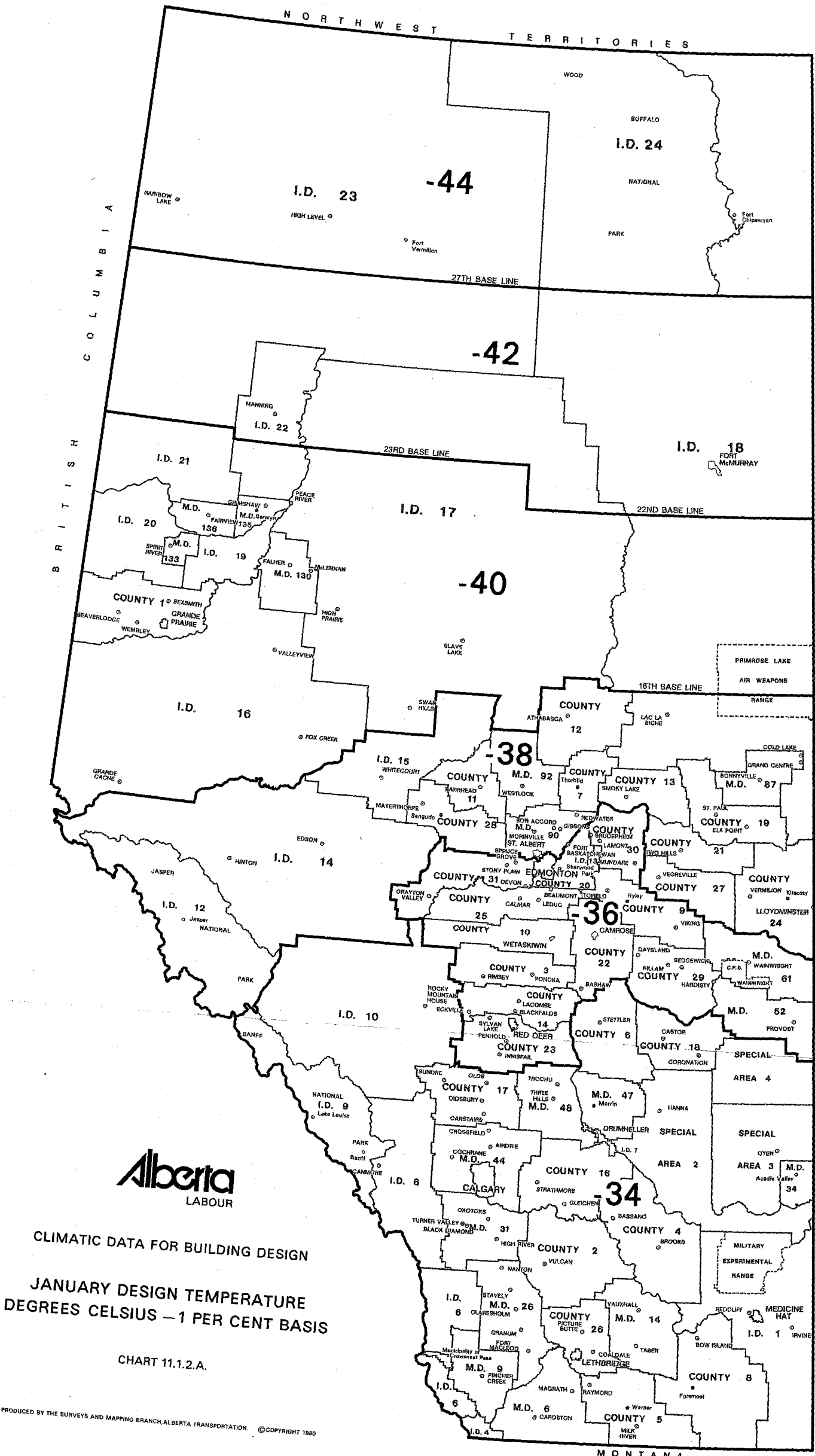
SUBSECTION 11.1.2. DESIGN DATA

11.1.2.1. Except as permitted by Article 11.1.3.1., climatic data for *building* design in Alberta shall be based on Charts 11.1.2.A. to 11.1.2.I.

SUBSECTION 11.1.3. SPECIFIC MUNICIPALITIES

11.1.3.1. Within the municipal boundaries of the municipalities listed in Table 11.1.3.A. the values of climatic data listed in the Table may be used instead of the values shown on Charts 11.1.2.A. to 11.1.2.I.

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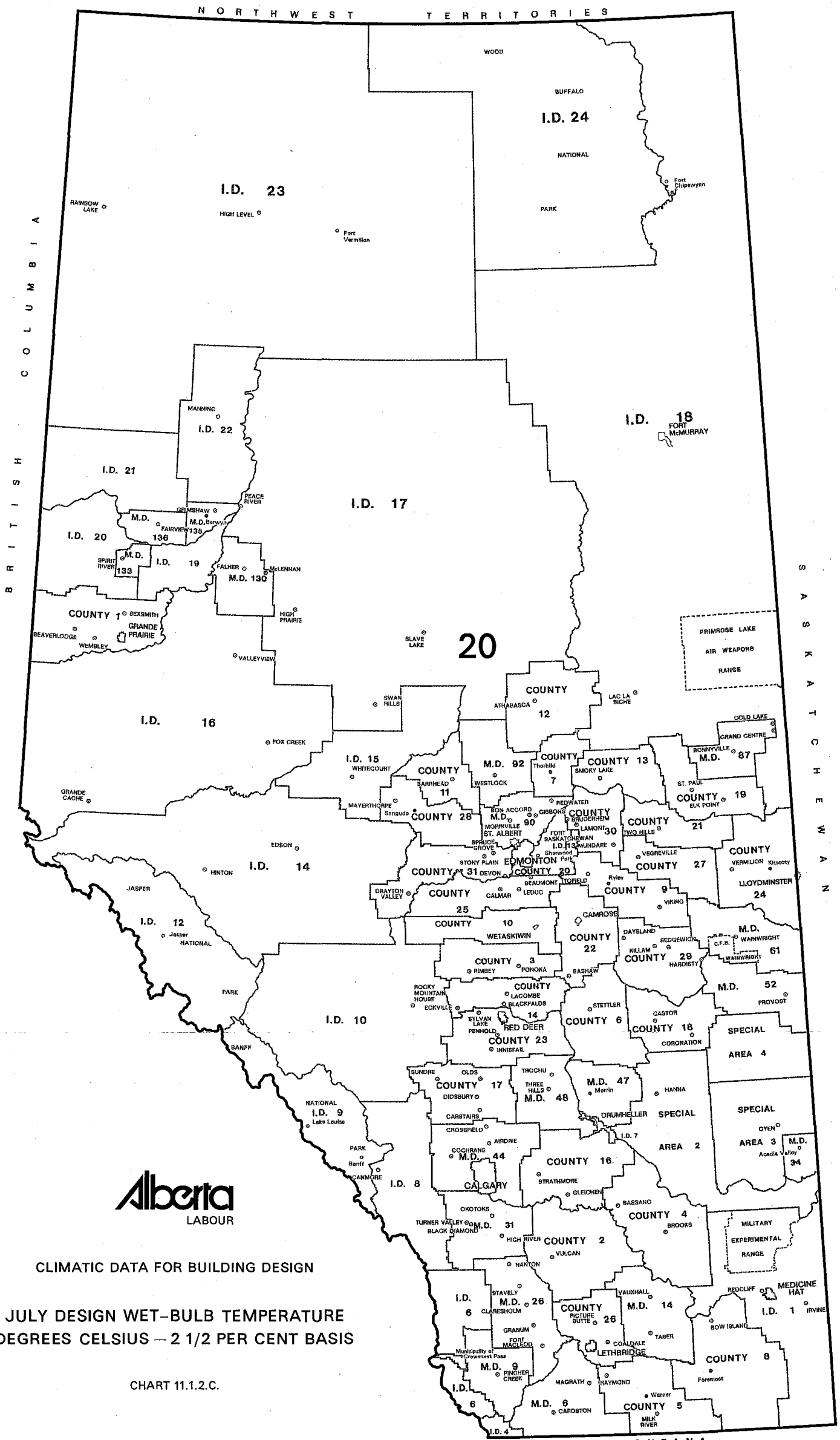
Alberta
LABOUR

CLIMATIC DATA FOR BUILDING DESIGN
JANUARY DESIGN TEMPERATURE
DEGREES CELSIUS -1 PER CENT BASIS

CHART 11.1.2.A.

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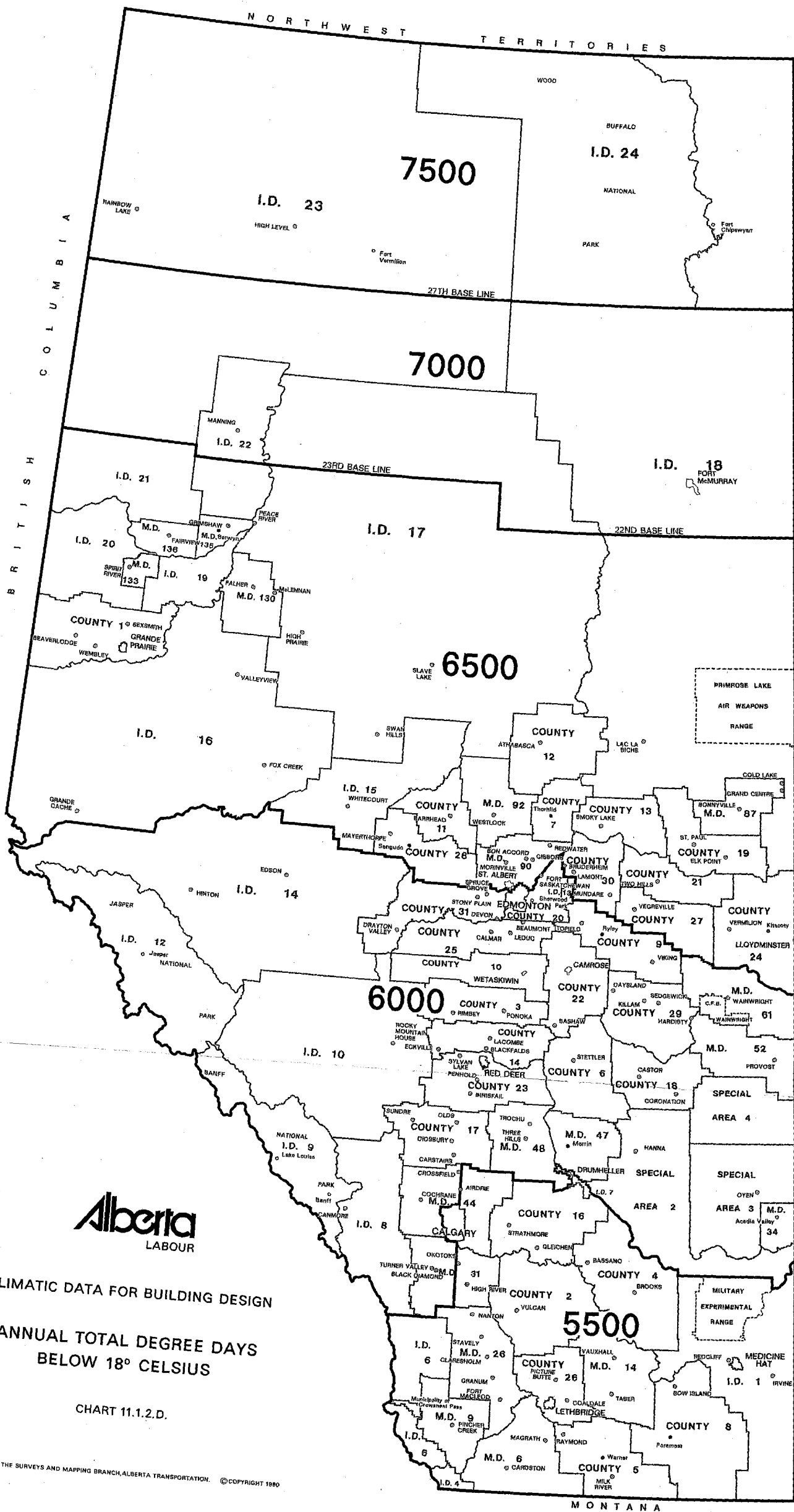
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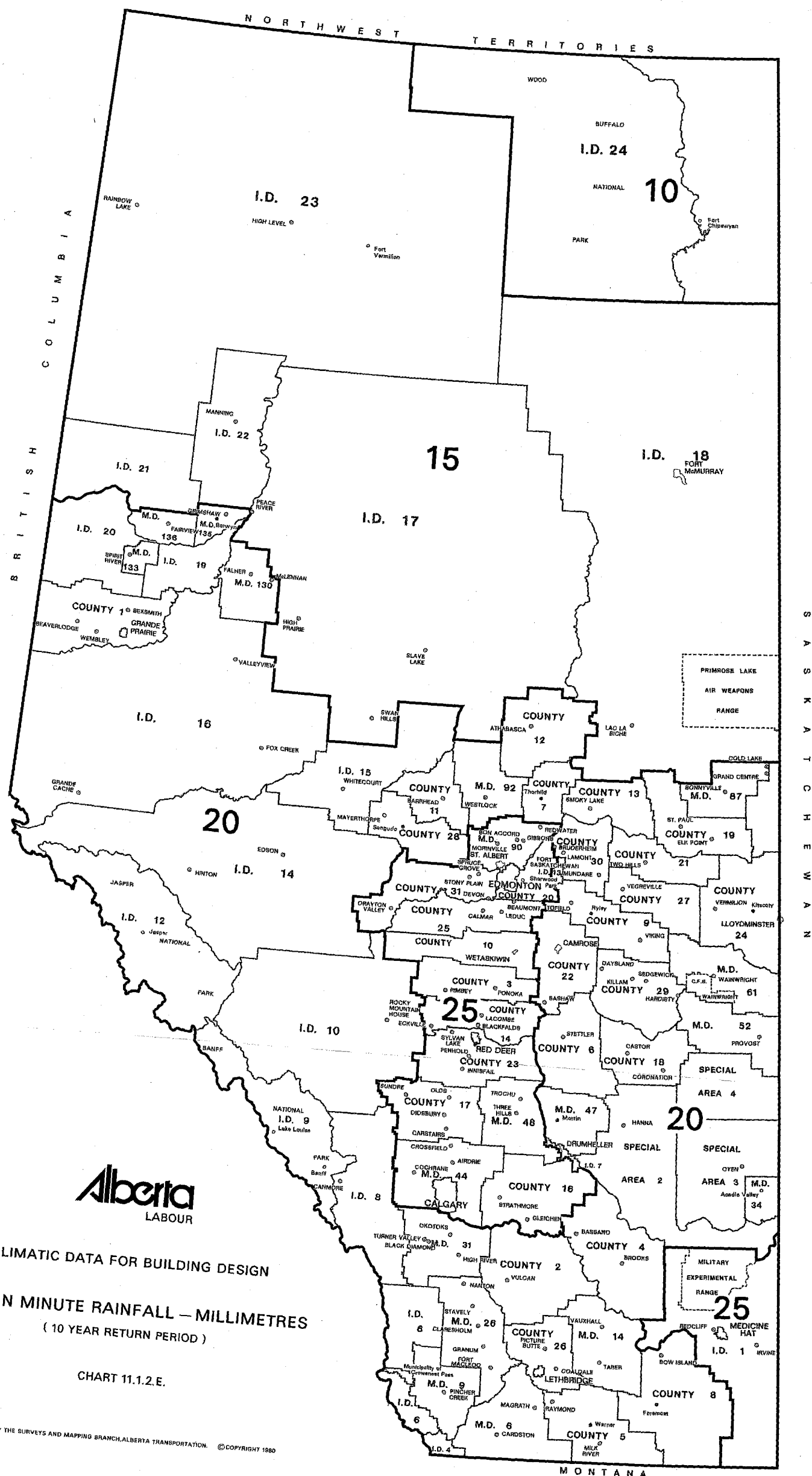
CLIMATIC DATA FOR BUILDING DESIGN

JULY DESIGN WET-BULB TEMPERATURE
DEGREES CELSIUS - 2 1/2 PER CENT BASIS

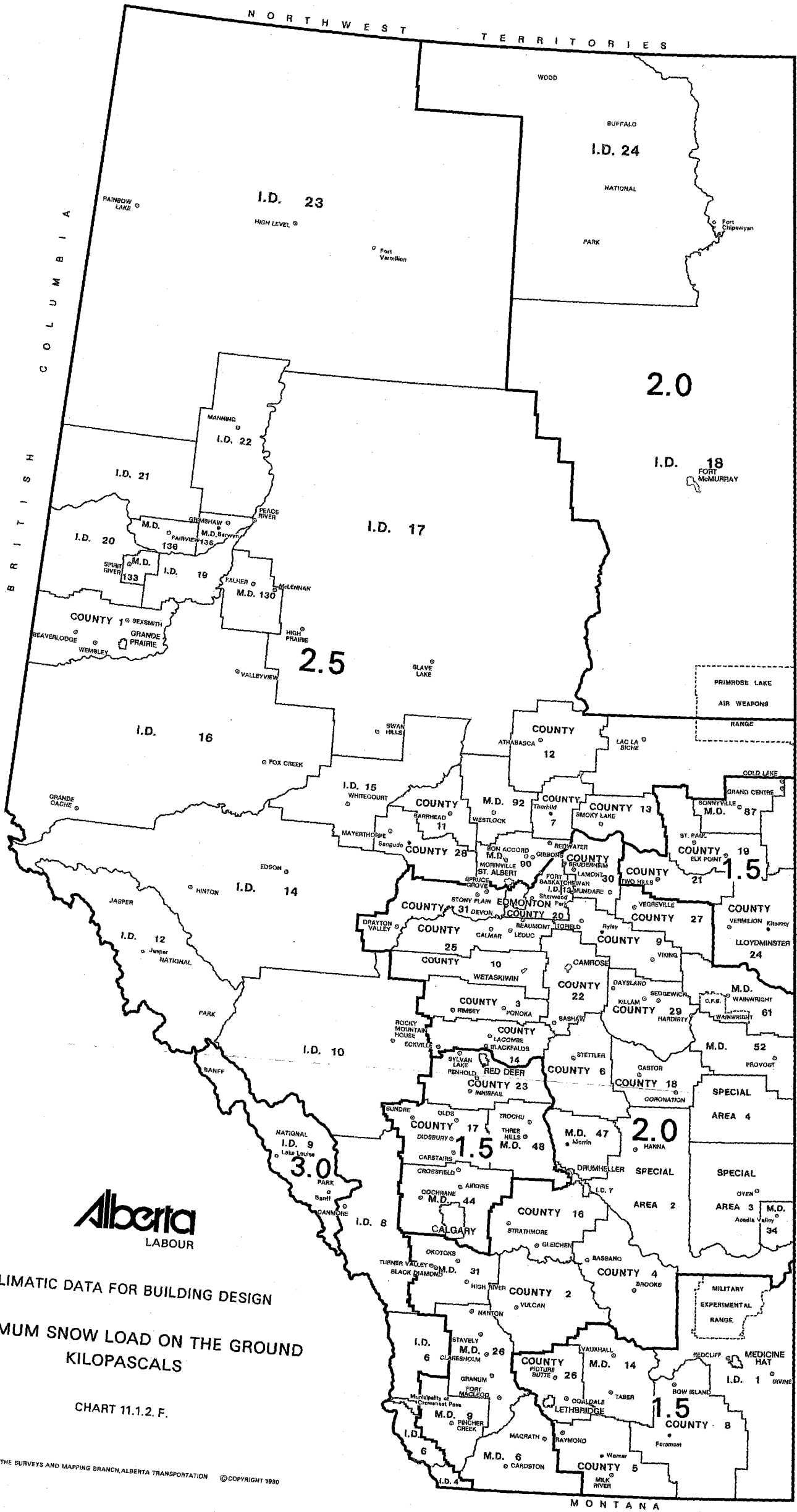
CHART 11.1.2.C.



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Alberta
LABOUR

CLIMATIC DATA FOR BUILDING DESIGN

MAXIMUM SNOW LOAD ON THE GROUND
KILOPASCALS

CHART 11.1.2. F.

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Table 11.1.3.A.
Forming Part of Article 11.1.3.1

CLIMATIC DATA FOR SELECTED MUNICIPALITIES IN ALBERTA

Municipality	Design Temperature				Degree Days Below 18°C	15 Min. Rain., mm	One Day Rain., mm	Ann. Tot Pcpn., mm	Gnd. Snow Load kPa	Hourly Wind Pressures			Seismic Data	
	January		July 2.5%							1/10 kPa	1/30 kPa	1/100 kPa	Zone	Acceleration Ratio, A
	2.5%, °C	1%, °C	Dry °C	Wet °C										
Athabasca	-35	-38	28	19	6 310	18	88	442	2.2	0.30	0.37	0.45	0	0
Banff	-30	-32	27	17	5 719	18	53	477	2.8	0.39	0.45	0.52	0	0
Barhead	-34	-37	28	19	6 000	20	102	460	2.2	0.32	0.39	0.49	0	0
Beaverlodge	-35	-38	28	18	5 909	25	101	455	2.1	0.27	0.33	0.40	0	0
Brooks	-32	-34	32	19	5 266	18	89	353	1.6	0.39	0.48	0.57	0	0
Calgary	-31	-33	29	17	5 344	23	95	437	0.9	0.40	0.46	0.54	0	0
Campsie	-34	-37	28	19	6 080	20	111	445	2.3	0.32	0.39	0.49	0	0
Camrose	-33	-35	29	19	5 960	20	92	394	1.7	0.21	0.29	0.39	0	0
Cardston	-30	-33	29	18	4 870	20	102	495	1.8	0.74	0.93	1.15	0	0
Clareholm	-31	-34	29	18	4 782	15	97	460	1.0	0.66	0.80	0.96	0	0
Cold Lake	-36	-38	28	20	6 183	15	94	433	1.5	0.31	0.37	0.44	0	0
Coleman	-31	-34	28	18	5 418	15	62	537	2.6	0.54	0.69	0.87	0	0
Coronation	-31	-33	30	19	5 905	20	99	373	1.9	0.23	0.32	0.43	0	0
Cowley	-31	-34	29	18	5 189	15	74	504	1.7	0.73	0.91	1.13	0	0
Drumheller	-31	-33	29	18	5 330	20	73	358	1.6	0.32	0.39	0.49	0	0
Edmonton	-32	-34	28	19	5 590	23	114	446	1.5	0.32	0.40	0.51	0	0
Edson	-34	-37	28	18	5 962	18	79	554	2.4	0.36	0.43	0.50	0	0
Embarras Portage	-41	-44	27	19	6 999	10	82	399	1.6	0.31	0.37	0.45	0	0
Fairview	-38	-40	27	18	6 152	15	64	422	2.1	0.26	0.32	0.39	0	0
Fort McMurray	-39	-41	28	19	6 779	13	61	435	1.8	0.27	0.32	0.38	0	0

Table 11.1.3.A. Cont'd.
Forming Part of Article 11.1.3.1

CLIMATIC DATA FOR SELECTED MUNICIPALITIES IN ALBERTA

	Design Temperature													
Municipality	January		July 2.5%		Degree Days Below 18°C	15 Min. Rain., mm	One Day Rain., mm	Ann. Tot Pcpn., mm	Gnd. Snow Load kPa	Hourly Wind Pressures			Seismic Data	
	2.5%, °C	1%, °C	Dry °C	Wet °C						1 10 kPa	1 30 kPa	1 100 kPa	Zone	Acceleration Ratio, A
Fort Saskatchewan	-32	-35	28	19	5 881	20	78	430	1.5	0.31	0.39	0.49	0	0
Fort Vermilion	-41	-43	28	18	7 077	13	60	360	2.0	0.22	0.26	0.32	0	0
Grande Prairie	-36	-39	27	18	6 144	23	78	442	2.1	0.37	0.44	0.52	0	0
Habay	-41	-43	28	18	7 050	13	63	360	2.5	0.20	0.24	0.28	0	0
Hardisty	-33	-35	30	19	5 950	20	56	384	1.8	0.24	0.32	0.42	0	0
High River	-31	-33	28	17	5 414	18	111	489	1.9	0.51	0.60	0.72	0	0
Jasper	-32	-35	28	18	5 530	10	108	402	2.4	0.37	0.43	0.50	0	0
Keg River	-40	-42	28	18	6 854	13	60	403	2.6	0.19	0.24	0.29	0	0
Lac La Biche	-35	-38	28	19	6 308	15	82	460	2.1	0.31	0.37	0.44	0	0
Lacombe	-33	-35	29	18	5 761	23	71	456	1.8	0.24	0.31	0.40	0	0
Lethbridge	-30	-33	31	18	4 717	20	93	436	1.5	0.64	0.76	0.91	0	0
Lloydminster	-35	-38	29	20	6 038	18	104	402	1.6	0.30	0.37	0.46	0	0
Manning	-39	-41	27	18	6 600	13	51	360	2.5	0.21	0.26	0.32	0	0
Medicine Hat	-31	-34	33	19	4 872	23	122	348	1.4	0.39	0.49	0.60	0	0
Peace River	-37	-40	27	18	6 424	15	48	351	2.4	0.24	0.29	0.36	0	0
Penhold	-32	-35	29	18	5 845	23	124	449	1.5	0.31	0.37	0.44	0	0
Pincher Creek	-32	-34	29	18	5 054	18	128	551	1.8	0.70	0.88	1.08	0	0
Ranfurly	-34	-37	29	19	6 015	18	89	434	1.6	0.23	0.29	0.36	0	0
Red Deer	-32	-35	29	18	5 846	23	154	442	1.5	0.31	0.37	0.44	0	0
Rocky Mountain House	-31	-33	28	18	5 639	20	77	543	1.8	0.26	0.32	0.39	0	0

Table 11.1.3.A. Cont'd.
Forming Part of Article 11.1.3.1

CLIMATIC DATA FOR SELECTED MUNICIPALITIES IN ALBERTA

Municipality	Design Temperature													
	January		July 2.5%		Degree Days Below 18°C	15 Min. Rain., mm	One Day Rain., mm	Ann. Tot Pcpn., mm	Gnd. Snow Load kPa	Hourly Wind Pressures			Seismic Data	
	2.5%, °C	1%, °C	Dry °C	Wet °C						1/10 kPa	1/30 kPa	1/100 kPa	Zone	Acceleration Ratio, A
Slave Lake	-36	-39	27	19	6 284	15	76	473	2.4	0.28	0.34	0.41	0	0
Stettler	-32	-34	30	19	5 585	20	165	420	1.8	0.24	0.32	0.42	0	0
Stony Plain	-32	-35	28	19	5 789	23	102	510	1.8	0.32	0.40	0.51	0	0
Suffield	-32	-34	33	19	5 102	20	69	323	1.1	0.43	0.52	0.64	0	0
Taber	-31	-33	31	19	4 821	20	93	373	1.4	0.57	0.69	0.82	0	0
Turner Valley	-31	-33	28	17	5 784	20	82	584	1.9	0.51	0.60	0.71	0	0
Valleyview	-37	-40	27	18	6 110	18	51	460	2.3	0.35	0.43	0.51	0	0
Vegreville	-34	-36	29	19	6 402	18	69	410	1.6	0.25	0.32	0.40	0	0
Vermilion	-35	-38	29	20	6 251	18	75	399	1.5	0.23	0.28	0.34	0	0
Wagner	-36	-39	27	19	6 280	15	72	465	2.2	0.28	0.34	0.41	0	0
Wainwright	-33	-36	29	19	6 000	20	63	380	1.6	0.24	0.32	0.41	0	0
Wetaskiwin	-33	-35	29	19	5 686	23	78	472	1.7	0.24	0.32	0.42	0	0
Whitecourt	-35	-38	27	18	6 196	20	89	522	2.2	0.32	0.39	0.48	0	0
Wimbome	-31	-34	29	18	5 620	23	89	430	1.5	0.30	0.37	0.45	0	0

Table 9.11.2.A.
Forming Part of Articles 9.10.4.1., 9.11.2.1. and 9.11.2.2.

FIRE AND SOUND RESISTANCE OF WALLS					
Type of Wall	No.	Description	Finish on Each Side (1)	Fire-resistance Rating, hr	Sound Rating (3)
Solid brick	1	4 in. * thick walls of shale, clay, concrete or sand-lime brick	None	1	II ⁽²⁾
	2	6 in. * thick walls of shale, clay, concrete or sand-lime brick	None	2½	II ⁽²⁾
	3	6 in. * thick walls of shale, clay, concrete or sand-lime brick	None	4	I ⁽²⁾
Hollow concrete block (normal weight aggregate)	4	4 in. *	None	¾	III
	5	Same as 4	A or B	1½	III
	6	Same as 4	C or D	2	II
	7	6 in. *	None	1	II ⁽²⁾
	8	Same as 7	A	1½	II
	9	Same as 7	B, C or D	2	II
	10	Same as 7 with mineral fibre between resilient channels on at least 1 side	A	1½	I
	11	8 in. *	None	1½	II ⁽²⁾
	12	Same as 11	A or B	2	I
	13	Same as 11	C or D	3	I
Concrete	14	6 in.	None	3	I ⁽²⁾
	15	8 in.	None	4	I ⁽²⁾
Column 1	2	3	4	5	6

Table 9.11.2.A. (Cont'd)

Type of Wall	No.	Description	Finish on Each Side (1)	Fire-Resistance Rating, hr	Sound Rating (3)
Interior wood stud, single row	16	2 x 4 in.* studs 16 in. o.c.	C or D	1	III
	17	2 x 4 in.* studs 16 in. o.c., mineral fibre with a mass of at least 0.25 lb/sq ft in cavity	A	3/4	III
	18	Same as 17 with resilient metal channels on at least 1 side	A	3/4	II
Interior stud, 2 rows staggered on 2 x 6 in.* plate	19	Two rows 2 x 4 in.* studs, each set 16 in. or 24 in. o.c. staggered on common 2 x 6 in.* plate, mineral fibre on each side	C or D	1 ⁽⁴⁾	II
	20	Two rows 2 x 4 in.* studs, each set 16 in. or 24 in. o.c. staggered on common 2 x 6 in.* plate, mineral fibre with a mass of at least 0.25 lb/sq ft on each side	A	3/4	II
Interior wood, 2 rows on separate plates	21	Two rows 2 x 4 in.* studs, each set 16 in. or 24 in. o.c. on 2 x 4 in.* plates set 1 in. apart, mineral fibre on 1 side	C or D	1 ⁽⁴⁾	II
	22	Two rows 2 x 4 in.* studs, each set 16 in. or 24 in. o.c. on 2 x 4 in.* plates set 1 in. apart, mineral fibre with a mass of at least 0.25 lb/sq ft on 1 side	A	3/4	II
Exterior, wood stud	23	2 x 4 in.* or 2 x 6 in.* studs spaced up to 24 in. o.c., mineral fibre with a mass of at least 0.25 lb/sq ft, wall sheathing and siding	A (interior side)	3/4	—
Column 1	2	3	4	5	6

Table 9.11.2.A. (Cont'd)

Type of Wall	No.	Description	Finish on Each Side (1)	Fire-Resistance Rating, hr	Sound Rating (3)
Exterior, wood stud (Cont'd)	24	Same as 23	C or D (interior side)	1	—
Non-load-bearing steel stud	25	3 $\frac{5}{8}$ in. steel studs spaced up to 24 in. o.c.	C	$\frac{3}{4}$	III
	26	Same as 25	D	1	III
	27	Same as 25 with mineral fibre filling cavity	C	1	II
	28	Same as 25 with mineral fibre filling cavity	D	1 ⁽⁴⁾	II
Column 1	2	3	4	5	6

Addendum to Table 9.11.2.A.:

(1) The finishes designated by letter refer to the following:

A = $\frac{1}{2}$ in. gypsum board, taped joints,

B = $\frac{1}{2}$ in. gypsum-sand plaster,

C = $\frac{5}{8}$ in. special fire-resistant Type X gypsum board conforming to CSA A82.27-M1977, "Gypsum Board Products," and

D = $\frac{3}{4}$ in. gypsum-sand plaster on $\frac{3}{8}$ gypsum lath or metal lath.

(2) Sound ratings listed assume that walls have their surfaces sealed by at least 2 coats of paint or other surface finish described in Section 9.30 to prevent airborne sound leakage.

(3) Rating I signifies constructions with sound transmission class ratings of 50 or more.

Rating II signifies constructions with sound transmission class ratings of 45 to 50.

Rating III signifies constructions with sound transmission class ratings of less than 45.

(4) Mineral fibre is required for sound resistance only and need not be provided to achieve the fire-resistance rating. Mineral fibre includes fibre processed from rock, slag or glass.

*Nominal dimension.

Table 9.11.2.B.
Forming Part of Articles 9.10.4.1. and 9.11.2.1.

FIRE AND SOUND RESISTANCE OF FLOORS, CEILINGS AND ROOFS⁽²⁾					
Type of Assembly	No.	Description	Ceiling Finish (1)	Fire-Resistance Rating, hr	Sound Rating (3)
Concrete slabs	1	3½ in. reinforced concrete with ¾ in. minimum cover over reinforcing steel	None	1	II
	2	5 in. reinforced concrete with 1 in. minimum cover over reinforcing steel	None	2	I
Open web steel joists	3	Open web steel joists with minimum 2 in. thick concrete deck, ceiling secured to furring channels spaced not more than 24 in. o.c. wired to underside of joists	C or D	1	I
Wood floor joists	4	Nominal 1 in. T&G lumber or 5/8 in. * plywood or wafer-board subfloor with mineral fibre between joists spaced 16 in. o.c. Ceiling finish attached to resilient channels	C	¾	II
	5	Same as 4	D	1	II
	6	Nominal 1 in. T&G lumber or 5/8 in. * plywood or wafer-board subfloor over joists spaced 16 in. o.c., 2 in. concrete topping	C	¾	II
	7	Same as 6	D	1	II
	8	Same as 6 with mineral fibre between joists and ceiling finish attached to resilient channels	C	¾	II
	9	Same as 6 with mineral fibre between joists and ceiling finish attached to resilient channels	D	1	I
Column 1	2	3	4	5	6

Table 9.11.2.B. (Cont'd)

Type of Assembly	No.	Description	Ceiling Finish (1)	Fire-Resistance Rating, hr	Sound Rating (3)
Wood ceiling joists or roof trusses	10	Nominal 2 in. thick framing members spaced not more than 24 in. o.c.	C	1/2	—
	11	Same as 10	C (2 layers)	1	—
Column 1	2	3	4	5	6

Addendum to Table 9.11.2.B.:

- (1) The finishes designated by letter refer to the following:

C = 5/8 in. special fire-resistant Type X gypsum board conforming to CSA A82.27-M1977, "Gypsum Board Products," and

D = 3/4 in. gypsum-sand plaster on 3/8 in. gypsum lath or metal lath.

- (2) *Fire-resistance ratings* for floor assemblies may be applied to roof assemblies having the same ceiling finish provided that, where wood joists are used, the roof sheathing consists of not less than 1/2 in. * plywood or waferboard or 1 in. * lumber. Where steel joists are used, the ratings are based on the assumption that the roof deck is at least equivalent in fire resistance to 2 in. concrete.

- (3) Rating I signifies constructions with sound transmission class ratings of 50 or more.

Rating II signifies constructions with sound transmission class ratings of 45 to 50.

Rating III signifies constructions with sound transmission class ratings of less than 45.

*Nominal dimension.

Table 9.15.3.A.
Forming Part of Articles 9.15.3.3. to 9.15.3.7.

MINIMUM FOOTING SIZES			
No. of Floors Supported	Minimum Width of Strip Footings, in.		Minimum Footing Area for Columns Spaced 9 ft 10 in. o.c., ⁽¹⁾ ft ²
	Supporting Exterior Walls	Supporting Interior Walls	
1	9 $\frac{7}{8}$	7 $\frac{7}{8}$	4.3
2	14 ⁽²⁾	14 ⁽³⁾	8.1
3	18 ⁽²⁾	20 ⁽³⁾	10.8
Column 1	2	3	4

Notes to Table 9.15.3.A.:

⁽¹⁾ See Article 9.15.3.7.

⁽²⁾ See Articles 9.15.3.4. and 9.15.3.5.

⁽³⁾ See Article 9.15.3.6.

Table 9.15.4.A.
Forming Part of Article 9.15.4.1.

THICKNESS OF FOUNDATION WALLS			
Type of Foundation Wall	Minimum Wall Thickness, in.*	Maximum Height of Finish Grade Above Basement Floor or Inside Grade	
		Foundation Wall Laterally Unsupported At the Top, ⁽¹⁾ ft—in.	Foundation Wall Laterally Supported At the Top, ⁽¹⁾ ft—in.
Solid concrete (2,030 psi min. strength)	6	2—6	5—0
	8	4—0	7—0
	10	4—6	7—6
	12	5—0	7—6
Solid concrete (2,900 psi min. strength)	6	2—6	6—0
	8	4—0	7—6
	10	4—6	7—6
	12	5—0	7—6
Unit masonry	6	2—0	2—0
	8	3—0	4—0
	10	4—0	6—0
	12	4—6	7—0
Column 1	2	3	4

Note to Table 9.15.4.A.:

⁽¹⁾ See Article 9.15.4.2.

*Nominal dimension.

Table 9.20.2.A.
Forming Part of Article 9.20.2.7.

COMPRESSIVE STRENGTH OF MASONRY		
Type of Masonry Unit	Minimum Compressive Strength over Gross Area, psi	
	Masonry Unit Exposed to Weather	Masonry Unit not Exposed to Weather
Hollow <i>loadbearing</i> concrete units	1,015	725
Solid <i>loadbearing</i> concrete units	1,813	1,160
Hollow non- <i>loadbearing</i> concrete units	1,015	363
Solid non- <i>loadbearing</i> concrete units	1,813	1,160
Solid <i>loadbearing</i> cellular units	Not permitted	725
Solid non- <i>loadbearing</i> cellular units	Not permitted	290
Column 1	2	3

Table 9.20.5.A.
Forming Part of Article 9.20.5.3.

MAXIMUM ALLOWABLE SPANS FOR STEEL LINTELS SUPPORTING MASONRY VENEER, ft—in.					
Minimum Angle Size, in.			3 in. Brick	3½ in. Brick	3⅞ in. Stone
Vert. Leg	Horiz. Leg	Thickness			
3½	3	¼	8—4	—	—
3½	3½	¼	8—6	8—1	7—7
3⅞	3½	¼	9—2	8—9	8—2
4⅞	3½	⅝	11—5	10—10	10—1
4⅞	3½	¾	11—11	11—5	10—8
Col. 1	2	3	4	5	6

Table 9.20.9.A.
Forming Part of Article 9.20.9.9.

VENEER TIE SPACING	
Maximum Vertical Spacing, in.	Maximum Horizontal Spacing, in.
16	31
20	24
24	16
Column 1	2

Table 9.21.2.A.
Forming Part of Article 9.21.2.4.

FLUE SIZES		
Maximum Rated Input of One or More <i>Appliances</i> , Btu/hr	Minimum Size of <i>Flue</i> , in.	
	Round	Rectangular
102,363	6*	8 x 8*
170,605	7*	8 x 8*
272,968	8*	8 x 8*
409,452	9*	8 x 12*
Column 1	2	3

Table 9.21.5.A.
Forming Part of Article 9.21.5.1.

WALL THICKNESS OF FLUE PIPES		
Diameter of Flue Pipes, in.	Minimum Thickness of Metal, in.	
	Uncoated Steel	Galvanized Steel
Below 6	0.016	0.016
6 to 8	0.021	0.019
Over 8	0.027	0.024
Column 1	2	3

Table 9.21.6.A.
Forming Part of Article 9.21.6.5.

CLEARANCE BETWEEN A FLUE PIPE AND PROTECTED COMBUSTIBLE MATERIAL	
Type of protection applied to the <i>combustible</i> material unless otherwise specified and covering all surfaces within 18 in. of the <i>flue pipe</i>	Clearance between <i>flue pipe</i> and <i>combustible</i> material, in.
¼-in. asbestos millboard spaced out 1 in. by <i>noncombustible</i> material	12
0.013-in. sheet metal on ¼ in. asbestos millboard	12
0.013-in. sheet metal spaced out 1 in. by <i>noncombustible</i> material	9
0.013-in. sheet metal on ⅛-in. asbestos millboard spaced out 1 in. by <i>noncombustible</i> material	9
1⅝-in. asbestos-cement covering on <i>flue pipe</i>	9
0.027-in. sheet metal on 1-in. mineral wool batts reinforced with wire mesh or equivalent	3
Column 1	2

*Nominal dimension.

Table 9.23.3.A.
Forming Part of Articles 9.23.3.3. and 9.23.3.4.

NAILING FOR FRAMING		
Construction Detail	Minimum Length of Nails, in.	Minimum Number or Maximum Spacing of Nails
Floor joist to plate— <i>toe nail</i>	3¼	2
Wood or metal strapping to underside of floor joists	2¼	2
Cross bridging to joists	2¼	2 each end
Double header or trimmer joists	3	12 in. (o.c.)
Floor joist to stud (balloon construction)	3	2
Ledger strip to wood beam	3¼	2 per joist
Joist to joist splice (see also Table 9.23.13.A.)	3	2 at each end
Tail joist to adjacent header joist (end nailed) around openings	3¼ 4	5 3
Each header joist to adjacent trimmer joist (end nailed) around openings	3¼ 4	5 3
Stud to wall plate (each end) <i>toe nail</i> or end nail	2½ 3¼	4 2
Doubled studs at openings, or studs at <i>partition</i> or wall intersections and corners	3	30 in. o.c.
Doubled top wall plates	3	24 in. o.c.
Bottom wall plate or sole plate to joists or blocking (exterior walls) ⁽¹⁾	3¼	16 in. o.c.
Interior <i>partitions</i> to framing or subflooring	3¼	24 in. o.c.
Horizontal member over openings in non-loadbearing <i>partitions</i> —each end	3¼	2
Lintels to studs	3¼	2 at each end
Ceiling joist to plate— <i>toe nail</i> each end	3¼	2
Roof rafter, roof truss or roof joist to plate— <i>toe nail</i>	3¼	3
Rafter plate to each ceiling joist	4	2
Rafter to joist (with ridge supported)	3	3
Rafter to joist (with ridge unsupported)	3	see Table 9.23.13.A.
Gusset plate to each rafter at peak	2¼	4
Rafter to ridge board— <i>toe nail</i>	2¼	4
—end nail	3¼	3
Collar tie to rafter —each end	3	3
Collar tie lateral support to each collar tie	2¼	2
Jack rafter to hip or valley rafter	3¼	2
Roof strut to rafter	3	3
Roof strut to bearing <i>partition</i> — <i>toe nail</i>	3¼	2
2 by 6 or less plank decking to support	3¼	2
Plank decking wider than 2 by 6 to support	3¼	3
2-in. edge laid plank decking to support (toe nail)	3	1
2-in. edge laid plank to each other	3	18 in. o.c.
Column 1	2	3

Note to Table 9.23.3.A.:

⁽¹⁾ See Article 9.23.3.4.

Table 9.23.3.B.
Forming Part of Article 9.23.3.5.

Element	Minimum Length of Fasteners for Sheathing and Subfloor Attachment, in.				Min. No. or Max. Spacing of Fasteners
	Common or Spiral Nails	Ring Thread Nails	Roofing Nails	Staples	
Plywood or waferboard up to 3/8 in.* thick	2	1 3/4	N/A	1 1/2	5 7/8 in. (o.c.) along edges and 12 in. (o.c.) along intermediate supports
Plywood or waferboard from 3/8 in.* to 3/4 in.* thick	2	1 3/4	N/A	2	
Plywood or waferboard over 3/4 in.* thick	2 1/4	2	N/A	N/A	
Fibreboard sheathing up to 1/2 in.* thick	N/A	N/A	1 3/4	1 1/2	
Gypsum sheathing up to 1/2 in.* thick	N/A	N/A	1 3/4	N/A	
Board lumber 8 in.* or less wide	2	N/A	N/A	2	2 per support
Board lumber more than 8 in.* wide	2	N/A	N/A	2	3 per support
Column 1	2	3	4	5	6

Table 9.23.4.A.
Forming Part of Article 9.23.4.2.

No. of Storeys	Beam Type	Maximum Spans for Steel Beams Supporting Floors in Dwellings, ft—in.				
		Supported Joist Length (Half the Sum of Joist Spans on Both Sides of the Beam)				
		7 ft 10 in.	9 ft 10 in.	11 ft 10 in.	13 ft. 9 in.	15 ft 9 in.
1	S100 x 11	13—9	12—4	11—3	10—6	9—9
	S130 x 15	17—6	15—8	14—4	13—4	12—6
	S150 x 19	21—3	19—0	17—5	16—2	15—1
	W150 x 22	22—10	20—5	18—9	17—4	16—3
	W200 x 27	30—1	27—0	24—9	23—0	21—6
	S200 x 27	29—8	26—8	24—5	22—8	21—6
2	S100 x 11	10—5	9—4	8—6	7—11	7—5
	S130 x 15	13—3	11—11	10—10	10—0	9—1
	S150 x 19	16—1	14—5	13—2	12—2	11—5
	W150 x 22	17—3	15—6	14—2	13—1	12—4
	W200 x 27	22—10	20—6	18—9	17—5	16—3
	S200 x 27	22—7	19—11	18—6	17—2	16—1
Column 1	2	3	4	5	6	7

*Nominal dimension.

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, in.*	Maximum Stud Spacing, in.	Maximum Unsupported Height, ft—in.
Interior	No load	2 by 2 2 by 4 flat	16 16	7—10 11—10
	Attic not accessible by a stairway	2 by 3 2 by 3 flat ⁽¹⁾	24 16	9—10 7—10
		2 by 4 2 by 4 flat ⁽¹⁾	24 16	11—10 7—10
	Attic accessible by a stairway plus 1 floor, Roof load plus 1 floor, Attic not accessible by stairway plus 2 floors	2 by 4	16	11—10
	Roof load, Attic accessible by a stairway, Attic not accessible by a stairway plus 1 floor	2 by 4 2 by 3	24 16	11—10 7—10
	Attic accessible by a stairway plus 2 floors or roof load plus 2 floors	2 by 4 3 by 4 2 by 6	12 16 16	11—10 11—10 13—9
	Attic accessible by a stairway plus 3 floors or roof load plus 3 floors	2 by 6	12	13—9
Exterior	Roof with or without attic storage	2 by 3 2 by 4	16 24	7—10 9—10
	Roof with or without attic storage plus 1 floor	2 by 4 2 by 6	16 24	9—10 9—10
	Roof with or without attic storage plus 2 floors	2 by 4 3 by 4 2 by 6	12 16 16	9—10 9—10 11—10
	Roof with or without attic storage plus 3 floors	2 by 6	12	5—11
Column 1	2	3	4	5

Note to Table 9.23.10.A.:

⁽¹⁾ See Article 9.23.10.2.

*Nominal dimension.

Table 9.23.12.A.
Forming Part of Articles 9.23.12.4. and 9.23.12.5.

WOOD LINTEL SPANS			
Location of Lintels	Supported Loads Including <i>Dead Loads</i> and Ceiling	Depth of Lintels, in. *	Maximum Allowable Spans, ft—in.
Interior walls	Limited attic storage	4	4—0
		6	6—0
		8	8—0
		10	10—0
		12	12—6
	Full attic storage or roof load or limited attic storage plus 1 floor	4	2—0
		6	3—0
		8	4—0
		10	5—0
		12	6—0
	Full attic storage plus 1 floor or roof load plus 1 floor or limited attic storage plus 2 or 3 floors	4	—
		6	2—6
		8	3—0
		10	4—0
		12	5—0
	Full attic storage plus 2 or 3 floors or roof load plus 2 or 3 floors	4	—
		6	2—0
		8	3—0
		10	3—6
		12	4—0
Exterior walls	Roof with or without attic storage	4	3—8
		6	5—6
		8	7—4
		10	9—2
		12	11—0
	Roof with or without attic storage plus 1 floor	4	1—10
		6	4—7
		8	6—5
		10	7—4
		12	8—3
	Roof with or without attic storage plus 2 or 3 floors	4	1—10
		6	3—8
		8	5—6
		10	6—5
		12	7—4
Column 1	2	3	4

*Nominal dimension.

Table 9.23.13.A.
Forming Part of Article 9.23.13.11.

RAFTER-TO-JOIST NAILING (Minimum Number of Nails at least 3 in. long) (Unsupported Ridge)													
Roof Slope	Rafter Spacing, in.	Rafter Tied to Every Joist						Rafter Tied to Joist Every 4 ft					
		Building Width up to 26 ft 3 in.			Building Width up to 32 ft 2 in.			Building Width up to 26 ft 3 in.			Building Width up to 32 ft 2 in.		
		Roof Snow Load, psf											
		21 or less	31	42 or more	21 or less	31	42 or more	21 or less	31	42 or more	21 or less	31	42 or more
1 in 3	16	4	5	6	5	6	8	11	—	—	—	—	—
	24	6	8	9	8	11	—	11	—	—	—	—	—
1 in 2.4	16	4	4	5	5	6	7	7	9	—	9	—	—
	24	5	6	8	7	8	11	7	9	—	—	—	—
1 in 2	16	4	4	4	4	4	5	6	8	9	8	11	—
	24	4	5	6	5	6	8	6	8	9	8	11	—
1 in 1.71	16	4	4	4	4	4	4	5	6	8	7	8	11
	24	4	4	5	5	6	7	5	6	8	7	8	11
1 in 1.33	16	4	4	4	4	4	4	4	5	6	5	6	7
	24	4	4	4	4	4	5	4	5	6	5	6	7
1 in 1	16	4	4	4	4	4	4	4	4	4	4	4	5
	24	4	4	4	4	4	4	4	4	4	4	4	5
Col. 1	2	3	4	5	6	7	8	9	10	11	12	13	14

Table 9.23.14.A.
Forming Part of Articles 9.23.14.6. and 9.23.15.6.

THICKNESS OF SUBFLOORING			
Maximum Joist Spacing, in.	Minimum Plywood Thickness, in.*	Minimum Wafer-board or Particleboard Thickness, in.*	Minimum Lumber Thickness, in.
16	5/8	5/8	1 1/6
20	5/8	3/4	3/4
24	3/4	1	3/4
Column 1	2	3	4

*Nominal dimension.

Table 9.23.15.A.
Forming Part of Article 9.23.15.6.

THICKNESS OF ROOF SHEATHING					
Joist or Rafter Spacing, in.	Minimum Plywood Thickness, in. *		Minimum Waferboard Thickness, in. *		Minimum Lumber Thickness, in.
	Edges Supported	Edges Unsupported	Edges Supported	Edges Unsupported	
12	$\frac{5}{16}$	$\frac{5}{16}$	$\frac{3}{8}$	$\frac{3}{8}$	$\frac{1}{4}$
16	$\frac{5}{16}$	$\frac{3}{8}$	$\frac{3}{8}$	$\frac{7}{16}$	$\frac{1}{4}$
20	$\frac{3}{8}$	$\frac{1}{2}$	$\frac{7}{16}$	$\frac{1}{2}$	$\frac{3}{4}$
24	$\frac{3}{8}$	$\frac{1}{2}$	$\frac{7}{16}$	$\frac{1}{2}$	$\frac{3}{4}$
Column 1	2	3	4	5	6

Table 9.23.16.A.
Forming Part of Article 9.23.16.2.

WALL SHEATHING THICKNESS AND SPECIFICATIONS			
Type of Sheathing	Minimum Thickness, in. ⁽¹⁾		Material Standards
	With Supports 16 in. o.c.	With Supports 24 in. o.c.	
Lumber	$\frac{1}{4}$	$\frac{1}{4}$	See Table 9.3.3.A. CSA A247-M1978 CSA A82.27-M1977 CSA O121-M1978 CSA O151-M1978 CSA O153-1976 CAN3-O188.2-M78
Fibreboard (insulating)	$\frac{3}{8}$ *	$\frac{7}{16}$ *	
Gypsum board	$\frac{3}{8}$ *	$\frac{1}{2}$ *	
Plywood (exterior type)	$\frac{1}{4}$ *	$\frac{5}{16}$ *	
Waferboard	$\frac{1}{4}$ *	$\frac{5}{16}$ *	
Column 1	2	3	4

Note to Table 9.23.16.A.:

⁽¹⁾ See also Articles 9.28.5.4. to 9.28.5.6.

Table 9.24.6.A.
Forming Part of Article 9.24.6.1.

NOMINAL THICKNESS OF PLANK FRAMING	
Supported Load (Including <i>dead load</i> and ceiling)	Minimum Plank Thickness, in. *
Roof with or without attic storage	2
Roof with or without attic storage plus 1 floor	2
Roof with or without attic storage plus 2 floors	3
Column 1	2

*Nominal dimension.

Table 9.24.6.B.
Forming Part of Article 9.24.6.8.

LINTEL SPANS	
Lintel Size, in.*	Maximum Span, ft—in.
2 by 8	5—1
2 by 10	6—5
2 by 12	7—4
3 by 8	6—5
3 by 10	7—4
Column 1	2

Table 9.25.2.A.
Forming Part of Article 9.25.2.1.

STEEL STUDS FOR NON-LOADBEARING PARTITIONS		
Minimum Stud Size, in.	Maximum Stud Spacing, in.	Maximum Wall Height, ft—in.
1¼ x 1⅝	16	9—10
	24	8—10
1¼ x 2½	16	13—1
	24	11—10
1¼ x 3⅝	16	17—1
	24	16—1
Column 1	2	3

Table 9.25.2.B.
Forming Part of Article 9.25.2.6.

STEEL STUDS FOR NON-LOADBEARING EXTERIOR WALLS				
Minimum Stud Size, in.	Minimum Nominal Metal Thickness, in. (excluding coating)	Maximum Stud Length, ft—in.		
		Spacing of Studs		
		12 in. o.c.	16 in. o.c.	24 in. o.c.
1¼ x 3⅝	0.021	9—10	7—10	—
1¼ x 3⅝	0.027	10—10	8—10	7—10
1¼ x 3⅝	0.033	11—10	9—10	8—10
1¼ x 3⅝	0.039	13—1	10—10	9—10
Column 1	2	3	4	5

*Nominal dimension.

Table 9.27.9.A.
Forming Part of Article 9.27.9.7.

EXPOSURE OF WOOD ROOF SHINGLES						
Roof Slope	Maximum Shingle Exposure, in.					
	No. 1 Grade			No. 2 Grade		
	Length of Shingle			Length of Shingle		
	16 in.	18 in.	24 in.	16 in.	18 in.	24 in.
1 in 3 or less	3¾	4⅞	5¾	3½	3⅞	5½
over 1 in 3	4⅞	5½	7½	3⅞	4½	6½
Column 1	2	3	4	5	6	7

Table 9.27.11.A.
Forming Part of Article 9.27.11.1.

QUANTITIES OF BITUMEN FOR BUILT-UP ROOFS		
Type of Roof	Amount of Bitumen per 100 sq ft of Roof Surface	
	Mopping Coats Between layers	Flood Coat
Asphalt and aggregate	20.5 lb	61.4 lb
Coal-tar and aggregate	24.6 lb	73.7 lb
Cold process roofing	1.5 gal. cold process cement	4.1 gal. cold process top coating
Column 1	2	3

Table 9.28.5.A.
Forming Part of Article 9.28.5.9.

ATTACHMENT OF SIDING			
Type of Siding	Min. Nail or Staple Length, in.	Min. No. of Nails or Staples	Maximum Nail or Staple Spacing
Wood trim	2	—	24 in. (o.c.)
Lumber siding or horizontal siding made from sheet material	2	—	24 in. (o.c.)
Metal siding	1½	—	24 in. (o.c.) (nailed to framing) 16 in. (o.c.) (nailed to sheathing only)
Handsplit wood shakes up to 8 in. in width	2	2	—
Handsplit wood shakes over 8 in. in width	2	3	—
Wood shingles and machine grooved shakes up to 8 in. in width	1¼	2	—
Wood shingles and machine grooved shakes over 8 in. in width	1¼	3	—
Asbestos-cement shingles	1¼	2	—
Panel or sheet type siding up to ¼ in. thick	1½	—	5⅞ in. (o.c.) along edges
Panel or sheet type siding greater than ¼ in. thickness	2	—	12 in. (o.c.) along intermediate supports
Column 1	2	3	4

Table 9.28.7.A.
Forming Part of Article 9.28.7.6.

EXPOSURE AND THICKNESS OF WOOD SHINGLES AND MACHINE GROOVED SHAKES			
Shake or Shingle Length, in.	Maximum Exposure		Minimum Butt Thickness, in.
	Single Coursing, in.	Double Coursing, in.	
16	7½	12	¾
18	8½	14	7/16
24	11½	16	½
Column 1	2	3	4

Table 9.28.9.A.
Forming Part of Article 9.28.9.2.

MINIMUM PLYWOOD THICKNESS, EXTERIOR WALL FINISH		
Spacing of Supports, in.	Face Grain Parallel to Supports, in.*	Face Grain Right Angles to Supports, in.*
16	$\frac{3}{8}$	$\frac{1}{4}$
24	$\frac{1}{2}$	$\frac{3}{8}$
Column 1	2	3

Table 9.29.2.A.
Forming Part of Article 9.29.2.2.

AGGREGATE GRADING FOR STUCCO		
Sieve Sizes	Per Cent Passing	
	Maximum	Minimum
No. 4	—	100
8	—	90
16	90	60
30	60	45
50	30	10
100	5	—
Column 1	2	3

Table 9.29.4.A.
Forming Part of Article 9.29.4.3.

STUCCO LATH				
Location	Type of Lath	Min. Diam of Wire, in.	Max. Mesh Opening	Min. Wt /Sq Yd
Vertical surfaces	Welded or woven wire	0.047 0.053 0.063	1 in. 1½ in. 2 in.	— — —
	Stucco mesh reinforcing (expanded metal)	—	4 sq in	1.8 lb
Horizontal surfaces ⁽¹⁾	¾-in. rib lath	—	—	3.4 lb
	Cedar lath	—	—	—
Column 1	2	3	4	5

Note to Table 9.29.4.A.:

⁽¹⁾ See Appendix A.

*Nominal dimension.

Table 9.30.3.A.
Forming Part of Article 9.30.3.1.

Maximum Spacing of Furring, in.	Minimum Size of Furring, in.		
	Maximum Spacing of Furring Supports		
	Continuous Support	16 in. o.c.	24 in. o.c.
12	¾ by 2*	¾ by 2*	¾ by 3*
16	¾ by 2*	¾ by 2*	¾ by 3*
24	¾ by 2*	¾ by 3*	¾ by 4*
Column 1	2	3	4

Table 9.30.5.A.
Forming Part of Article 9.30.5.2.

MINIMUM WEIGHT OF METAL LATH			
Type of Lath	Min. Weight, lb per sq yd	Max. Spacing of Wood Supports, in.	
		Walls	Ceilings
Diamond mesh	2.5	12	12
	3.0	16	12
Flat rib	2.5	16	12
	3.0	16	16
¾-in. rib	2.5	16	16
	3.0	20	20
	3.5	24	24
Paper-backed welded wire	1.4	16	16
	1.95	24	24
Column 1	2	3	4

Table 9.30.8.A.
Forming Part of Article 9.30.8.3.

FASTENER PENETRATION INTO WOOD SUPPORTS				
Required Fire-Resistance Rating of Assembly, hr	Min. Fastener Penetration Into Wood Supports, in.			
	Walls		Ceilings	
	Nails	Screws	Nails	Screws
Fire-resistance not required	¾	⅝	¾	⅝
¾	¾	¾	1⅛	1⅛
1	¾	¾	1¾	1¾
1½	¾	¾	2⅜	2⅜
Column 1	2	3	4	5

*Nominal dimension.

Table 9.30.9.A.
Forming Part of Articles 9.30.9.1. and 9.30.9.2.

MINIMUM THICKNESS OF PLYWOOD INTERIOR FINISH		
Maximum Spacing of Supports, in. o.c.	On Supports with no Horizontal Blocking, in.	On Supports with Blocking at Vertical Intervals not Exceeding 4 ft, in.
16 24	$\frac{5}{16}$ $\frac{3}{8}$	$\frac{5}{32}$ $\frac{3}{16}$
Column 1	2	3

Table 9.31.3.A.
Forming Part of Article 9.31.3.1.

WOOD STRIP FLOORING			
Type of Flooring	Maximum Joist Spacing, in.	Minimum Actual Thickness of Flooring, in.	
		With Subfloor	No Subfloor
Matched hardwood (interior use only)	16 24	$\frac{5}{16}$ $\frac{5}{16}$	$\frac{3}{4}$ $1\frac{5}{16}$
Matched softwood (interior or exterior use)	16 24	$\frac{3}{4}$ $\frac{3}{4}$	$\frac{3}{4}$ $1\frac{1}{4}$
Square edge softwood (exterior use only)	16 24	— —	1 $1\frac{1}{2}$
Column 1	2	3	4

Table 9.31.3.B.
Forming Part of Article 9.31.3.4.

NAILING OF WOOD STRIP FLOORING		
Finish Floor Thickness, in.	Minimum Length of Flooring Nails, in.	Maximum Spacing of Flooring Nails, in.
$\frac{5}{16}$	$1\frac{1}{2}$ ⁽¹⁾	$7\frac{7}{8}$
$\frac{7}{16}$	2	12
$\frac{3}{4}$	$2\frac{1}{4}$	16
1	$2\frac{1}{2}$	16
$1\frac{1}{4}$	$2\frac{3}{4}$	24
$1\frac{1}{2}$	$3\frac{1}{4}$	24
Column 1	2	3

Note to Table 9.31.3.B.:

⁽¹⁾ See Article 9.31.3.5.

*Nominal dimension.

Table 9.33.3.A.
Forming Part of Article 9.33.3.1.

NATURAL VENTILATION		
Location		Minimum Unobstructed Area
<i>Within dwelling units</i>	Bathrooms or water-closet rooms	1 sq ft
	Unfinished basement space	0.2 per cent of the floor area
	Dining rooms, living rooms Bedrooms, kitchens, combined rooms Dens, recreation rooms and all other finished rooms	3 sq ft per room or combination of rooms
<i>Other than within dwelling units</i>	Bathrooms or water-closet rooms	1 sq ft per water-closet
	Sleeping areas	1½ sq ft per occupant
	Laundry rooms, kitchens, recreation rooms	4 per cent of the floor area
	Corridors, storage rooms and other similar public rooms or spaces	2 per cent of the floor area
	Unfinished basement space not used on a shared basis	0.2 per cent of the floor area
Column 1	2	3

Table 9.34.3.A.
Forming Part of Articles 9.34.3.2. and 9.34.5.1.

MINIMUM METAL THICKNESS OF DUCTS, in.				
Shape and Location of Duct	Size of Duct, in.	Galvanized Steel	Aluminum	Tin Plate
All round ducts and enclosed rectangular ducts	14 or under over 14	0.013 0.016	0.012 0.016	0.015 —
Exposed rectangular ducts having a required clearance of up to ½ in. and serving single <i>dwelling units</i>	14 or under over 14	0.013 0.016	0.016 0.019	— —
Other exposed rectangular ducts	14 or under over 14	0.016 0.019	0.016 0.019	— —
Column 1	2	3	4	5

Table 9.34.9.A.
Forming Part of Article 9.34.9.2.

MINIMUM CLEARANCES TO COMBUSTIBLE MATERIAL FOR STOVES, RANGES AND SPACE HEATERS USING SOLID FUEL				
Appliances	Minimum Clearance, in.			
	Top	Sides	Rear	Front
<i>Stoves and ranges without refractory lining</i>	30	—	35	47
<i>fire box side</i>	—	35	—	—
<i>other side</i>	—	18	—	—
<i>Stoves and ranges with refractory lining</i>	30	—	24	47
<i>fire box side</i>	—	24	—	—
<i>other side</i>	—	18	—	—
<i>Space heaters with an air space between the outside of the fire chamber and the external casing to allow air circulation</i>	35	12	12	47
<i>Space heaters other than above</i>	35	35	35	47
Column 1	2	3	4	5

Table 9.35.2.A.
Forming Part of Article 9.35.2.9.

MINIMUM LIGHTING FOR PUBLIC AREAS		
Room or Space	Footcandles	Watts per Square Foot of Floor Area (Incandescent Lighting)
Storage rooms	5	½
<i>Service rooms</i> and laundry areas	20	2
Garages	5	½
Public water-closet rooms	10	1
<i>Public corridors</i> and stairways	5	—
Service hallways and stairways	5	—
Recreation rooms	10	1
Column 1	2	3

Table A-1
Forming Part of Article 9.23.4.1.

CEILING JOISTS — ATTIC NOT ACCESSIBLE BY A STAIRWAY (LIVE LOAD 10 lb per sq ft)																		
Commercial Designation	Grade	Nominal Size, in.	LIVE LOAD 10 lb per sq ft															
			Gypsum Board or Plastered Ceiling								Other Ceilings							
			Joist Spacing								Joist Spacing							
			12 in.		16 in.		20 in.		24 in.		12 in.		16 in.		20 in.		24 in.	
			ft	in.	ft	in.	ft	in.	ft	in.	ft	in.	ft	in.	ft	in.	ft	in.
Douglas Fir-Larch (includes Douglas Fir and Western Larch)	Select structural	2 x 4	11	3	10	2	9	6	8	11	12	10	11	8	10	10	10	2
		2 x 6	17	8	16	0	14	11	14	0	20	3	18	4	17	1	16	0
		2 x 8	23	3	21	2	19	8	18	6	26	8	24	3	22	6	21	2
		2 x 10	29	9	27	0	25	1	23	7	34	0	30	11	28	8	27	0
		2 x 12	36	2	32	10	30	6	28	8	41	5	37	7	34	11	32	10
	No. 1	2 x 4	11	3	10	2	9	6	8	11	12	10	11	8	10	10	10	2
		2 x 6	17	8	16	0	14	11	14	0	20	3	18	4	17	1	16	0
		2 x 8	23	3	21	2	19	8	18	6	26	8	24	3	22	6	21	2
		2 x 10	29	9	27	0	25	1	23	7	34	0	30	11	28	8	27	0
		2 x 12	36	2	32	10	30	6	28	8	41	5	37	7	34	11	32	10
	No. 2	2 x 4	10	10	9	10	9	2	8	7	12	5	11	3	10	5	9	10
		2 x 6	17	1	15	6	14	4	13	6	19	6	17	9	16	5	15	0
		2 x 8	22	6	20	5	19	0	17	10	25	9	23	5	21	8	19	9
		2 x 10	28	8	26	1	24	2	22	9	32	10	29	10	27	7	25	2
		2 x 12	34	11	31	9	29	5	27	8	40	0	36	4	33	7	30	8
	No. 3	2 x 4	10	5	9	5	8	5	7	8	10	11	9	5	8	5	7	8
		2 x 6	16	1	13	11	12	5	11	4	16	1	13	11	12	5	11	4
		2 x 8	21	3	18	4	16	5	15	0	21	3	18	4	16	5	15	0
		2 x 10	27	1	23	5	21	0	19	2	27	1	23	5	21	0	19	2
		2 x 12	32	11	28	6	25	6	23	3	32	11	28	6	25	6	23	3
	Con- struction	2 x 4	10	5	9	6	8	9	8	3	11	11	10	9	9	7	8	9
	Standard	2 x 4	9	2	7	11	7	1	6	5	9	2	7	11	7	1	6	5
	Utility	2 x 4	6	5	5	7	5	0	4	7	6	5	5	7	5	0	4	7
Hem-Fir (includes Western Hemlock, Amabilis Fir and Grand Fir)	Select structural	2 x 4	10	10	9	10	9	2	8	7	12	5	11	3	10	5	9	10
		2 x 6	17	1	15	6	14	4	13	6	19	6	17	9	16	6	15	6
		2 x 8	22	6	20	5	19	0	17	10	25	9	23	5	21	8	20	5
		2 x 10	28	8	26	1	24	2	22	9	32	10	29	10	27	8	26	1
		2 x 12	34	11	31	9	29	5	27	8	40	0	36	4	33	8	31	9
	No. 1	2 x 4	10	10	9	10	9	2	8	7	12	5	11	3	10	5	9	8
		2 x 6	17	1	15	6	14	4	13	6	19	6	17	7	15	9	14	5
		2 x 8	22	6	20	5	19	0	17	10	25	9	23	3	20	9	19	0
		2 x 10	28	8	26	1	24	2	22	9	32	10	29	8	26	6	24	3
		2 x 12	34	11	31	9	29	5	27	8	40	0	36	1	32	3	29	5
	No. 2	2 x 4	10	5	9	6	8	10	8	3	11	11	10	10	9	10	8	11
		2 x 6	16	5	14	11	13	10	12	9	18	1	15	8	14	0	12	9
		2 x 8	21	8	19	8	18	3	16	10	23	11	20	8	18	6	16	10
		2 x 10	27	8	25	1	23	4	21	6	30	6	26	5	23	7	21	6
		2 x 12	33	8	30	7	28	4	26	2	37	1	32	1	28	9	26	2
	No. 3	2 x 4	9	2	7	11	7	1	6	5	9	2	7	11	7	1	6	5
		2 x 6	13	9	11	11	10	8	9	9	13	9	11	11	10	8	9	9
		2 x 8	18	2	15	9	14	1	12	10	18	2	15	9	14	1	12	10
		2 x 10	23	2	20	1	17	11	16	5	23	2	20	1	17	11	16	5
		2 x 12	28	2	24	5	21	10	19	11	28	2	24	5	21	10	19	11
	Con- struction	2 x 4	10	0	9	1	8	2	7	5	10	7	9	2	8	2	7	5
	Standard	2 x 4	7	11	6	10	6	1	5	7	7	11	6	10	6	1	5	7
	Utility	2 x 4	5	3	4	7	4	1	3	8	5	3	4	7	4	1	3	8

Continued on next page

Table A-1 (Cont'd)

CEILING JOISTS — ATTIC NOT ACCESSIBLE BY A STAIRWAY (LIVE LOAD 10 lb per sq ft)										
Commercial Designation	Grade	Nominal Size, in.	LIVE LOAD 10 lb per sq ft							
			Gypsum Board or Plastered Ceiling				Other Ceilings			
			Joist Spacing				Joist Spacing			
			12 in.		16 in.		20 in.		24 in.	
			ft in.	ft in.	ft in.	ft in.	ft in.	ft in.	ft in.	ft in.
Eastern Hemlock-Tamarack (includes Eastern Hemlock and Tamarack)	Select structural	2 x 4	10 4	9 4	8 8	8 2	11 9	10 8	9 11	9 4
		2 x 6	16 2	14 9	13 8	12 10	18 7	16 10	15 8	14 9
		2 x 8	21 4	19 5	18 0	16 11	24 6	22 3	20 8	19 5
		2 x 10	27 3	24 9	23 0	21 8	31 3	28 4	26 4	24 9
		2 x 12	33 2	30 2	28 0	26 4	38 0	34 6	32 0	30 2
	No. 1	2 x 4	10 4	9 4	8 8	8 2	11 9	10 8	9 11	9 4
		2 x 6	16 2	14 9	13 8	12 10	18 7	16 10	15 8	14 9
		2 x 8	21 4	19 5	18 0	16 11	24 6	22 3	20 8	19 5
		2 x 10	27 3	24 9	23 0	21 8	31 3	28 4	26 4	24 9
		2 x 12	33 2	30 2	28 0	26 4	38 0	34 6	32 0	30 2
	No. 2	2 x 4	9 11	9 0	8 4	7 11	11 5	10 4	9 7	9 0
		2 x 6	15 8	14 2	13 2	12 5	17 11	16 3	15 1	14 2
		2 x 8	20 7	18 9	17 5	16 4	23 7	21 5	19 11	18 9
		2 x 10	26 4	23 11	22 2	20 11	30 2	27 5	25 5	23 11
		2 x 12	32 0	29 1	27 0	25 5	36 8	33 4	30 11	29 1
	Con- struction	2 x 4	9 7	8 8	8 1	7 7	10 11	9 11	9 2	8 4
	Standard	2 x 4	8 9	7 7	6 9	6 2	8 9	7 7	6 9	6 2
	Utility	2 x 4	5 11	5 1	4 7	4 2	5 11	5 1	4 7	4 2
Coast Species (includes Douglas Fir, Western Larch, Western Hemlock, Amabilis Fir, Grand Fir and Coast Sitka Spruce)	Select structural	2 x 4	10 10	9 10	9 2	8 7	12 5	11 3	10 5	9 10
		2 x 6	17 1	15 6	14 4	13 6	19 6	17 9	16 6	15 3
		2 x 8	22 6	20 5	19 0	17 10	25 9	23 5	21 8	20 1
		2 x 10	28 8	26 1	24 2	22 9	32 10	29 10	27 8	25 8
		2 x 12	34 11	31 9	29 5	27 8	40 0	36 4	33 8	31 3
	No. 1	2 x 4	10 10	9 10	9 2	8 7	12 5	11 3	10 5	9 8
		2 x 6	17 1	15 6	14 4	13 6	19 6	17 3	15 5	14 1
		2 x 8	22 6	20 5	19 0	17 10	25 9	22 9	20 4	18 7
		2 x 10	28 8	26 1	24 2	22 9	32 10	29 0	26 0	23 8
		2 x 12	34 11	31 9	29 5	27 8	40 0	35 4	31 7	28 10
	No. 2	2 x 4	10 5	9 6	8 10	8 3	11 11	10 9	9 7	8 9
		2 x 6	16 5	14 11	13 10	12 9	18 1	15 8	14 0	12 9
		2 x 8	21 8	19 8	18 3	16 10	23 11	20 8	18 6	16 10
		2 x 10	27 8	25 1	23 4	21 6	30 6	26 5	23 7	21 6
		2 x 12	33 8	30 7	28 4	26 2	37 1	32 1	28 9	26 2
	No. 3	2 x 4	9 2	7 11	7 1	6 5	9 2	7 11	7 1	6 5
		2 x 6	13 9	11 11	10 8	9 9	13 9	11 11	10 8	9 9
		2 x 8	18 2	15 9	14 1	12 10	18 2	15 9	14 1	12 10
		2 x 10	23 2	20 1	17 11	16 5	23 2	20 1	17 11	16 5
		2 x 12	28 2	24 5	21 10	19 11	28 2	24 5	21 10	19 11
	Con- struction	2 x 4	10 0	9 1	8 2	7 5	10 7	9 2	8 2	7 5
	Standard	2 x 4	7 11	6 10	6 1	5 7	7 11	6 10	6 1	5 7
	Utility	2 x 4	5 3	4 7	4 1	3 8	5 3	4 7	4 1	3 8

Continued on next page

Table A-1 (Cont'd)

CEILING JOISTS — ATTIC NOT ACCESSIBLE BY A STAIRWAY (LIVE LOAD 10 lb per sq ft)										
Commercial Designation	Grade	Nominal Size, in.	LIVE LOAD 10 lb per sq ft							
			Gypsum Board or Plastered Ceiling				Other Ceilings			
			Joist Spacing				Joist Spacing			
			12 in.	16 in.	20 in.	24 in.	12 in.	16 in.	20 in.	24 in.
			ft in.	ft in.	ft in.	ft in.	ft in.	ft in.	ft in.	ft in.
Spruce-Pine-Fir (includes Spruce (all species except Coast Sitka Spruce), Jack Pine, Lodgepole Pine, Ponderosa Pine, Balsam Fir and Alpine Fir)	Select structural	2 x 4	10 2	9 3	8 7	8 1	11 8	10 7	9 10	9 3
		2 x 6	16 0	14 7	13 6	12 9	18 4	16 8	15 6	14 7
		2 x 8	21 2	19 3	17 10	16 9	24 3	22 0	20 5	19 3
		2 x 10	27 0	24 6	22 9	21 5	30 11	28 1	26 1	24 6
		2 x 12	32 10	29 10	27 8	26 1	37 7	34 2	31 9	29 10
	No. 1	2 x 4	10 2	9 3	8 7	8 1	11 8	10 7	9 10	9 3
		2 x 6	16 0	14 7	13 6	12 9	18 4	16 8	15 1	13 9
		2 x 8	21 2	19 3	17 10	16 9	24 3	22 0	19 11	18 2
		2 x 10	27 0	24 6	22 9	21 5	30 11	28 1	25 5	23 2
		2 x 12	32 10	29 10	27 8	26 1	37 7	34 2	30 11	28 2
	No. 2	2 x 4	9 10	8 11	8 4	7 10	11 3	10 3	9 4	8 7
		2 x 6	15 6	14 1	13 1	12 4	17 7	15 3	13 8	12 5
		2 x 8	20 5	18 7	17 3	16 3	23 3	20 1	18 0	16 5
		2 x 10	26 1	23 9	22 0	20 9	29 8	25 8	23 0	21 0
		2 x 12	31 9	28 10	26 9	25 2	36 1	31 3	27 11	25 6
	No. 3	2 x 4	9 2	7 11	7 1	6 5	9 2	7 11	7 1	6 5
		2 x 6	13 1	11 4	10 2	9 3	13 1	11 4	10 2	9 3
		2 x 8	17 4	15 0	13 5	12 3	17 4	15 0	13 5	12 3
		2 x 10	22 1	19 2	17 1	15 7	22 1	19 2	17 1	15 7
		2 x 12	26 11	23 3	20 10	19 0	26 11	23 3	20 10	19 0
	Con- struction	2 x 4	9 6	8 7	7 11	7 3	10 3	8 10	7 11	7 3
	Standard	2 x 4	7 11	6 10	6 1	5 7	7 11	6 10	6 1	5 7
	Utility	2 x 4	5 3	4 7	4 1	3 8	5 3	4 7	4 1	3 8
Western Cedars (includes Western Red Cedar and Pacific Coast Yellow Cedar)	Select structural	2 x 4	9 10	8 11	8 3	7 9	11 3	10 3	9 6	8 11
		2 x 6	15 6	14 1	13 0	12 3	17 8	16 1	14 11	14 1
		2 x 8	20 5	18 6	17 2	16 2	23 4	21 3	19 8	18 6
		2 x 10	26 0	23 8	21 11	20 8	29 10	27 1	25 2	23 8
		2 x 12	31 8	28 9	26 9	25 2	36 3	32 11	30 7	28 9
	No. 1	2 x 4	9 10	8 11	8 3	7 9	11 3	10 3	9 6	8 11
		2 x 6	15 6	14 1	13 0	12 3	17 8	16 1	14 11	14 1
		2 x 8	20 5	18 6	17 2	16 2	23 4	21 3	19 8	18 6
		2 x 10	26 0	23 8	21 11	20 8	29 10	27 1	25 2	23 8
		2 x 12	31 8	28 9	26 9	25 2	36 3	32 11	30 7	28 9
	No. 2	2 x 4	9 6	8 7	8 0	7 6	10 10	9 10	9 2	8 7
		2 x 6	14 11	13 7	12 7	11 10	17 1	15 3	13 8	12 5
		2 x 8	19 8	17 11	16 7	15 8	22 7	20 1	18 0	16 5
		2 x 10	25 2	22 10	21 2	19 11	28 9	25 8	23 0	21 0
		2 x 12	30 7	27 9	25 10	24 3	35 0	31 3	27 11	25 6
	No. 3	2 x 4	9 1	7 11	7 1	6 5	9 2	7 11	7 1	6 5
		2 x 6	13 9	11 11	10 8	9 9	13 9	11 11	10 8	9 9
		2 x 8	18 2	15 9	14 1	12 10	18 2	15 9	14 1	12 10
		2 x 10	23 2	20 1	17 11	16 5	23 2	20 1	17 11	16 5
		2 x 12	28 2	24 5	21 10	19 11	28 2	24 5	21 10	19 11
	Con- struction	2 x 4	9 1	8 3	7 8	7 3	10 5	9 2	8 2	7 5
	Standard	2 x 4	7 11	6 10	6 1	5 7	7 11	6 10	6 1	5 7
	Utility	2 x 4	5 3	4 7	4 1	3 8	5 3	4 7	4 1	3 8

Continued on next page

Table A-1 (Cont'd)

CEILING JOISTS — ATTIC NOT ACCESSIBLE BY A STAIRWAY (LIVE LOAD 10 lb per sq ft)										
Commercial Designation	Grade	Nominal Size, in.	LIVE LOAD 10 lb per sq ft							
			Gypsum Board or Plastered Ceiling				Other Ceilings			
			Joist Spacing				Joist Spacing			
			12 in.		16 in.		20 in.		24 in.	
			ft in.	ft in.	ft in.	ft in.	ft in.	ft in.	ft in.	ft in.
Northern Species (includes any Canadian softwood covered by the NLGA Standard Grading Rules)	Select structural	2 x 4	9 10	8 11	8 3	7 9	11 3	10 3	9 6	8 11
		2 x 6	15 6	14 1	13 0	12 3	17 8	16 1	14 11	14 1
		2 x 8	20 5	18 6	17 2	16 2	23 4	21 3	19 8	18 6
		2 x 10	26 0	23 8	21 11	20 8	29 10	27 1	25 2	23 8
		2 x 12	31 8	28 9	26 9	25 2	36 3	32 11	30 7	28 9
	No. 1	2 x 4	9 10	8 11	8 3	7 9	11 3	10 3	9 6	8 11
		2 x 6	15 6	14 1	13 0	12 3	17 8	16 1	14 9	13 5
		2 x 8	20 5	18 6	17 2	16 2	23 4	21 3	19 5	17 9
		2 x 10	26 0	23 8	21 11	20 8	29 10	27 1	24 10	22 8
		2 x 12	31 8	28 9	26 9	25 2	36 3	32 11	30 2	27 7
	No. 2	2 x 4	9 6	8 7	8 0	7 6	10 10	9 10	9 2	8 4
		2 x 6	14 11	13 7	12 7	11 10	17 1	14 10	13 3	12 1
		2 x 8	19 8	17 11	16 7	15 7	22 7	19 7	17 6	15 11
		2 x 10	25 2	22 10	21 2	19 11	28 9	25 0	22 4	20 4
		2 x 12	30 7	27 9	25 10	24 3	35 0	30 4	27 2	24 9
	No. 3	2 x 4	8 9	7 7	6 9	6 2	8 9	7 7	6 9	6 2
		2 x 6	13 1	11 4	10 2	9 3	13 1	11 4	10 2	9 2
		2 x 8	17 4	15 0	13 5	12 3	17 4	15 0	13 5	12 3
		2 x 10	22 1	19 2	17 1	15 7	22 1	19 2	17 1	15 7
		2 x 12	26 11	23 3	20 10	19 0	26 11	23 3	20 10	19 0
	Con- struction	2 x 4	9 1	8 3	7 8	7 0	9 10	8 7	7 8	7 0
	Standard	2 x 4	7 5	6 5	5 9	5 3	7 5	6 5	5 9	5 3
	Utility	2 x 4	5 3	4 7	4 1	3 8	5 3	4 7	4 1	3 8
Northern Aspen (includes Aspen Poplar, Large Tooth Aspen and Balsam Poplar)	Select structural	2 x 4	10 0	9 1	8 5	7 11	11 5	10 4	9 7	9 1
		2 x 6	15 8	14 3	13 3	12 5	17 11	16 4	15 2	14 3
		2 x 8	20 8	18 9	17 5	16 5	23 8	21 6	20 0	18 9
		2 x 10	26 5	24 0	22 3	20 11	30 3	27 5	25 6	24 0
		2 x 12	32 1	29 2	27 1	25 6	36 9	33 5	31 0	29 2
	No. 1	2 x 4	10 0	9 1	8 5	7 11	11 5	10 4	9 7	9 1
		2 x 6	15 8	14 3	13 3	12 5	17 11	16 4	15 1	13 9
		2 x 8	20 8	18 9	17 5	16 5	23 8	21 6	19 11	18 2
		2 x 10	26 5	24 0	22 3	20 11	30 3	27 5	25 5	23 2
		2 x 12	32 1	29 2	27 1	25 6	36 9	33 5	30 11	28 2
	No. 2	2 x 4	9 7	8 9	8 1	7 7	11 0	10 0	9 3	8 7
		2 x 6	15 1	13 9	12 9	12 0	17 4	15 3	13 8	12 5
		2 x 8	19 11	18 1	16 10	15 10	22 10	20 1	18 0	16 5
		2 x 10	25 5	23 1	21 5	20 2	29 2	25 8	23 0	21 0
		2 x 12	31 0	28 1	26 1	24 7	35 5	31 3	27 11	25 6
	No. 3	2 x 4	9 2	7 11	7 1	6 5	9 2	7 11	7 1	6 5
		2 x 6	13 1	11 4	10 2	9 3	13 1	11 4	10 2	9 3
		2 x 8	17 4	15 0	13 5	12 3	17 4	15 0	13 5	12 3
		2 x 10	22 1	19 2	17 1	15 7	22 1	19 2	17 1	15 7
		2 x 12	26 11	23 3	20 10	19 0	26 11	23 3	20 10	19 0
	Con- struction	2 x 4	9 3	8 5	7 10	7 3	10 3	8 10	7 11	7 3
	Standard	2 x 4	7 11	6 10	6 1	5 7	7 11	6 10	6 1	5 7
	Utility	2 x 4	5 3	4 7	4 1	3 8	5 3	4 7	4 1	3 8

Table A-2
Forming Part of Article 9.23.4.1.

FLOOR JOISTS — LIVING QUARTERS (LIVE LOAD 40 lb per sq ft)										
Commercial Designation	Grade	Nominal Size, in.	LIVE LOAD 40 lb per sq ft							
			All Ceilings							
			Joist Spacing							
			12 in.		16 in.		20 in.		24 in.	
			ft	in.	ft	in.	ft	in.	ft	in.
Douglas Fir-Larch (includes Douglas Fir and Western Larch)	Select structural	2 x 4	7	1	6	5	5	11	5	7
		2 x 6	11	1	10	1	9	4	8	10
		2 x 8	14	8	13	4	12	4	11	7
		2 x 10	18	9	17	0	15	9	14	10
		2 x 12	22	9	20	8	19	2	18	1
	No. 1	2 x 4	7	1	6	5	5	11	5	7
		2 x 6	11	1	10	1	9	4	8	10
		2 x 8	14	8	13	4	12	4	11	7
		2 x 10	18	9	17	0	15	9	14	10
		2 x 12	22	9	20	8	19	2	18	1
	No. 2	2 x 4	6	10	6	2	5	9	5	5
		2 x 6	10	9	9	9	9	0	8	5
		2 x 8	14	2	12	10	11	11	11	2
		2 x 10	18	1	16	5	15	3	14	3
		2 x 12	22	0	20	0	18	6	17	4
	No. 3	2 x 4	6	2	5	4	4	9	4	4
		2 x 6	9	1	7	10	7	0	6	5
		2 x 8	12	0	10	4	9	3	8	6
		2 x 10	15	4	13	3	11	10	10	10
		2 x 12	18	7	16	1	14	5	13	2
	Construction	2 x 4	6	7	5	11	5	5	4	11
Standard	2 x 4	5	2	4	5	4	0	3	8	
Utility	2 x 4	3	8	3	2	2	10	2	7	
Hem-Fir (includes Western Hemlock, Amabilis Fir and Grand Fir)	Select structural	2 x 4	6	10	6	2	5	9	5	5
		2 x 6	10	9	9	9	9	0	8	6
		2 x 8	14	2	12	10	11	11	11	3
		2 x 10	18	1	16	5	15	3	14	4
		2 x 12	22	0	20	0	18	6	17	5
	No. 1	2 x 4	6	10	6	2	5	9	5	5
		2 x 6	10	9	9	9	8	11	8	1
		2 x 8	14	2	12	10	11	9	10	9
		2 x 10	18	1	16	5	15	0	13	8
		2 x 12	22	0	20	0	18	3	16	8
	No. 2	2 x 4	6	7	5	11	5	6	5	0
		2 x 6	10	3	8	10	7	11	7	3
		2 x 8	13	6	11	8	10	5	9	6
		2 x 10	17	3	14	11	13	4	12	2
		2 x 12	20	11	18	2	16	3	14	10
	No. 3	2 x 4	5	2	4	5	4	0	3	8
		2 x 6	7	9	6	9	6	0	5	6
		2 x 8	10	3	8	10	7	11	7	3
		2 x 10	13	1	11	4	10	2	9	3
		2 x 12	15	11	13	10	12	4	11	3
	Construction	2 x 4	5	11	5	2	4	7	4	2
Standard	2 x 4	4	5	3	10	3	5	3	2	
Utility	2 x 4	2	11	2	7	2	3	2	1	

Continued on next page

Table A-2 (Cont'd)

FLOOR JOISTS — LIVING QUARTERS (LIVE LOAD 40 lb per sq ft)										
Commercial Designation	Grade	Nominal Size, in.	LIVE LOAD 40 lb per sq ft							
			All Ceilings							
			Joist Spacing							
			12 in.		16 in.		20 in.		24 in.	
			ft	in.	ft	in.	ft	in.	ft	in.
Eastern Hemlock-Tamarack (includes Eastern Hemlock and Tamarack)	Select structural	2 x 4	6	6	5	10	5	5	5	2
		2 x 6	10	2	9	3	8	7	8	1
		2 x 8	13	5	12	3	11	4	10	8
		2 x 10	17	2	15	7	14	6	13	7
		2 x 12	20	11	19	0	17	7	16	7
	No. 1	2 x 4	6	6	5	10	5	5	5	2
		2 x 6	10	2	9	3	8	7	8	1
		2 x 8	13	5	12	3	11	4	10	8
		2 x 10	17	2	15	7	14	6	13	7
		2 x 12	20	11	19	0	17	7	16	7
	No. 2	2 x 4	6	3	5	8	5	3	4	11
		2 x 6	9	10	8	11	8	3	7	10
		2 x 8	13	0	11	9	10	11	10	3
		2 x 10	16	7	15	1	14	0	13	2
		2 x 12	20	2	18	4	17	0	16	0
	No. 3	2 x 4	5	11	5	2	4	7	4	2
		2 x 6	8	9	7	7	6	9	6	2
		2 x 8	11	7	10	0	8	11	8	2
		2 x 10	14	9	12	10	11	5	10	5
		2 x 12	18	0	15	7	13	11	12	8
	Construction	2 x 4	6	0	5	5	5	1	4	8
	Standard	2 x 4	4	11	4	3	3	10	3	6
	Utility	2 x 4	3	4	2	10	2	7	2	4
Coast Species (includes Douglas Fir, Western Larch, Western Hemlock, Amabilis Fir, Grand Fir and Coast Sitka Spruce)	Select structural	2 x 4	6	10	6	2	5	9	5	5
		2 x 6	10	9	9	9	9	0	8	6
		2 x 8	14	2	12	10	11	11	11	3
		2 x 10	18	1	16	5	15	3	14	4
		2 x 12	22	0	20	0	18	6	17	5
	No. 1	2 x 4	6	10	6	2	5	9	5	5
		2 x 6	10	9	9	9	8	8	7	11
		2 x 8	14	2	12	10	11	6	10	6
		2 x 10	18	1	16	5	14	8	13	5
		2 x 12	22	0	20	0	17	10	16	4
	No. 2	2 x 4	6	7	5	11	5	5	4	11
		2 x 6	10	3	8	10	7	11	7	3
		2 x 8	13	6	11	8	10	5	9	6
		2 x 10	17	3	14	11	13	4	12	2
		2 x 12	20	11	18	2	16	3	14	10
	No. 3	2 x 4	5	2	4	5	4	0	3	8
		2 x 6	7	9	6	9	6	0	5	6
		2 x 8	10	3	8	10	7	11	7	3
		2 x 10	13	1	11	4	10	2	9	3
		2 x 12	15	11	13	10	12	4	11	3
	Construction	2 x 4	5	11	5	2	4	7	4	2
	Standard	2 x 4	4	5	3	10	3	5	3	2
	Utility	2 x 4	2	11	2	7	2	3	2	1

Continued on next page

Table A-2 (Cont'd)

FLOOR JOISTS — LIVING QUARTERS (LIVE LOAD 40 lb per sq ft)										
Commercial Designation	Grade	Nominal Size, in.	LIVE LOAD 40 lb per sq ft							
			All Ceilings							
			Joist Spacing							
			12 in.		16 in.		20 in.		24 in.	
			ft	in.	ft	in.	ft	in.	ft	in.
Spruce-Pine-Fir (includes Spruce (all Species except Coast Sitka Spruce), Jack Pine, Lodgepole Pine, Ponderosa Pine, Balsam Fir and Alpine Fir)	Select structural	2 x 4	6	5	5	10	5	5	5	1
		2 x 6	10	1	9	2	8	6	8	0
		2 x 8	13	4	12	1	11	3	10	7
		2 x 10	17	0	15	5	14	4	13	6
		2 x 12	20	8	18	9	17	5	16	5
	No. 1	2 x 4	6	5	5	10	5	5	5	1
		2 x 6	10	1	9	2	8	6	7	9
		2 x 8	13	4	12	1	11	3	10	3
		2 x 10	17	0	15	5	14	4	13	1
		2 x 12	20	8	18	9	17	5	15	11
	No. 2	2 x 4	6	2	5	7	5	3	4	10
		2 x 6	9	9	8	7	7	8	7	0
		2 x 8	12	10	11	4	10	2	9	3
		2 x 10	16	5	14	6	13	0	11	10
		2 x 12	20	0	17	8	15	9	14	5
	No. 3	2 x 4	5	2	4	5	4	0	3	8
		2 x 6	7	5	6	5	5	9	5	3
		2 x 8	9	9	8	6	7	7	6	11
		2 x 10	12	6	10	10	9	8	8	10
		2 x 12	15	2	13	2	11	9	10	9
	Construction	2 x 4	5	9	5	0	4	5	4	1
Standard	2 x 4	4	5	3	10	3	5	3	2	
Utility	2 x 4	2	11	2	7	2	3	2	1	
Western Cedars (includes Western Red Cedar and Pacific Coast Yellow Cedar)	Select structural	2 x 4	6	2	5	7	5	2	4	11
		2 x 6	9	9	8	10	8	2	7	9
		2 x 8	12	10	11	18	10	10	10	2
		2 x 10	16	5	14	11	13	10	13	0
		2 x 12	19	11	18	1	16	10	15	10
	No. 1	2 x 4	6	2	5	7	5	2	4	11
		2 x 6	9	9	8	10	8	2	7	9
		2 x 8	12	10	11	8	10	10	10	2
		2 x 10	16	5	14	11	13	10	13	0
		2 x 12	19	11	18	1	16	10	15	10
	No. 2	2 x 4	6	0	5	5	5	0	4	9
		2 x 6	9	5	8	6	7	8	7	0
		2 x 8	12	5	11	3	10	2	9	3
		2 x 10	15	10	14	4	13	0	11	10
		2 x 12	19	3	17	6	15	9	14	5
	No. 3	2 x 4	5	2	4	5	4	0	3	8
		2 x 6	7	9	6	9	6	0	5	6
		2 x 8	10	3	8	10	7	11	7	3
		2 x 10	13	1	11	4	10	2	9	3
		2 x 12	15	11	13	10	12	4	11	3
	Construction	2 x 4	5	9	5	2	4	7	4	2
Standard	2 x 4	4	5	3	10	3	5	3	2	
Utility	2 x 4	2	11	2	7	2	3	2	1	

Continued on next page

Table A-2 (Cont'd)

FLOOR JOISTS — LIVING QUARTERS (LIVE LOAD 40 lb per sq ft)										
Commercial Designation	Grade	Nominal Size, in.	LIVE LOAD 40 lb per sq ft							
			All Ceilings							
			Joist Spacing							
			12 in.		16 in.		20 in.		24 in.	
			ft	in.	ft	in.	ft	in.	ft	in.
Northern Species (includes any Canadian softwood covered by the NLGA Standard Grading Rules)	Select structural	2 x 4	6	2	5	7	5	2	4	11
		2 x 6	9	9	8	10	8	2	7	9
		2 x 8	12	10	11	8	10	10	10	2
		2 x 10	16	5	14	11	13	10	13	0
		2 x 12	19	11	18	1	16	10	15	10
	No. 1	2 x 4	6	2	5	7	5	2	4	11
		2 x 6	9	9	8	10	8	2	7	7
		2 x 8	12	10	11	8	10	10	10	0
		2 x 10	16	5	14	11	13	10	12	10
		2 x 12	19	11	18	1	16	10	15	7
	No. 2	2 x 4	6	0	5	5	5	0	4	8
		2 x 6	9	5	8	4	7	6	6	10
		2 x 8	12	5	11	1	9	10	9	0
		2 x 10	15	10	14	1	12	7	11	6
		2 x 12	19	3	17	2	15	4	14	0
	No. 3	2 x 4	4	11	4	3	3	10	3	6
		2 x 6	7	5	6	5	5	9	5	3
		2 x 8	9	9	8	6	7	7	6	11
		2 x 10	12	6	10	10	9	8	8	10
		2 x 12	15	2	13	2	11	9	10	9
	Construction	2 x 4	5	7	4	10	4	4	3	11
Standard	2 x 4	4	2	3	8	3	3	2	11	
Utility	2 x 4	2	11	2	7	2	3	2	1	
Northern Aspen (includes Aspen Poplar, Large Tooth Aspen and Balsam Poplar)	Select structural	2 x 4	6	3	5	8	5	3	5	0
		2 x 6	9	10	8	11	8	4	7	10
		2 x 8	13	0	11	10	11	0	10	4
		2 x 10	16	7	15	1	14	0	13	2
		2 x 12	20	3	18	4	17	0	16	0
	No. 1	2 x 4	6	3	5	8	5	3	5	0
		2 x 6	9	10	8	11	8	4	7	9
		2 x 8	13	0	11	10	11	0	10	3
		2 x 10	16	7	15	1	14	0	13	1
		2 x 12	20	3	18	4	17	0	15	11
	No. 2	2 x 4	6	0	5	6	5	1	4	9
		2 x 6	9	6	8	7	7	8	7	0
		2 x 8	12	7	11	4	10	2	9	3
		2 x 10	16	0	14	6	13	0	11	10
		2 x 12	19	6	17	8	15	9	14	5
	No. 3	2 x 4	5	2	4	5	4	0	3	8
		2 x 6	7	5	6	5	5	9	5	3
		2 x 8	9	9	8	6	7	7	6	11
		2 x 10	12	6	10	10	9	8	8	10
		2 x 12	15	2	13	2	11	9	10	9
	Construction	2 x 4	5	9	5	0	4	5	4	1
Standard	2 x 4	4	5	3	10	3	5	3	2	
Utility	2 x 4	2	11	2	7	2	3	2	1	

Table A-3
Forming Part of Article 9.23.4.1.

FLOOR JOISTS — BEDROOMS AND ATTICS ACCESSIBLE BY A STAIRWAY (LIVE LOAD 30 lb per sq ft)										
Commercial Designation	Grade	Nominal Size, in.	LIVE LOAD 30 lb per sq ft							
			Gypsum Board or Plastered Ceiling				Other Ceilings			
			Joist Spacing				Joist Spacing			
			12 in.	16 in.	20 in.	24 in.	12 in.	16 in.	20 in.	24 in.
			ft in.	ft in.	ft in.	ft in.	ft in.	ft in.	ft in.	ft in.
Douglas Fir- Larch (includes Douglas Fir and Western Larch)	Select structural	2 x 4	7 9	7 1	6 7	6 2	8 11	8 1	7 6	7 1
		2 x 6	12 3	11 1	10 4	9 8	14 0	12 9	11 10	11 1
		2 x 8	16 2	14 8	13 7	12 10	18 6	16 9	15 7	14 8
		2 x 10	20 7	18 9	17 4	16 4	23 7	21 5	19 11	18 9
		2 x 12	25 1	22 9	21 2	19 11	28 8	26 1	24 2	22 9
	No. 1	2 x 4	7 9	7 1	6 7	6 2	8 11	8 1	7 6	7 1
		2 x 6	12 3	11 1	10 4	9 8	14 0	12 9	11 8	10 7
		2 x 8	16 2	14 8	13 7	12 10	18 6	16 9	15 4	14 0
		2 x 10	20 7	18 9	17 4	16 4	23 7	21 5	19 7	17 11
		2 x 12	25 1	22 9	21 2	19 11	28 8	26 1	23 10	21 9
	No. 2	2 x 4	7 6	6 10	6 4	5 11	8 7	7 10	7 3	6 8
		2 x 6	11 10	10 9	9 11	9 4	13 6	11 9	10 6	9 7
		2 x 8	15 7	14 2	13 2	12 4	17 10	15 6	13 10	12 8
		2 x 10	19 11	18 1	16 9	15 9	22 9	19 9	17 8	16 2
		2 x 12	24 2	22 0	20 5	19 2	27 8	24 1	21 6	19 7
	No. 3	2 x 4	6 11	6 0	5 5	4 11	6 11	6 0	5 5	4 11
		2 x 6	10 3	8 11	7 11	7 3	10 3	8 11	7 11	7 3
		2 x 8	13 7	11 9	10 6	9 7	13 7	11 9	10 6	9 7
		2 x 10	17 4	15 0	13 5	12 3	17 4	15 0	13 5	12 3
		2 x 12	21 1	18 3	16 4	14 11	21 1	18 3	16 4	14 11
	Con- struction	2 x 4	7 3	6 7	6 1	5 7	7 11	6 10	6 1	5 7
	Standard	2 x 4	5 10	5 1	4 6	4 1	5 10	5 1	4 6	4 1
	Utility	2 x 4	4 1	3 7	3 2	2 11	4 1	3 7	3 2	2 11
Hem-Fir (includes Western Hemlock, Amabilis Fir and Grand Fir)	Select structural	2 x 4	7 6	6 10	6 4	5 11	8 7	7 10	7 3	6 9
		2 x 6	11 10	10 9	9 11	9 4	13 6	12 2	10 11	9 11
		2 x 8	15 7	14 2	13 2	12 4	17 10	16 1	14 4	13 1
		2 x 10	19 11	18 1	16 9	15 9	22 9	20 6	18 4	16 9
		2 x 12	24 2	22 0	20 5	19 2	27 8	24 11	22 4	20 4
	No. 1	2 x 4	7 6	6 10	6 4	5 11	8 7	7 7	6 9	6 2
		2 x 6	11 10	10 9	9 11	9 2	13 0	11 3	10 1	9 2
		2 x 8	15 7	14 2	13 2	12 2	17 2	14 10	13 4	12 2
		2 x 10	19 11	18 1	16 9	15 6	21 11	19 0	17 0	15 6
		2 x 12	24 2	22 0	20 5	18 10	26 8	23 1	20 8	18 10
	No. 2	2 x 4	7 3	6 7	6 1	5 9	8 1	7 0	6 3	5 9
		2 x 6	11 5	10 0	9 0	8 2	11 7	10 0	9 0	8 2
		2 x 8	15 0	13 3	11 10	10 10	15 3	13 3	11 10	10 10
		2 x 10	19 2	16 11	15 1	13 9	19 6	16 11	15 1	13 9
		2 x 12	23 4	20 7	18 4	16 9	23 9	20 7	18 4	16 9
	No. 3	2 x 4	5 10	5 1	4 6	4 1	5 10	5 1	4 6	4 1
		2 x 6	8 10	7 7	6 10	6 3	8 10	7 7	6 10	6 3
		2 x 8	11 7	10 1	9 0	8 2	11 7	10 1	9 0	8 2
		2 x 10	14 10	12 10	11 6	10 6	14 10	12 10	11 6	10 6
		2 x 12	18 1	15 7	14 0	12 9	18 1	15 7	14 0	12 9
	Con- struction	2 x 4	6 9	5 10	5 3	4 9	6 9	5 10	5 3	4 9
	Standard	2 x 4	5 1	4 4	3 11	3 7	5 1	4 4	3 11	3 7
	Utility	2 x 4	3 4	2 11	2 7	2 4	3 4	2 11	2 7	2 4

Continued on next page

Table A-3 (Cont'd)

FLOOR JOISTS — BEDROOMS AND ATTICS ACCESSIBLE BY A STAIRWAY (LIVE LOAD 30 lb per sq ft)										
Commercial Designation	Grade	Nominal Size, in.	LIVE LOAD 30 lb per sq ft							
			Gypsum Board or Plastered Ceiling				Other Ceilings			
			Joist Spacing				Joist Spacing			
			12 in.	16 in.	20 in.	24 in.	12 in.	16 in.	20 in.	24 in.
			ft in.	ft in.	ft in.	ft in.	ft in.	ft in.	ft in.	ft in.
Eastern Hemlock- Tamarack (includes Eastern Hemlock and Tamarack)	Select structural	2 x 4	7 1	6 6	6 0	5 8	8 2	7 5	6 11	6 6
		2 x 6	11 3	10 2	9 5	8 11	12 10	11 8	10 10	10 2
		2 x 8	14 10	13 5	12 6	11 9	16 11	15 5	14 3	13 5
		2 x 10	18 11	17 2	15 11	15 0	21 8	19 8	18 3	17 2
		2 x 12	23 0	20 11	19 5	18 3	26 4	23 11	22 2	20 11
	No. 1	2 x 4	7 1	6 6	6 0	5 8	8 2	7 5	6 11	6 6
		2 x 6	11 3	10 2	9 5	8 11	12 10	11 8	10 10	10 2
		2 x 8	14 10	13 5	12 6	11 9	16 11	15 5	14 3	13 5
		2 x 10	18 11	17 2	15 11	15 0	21 8	19 8	18 3	17 2
		2 x 12	23 0	20 11	19 5	18 3	26 4	23 11	22 2	20 11
	No. 2	2 x 4	6 10	6 3	5 9	5 5	7 11	7 2	6 8	6 3
		2 x 6	10 10	9 10	9 1	8 7	12 5	11 3	10 1	9 2
		2 x 8	14 3	13 0	12 0	11 4	16 4	14 10	13 4	12 2
		2 x 10	18 3	16 7	15 4	14 6	20 11	19 0	17 0	15 6
		2 x 12	22 2	20 2	18 8	17 7	25 5	23 1	20 8	18 10
	No. 3	2 x 4	6 7	5 10	5 3	4 9	6 9	5 10	5 3	4 9
		2 x 6	9 11	8 7	7 8	7 0	9 11	8 7	7 8	7 0
		2 x 8	13 1	11 4	10 2	9 3	13 1	11 4	10 2	9 3
		2 x 10	16 9	14 6	12 11	11 10	16 9	14 6	12 11	11 10
		2 x 12	20 4	17 8	15 9	14 5	20 4	17 8	15 9	14 5
	Con- struction	2 x 4	6 7	6 0	5 7	5 3	7 7	6 6	5 10	5 4
	Standard	2 x 4	5 7	4 10	4 4	3 11	5 7	4 10	4 4	3 11
	Utility	2 x 4	3 9	3 3	2 11	2 8	3 9	3 3	2 11	2 8
Coast Species (includes Douglas Fir, Western Larch, Western Hemlock, Amabilis Fir, Grand Fir and Coast Sitka Spruce)	Select structural	2 x 4	7 6	6 10	6 4	5 11	8 7	7 10	7 3	6 9
		2 x 6	11 10	10 9	9 11	9 4	13 6	11 11	10 8	9 9
		2 x 8	15 7	14 2	13 2	12 4	17 10	15 9	14 1	12 10
		2 x 10	19 11	18 1	16 9	15 9	22 9	20 2	18 0	16 5
		2 x 12	24 2	22 0	20 5	19 2	27 8	24 6	21 11	20 0
	No. 1	2 x 4	7 6	6 10	6 4	5 11	8 7	7 7	6 9	6 2
		2 x 6	11 10	10 9	9 10	9 0	12 9	11 0	9 10	9 0
		2 x 8	15 7	14 2	13 0	11 11	16 10	14 7	13 0	11 11
		2 x 10	19 11	18 1	16 7	15 2	21 6	18 7	16 7	15 2
		2 x 12	24 2	22 0	20 3	18 5	26 1	22 7	20 3	18 5
	No. 2	2 x 4	7 3	6 7	6 1	5 7	7 11	6 10	6 1	5 7
		2 x 6	11 5	10 0	9 0	8 2	11 7	10 0	9 0	8 2
		2 x 8	15 0	13 3	11 10	10 10	15 3	13 3	11 10	10 10
		2 x 10	19 2	16 11	15 1	13 9	19 6	16 11	15 1	13 9
		2 x 12	23 4	20 7	18 4	16 9	23 9	20 7	18 4	16 9
	No. 3	2 x 4	5 10	5 1	4 6	4 1	5 10	5 1	4 6	4 1
		2 x 6	8 10	7 7	6 10	6 3	8 10	7 7	6 10	6 3
		2 x 8	11 7	10 1	9 0	8 2	11 7	10 1	9 0	8 2
		2 x 10	14 10	12 10	11 6	10 6	14 10	12 10	11 6	10 6
		2 x 12	18 1	15 7	14 0	12 9	18 1	15 7	14 0	12 9
	Con- struction	2 x 4	6 9	5 10	5 3	4 9	6 9	5 10	5 3	4 9
	Standard	2 x 4	5 1	4 4	3 11	3 7	5 1	4 4	3 11	3 7
	Utility	2 x 4	3 4	2 11	2 7	2 4	3 4	2 11	2 7	2 4

Continued on next page

Table A-3 (Cont'd)

FLOOR JOISTS — BEDROOMS AND ATTICS ACCESSIBLE BY A STAIRWAY (LIVE LOAD 30 lb per sq ft)										
Commercial Designation	Grade	Nominal Size, in.	LIVE LOAD 30 lb per sq ft							
			Gypsum Board or Plastered Ceiling				Other Ceilings			
			Joist Spacing				Joist Spacing			
			12 in.	16 in.	20 in.	24 in.	12 in.	16 in.	20 in.	24 in.
			ft in.	ft in.	ft in.	ft in.	ft in.	ft in.	ft in.	ft in.
Spruce-Pine-Fir- (includes Spruce (all species except Coast Sitka Spruce), Jack Pine, Lodgepole Pine, Ponderosa Pine, Balsam Fir and Alpine Fir)	Select structural	2 x 4	7 1	6 5	5 11	5 7	8 1	7 4	6 10	6 5
		2 x 6	11 1	10 1	9 4	8 10	12 9	11 7	10 6	9 7
		2 x 8	14 8	13 4	12 4	11 7	16 9	15 3	13 10	12 8
		2 x 10	18 9	17 0	15 9	14 10	21 5	19 6	17 8	16 2
		2 x 12	22 9	20 8	19 2	18 1	26 1	23 8	21 6	19 7
	No. 1	2 x 4	7 1	6 5	5 11	5 7	8 1	7 4	6 8	6 1
		2 x 6	11 1	10 1	9 4	8 10	12 6	10 9	9 8	8 10
		2 x 8	14 8	13 4	12 4	11 7	16 5	14 3	12 9	11 7
		2 x 10	18 9	17 0	15 9	14 10	21 0	18 2	16 3	14 10
		2 x 12	22 9	20 8	19 2	18 1	25 6	22 1	19 9	18 1
	No. 2	2 x 4	6 10	6 2	5 9	5 5	7 9	6 8	6 0	5 5
		2 x 6	10 9	9 9	8 9	7 11	11 3	9 9	8 9	7 11
		2 x 8	14 2	12 10	11 6	10 6	14 10	12 10	11 6	10 6
		2 x 10	18 1	16 5	14 8	13 5	19 0	16 5	14 8	13 5
		2 x 12	22 0	20 0	17 11	16 4	23 1	20 0	17 11	16 4
	No. 3	2 x 4	5 10	5 1	4 6	4 1	5 10	5 1	4 6	4 1
		2 x 6	8 5	7 3	6 6	5 11	8 5	7 3	6 6	5 11
		2 x 8	11 1	9 7	8 7	7 10	11 1	9 7	8 7	7 10
		2 x 10	14 2	12 3	10 11	10 0	14 2	12 3	10 11	10 0
		2 x 12	17 2	14 11	13 4	12 2	17 2	14 11	13 4	12 2
	Con- struction	2 x 4	6 6	5 8	5 1	4 7	6 6	5 8	5 1	4 7
	Standard	2 x 4	5 1	4 4	3 11	3 7	5 1	4 4	3 11	3 7
	Utility	2 x 4	3 4	2 11	2 7	2 4	3 4	2 11	2 7	2 4
Western Cedars (includes Western Red Cedar and Pacific Coast Yellow Cedar)	Select structural	2 x 4	6 10	6 2	5 9	5 5	7 9	7 1	6 7	6 2
		2 x 6	10 9	9 9	9 0	8 6	12 3	11 2	10 4	9 7
		2 x 8	14 2	12 10	11 11	11 2	16 2	14 8	13 8	12 8
		2 x 10	18 0	16 5	15 3	14 4	20 8	18 9	17 5	16 2
		2 x 12	21 11	19 11	18 6	17 5	25 2	22 10	21 2	19 7
	No. 1	2 x 4	6 10	6 2	5 9	5 5	7 9	7 1	6 7	6 1
		2 x 6	10 9	9 9	9 0	8 6	12 3	11 0	9 10	9 0
		2 x 8	14 2	12 10	11 11	11 2	16 2	14 7	13 0	11 11
		2 x 10	18 0	16 5	15 3	14 4	20 8	18 7	16 7	15 2
		2 x 12	21 11	19 11	18 6	17 5	25 2	22 7	20 3	18 5
	No. 2	2 x 4	6 7	6 0	5 6	5 2	7 6	6 10	6 1	5 7
		2 x 6	10 4	9 5	8 9	7 11	11 3	9 9	8 9	7 11
		2 x 8	13 8	12 5	11 6	10 6	14 10	12 10	11 6	10 6
		2 x 10	17 5	15 10	14 8	13 5	19 0	16 5	14 8	13 5
		2 x 12	21 2	19 3	17 10	16 4	23 1	20 0	17 11	16 4
	No. 3	2 x 4	5 10	5 1	4 6	4 1	5 10	5 1	4 6	4 1
		2 x 6	8 10	7 7	6 10	6 3	8 10	7 7	6 10	6 3
		2 x 8	11 7	10 1	9 0	8 2	11 7	10 1	9 0	8 2
		2 x 10	14 10	12 10	11 6	10 6	14 10	12 10	11 6	10 6
		2 x 12	18 1	15 7	14 0	12 9	18 1	15 7	14 0	12 9
	Con- struction	2 x 4	6 4	5 9	5 3	4 9	6 9	5 10	5 3	4 9
	Standard	2 x 4	5 1	4 4	3 11	3 7	5 1	4 4	3 11	3 7
	Utility	2 x 4	3 4	2 11	2 7	2 4	3 4	2 11	2 7	2 4

Continued on next page

Table A-3 (Cont'd)

FLOOR JOISTS — BEDROOMS AND ATTICS ACCESSIBLE BY A STAIRWAY (LIVE LOAD 30 lb per sq ft)											
Commercial Designation	Grade	Nominal Size, in.	LIVE LOAD 30 lb per sq ft								
			Gypsum Board or Plastered Ceiling				Other Ceilings				
			Joist Spacing				Joist Spacing				
			12 in.	16 in.	20 in.	24 in.	12 in.	16 in.	20 in.	24 in.	
			ft in.	ft in.	ft in.	ft in.	ft in.	ft in.	ft in.	ft in.	
Northern Species (includes any Canadian softwood covered by the NLGA Standard Grading Rules)	Select structural	2 x 4	6 10	6 2	5 9	5 5	7 9	7 1	6 7	6 2	
		2 x 6	10 9	9 9	9 0	8 6	12 3	11 2	10 1	9 2	
		2 x 8	14 2	12 10	11 11	11 2	16 2	14 8	13 4	12 2	
		2 x 10	18 0	16 5	15 3	14 4	20 8	18 9	17 0	15 6	
		2 x 12	21 11	19 11	18 6	17 5	25 2	22 10	20 8	18 10	
	No. 1	2 x 4	6 10	6 2	5 9	5 5	7 9	7 1	6 5	5 10	
		2 x 6	10 9	9 9	9 0	8 6	12 2	10 6	9 5	8 7	
		2 x 8	14 2	12 10	11 11	11 2	16 1	13 11	12 5	11 4	
		2 x 10	18 0	16 5	15 3	14 4	20 6	17 9	15 11	14 6	
		2 x 12	21 11	19 11	18 6	17 5	24 11	21 7	19 4	17 8	
	No. 2	2 x 4	6 7	6 0	5 6	5 2	7 6	6 6	5 10	5 4	
		2 x 6	10 4	9 5	8 6	7 9	10 11	9 6	8 6	7 9	
		2 x 8	13 8	12 5	11 2	10 2	14 5	12 6	11 2	10 2	
		2 x 10	17 5	15 10	14 3	13 0	18 5	16 0	14 3	13 0	
		2 x 12	21 2	19 3	17 5	15 10	22 5	19 5	17 5	15 10	
	No. 3	2 x 4	5 7	4 10	4 4	3 11	5 7	4 10	4 4	3 11	
2 x 6		8 5	7 3	6 6	5 11	8 5	7 3	6 6	5 11		
2 x 8		11 1	9 7	8 7	7 10	11 1	9 7	8 7	7 10		
2 x 10		14 2	12 3	10 11	10 0	14 2	12 3	10 11	10 0		
2 x 12		17 2	14 11	13 4	12 2	17 2	14 11	13 4	12 2		
Construction	2 x 4	6 4	5 5	4 11	4 5	6 4	5 5	4 11	4 5		
	Standard	2 x 4	4 9	4 1	3 8	3 4	4 9	4 1	3 8	3 4	
		2 x 4	3 4	2 11	2 7	2 4	3 4	2 11	2 7	2 4	
Northern Aspen (includes Aspen Poplar, Large Tooth Aspen and Balsam Poplar)		Select structural	2 x 4	6 11	6 3	5 10	5 6	7 11	7 2	6 8	6 3
	2 x 6		10 10	9 10	9 2	8 7	12 5	11 4	10 6	9 7	
	2 x 8		14 4	13 0	12 1	11 4	16 5	14 11	13 10	12 8	
	2 x 10		18 3	16 7	15 5	14 6	20 11	19 0	17 8	16 2	
	2 x 12		22 3	20 3	18 9	17 8	25 6	23 2	21 6	19 7	
	No. 1	2 x 4	6 11	6 3	5 10	5 6	7 11	7 2	6 8	6 1	
		2 x 6	10 10	9 10	9 2	8 7	12 5	10 9	9 8	8 10	
		2 x 8	14 4	13 0	12 1	11 4	16 5	14 3	12 9	11 7	
		2 x 10	18 3	16 7	15 5	14 6	20 11	18 2	16 3	14 10	
		2 x 12	22 3	20 3	18 9	17 8	25 6	22 1	19 9	18 1	
	No. 2	2 x 4	6 8	6 0	5 7	5 3	7 7	6 8	6 0	5 5	
		2 x 6	10 6	9 6	8 9	7 11	11 3	9 9	8 9	7 11	
		2 x 8	13 10	12 7	11 6	10 6	14 10	12 10	11 6	10 6	
		2 x 10	17 8	16 0	14 8	13 5	19 0	16 5	14 8	13 5	
		2 x 12	21 5	19 6	17 11	16 4	23 1	20 0	17 11	16 4	
	No. 3	2 x 4	5 10	5 1	4 6	4 1	5 10	5 1	4 6	4 1	
2 x 6		8 5	7 3	6 6	5 11	8 5	7 3	6 6	5 11		
2 x 8		11 1	9 7	8 7	7 10	11 1	9 7	8 7	7 10		
2 x 10		14 2	12 3	10 11	10 0	14 2	12 3	10 11	10 0		
2 x 12		17 2	14 11	13 4	12 2	17 2	14 11	13 4	12 2		
Construction	2 x 4	6 5	5 8	5 1	4 7	6 6	5 8	5 1	4 7		
	Standard	2 x 4	5 1	4 4	3 11	3 7	5 1	4 4	3 11	3 7	
		2 x 4	3 4	2 11	2 7	2 4	3 4	2 11	2 7	2 4	

Table A-4
Forming Part of Article 9.23.4.1.

ROOF JOISTS — SUPPORTING CEILING (LIVE LOAD 50 lb per sq ft)										
Commercial Designation	Grade	Nominal Size, in.	LIVE LOAD 50 lb per sq ft							
			Gypsum Board or Plastered Ceiling				Other Ceilings			
			Joist Spacing				Joist Spacing			
			12 in.	16 in.	20 in.	24 in.	12 in.	16 in.	20 in.	24 in.
			ft in.	ft in.	ft in.	ft in.	ft in.	ft in.	ft in.	ft in.
Douglas Fir-Larch (includes Douglas Fir and Western Larch)	Select structural	2 x 4	6 7	5 11	5 6	5 2	7 6	6 10	6 4	5 11
		2 x 6	10 4	9 4	8 8	8 2	11 10	10 9	9 11	9 4
		2 x 8	13 7	12 4	11 6	10 9	15 7	14 2	13 2	12 4
		2 x 10	17 4	15 9	14 8	13 9	19 11	18 1	16 9	15 9
		2 x 12	21 2	19 2	17 10	16 9	24 2	22 0	20 5	19 2
	No. 1	2 x 4	6 7	5 11	5 6	5 2	7 6	6 10	6 4	5 11
		2 x 6	10 4	9 4	8 8	8 2	11 10	10 9	9 11	9 2
		2 x 8	13 7	12 4	11 6	10 9	15 7	14 2	13 2	12 1
		2 x 10	17 4	15 9	14 8	13 9	19 11	18 1	16 9	15 6
		2 x 12	21 2	19 2	17 10	16 9	24 2	22 0	20 5	18 10
	No. 2	2 x 4	6 4	5 9	5 4	5 0	7 3	6 7	6 1	5 9
		2 x 6	9 11	9 0	8 5	7 11	11 5	10 2	9 1	8 3
		2 x 8	13 2	11 11	11 1	10 5	15 0	13 5	12 0	10 11
		2 x 10	16 9	15 3	14 2	13 4	19 2	17 1	15 3	13 11
		2 x 12	20 5	18 6	17 2	16 2	23 4	20 9	18 7	17 0
	No. 3	2 x 4	6 0	5 2	4 8	4 3	6 0	5 2	4 8	4 3
		2 x 6	8 11	7 8	6 10	6 3	8 11	7 8	6 10	6 3
		2 x 8	11 9	10 2	9 1	8 3	11 9	10 2	9 1	8 3
		2 x 10	15 0	13 0	11 7	10 7	15 0	13 0	11 7	10 7
		2 x 12	18 3	15 9	14 1	12 10	18 3	15 9	14 1	12 10
	Con- struction	2 x 4	6 1	5 6	5 1	4 10	6 10	5 11	5 3	4 10
	Standard	2 x 4	5 0	4 4	3 11	3 7	5 0	4 4	3 11	3 7
	Utility	2 x 4	3 7	3 1	2 9	2 6	3 7	3 1	2 9	2 6
Hem-Fir (includes Western Hemlock, Amabilis Fir and Grand Fir)	Select structural	2 x 4	6 4	5 9	5 4	5 0	7 3	6 7	6 1	5 9
		2 x 6	9 11	9 0	8 5	7 11	11 5	10 4	9 5	8 7
		2 x 8	13 2	11 11	11 1	10 5	15 0	13 8	12 5	11 4
		2 x 10	16 9	15 3	14 2	13 4	19 2	17 5	15 10	14 6
		2 x 12	20 5	18 6	17 2	16 2	23 4	21 3	19 3	17 7
	No. 1	2 x 4	6 4	5 9	5 4	5 0	7 3	6 7	5 10	5 4
		2 x 6	9 11	9 0	8 5	7 11	11 3	9 9	8 8	7 11
		2 x 8	13 2	11 11	11 1	10 5	14 10	12 10	11 6	10 6
		2 x 10	16 9	15 3	14 2	13 4	18 11	16 5	14 8	13 5
		2 x 12	20 5	18 6	17 2	16 2	23 1	20 0	17 10	16 4
	No. 2	2 x 4	6 1	5 6	5 2	4 10	7 0	6 1	5 5	4 11
		2 x 6	9 7	8 8	7 9	7 1	10 0	8 8	7 9	7 1
		2 x 8	12 8	11 5	10 3	9 4	13 2	11 5	10 3	9 4
		2 x 10	16 2	14 7	13 1	11 11	16 10	14 7	13 1	11 11
		2 x 12	19 8	17 9	15 11	14 6	20 6	17 9	15 11	14 6
	No. 3	2 x 4	5 0	4 4	3 11	3 7	5 0	4 4	3 11	3 7
		2 x 6	7 7	6 7	5 11	5 4	7 7	6 7	5 11	5 4
		2 x 8	10 0	8 8	7 9	7 1	10 0	8 8	7 9	7 1
		2 x 10	12 10	11 1	9 11	9 1	12 10	11 1	9 11	9 1
		2 x 12	15 7	13 6	12 1	11 0	15 7	13 6	12 1	11 0
	Con- struction	2 x 4	5 10	5 0	4 6	4 1	5 10	5 0	4 6	4 1
	Standard	2 x 4	4 4	3 9	3 4	3 1	4 4	3 9	3 4	3 1
	Utility	2 x 4	2 11	2 6	2 3	2 0	2 11	2 6	2 3	2 0

Continued on next page

Table A-4 (Cont'd)

ROOF JOISTS — SUPPORTING CEILING (LIVE LOAD 50 lb per sq ft)																		
Commercial Designation	Grade	Nominal Size, in.	LIVE LOAD 50 lb per sq ft															
			Gypsum Board or Plastered Ceiling								Other Ceilings							
			Joist Spacing								Joist Spacing							
			12 in.		16 in.		20 in.		24 in.		12 in.		16 in.		20 in.		24 in.	
			ft	in.	ft	in.	ft	in.	ft	in.	ft	in.	ft	in.	ft	in.	ft	in.
Eastern Hemlock-Tamarack (includes Eastern Hemlock and Tamarack)	Select structural	2 x 4	6	0	5	5	5	1	4	9	6	11	6	3	5	10	5	5
		2 x 6	9	5	8	7	8	0	7	6	10	10	9	10	9	2	8	7
		2 x 8	12	6	11	4	10	6	9	11	14	3	13	0	12	1	11	4
		2 x 10	15	11	14	6	13	5	12	8	18	3	16	7	15	5	14	6
		2 x 12	19	5	17	7	16	4	15	5	22	2	20	2	18	9	17	7
	No. 1	2 x 4	6	0	5	5	5	1	4	9	6	11	6	3	5	10	5	5
		2 x 6	9	5	8	7	8	0	7	6	10	10	9	10	9	2	8	7
		2 x 8	12	6	11	4	10	6	9	11	14	3	13	0	12	1	11	4
		2 x 10	15	11	14	6	13	5	12	8	18	3	16	7	15	5	14	6
		2 x 12	19	5	17	7	16	4	15	5	22	2	20	2	18	9	17	7
	No. 2	2 x 4	5	9	5	3	4	11	4	7	6	8	6	0	5	7	5	3
		2 x 6	9	1	8	3	7	8	7	3	10	5	9	6	8	8	7	11
		2 x 8	12	0	10	11	10	2	9	7	13	9	12	6	11	6	10	6
		2 x 10	15	4	14	0	13	0	12	2	17	7	16	0	14	8	13	5
2 x 12		18	8	17	0	15	9	14	10	21	5	19	6	17	10	16	4	
No. 3	2 x 4	5	7	5	0	4	6	4	1	5	10	5	0	4	6	4	1	
	2 x 6	8	7	7	5	6	8	6	1	8	7	7	5	6	8	6	1	
No. 3	2 x 8	11	4	9	10	8	9	8	0	11	4	9	10	8	9	8	0	
	2 x 10	14	6	12	6	11	2	10	3	14	6	12	6	11	2	10	3	
No. 3	2 x 12	17	7	15	3	13	8	12	5	17	7	15	3	13	8	12	5	
	Con- struction	2 x 4	5	7	5	1	4	8	4	5	6	5	5	8	5	0	4	7
No. 3	Standard	2 x 4	4	10	4	2	3	9	3	5	4	10	4	2	3	9	3	5
	Utility	2 x 4	3	3	2	10	2	6	2	3	3	3	2	10	2	6	2	3
Coast Species (includes Douglas Fir, Western Larch, Western Hemlock, Amabilis Fir, Grand Fir and Coast Sitka Spruce)	Select structural	2 x 4	6	4	5	9	5	4	5	0	7	3	6	7	6	1	5	9
		2 x 6	9	11	9	0	8	5	7	11	11	5	10	4	9	3	8	5
		2 x 8	13	2	11	11	11	1	10	5	15	0	13	8	12	2	11	1
		2 x 10	16	9	15	3	14	2	13	4	19	2	17	5	15	7	14	2
		2 x 12	20	5	18	6	17	2	16	2	23	4	21	2	18	11	17	3
	No. 1	2 x 4	6	4	5	9	5	4	5	0	7	3	6	7	5	10	5	4
		2 x 6	9	11	9	0	8	5	7	9	11	0	9	6	8	6	7	9
		2 x 8	13	2	11	11	11	1	10	3	14	6	12	7	11	3	10	3
		2 x 10	16	9	15	3	14	2	13	1	18	7	16	1	14	4	13	1
		2 x 12	20	5	18	6	17	2	15	11	22	7	19	7	17	6	15	11
	No. 2	2 x 4	6	1	5	6	5	2	4	10	6	10	5	11	5	3	4	10
		2 x 6	9	7	8	8	7	9	7	1	10	0	8	8	7	9	7	1
		2 x 8	12	8	11	5	10	3	9	4	13	2	11	5	10	3	9	4
		2 x 10	16	2	14	7	13	1	11	11	16	10	14	7	13	1	11	11
2 x 12		19	8	17	9	15	11	14	6	20	6	17	9	15	11	14	6	
No. 3	2 x 4	5	0	4	4	3	11	3	7	5	0	4	4	3	11	3	7	
	2 x 6	7	7	6	7	5	11	5	4	7	7	6	7	5	11	5	4	
	2 x 8	10	0	8	8	7	9	7	1	10	0	8	8	7	9	7	1	
	2 x 10	12	10	11	1	9	11	9	1	12	10	11	1	9	11	9	1	
	2 x 12	15	7	13	6	12	1	11	0	15	7	13	6	12	1	11	0	
No. 3	Con- struction	2 x 4	5	10	5	0	4	6	4	1	5	10	5	0	4	6	4	1
	Standard	2 x 4	4	4	3	9	3	4	3	1	4	4	3	9	3	4	3	1
No. 3	Utility	2 x 4	2	11	2	6	2	3	2	0	2	11	2	6	2	3	2	0

Continued on next page

Table A-4 (Cont'd)

ROOF JOISTS — SUPPORTING CEILING (LIVE LOAD 50 lb per sq ft)										
Commercial Designation	Grade	Nominal Size, in.	LIVE LOAD 50 lb per sq ft							
			Gypsum Board or Plastered Ceiling				Other Ceilings			
			Joist Spacing				Joist Spacing			
			12 in.		16 in.		20 in.		24 in.	
			ft	in.	ft	in.	ft	in.	ft	in.
Spruce-Pine-Fir (includes Spruce (all species except Coast Sitka Spruce), Jack Pine, Lodgepole Pine, Ponderosa Pine, Balsam Fir and Alpine Fir)	Select structural	2 x 4	5	11	5	5	5	0	4	9
		2 x 6	9	4	8	6	7	11	7	5
		2 x 8	12	4	11	3	10	5	9	10
		2 x 10	15	9	14	4	13	4	12	6
		2 x 12	19	2	17	5	16	2	15	3
	No. 1	2 x 4	5	11	5	5	5	0	4	9
		2 x 6	9	4	8	6	7	11	7	5
		2 x 8	12	4	11	3	10	5	9	10
		2 x 10	15	9	14	4	13	4	12	6
		2 x 12	19	2	17	5	16	2	15	3
	No. 2	2 x 4	5	9	5	3	4	10	4	7
		2 x 6	9	1	8	3	7	6	6	10
		2 x 8	11	11	10	10	9	11	12	10
		2 x 10	15	3	13	10	12	8	16	5
		2 x 12	18	7	16	10	15	5	20	0
	No. 3	2 x 4	5	0	4	4	3	11	5	0
		2 x 6	7	3	6	3	5	7	7	3
		2 x 8	9	7	8	3	7	5	9	7
		2 x 10	12	3	10	7	9	5	12	3
		2 x 12	14	10	12	10	11	6	14	10
	Con- struction	2 x 4	5	6	4	11	4	4	5	8
	Standard	2 x 4	4	4	3	9	3	4	4	4
	Utility	2 x 4	2	11	2	6	2	3	2	11
Western Cedars (includes Western Red Cedar and Pacific Coast Yellow Cedar)	Select structural	2 x 4	5	9	5	2	4	10	4	6
		2 x 6	9	0	8	2	7	7	7	2
		2 x 8	11	11	10	10	10	0	9	5
		2 x 10	15	3	13	10	12	10	13	8
		2 x 12	18	6	16	10	15	7	17	5
	No. 1	2 x 4	5	9	5	2	4	10	4	6
		2 x 6	9	0	8	2	7	7	7	2
		2 x 8	11	11	10	10	10	0	9	5
		2 x 10	15	3	13	10	12	10	13	8
		2 x 12	18	6	16	10	15	7	17	5
	No. 2	2 x 4	5	6	5	0	4	8	6	4
		2 x 6	8	9	7	11	7	4	6	10
		2 x 8	11	6	10	5	9	8	9	1
		2 x 10	14	8	13	4	12	5	11	7
		2 x 12	17	10	16	3	15	1	14	1
	No. 3	2 x 4	5	0	4	4	3	11	5	0
		2 x 6	7	7	6	7	5	11	7	7
		2 x 8	10	0	8	8	7	9	10	0
		2 x 10	12	10	11	1	9	11	12	10
		2 x 12	15	7	13	6	12	1	15	7
	Con- struction	2 x 4	5	4	4	10	4	6	5	10
	Standard	2 x 4	4	4	3	9	3	4	4	4
	Utility	2 x 4	2	11	2	6	2	3	2	11

Continued on next page

Table A-4 (Cont'd)

ROOF JOISTS — SUPPORTING CEILING (LIVE LOAD 50 lb per sq ft)										
Commercial Designation	Grade	Nominal Size, in.	LIVE LOAD 50 lb per sq ft							
			Gypsum Board or Plastered Ceiling				Other Ceilings			
			Joist Spacing				Joist Spacing			
			12 in.	16 in.	20 in.	24 in.	12 in.	16 in.	20 in.	24 in.
			ft in.	ft in.	ft in.	ft in.	ft in.	ft in.	ft in.	ft in.
Northern Species (includes any Canadian softwood covered by the NLGA Standard Grading Rules)	Select structural	2 x 4	5 9	5 2	4 10	4 6	6 7	6 0	5 6	5 2
		2 x 6	9 0	8 2	7 7	7 2	10 4	9 5	8 8	7 11
		2 x 8	11 11	10 10	10 0	9 5	13 8	12 5	11 6	10 6
		2 x 10	15 3	13 10	12 10	12 1	17 5	15 10	14 8	13 5
		2 x 12	18 6	16 10	15 7	14 8	21 2	19 3	17 10	16 4
	No. 1	2 x 4	5 9	5 2	4 10	4 6	6 7	6 0	5 6	5 0
		2 x 6	9 0	8 2	7 7	7 2	10 4	9 1	8 2	7 5
		2 x 8	11 11	10 10	10 0	9 5	13 8	12 0	10 9	9 10
		2 x 10	15 3	13 10	12 10	12 1	17 5	15 4	13 9	12 6
		2 x 12	18 6	16 10	15 7	14 8	21 2	18 8	16 8	15 3
	No. 2	2 x 4	5 6	5 0	4 8	4 5	6 4	5 8	5 0	4 7
		2 x 6	8 9	7 11	7 4	6 8	9 6	8 2	7 4	6 8
		2 x 8	11 6	10 5	9 8	8 10	12 6	10 10	9 8	8 10
		2 x 10	14 8	13 4	12 4	11 3	15 11	13 10	12 4	11 3
		2 x 12	17 10	16 3	15 0	13 8	19 5	16 10	15 0	13 8
	No. 3	2 x 4	4 10	4 2	3 9	3 5	4 10	4 2	3 9	3 5
		2 x 6	7 3	6 3	5 7	5 1	7 3	6 3	5 7	5 1
		2 x 8	9 7	8 3	7 5	6 9	9 7	8 3	7 5	6 9
		2 x 10	12 3	10 7	9 5	8 8	12 3	10 7	9 5	8 8
	Construction	2 x 4	5 4	4 9	4 3	3 10	5 5	4 9	4 3	3 10
		2 x 6	4 1	3 7	3 2	2 11	4 1	3 7	3 2	2 11
	Standard	2 x 4	4 1	3 7	3 2	2 11	4 1	3 7	3 2	2 11
	Utility	2 x 4	2 11	2 6	2 3	2 0	2 11	2 6	2 3	2 0
Northern Aspen (includes Aspen Poplar, Large Tooth Aspen and Balsam Poplar)	Select structural	2 x 4	5 10	5 3	4 11	4 7	6 8	6 0	5 7	5 3
		2 x 6	9 2	8 4	7 9	7 3	10 6	9 6	8 10	8 3
		2 x 8	12 1	11 0	10 2	9 7	13 10	12 7	11 8	10 11
		2 x 10	15 5	14 0	13 0	12 3	17 8	16 0	14 11	13 11
		2 x 12	18 9	17 0	15 10	14 11	21 6	19 6	18 1	17 0
	No. 1	2 x 4	5 10	5 3	4 11	4 7	6 8	6 0	5 7	5 3
		2 x 6	9 2	8 4	7 9	7 3	10 6	9 4	8 4	7 7
		2 x 8	12 1	11 0	10 2	9 7	13 10	12 4	11 0	10 0
		2 x 10	15 5	14 0	13 0	12 3	17 8	15 8	14 1	12 10
		2 x 12	18 9	17 0	15 10	14 11	21 6	19 1	17 1	15 7
	No. 2	2 x 4	5 7	5 1	4 9	4 5	6 5	5 9	5 2	4 9
		2 x 6	8 10	8 0	7 5	6 10	9 9	8 5	7 6	6 10
		2 x 8	11 8	10 7	9 10	9 1	12 10	11 1	9 11	9 1
		2 x 10	14 10	13 6	12 6	11 7	16 5	14 2	12 8	11 7
		2 x 12	18 1	16 5	15 3	14 1	20 0	17 3	15 5	14 1
	No. 3	2 x 4	5 0	4 4	3 11	3 7	5 0	4 4	3 11	3 7
		2 x 6	7 3	6 3	5 7	5 1	7 3	6 3	5 7	5 1
		2 x 8	9 7	8 3	7 5	6 9	9 7	8 3	7 5	6 9
		2 x 10	12 3	10 7	9 5	8 8	12 3	10 7	9 5	8 8
	Construction	2 x 4	5 5	4 11	4 4	4 0	5 8	4 11	4 4	4 0
		2 x 6	4 4	3 9	3 4	3 1	4 4	3 9	3 4	3 1
	Standard	2 x 4	4 4	3 9	3 4	3 1	4 4	3 9	3 4	3 1
	Utility	2 x 4	2 11	2 6	2 3	2 0	2 11	2 6	2 3	2 0

Table A-5
Forming Part of Article 9.23.4.1.

ROOF JOISTS — SUPPORTING CEILING (LIVE LOAD 40 lb per sq ft)										
Commercial Designation	Grade	Nominal Size, in.	LIVE LOAD 40 lb per sq ft							
			Gypsum Board or Plastered Ceiling				Other Ceilings			
			Joist Spacing				Joist Spacing			
			12 in.	16 in.	20 in.	24 in.	12 in.	16 in.	20 in.	24 in.
			ft. in.	ft. in.	ft. in.	ft. in.	ft. in.	ft. in.	ft. in.	ft. in.
Douglas Fir-Larch (includes Douglas Fir and Western Larch)	Select structural	2 x 4	7 1	6 5	5 11	5 7	8 1	7 4	6 10	6 5
		2 x 6	11 1	10 1	9 4	8 10	12 9	11 7	10 9	10 1
		2 x 8	14 8	13 4	12 4	11 7	16 9	15 3	14 2	13 4
		2 x 10	18 9	17 0	15 9	14 10	21 5	19 6	18 1	17 0
		2 x 12	22 9	20 8	19 2	18 1	26 1	23 8	22 0	20 8
	No. 1	2 x 4	7 1	6 5	5 11	5 7	8 1	7 4	6 10	6 5
		2 x 6	11 1	10 1	9 4	8 10	12 9	11 7	10 9	10 1
		2 x 8	14 8	13 4	12 4	11 7	16 9	15 3	14 2	13 3
		2 x 10	18 9	17 0	15 9	14 10	21 5	19 6	18 1	16 11
		2 x 12	22 9	20 8	19 2	18 1	26 1	23 8	22 0	20 7
	No. 2	2 x 4	6 10	6 2	5 9	5 5	7 10	7 1	6 7	6 2
		2 x 6	10 9	9 9	9 0	8 6	12 3	11 1	9 11	9 1
		2 x 8	14 2	12 10	11 11	11 3	16 2	14 8	13 1	12 0
		2 x 10	18 1	16 5	15 3	14 4	20 8	18 9	16 9	15 3
		2 x 12	22 0	20 0	18 6	17 5	25 2	22 9	20 4	18 7
	No. 3	2 x 4	6 7	5 8	5 1	4 8	6 7	5 8	5 1	4 8
		2 x 6	9 9	8 5	7 6	6 10	9 9	8 5	7 6	6 10
		2 x 8	12 10	11 1	9 11	9 1	12 10	11 1	9 11	9 1
		2 x 10	16 5	14 2	12 8	11 7	16 5	14 2	12 8	11 7
		2 x 12	20 0	17 3	15 5	14 1	20 0	17 3	15 5	14 1
	Con- struction	2 x 4	6 7	5 11	5 6	5 2	7 6	6 6	5 10	5 3
	Standard	2 x 4	5 6	4 9	4 3	3 11	5 6	4 9	4 3	3 11
	Utility	2 x 4	3 11	3 4	3 0	2 9	3 11	3 4	3 0	2 9
Hem-Fir (includes Western Hemlock, Amabilis Fir and Grand Fir)	Select structural	2 x 4	6 10	6 2	5 9	5 5	7 10	7 1	6 7	6 2
		2 x 6	10 9	9 9	9 0	8 6	12 3	11 2	10 4	9 5
		2 x 8	14 2	12 10	11 11	11 3	16 2	14 9	13 7	12 5
		2 x 10	18 1	16 5	15 3	14 4	20 8	18 9	17 4	15 10
		2 x 12	22 0	20 0	18 6	17 5	25 2	22 10	21 2	19 3
	No. 1	2 x 4	6 10	6 2	5 9	5 5	7 10	7 1	6 5	5 10
		2 x 6	10 9	9 9	9 0	8 6	12 3	10 8	9 6	8 8
		2 x 8	14 2	12 10	11 11	11 3	16 2	14 1	12 7	11 6
		2 x 10	18 1	16 5	15 3	14 4	20 8	18 0	16 1	14 8
		2 x 12	22 0	20 0	18 6	17 5	25 2	21 10	19 7	17 10
	No. 2	2 x 4	6 7	5 11	5 6	5 2	7 6	6 8	5 11	5 5
		2 x 6	10 4	9 5	8 6	7 9	11 0	9 6	8 6	7 9
		2 x 8	13 8	12 5	11 2	10 3	14 6	12 6	11 2	10 3
		2 x 10	17 5	15 10	14 4	13 1	18 6	16 0	14 4	13 1
		2 x 12	21 2	19 3	17 5	15 11	22 6	19 5	17 5	15 11
	No. 3	2 x 4	5 6	4 9	4 3	3 11	5 6	4 9	4 3	3 11
		2 x 6	8 4	7 3	6 5	5 11	8 4	7 3	6 5	5 11
		2 x 8	11 0	9 6	8 6	7 9	11 0	9 6	8 6	7 9
		2 x 10	14 1	12 2	10 10	9 11	14 1	12 2	10 10	9 11
		2 x 12	17 1	14 10	13 3	12 1	17 1	14 10	13 3	12 1
	Con- struction	2 x 4	6 4	5 6	4 11	4 6	6 5	5 6	4 11	4 6
	Standard	2 x 4	4 9	4 2	3 8	3 4	4 9	4 2	3 8	3 4
	Utility	2 x 4	3 2	2 9	2 5	2 3	3 2	2 9	2 5	2 3

Continued on next page

Table A-5 (Cont'd)

ROOF JOISTS — SUPPORTING CEILING (LIVE LOAD 40 lb per sq ft)										
Commercial Designation	Grade	Nominal Size, in.	LIVE LOAD 40 lb per sq ft							
			Gypsum Board or Plastered Ceiling				Other Ceilings			
			Joist Spacing				Joist Spacing			
			12 in.	16 in.	20 in.	24 in.	12 in.	16 in.	20 in.	24 in.
			ft in.	ft in.	ft in.	ft in.	ft in.	ft in.	ft in.	ft in.
Eastern Hemlock-Tamarack (includes Eastern Hemlock and Tamarack)	Select structural	2 x 4	6 6	5 10	5 5	5 2	7 5	6 9	6 3	5 10
		2 x 6	10 2	9 3	8 7	8 1	11 8	10 7	9 10	9 3
		2 x 8	13 5	12 3	11 4	10 8	15 5	14 0	13 0	12 3
		2 x 10	17 2	15 7	14 6	13 7	19 8	17 10	16 7	15 7
		2 x 12	20 11	19 0	17 7	16 7	23 11	21 9	20 2	19 0
	No. 1	2 x 4	6 6	5 10	5 5	5 2	7 5	6 9	6 3	5 10
		2 x 6	10 2	9 3	8 7	8 1	11 8	10 7	9 10	9 3
		2 x 8	13 5	12 3	11 4	10 8	15 5	14 0	13 0	12 3
		2 x 10	17 2	15 7	14 6	13 7	19 8	17 10	16 7	15 7
	No. 2	2 x 4	6 3	5 8	5 3	4 11	7 2	6 6	6 0	5 8
		2 x 6	9 10	8 11	8 3	7 10	11 3	10 3	9 6	8 8
		2 x 8	13 0	11 9	10 11	10 3	14 10	13 6	12 6	11 6
		2 x 10	16 7	15 1	14 0	13 2	19 0	17 3	16 0	14 8
	No. 3	2 x 4	6 0	5 5	4 11	4 6	6 5	5 6	4 11	4 6
		2 x 6	9 5	8 2	7 3	6 8	9 5	8 2	7 3	6 8
		2 x 8	12 5	10 9	9 7	8 9	12 5	10 9	9 7	8 9
		2 x 10	15 10	13 9	12 3	11 2	15 10	13 9	12 3	11 2
	Construction	2 x 4	6 0	5 5	4 11	4 6	6 5	5 6	4 11	4 6
	Standard	2 x 4	5 3	4 7	4 1	3 9	5 3	4 7	4 1	3 9
	Utility	2 x 4	3 7	3 1	2 9	2 6	3 7	3 1	2 9	2 6
Coast Species (includes Douglas Fir, Western Larch, Western Hemlock, Amabilis Fir, Grand Fir and Coast Sitka Spruce)	Select structural	2 x 4	6 10	6 2	5 9	5 5	7 10	7 1	6 7	6 2
		2 x 6	10 9	9 9	9 0	8 6	12 3	11 2	10 1	9 3
		2 x 8	14 2	12 10	11 11	11 3	16 2	14 9	13 4	12 2
		2 x 10	18 1	16 5	15 3	14 4	20 8	18 9	17 1	15 7
		2 x 12	22 0	20 0	18 6	17 5	25 2	22 10	20 9	18 11
	No. 1	2 x 4	6 10	6 2	5 9	5 5	7 10	7 1	6 5	5 10
		2 x 6	10 9	9 9	9 0	8 6	12 1	10 5	9 4	8 6
		2 x 8	14 2	12 10	11 11	11 3	15 11	13 9	12 4	11 3
		2 x 10	18 1	16 5	15 3	14 4	20 4	17 7	15 9	14 4
	No. 2	2 x 4	6 7	5 11	5 6	5 2	7 6	6 6	5 10	5 3
		2 x 6	10 4	9 5	8 6	7 9	11 0	9 6	8 6	7 9
		2 x 8	13 8	12 5	11 2	10 3	14 6	12 6	11 2	10 3
		2 x 10	17 5	15 10	14 4	13 1	18 6	16 0	14 4	13 1
	No. 3	2 x 4	5 6	4 9	4 3	3 11	5 6	4 9	4 3	3 11
		2 x 6	8 4	7 3	6 5	5 11	8 4	7 3	6 5	5 11
		2 x 8	11 0	9 6	8 6	7 9	11 0	9 6	8 6	7 9
		2 x 10	14 1	12 2	10 10	9 11	14 1	12 2	10 10	9 11
	Construction	2 x 4	6 4	5 6	4 11	4 6	6 5	5 6	4 11	4 6
	Standard	2 x 4	4 9	4 2	3 8	3 4	4 9	4 2	3 8	3 4
	Utility	2 x 4	3 2	2 9	2 5	2 3	3 2	2 9	2 5	2 3

Continued on next page

Table A-5 (Cont'd)

ROOF JOISTS — SUPPORTING CEILING (LIVE LOAD 40 lb per sq ft)										
Commercial Designation	Grade	Nominal Size, in.	LIVE LOAD 40 lb per sq ft							
			Gypsum Board or Plastered Ceiling				Other Ceilings			
			Joist Spacing				Joist Spacing			
			12 in.	16 in.	20 in.	24 in.	12 in.	16 in.	20 in.	24 in.
			ft in.	ft in.	ft in.	ft in.	ft in.	ft in.	ft in.	ft in.
Spruce-Pine-Fir (includes Spruce (all species except Coast Sitka Spruce), Jack Pine, Lodgepole Pine, Ponderosa Pine, Balsam Fir and Alpine Fir)	Select structural	2 x 4	6 5	5 10	5 5	5 1	7 4	6 8	6 2	5 10
		2 x 6	10 1	9 2	8 6	8 0	11 7	10 6	9 9	9 1
		2 x 8	13 4	12 1	11 3	10 7	15 3	13 10	12 10	12 0
		2 x 10	17 0	15 5	14 4	13 6	19 6	17 8	16 5	15 3
		2 x 12	20 8	18 9	17 5	16 5	23 8	21 6	20 0	18 7
	No. 1	2 x 4	6 5	5 10	5 5	5 1	7 4	6 8	6 2	5 9
		2 x 6	10 1	9 2	8 6	8 0	11 7	10 3	9 2	8 4
		2 x 8	13 4	12 1	11 3	10 7	15 3	13 6	12 1	11 0
		2 x 10	17 0	15 5	14 4	13 6	19 6	17 3	15 5	14 1
		2 x 12	20 8	18 9	17 5	16 5	23 8	20 11	18 9	17 1
	No. 2	2 x 4	6 2	5 7	5 3	4 11	7 1	6 4	5 8	5 2
		2 x 6	9 9	8 10	8 3	7 6	10 8	9 3	8 3	7 6
		2 x 8	12 10	11 8	10 10	9 11	14 1	12 2	10 11	9 11
		2 x 10	16 5	14 11	13 10	12 8	18 0	15 7	13 11	12 8
No. 3	2 x 4	5 6	4 9	4 3	3 11	5 6	4 9	4 3	3 11	
	2 x 6	7 11	6 10	6 2	5 7	7 11	6 10	6 2	5 7	
	2 x 8	10 6	9 1	8 1	7 5	10 6	9 1	8 1	7 5	
	2 x 10	13 5	11 7	10 4	9 5	13 5	11 7	10 4	9 5	
Construction	2 x 4	5 11	5 4	4 9	4 4	6 2	5 4	4 9	4 4	
	Standard	2 x 4	4 9	4 2	3 8	3 4	4 9	4 2	3 8	
	Utility	2 x 4	3 2	2 9	2 5	2 3	3 2	2 9	2 5	
Western Cedars (includes Western Red Cedar and Pacific Coast Yellow Cedar)	Select structural	2 x 4	6 2	5 7	5 2	4 11	7 1	6 5	6 0	5 7
		2 x 6	9 9	8 10	8 2	7 9	11 2	10 1	9 5	8 10
		2 x 8	12 10	11 8	10 10	10 2	14 8	13 4	12 5	11 8
		2 x 10	16 5	14 11	13 10	13 0	18 9	17 1	15 10	14 11
		2 x 12	19 11	18 1	16 10	15 10	22 10	20 9	19 3	18 1
	No. 1	2 x 4	6 2	5 7	5 2	4 11	7 1	6 5	6 0	5 7
		2 x 6	9 9	8 10	8 2	7 9	11 2	10 1	9 4	8 6
		2 x 8	12 10	11 8	10 10	10 2	14 8	13 4	12 4	11 3
		2 x 10	16 5	14 11	13 10	13 0	18 9	17 1	15 9	14 4
		2 x 12	19 11	18 1	16 10	15 10	22 10	20 9	19 2	17 6
	No. 2	2 x 4	6 0	5 5	5 0	4 9	6 10	6 2	5 9	5 3
		2 x 6	9 5	8 6	7 11	7 5	10 8	9 3	8 3	7 6
		2 x 8	12 5	11 3	10 5	9 10	14 1	12 2	10 11	9 11
		2 x 10	15 10	14 4	13 4	12 7	18 0	15 7	13 11	12 8
2 x 12		19 3	17 6	16 3	15 3	21 10	18 11	16 11	15 5	
No. 3	2 x 4	5 6	4 9	4 3	3 11	5 6	4 9	4 3	3 11	
	2 x 6	8 4	7 3	6 5	5 11	8 4	7 3	6 5	5 11	
	2 x 8	11 0	9 6	8 6	7 9	11 0	9 6	8 6	7 9	
	2 x 10	14 1	12 2	10 10	9 11	14 1	12 2	10 10	9 11	
Construction	2 x 4	5 9	5 2	4 10	4 6	6 5	5 6	4 11	4 6	
	Standard	2 x 4	4 9	4 2	3 8	3 4	4 9	4 2	3 8	
	Utility	2 x 4	3 2	2 9	2 5	2 3	3 2	2 9	2 5	

Continued on next page

Table A-5 (Cont'd)

ROOF JOISTS — SUPPORTING CEILING (LIVE LOAD 40 lb per sq ft)										
Commercial Designation	Grade	Nominal Size, in.	LIVE LOAD 40 lb per sq ft							
			Gypsum Board or Plastered Ceiling				Other Ceilings			
			Joist Spacing				Joist Spacing			
			12 in.	16 in.	20 in.	24 in.	12 in.	16 in.	20 in.	24 in.
			ft in.	ft in.	ft in.	ft in.	ft in.	ft in.	ft in.	ft in.
Northern Species (includes any Canadian softwood covered by the NLGA Standard Grading Rules)	Select structural	2 x 4	6 2	5 7	5 2	4 11	7 1	6 5	6 0	5 7
		2 x 6	9 9	8 10	8 2	7 9	11 2	10 1	9 5	8 8
		2 x 8	12 10	11 8	10 10	10 2	14 8	13 4	12 5	11 6
		2 x 10	16 5	14 11	13 10	13 0	18 9	17 1	15 10	14 8
		2 x 12	19 11	18 1	16 10	15 10	22 10	20 9	19 3	17 10
	No. 1	2 x 4	6 2	5 7	5 2	4 11	7 1	6 5	6 0	5 6
		2 x 6	9 9	8 10	8 2	7 9	11 2	10 0	8 11	8 2
		2 x 8	12 10	11 8	10 10	10 2	14 8	13 2	11 9	10 9
		2 x 10	16 5	14 11	13 10	13 0	18 9	16 10	15 0	13 9
		2 x 12	19 11	18 1	16 10	15 10	22 10	20 6	18 4	16 8
	No. 2	2 x 4	6 0	5 5	5 0	4 9	6 10	6 2	5 6	5 0
		2 x 6	9 5	8 6	7 11	7 4	10 4	9 0	8 0	7 4
		2 x 8	12 5	11 3	10 5	9 8	13 8	11 10	10 7	9 8
		2 x 10	15 10	14 4	13 4	12 4	17 6	15 1	13 6	12 4
		2 x 12	19 3	17 6	16 2	15 0	21 3	18 5	16 5	15 0
	No. 3	2 x 4	5 3	4 7	4 1	3 9	5 3	4 7	4 1	3 9
		2 x 6	7 11	6 10	6 2	5 7	7 11	6 10	6 2	5 7
		2 x 8	10 6	9 1	8 1	7 5	10 6	9 1	8 1	7 5
		2 x 10	13 5	11 7	10 4	9 5	13 5	11 7	10 4	9 5
		2 x 12	16 4	14 1	12 7	11 6	16 4	14 1	12 7	11 6
	Con- struction	2 x 4	5 9	5 2	4 7	4 3	6 0	5 2	4 7	4 3
	Standard	2 x 4	4 6	3 11	3 6	3 2	4 6	3 11	3 6	3 2
	Utility	2 x 4	3 2	2 9	2 5	2 3	3 2	2 9	2 5	2 3
Northern Aspen (includes Aspen Poplar, Large Tooth Aspen and Balsam Poplar)	Select structural	2 x 4	6 3	5 8	5 3	5 0	7 2	6 6	6 0	5 8
		2 x 6	9 10	8 11	8 4	7 10	11 4	10 3	9 6	8 11
		2 x 8	13 0	11 10	11 0	10 4	14 11	13 6	12 7	11 10
		2 x 10	16 7	15 1	14 0	13 2	19 0	17 3	16 0	15 1
		2 x 12	20 3	18 4	17 0	16 0	23 2	21 0	19 6	18 4
	No. 1	2 x 4	6 3	5 8	5 3	5 0	7 2	6 6	6 0	5 8
		2 x 6	9 10	8 11	8 4	7 10	11 4	10 3	9 2	8 4
		2 x 8	13 0	11 10	11 0	10 4	14 11	13 6	12 1	11 0
		2 x 10	16 7	15 1	14 0	13 2	19 0	17 3	15 5	14 1
		2 x 12	20 3	18 4	17 0	16 0	23 2	20 11	18 9	17 1
	No. 2	2 x 4	6 0	5 6	5 1	4 9	6 11	6 3	5 8	5 2
		2 x 6	9 6	8 8	8 0	7 6	10 8	9 3	8 3	7 6
		2 x 8	12 7	11 5	10 7	9 11	14 1	12 2	10 11	9 11
		2 x 10	16 0	14 7	13 6	12 8	18 0	15 7	13 11	12 8
		2 x 12	19 6	17 8	16 5	15 5	21 10	18 11	16 11	15 5
	No. 3	2 x 4	5 6	4 9	4 3	3 11	5 6	4 9	4 3	3 11
		2 x 6	7 11	6 10	6 2	5 7	7 11	6 10	6 2	5 7
		2 x 8	10 6	9 1	8 1	7 5	10 6	9 1	8 1	7 5
		2 x 10	13 5	11 7	10 4	9 5	13 5	11 7	10 4	9 5
		2 x 12	16 4	14 1	12 7	11 6	16 4	14 1	12 7	11 6
	Con- struction	2 x 4	5 10	5 3	4 9	4 4	6 2	5 4	4 9	4 4
	Standard	2 x 4	4 9	4 2	3 8	3 4	4 9	4 2	3 8	3 4
	Utility	2 x 4	3 2	2 9	2 5	2 3	3 2	2 9	2 5	2 3

Table A-6
Forming Part of Article 9.23.4.1.

ROOF JOISTS — SUPPORTING CEILING (LIVE LOAD 30 lb per sq ft)										
Commercial Designation	Grade	Nominal Size, in.	LIVE LOAD 30 lb per sq ft							
			Gypsum Board or Plastered Ceiling				Other Ceilings			
			Joist Spacing				Joist Spacing			
			12 in.	16 in.	20 in.	24 in.	12 in.	16 in.	20 in.	24 in.
			ft in.	ft in.	ft in.	ft in.	ft in.	ft in.	ft in.	ft in.
Douglas Fir-Larch (includes Douglas Fir and Western Larch)	Select structural	2 x 4	7 9	7 1	6 7	6 2	8 11	8 1	7 6	7 1
		2 x 6	12 3	11 1	10 4	9 8	14 0	12 9	11 10	11 1
		2 x 8	16 2	14 8	13 7	12 10	18 6	16 9	15 7	14 8
		2 x 10	20 7	18 9	17 4	16 4	23 7	21 5	19 11	18 9
		2 x 12	25 1	22 9	21 2	19 11	28 8	26 1	24 2	22 9
	No. 1	2 x 4	7 9	7 1	6 7	6 2	8 11	8 1	7 6	7 1
		2 x 6	12 3	11 1	10 4	9 8	14 0	12 9	11 10	11 1
		2 x 8	16 2	14 8	13 7	12 10	18 6	16 9	15 7	14 8
		2 x 10	20 7	18 9	17 4	16 4	23 7	21 5	19 11	18 9
		2 x 12	25 1	22 9	21 2	19 11	28 8	26 1	24 2	22 9
	No. 2	2 x 4	7 6	6 10	6 4	5 11	8 7	7 10	7 3	6 10
		2 x 6	11 10	10 9	9 11	9 4	13 6	12 3	11 1	10 2
		2 x 8	15 7	14 2	13 2	12 4	17 10	16 2	14 8	13 5
		2 x 10	19 11	18 1	16 9	15 9	22 9	20 8	18 9	17 1
		2 x 12	24 2	22 0	20 5	19 2	27 8	25 2	22 9	20 9
	Con- struction	2 x 4	7 3	6 7	6 1	5 9	8 3	7 3	6 6	5 11
	Standard	2 x 4	6 2	5 4	4 9	4 4	6 2	5 4	4 9	4 4
	Utility	2 x 4	4 4	3 9	3 4	3 1	4 4	3 9	3 4	3 1
Hem-Fir (includes Western Hemlock, Amabilis Fir and Grand Fir)	Select structural	2 x 4	7 6	6 10	6 4	5 11	8 7	7 10	7 3	6 10
		2 x 6	11 10	10 9	9 11	9 4	13 6	12 3	11 5	10 6
		2 x 8	15 7	14 2	13 2	12 4	17 10	16 2	15 0	13 11
		2 x 10	19 11	18 1	16 9	15 9	22 9	20 8	19 2	17 9
		2 x 12	24 2	22 0	20 5	19 2	27 8	25 2	23 4	21 7
	No. 1	2 x 4	7 6	6 10	6 4	5 11	8 7	7 10	7 2	6 7
		2 x 6	11 10	10 9	9 11	9 4	13 6	11 11	10 8	9 9
		2 x 8	15 7	14 2	13 2	12 4	17 10	15 9	14 1	12 10
		2 x 10	19 11	18 1	16 9	15 9	22 9	20 1	18 0	16 5
		2 x 12	24 2	22 0	20 5	19 2	27 8	24 6	21 10	20 0
	No. 2	2 x 4	7 3	6 7	6 1	5 9	8 3	7 5	6 8	6 1
		2 x 6	11 5	10 4	9 6	8 8	12 3	10 7	9 6	8 8
		2 x 8	15 0	13 8	12 6	11 5	16 2	14 0	12 6	11 5
		2 x 10	19 2	17 5	16 0	14 7	20 8	17 11	16 0	14 7
		2 x 12	23 4	21 2	19 5	17 9	25 2	21 9	19 5	17 9
	No. 3	2 x 4	6 2	5 4	4 9	4 4	6 2	5 4	4 9	4 4
		2 x 6	9 4	8 1	7 3	6 7	9 4	8 1	7 3	6 7
		2 x 8	12 4	10 8	9 6	8 8	12 4	10 8	9 6	8 8
		2 x 10	15 8	13 7	12 2	11 1	15 8	13 7	12 2	11 1
		2 x 12	19 1	16 7	14 10	13 6	19 1	16 7	14 10	13 6
	Con- struction	2 x 4	6 11	6 2	5 6	5 0	7 2	6 2	5 6	5 0
	Standard	2 x 4	5 4	4 8	4 2	3 9	5 4	4 8	4 2	3 9
	Utility	2 x 4	3 7	3 1	2 9	2 6	3 7	3 1	2 9	2 6

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Table A-6 (Cont'd)

ROOF JOISTS — SUPPORTING CEILING (LIVE LOAD 30 lb per sq ft)																		
Commercial Designation	Grade	Nominal Size, in.	LIVE LOAD 30 lb per sq ft															
			Gypsum Board or Plastered Ceiling				Other Ceilings											
			Joist Spacing				Joist Spacing											
			12 in.		16 in.		20 in.		24 in.									
			ft in.	ft in.	ft in.	ft in.	ft in.	ft in.	ft in.	ft in.								
Eastern Hemlock-Tamarack (includes Eastern Hemlock and Tamarack)	Select structural	2 x 4	7	1	6	6	6	0	5	8	8	2	7	5	6	11	6	6
		2 x 6	11	3	10	2	9	5	8	11	12	10	11	8	10	10	10	2
		2 x 8	14	10	13	5	12	6	11	9	16	11	15	5	14	3	13	5
		2 x 10	18	11	17	2	15	11	15	0	21	8	19	8	18	3	17	2
		2 x 12	23	0	20	11	19	5	18	3	26	4	23	11	22	2	20	11
	No. 1	2 x 4	7	1	6	6	6	0	5	8	8	2	7	5	6	11	6	6
		2 x 6	11	3	10	2	9	5	8	11	12	10	11	8	10	10	10	2
		2 x 8	14	10	13	5	12	6	11	9	16	11	15	5	14	3	13	5
		2 x 10	18	11	17	2	15	11	15	0	21	8	19	8	18	3	17	2
		2 x 12	23	0	20	11	19	5	18	3	26	4	23	11	22	2	20	11
	No. 2	2 x 4	6	10	6	3	5	9	5	5	7	11	7	2	6	8	6	3
		2 x 6	10	10	9	10	9	1	8	7	12	5	11	3	10	5	9	9
		2 x 8	14	3	13	0	12	0	11	4	16	4	14	10	13	9	12	10
		2 x 10	18	3	16	7	15	4	14	6	20	11	19	0	17	7	16	5
		2 x 12	22	2	20	2	18	8	17	7	25	5	23	1	21	5	20	0
	No. 3	2 x 4	6	7	6	0	5	6	5	0	7	2	6	2	5	6	5	0
2 x 6		10	5	9	1	8	2	7	5	10	6	9	1	8	2	7	5	
2 x 8		13	9	12	0	10	9	9	10	13	11	12	0	10	9	9	10	
2 x 10		17	6	15	4	13	9	12	6	17	9	15	4	13	9	12	6	
2 x 12		21	4	18	8	16	8	15	3	21	7	18	8	16	8	15	3	
Con-struction	2 x 4	6	7	6	0	5	7	5	3	7	7	6	10	6	2	5	8	
	Standard	2 x 4	5	11	5	1	4	7	4	2	5	11	5	1	4	7	4	2
	Utility	2 x 4	4	0	3	5	3	1	2	10	4	0	3	5	3	1	2	10
Coast Species (includes Douglas Fir, Western Larch, Western Hemlock, Amabilis Fir, Grand Fir and Coast Sitka Spruce)	Select structural	2 x 4	7	6	6	10	6	4	5	11	8	7	7	10	7	3	6	10
		2 x 6	11	10	10	9	9	11	9	4	13	6	12	3	11	4	10	4
		2 x 8	15	7	14	2	13	2	12	4	17	10	16	2	14	11	13	8
		2 x 10	19	11	18	1	16	9	15	9	22	9	20	8	19	1	17	5
		2 x 12	24	2	22	0	20	5	19	2	27	8	25	2	23	2	21	2
	No. 1	2 x 4	7	6	6	10	6	4	5	11	8	7	7	10	7	2	6	7
		2 x 6	11	10	10	9	9	11	9	4	13	6	11	8	10	5	9	6
		2 x 8	15	7	14	2	13	2	12	4	17	10	15	5	13	9	12	7
		2 x 10	19	11	18	1	16	9	15	9	22	9	19	8	17	7	16	1
		2 x 12	24	2	22	0	20	5	19	2	27	8	23	11	21	5	19	7
	No. 2	2 x 4	7	3	6	7	6	1	5	9	8	3	7	3	6	6	5	11
		2 x 6	11	5	10	4	9	6	8	8	12	3	10	7	9	6	8	8
		2 x 8	15	0	13	8	12	6	11	5	16	2	14	0	12	6	11	5
		2 x 10	19	2	17	5	16	0	14	7	20	8	17	11	16	0	14	7
		2 x 12	23	4	21	2	19	5	17	9	25	2	21	9	19	5	17	9
	No. 3	2 x 4	6	2	5	4	4	9	4	4	6	2	5	4	4	9	4	4
2 x 6		9	4	8	1	7	3	6	7	9	4	8	1	7	3	6	7	
2 x 8		12	4	10	8	9	6	8	8	12	4	10	8	9	6	8	8	
2 x 10		15	8	13	7	12	2	11	1	15	8	13	7	12	2	11	1	
2 x 12		19	1	16	7	14	10	13	6	19	1	16	7	14	10	13	6	
Con-struction	2 x 4	6	11	6	2	5	6	5	0	7	2	6	2	5	6	5	0	
	Standard	2 x 4	5	4	4	8	4	2	3	9	5	4	4	8	4	2	3	9
	Utility	2 x 4	3	7	3	1	2	9	2	6	3	7	3	1	2	9	2	6

Continued on next page

Table A-6 (Cont'd)

ROOF JOISTS — SUPPORTING CEILING (LIVE LOAD 30 lb per sq ft)										
Commercial Designation	Grade	Nominal Size, in.	LIVE LOAD 30 lb per sq ft							
			Gypsum Board or Plastered Ceiling				Other Ceilings			
			Joist Spacing				Joist Spacing			
			12 in.	16 in.	20 in.	24 in.	12 in.	16 in.	20 in.	24 in.
			ft in.	ft in.	ft in.	ft in.	ft in.	ft in.	ft in.	ft in.
Spruce-Pine-Fir (includes Spruce (all species except Coast Sitka Spruce), Jack Pine, Lodgepole Pine, Ponderosa Pine, Balsam Fir and Alpine Fir)	Select structural	2 x 4	7 1	6 5	5 11	5 7	8 1	7 4	6 10	6 5
		2 x 6	11 1	10 1	9 4	8 10	12 9	11 7	10 9	10 1
		2 x 8	14 8	13 4	12 4	11 7	16 9	15 3	14 2	13 4
		2 x 10	18 9	17 0	15 9	14 10	21 5	19 6	18 1	17 0
		2 x 12	22 9	20 8	19 2	18 1	26 1	23 8	22 0	20 8
	No. 1	2 x 4	7 1	6 5	5 11	5 7	8 1	7 4	6 10	6 5
		2 x 6	11 1	10 1	9 4	8 10	12 9	11 5	10 3	9 4
		2 x 8	14 8	13 4	12 4	11 7	16 9	15 1	13 6	12 4
		2 x 10	18 9	17 0	15 9	14 10	21 5	19 3	17 3	15 8
		2 x 12	22 9	20 8	19 2	18 1	26 1	23 5	20 11	19 1
	No. 2	2 x 4	6 10	6 2	5 9	5 5	7 10	7 1	6 4	5 9
		2 x 6	10 9	9 9	9 1	8 5	11 11	10 4	9 3	8 5
		2 x 8	14 2	12 10	11 11	11 1	15 9	13 8	12 2	11 1
		2 x 10	18 1	16 5	15 3	14 2	20 1	17 5	15 7	14 2
		2 x 12	22 0	20 0	18 7	17 3	24 6	21 2	18 11	17 3
	No. 3	2 x 4	6 2	5 4	4 9	4 4	6 2	5 4	4 9	4 4
		2 x 6	8 11	7 8	6 10	6 3	8 11	7 8	6 10	6 3
		2 x 8	11 9	10 2	9 1	8 3	11 9	10 2	9 1	8 4
		2 x 10	15 0	13 0	11 7	10 7	15 0	13 0	11 7	10 7
		2 x 12	18 3	15 9	14 1	12 10	18 3	15 9	14 1	12 10
	Con- struction	2 x 4	6 7	5 11	5 4	4 11	6 11	6 0	5 4	4 11
	Standard	2 x 4	5 4	4 8	4 2	3 9	5 4	4 8	4 2	3 9
	Utility	2 x 4	3 7	3 1	2 9	2 6	3 7	3 1	2 9	2 6
Western Cedars (includes Western Red Cedar and Pacific Coast Yellow Cedar)	Select structural	2 x 4	6 10	6 2	5 9	5 5	7 9	7 1	6 7	6 2
		2 x 6	10 9	9 9	9 0	8 6	12 3	11 2	10 4	9 9
		2 x 8	14 2	12 10	11 11	11 2	16 2	14 8	13 8	12 10
		2 x 10	18 0	16 5	15 3	14 4	20 8	18 9	17 5	16 5
		2 x 12	21 11	19 11	18 6	17 5	25 2	22 10	21 2	19 11
	No. 1	2 x 4	6 10	6 2	5 9	5 5	7 9	7 1	6 7	6 2
		2 x 6	10 9	9 9	9 0	8 6	12 3	11 2	10 4	9 9
		2 x 8	14 2	12 10	11 11	11 2	16 2	14 8	13 8	12 10
		2 x 10	18 0	16 5	15 3	14 4	20 8	18 9	17 5	16 5
		2 x 12	21 11	19 11	18 6	17 5	25 2	22 10	21 2	19 11
	No. 2	2 x 4	6 7	6 0	5 6	5 2	7 6	6 10	6 4	5 11
		2 x 6	10 4	9 5	8 9	8 2	11 10	10 4	9 3	8 5
		2 x 8	13 8	12 5	11 6	10 10	15 8	13 8	12 2	11 1
		2 x 10	17 5	15 10	14 8	13 10	19 11	17 5	15 7	14 2
		2 x 12	21 2	19 3	17 10	16 10	24 3	21 2	18 11	17 3
	No. 3	2 x 4	6 2	5 4	4 9	4 4	6 2	5 4	4 9	4 4
		2 x 6	9 4	8 1	7 3	6 7	9 4	8 1	7 3	6 7
		2 x 8	12 4	10 8	9 6	8 8	12 4	10 8	9 6	8 8
		2 x 10	15 8	13 7	12 2	11 1	15 8	13 7	12 2	11 1
		2 x 12	19 1	16 7	14 10	13 6	19 1	16 7	14 10	13 6
	Con- struction	2 x 4	6 4	5 9	5 4	5 0	7 2	6 2	5 6	5 0
	Standard	2 x 4	5 4	4 8	4 2	3 9	5 4	4 8	4 2	3 9
	Utility	2 x 4	3 7	3 1	2 9	2 6	3 7	3 1	2 9	2 6

Continued on next page

Table A-6 (Cont'd)

ROOF JOISTS — SUPPORTING CEILING (LIVE LOAD 30 lb per sq ft)										
Commercial Designation	Grade	Nominal Size, in.	LIVE LOAD 30 lb per sq ft							
			Gypsum Board or Plastered Ceiling				Other Ceilings			
			Joist Spacing				Joist Spacing			
			12 in.	16 in.	20 in.	24 in.	12 in.	16 in.	20 in.	24 in.
			ft in.	ft in.	ft in.	ft in.	ft in.	ft in.	ft in.	ft in.
Northern Species (includes any Canadian softwood covered by the NLGA Standard Grading Rules)	Select structural	2 x 4	6 10	6 2	5 9	5 5	7 9	7 1	6 7	6 2
		2 x 6	10 9	9 9	9 0	8 6	12 3	11 2	10 4	9 9
		2 x 8	14 2	12 10	11 11	11 2	16 2	14 8	13 8	12 10
		2 x 10	18 0	16 5	15 3	14 4	20 8	18 9	17 5	16 5
	No. 1	2 x 12	21 11	19 11	18 6	17 5	25 2	22 10	21 2	19 11
		2 x 4	6 10	6 2	5 9	5 5	7 9	7 1	6 7	6 2
		2 x 6	10 9	9 9	9 0	8 6	12 3	11 2	10 4	9 9
		2 x 8	14 2	12 10	11 11	11 2	16 2	14 8	13 2	12 0
	No. 2	2 x 10	18 0	16 5	15 3	14 4	20 8	18 9	16 10	15 4
		2 x 12	21 11	19 11	18 6	17 5	25 2	22 10	20 6	18 8
	No. 3	2 x 4	6 7	6 0	5 6	5 2	7 6	6 10	6 2	5 8
		2 x 6	10 4	9 5	8 9	8 2	11 7	10 0	9 0	8 2
		2 x 8	13 8	12 5	11 6	10 10	15 4	13 3	11 10	10 10
		2 x 10	17 5	15 10	14 8	13 10	19 6	16 11	15 1	13 10
	Construction	2 x 12	21 2	19 3	17 10	16 10	23 9	20 7	18 5	16 10
		2 x 4	5 11	5 1	4 7	4 2	5 11	5 1	4 7	4 2
		2 x 6	8 11	7 8	6 10	6 3	8 11	7 8	6 10	6 3
		2 x 8	11 9	10 2	9 1	8 3	11 9	10 2	9 1	8 3
Northern Aspen (includes Aspen Poplar, Large Tooth Aspen and Balsam Poplar)	Standard	2 x 10	15 0	13 0	11 7	10 7	15 0	13 0	11 7	10 7
		2 x 12	18 3	15 9	14 1	12 10	18 3	15 9	14 1	12 10
	Utility	2 x 4	6 4	5 9	5 2	4 9	6 8	5 9	5 2	4 9
		2 x 6	5 0	4 4	3 11	3 7	5 0	4 4	3 11	3 7
	Select structural	2 x 8	3 7	3 1	2 9	2 6	3 7	3 1	2 9	2 6
		2 x 4	6 11	6 3	5 10	5 6	7 11	7 2	6 8	6 3
		2 x 6	10 10	9 10	9 2	8 7	12 5	11 4	10 6	9 10
		2 x 8	14 4	13 0	12 1	11 4	16 5	14 11	13 10	13 0
	No. 1	2 x 10	18 3	16 7	15 5	14 6	20 11	19 0	17 8	16 7
		2 x 12	22 3	20 3	18 9	17 8	25 6	23 2	21 6	20 3
	No. 2	2 x 4	6 11	6 3	5 10	5 6	7 11	7 2	6 8	6 3
		2 x 6	10 10	9 10	9 2	8 7	12 5	11 4	10 3	9 4
		2 x 8	14 4	13 0	12 1	11 4	16 5	14 11	13 6	12 4
		2 x 10	18 3	16 7	15 5	14 6	20 11	19 0	17 3	15 8
	No. 3	2 x 12	22 3	20 3	18 9	17 8	25 6	23 2	20 11	19 1
		2 x 4	6 8	6 0	5 7	5 3	7 7	6 11	6 4	5 9
		2 x 6	10 6	9 6	8 10	8 4	11 11	10 4	9 3	8 5
		2 x 8	13 10	12 7	11 8	10 11	15 9	13 8	12 2	11 1
Northern Aspen (includes Aspen Poplar, Large Tooth Aspen and Balsam Poplar)	Standard	2 x 10	17 8	16 0	14 10	14 0	20 1	17 5	15 7	14 2
		2 x 12	21 5	19 6	18 1	17 0	24 6	21 2	18 11	17 3
	Utility	2 x 4	6 2	5 4	4 9	4 4	6 2	5 4	4 9	4 4
		2 x 6	8 11	7 8	6 10	6 3	8 11	7 8	6 10	6 3
	Select structural	2 x 8	11 9	10 2	9 1	8 3	11 9	10 2	9 1	8 3
		2 x 10	15 0	13 0	11 7	10 7	15 0	13 0	11 7	10 7
		2 x 12	18 3	15 9	14 1	12 10	18 3	15 9	14 1	12 10
	Construction	2 x 4	6 5	5 10	5 4	4 11	6 11	6 0	5 4	4 11
		2 x 6	5 4	4 8	4 2	3 9	5 4	4 8	4 2	3 9
	Standard	2 x 8	3 7	3 1	2 9	2 6	3 7	3 1	2 9	2 6
		2 x 10	3 7	3 1	2 9	2 6	3 7	3 1	2 9	2 6
	Utility	2 x 12	3 7	3 1	2 9	2 6	3 7	3 1	2 9	2 6
		2 x 4	3 7	3 1	2 9	2 6	3 7	3 1	2 9	2 6
	Select structural	2 x 6	5 4	4 8	4 2	3 9	5 4	4 8	4 2	3 9
		2 x 8	3 7	3 1	2 9	2 6	3 7	3 1	2 9	2 6
	No. 1	2 x 10	3 7	3 1	2 9	2 6	3 7	3 1	2 9	2 6
		2 x 12	3 7	3 1	2 9	2 6	3 7	3 1	2 9	2 6

Table A-7
Forming Part of Article 9.23.4.1.

ROOF JOISTS — SUPPORTING CEILING (LIVE LOAD 20 lb per sq ft)																		
Commercial Designation	Grade	Nominal Size, in.	LIVE LOAD 20 lb per sq ft															
			Gypsum Board or Plastered Ceiling						Other Ceilings									
			Joist Spacing						Joist Spacing									
			12 in.		16 in.		20 in.		24 in.		12 in.		16 in.		20 in.		24 in.	
			ft	in.	ft	in.	ft	in.	ft	in.	ft	in.	ft	in.	ft	in.	ft	in.
Douglas Fir-Larch (includes Douglas Fir and Western Larch)	Select structural	2 x 4	8	11	8	1	7	6	7	1	10	2	9	3	8	7	8	1
		2 x 6	14	0	12	9	11	10	11	1	16	0	14	7	13	6	12	9
		2 x 8	18	6	16	9	15	7	14	8	21	2	19	3	17	10	16	9
		2 x 10	23	7	21	5	19	11	18	9	27	0	24	6	22	9	21	5
		2 x 12	28	8	26	1	24	2	22	9	32	10	29	10	27	8	26	1
	No. 1	2 x 4	8	11	8	1	7	6	7	1	10	2	9	3	8	7	8	1
		2 x 6	14	0	12	9	11	10	11	1	16	0	14	7	13	6	12	9
		2 x 8	18	6	16	9	15	7	14	8	21	2	19	3	17	10	16	9
		2 x 10	23	7	21	5	19	11	18	9	27	0	24	6	22	9	21	5
		2 x 12	28	8	26	1	24	2	22	9	32	10	29	10	27	8	26	1
	No. 2	2 x 4	8	7	7	10	7	3	6	10	9	10	8	11	8	4	7	10
		2 x 6	13	6	12	3	11	5	10	9	15	6	14	1	12	10	11	9
		2 x 8	17	10	16	2	15	0	14	2	20	5	18	7	16	11	15	5
		2 x 10	22	9	20	8	19	2	18	1	26	1	23	8	21	7	19	9
		2 x 12	27	8	25	2	23	4	22	0	31	9	28	10	26	4	24	0
	No. 3	2 x 4	8	3	7	4	6	7	6	0	8	6	7	4	6	7	6	0
		2 x 6	12	7	10	11	9	9	8	11	12	7	10	11	9	9	8	11
		2 x 8	16	7	14	4	12	10	11	9	16	7	14	4	12	10	11	9
		2 x 10	21	2	18	4	16	5	15	0	21	2	18	4	16	5	15	0
		2 x 12	25	9	22	4	20	0	18	3	25	9	22	4	20	0	18	3
	Construction	2 x 4	8	3	7	6	7	0	6	7	9	6	8	5	7	6	6	10
	Standard	2 x 4	7	2	6	2	5	6	5	0	7	2	6	2	5	6	5	0
	Utility	2 x 4	5	0	4	4	3	11	3	7	5	0	4	4	3	11	3	7
Hem-Fir (includes Western Hemlock, Amabilis Fir and Grand Fir)	Select structural	2 x 4	8	7	7	10	7	3	6	10	9	10	8	11	8	4	7	10
		2 x 6	13	6	12	3	11	5	10	9	15	6	14	1	13	1	12	2
		2 x 8	17	10	16	2	15	0	14	2	20	5	18	7	17	3	16	0
		2 x 10	22	9	20	8	19	2	18	1	26	1	23	8	22	0	20	6
		2 x 12	27	8	25	2	23	4	22	0	31	9	28	10	26	9	24	11
	No. 1	2 x 4	8	7	7	10	7	3	6	10	9	10	8	11	8	4	7	7
		2 x 6	13	6	12	3	11	5	10	9	15	6	13	9	12	4	11	3
		2 x 8	17	10	16	2	15	0	14	2	20	5	18	2	16	3	14	10
		2 x 10	22	9	20	8	19	2	18	1	26	1	23	3	20	9	18	11
		2 x 12	27	8	25	2	23	4	22	0	31	9	28	3	25	3	23	1
	No. 2	2 x 4	8	3	7	6	7	0	6	7	9	6	8	7	7	8	7	0
		2 x 6	13	0	11	10	11	0	10	0	14	2	12	3	11	0	10	0
		2 x 8	17	2	15	7	14	6	13	2	18	8	16	2	14	6	13	2
		2 x 10	22	11	19	11	18	6	16	10	23	10	20	8	18	6	16	10
		2 x 12	26	8	24	3	22	6	20	6	29	0	25	2	22	6	20	6
	No. 3	2 x 4	7	2	6	2	5	6	5	0	7	2	6	2	5	6	5	0
		2 x 6	10	9	9	4	8	4	7	7	10	9	9	4	8	4	7	7
		2 x 8	14	3	12	4	11	0	10	0	14	3	12	4	11	0	10	0
		2 x 10	18	2	15	8	14	1	12	10	18	2	15	8	14	1	12	10
		2 x 12	22	1	19	1	17	1	15	7	22	1	19	1	17	1	15	7
	Construction	2 x 4	8	0	7	2	6	5	5	10	8	3	7	2	6	5	5	10
	Standard	2 x 4	6	2	5	4	4	9	4	4	6	2	5	4	4	9	4	4
	Utility	2 x 4	4	1	3	7	3	2	2	11	4	1	3	7	3	2	2	11

Continued on next page

Table A-7 (Cont'd)

ROOF JOISTS — SUPPORTING CEILING (LIVE LOAD 20 lb per sq ft)										
Commercial Designation	Grade	Nominal Size, in.	LIVE LOAD 20 lb per sq ft							
			Gypsum Board or Plastered Ceiling				Other Ceilings			
			Joist Spacing				Joist Spacing			
			12 in.		16 in.		20 in.		24 in.	
			ft. in.	ft. in.	ft. in.	ft. in.	ft. in.	ft. in.	ft. in.	ft. in.
Eastern Hemlock-Tamarack (includes Eastern Hemlock and Tamarack)	Select structural	2 x 4	8 2	7 5	6 11	6 6	9 4	8 6	7 11	7 5
		2 x 6	12 10	11 8	10 10	10 2	14 9	13 4	12 5	11 8
		2 x 8	16 11	15 5	14 3	13 5	19 5	17 8	16 4	15 5
		2 x 10	21 8	19 8	18 3	17 2	24 9	22 6	20 11	19 8
		2 x 12	26 4	23 11	22 2	20 11	30 2	27 5	25 5	23 11
	No. 1	2 x 4	8 2	7 5	6 11	6 6	9 4	8 6	7 11	7 5
		2 x 6	12 10	11 8	10 10	10 2	14 9	13 4	12 5	11 8
		2 x 8	16 11	15 5	14 3	13 5	19 5	17 8	16 4	15 5
		2 x 10	21 8	19 8	18 3	17 2	24 9	22 6	20 11	19 8
		2 x 12	26 4	23 11	22 2	20 11	30 2	27 5	25 5	23 11
	No. 2	2 x 4	7 11	7 2	6 8	6 3	9 0	8 2	7 7	7 2
		2 x 6	12 5	11 3	10 5	9 10	14 2	12 11	12 0	11 3
		2 x 8	16 4	14 10	13 9	13 0	18 9	17 0	15 10	14 10
		2 x 10	20 11	19 0	17 7	16 7	23 11	21 9	20 2	18 11
		2 x 12	25 5	23 1	21 5	20 2	29 1	26 5	24 6	23 1
	No. 3	2 x 4	7 7	6 10	6 5	5 10	8 3	7 2	6 5	5 10
		2 x 6	11 11	10 6	9 5	8 7	12 2	10 6	9 5	8 7
		2 x 8	15 9	13 11	12 5	11 4	16 0	13 11	12 5	11 4
		2 x 10	20 1	17 9	15 10	14 6	20 6	17 9	15 10	14 6
		2 x 12	24 5	21 7	19 3	17 7	24 11	21 7	19 3	17 7
	Con- struction	2 x 4	7 7	6 10	6 5	6 0	8 8	7 10	7 2	6 6
	Standard	2 x 4	6 10	5 11	5 3	4 10	6 10	5 11	5 3	4 10
	Utility	2 x 4	4 7	4 0	3 7	3 3	4 7	4 0	3 7	3 3
Coast Species (includes Douglas Fir, Western Larch, Western Hemlock, Amabilis Fir, Grand Fir and Coast Sitka Spruce)	Select structural	2 x 4	8 7	7 10	7 3	6 10	9 10	8 11	8 4	7 10
		2 x 6	13 6	12 3	11 5	10 9	15 6	14 1	13 1	11 11
		2 x 8	17 10	16 2	15 0	14 2	20 5	18 7	17 3	15 9
		2 x 10	22 9	20 8	19 2	18 1	26 1	23 8	23 0	20 1
		2 x 12	27 8	25 2	23 4	22 0	31 9	28 10	26 9	24 6
	No. 1	2 x 4	8 7	7 10	7 3	6 10	9 10	8 11	8 4	7 7
		2 x 6	13 6	12 3	11 5	10 9	15 6	13 6	12 1	11 0
		2 x 8	17 10	16 2	15 0	14 2	20 5	17 10	15 11	14 6
		2 x 10	22 9	20 8	19 2	18 1	26 1	22 9	20 4	18 7
		2 x 12	27 8	25 2	23 4	22 0	31 9	27 8	24 9	22 7
	No. 2	2 x 4	8 3	7 6	7 0	6 7	9 6	8 5	7 6	6 10
		2 x 6	13 0	11 10	11 0	10 0	14 2	12 3	11 0	10 0
		2 x 8	17 2	15 7	14 6	13 2	18 8	16 2	14 6	13 2
		2 x 10	21 11	19 11	18 6	16 10	23 10	20 8	18 6	16 10
		2 x 12	26 8	24 3	22 6	20 6	29 0	25 2	22 6	20 6
	No. 3	2 x 4	7 2	6 2	5 6	5 0	7 2	6 2	5 6	5 0
		2 x 6	10 9	9 4	8 4	7 7	10 9	9 4	8 4	7 7
		2 x 8	14 3	12 4	11 0	10 0	14 3	12 4	11 0	10 0
		2 x 10	18 2	15 8	14 1	12 10	18 2	15 8	14 1	12 10
		2 x 12	22 1	19 1	17 1	15 7	22 1	19 1	17 1	15 7
	Con- struction	2 x 4	8 0	7 2	6 5	5 10	8 3	7 2	6 5	5 10
	Standard	2 x 4	6 2	5 4	4 9	4 4	6 2	5 4	4 9	4 4
	Utility	2 x 4	4 1	3 7	3 2	2 11	4 1	3 7	3 2	2 11

Continued on next page

Table A-7 (Cont'd)

ROOF JOISTS — SUPPORTING CEILING (LIVE LOAD 20 lb per sq ft)										
Commercial Designation	Grade	Nominal Size, in.	LIVE LOAD 20 lb per sq ft							
			Gypsum Board or Plastered Ceiling				Other Ceilings			
			Joist Spacing				Joist Spacing			
			12 in.	16 in.	20 in.	24 in.	12 in.	16 in.	20 in.	24 in.
			ft in.	ft in.	ft in.	ft in.	ft in.	ft in.	ft in.	ft in.
Spruce-Pine-Fir (includes Spruce (all species except Coast Sitka Spruce), Jack Pine, Lodgepole Pine, Ponderosa Pine, Balsam Fir and Alpine Fir)	Select structural	2 x 4	8 1	7 4	6 10	6 5	9 3	8 5	7 10	7 4
		2 x 6	12 9	11 7	10 9	10 1	14 7	13 3	12 3	11 7
		2 x 8	16 9	15 3	14 2	13 4	19 3	17 5	16 2	15 3
		2 x 10	21 5	19 6	18 1	17 0	24 6	22 3	20 8	19 6
		2 x 12	26 1	23 8	22 0	20 8	29 10	27 1	25 2	23 8
	No. 1	2 x 4	8 1	7 4	6 10	6 5	9 3	8 5	7 10	7 4
		2 x 6	12 9	11 7	10 9	10 1	14 7	13 2	11 10	10 9
		2 x 8	16 9	15 3	14 2	13 4	19 3	17 5	15 7	14 3
		2 x 10	21 5	19 6	18 1	17 0	24 6	22 3	19 11	18 2
		2 x 12	26 1	23 8	22 0	20 8	29 10	27 1	24 2	22 1
	No. 2	2 x 4	7 10	7 1	6 7	6 2	8 11	8 2	7 4	6 8
		2 x 6	12 4	11 2	10 4	9 9	13 9	11 11	10 8	9 9
		2 x 8	16 3	14 9	13 8	12 10	18 2	15 9	14 1	12 10
		2 x 10	20 9	18 10	17 6	16 5	23 3	20 1	18 0	16 5
		2 x 12	25 2	22 11	21 3	20 0	28 3	24 6	21 10	20 0
	No. 3	2 x 4	7 2	6 2	5 6	5 0	7 2	6 2	5 6	5 0
		2 x 6	10 3	8 11	7 11	7 3	10 3	8 11	7 11	7 3
		2 x 8	13 7	11 9	10 6	9 7	13 7	11 9	10 6	9 7
		2 x 10	17 4	15 0	13 5	12 3	17 4	15 0	13 5	12 3
		2 x 12	21 1	18 3	16 4	14 10	21 1	18 3	16 4	14 10
	Con- struction	2 x 4	7 6	6 10	6 2	5 8	8 0	6 11	6 2	5 8
	Standard	2 x 4	6 2	5 4	4 9	4 4	6 2	5 4	4 9	4 4
	Utility	2 x 4	4 1	3 7	3 2	2 11	4 1	3 7	3 2	2 11
Western Cedars (includes Western Red Cedar and Pacific Coast Yellow Cedar)	Select structural	2 x 4	7 9	7 1	6 7	6 2	8 11	8 1	7 6	7 1
		2 x 6	12 3	11 2	10 4	9 9	14 1	12 9	11 10	11 2
		2 x 8	16 2	14 8	13 8	12 10	18 6	16 10	15 7	14 8
		2 x 10	20 8	18 9	17 5	16 5	23 8	21 6	19 11	18 9
		2 x 12	25 2	22 10	21 2	19 11	28 9	26 2	24 3	22 10
	No. 1	2 x 4	7 9	7 1	6 7	6 2	8 11	8 1	7 6	7 1
		2 x 6	12 3	11 2	10 4	9 9	14 1	12 9	11 10	11 0
		2 x 8	16 2	14 8	13 8	12 10	18 6	16 10	15 7	14 6
		2 x 10	20 8	18 9	17 5	16 5	23 8	21 6	19 11	18 7
		2 x 12	25 2	22 10	21 2	19 11	28 9	26 2	24 3	22 7
	No. 2	2 x 4	7 6	6 10	6 4	6 0	8 7	7 10	7 3	6 10
		2 x 6	11 10	10 9	10 0	9 5	13 7	11 11	10 8	9 9
		2 x 8	15 8	14 2	13 2	12 5	17 11	15 9	14 1	12 10
		2 x 10	19 11	18 1	16 10	15 10	22 10	20 1	18 0	16 5
		2 x 12	24 3	22 1	20 6	19 3	27 9	24 6	21 10	20 0
	No. 3	2 x 4	7 2	6 2	5 6	5 0	7 2	6 2	5 6	5 0
		2 x 6	10 9	9 4	8 4	7 7	10 9	9 4	8 4	7 7
		2 x 8	14 3	12 4	11 0	10 0	14 3	12 4	11 0	10 0
		2 x 10	18 2	15 8	14 1	12 10	18 2	15 8	14 1	12 10
		2 x 12	22 1	19 1	17 1	15 7	22 1	19 1	17 1	15 7
	Con- struction	2 x 4	7 3	6 7	6 1	5 9	8 3	7 2	6 5	5 10
	Standard	2 x 4	6 2	5 4	4 9	4 4	6 2	5 4	4 9	4 4
	Utility	2 x 4	4 1	3 7	3 2	2 11	4 1	3 7	3 2	2 11

Continued on next page

Table A-7 (Cont'd)

ROOF JOISTS — SUPPORTING CEILING (LIVE LOAD 20 lb per sq ft)										
Commercial Designation	Grade	Nominal Size, in.	LIVE LOAD 20 lb per sq ft							
			Gypsum Board or Plastered Ceiling				Other Ceilings			
			Joist Spacing				Joist Spacing			
			12 in.	16 in.	20 in.	24 in.	12 in.	16 in.	20 in.	24 in.
			ft. in.	ft. in.	ft. in.	ft. in.	ft. in.	ft. in.	ft. in.	ft. in.
Northern Species (includes any Canadian softwood covered by the NLGA Standard Grading Rules)	Select structural	2x4	7 9	7 1	6 7	6 2	8 11	8 1	7 6	7 1
		2x6	12 3	11 2	10 4	9 9	14 1	12 9	11 10	11 2
		2x8	16 2	14 8	13 8	12 10	18 6	16 10	15 7	14 8
		2x10	20 8	18 9	17 5	16 5	23 8	21 6	19 11	18 9
		2x12	25 2	22 10	21 2	19 11	28 9	26 2	24 3	22 10
	No. 1	2x4	7 9	7 1	6 7	6 2	8 11	8 1	7 6	7 1
		2x6	12 3	11 2	10 4	9 9	14 1	12 9	11 6	10 6
		2x8	16 2	14 8	13 8	12 10	18 6	16 10	15 3	13 11
		2x10	20 8	18 9	17 5	16 5	23 8	21 6	19 5	17 9
		2x12	25 2	22 10	21 2	19 11	28 9	26 2	23 8	21 7
	No. 2	2x4	7 6	6 10	6 4	6 0	8 7	7 10	7 2	6 6
		2x6	11 10	10 9	10 0	9 5	13 5	11 7	10 4	9 6
		2x8	15 8	14 2	13 2	12 5	17 8	15 4	13 8	12 6
		2x10	19 11	18 1	16 10	15 10	22 7	19 6	17 6	15 11
		2x12	24 3	22 1	20 6	19 3	27 5	23 9	21 3	19 5
	No. 3	2x4	6 10	5 11	5 3	4 10	6 10	5 11	5 3	4 10
		2x6	10 3	8 11	7 11	7 3	10 3	8 11	7 11	7 3
		2x8	13 7	11 9	10 6	9 7	13 7	11 9	10 6	9 7
		2x10	17 4	15 0	13 5	12 3	17 4	15 0	13 5	12 3
		2x12	21 1	18 3	16 4	14 10	21 1	18 3	16 4	14 10
	Con- struction	2x4	7 3	6 7	6 0	5 5	7 9	6 8	6 0	5 5
	Standard	2x4	5 10	5 0	4 6	4 1	5 10	5 0	4 6	4 1
	Utility	2x4	4 1	3 7	3 2	2 11	4 1	3 7	3 2	2 11
Northern Aspen (includes Aspen Poplar, Large Tooth Aspen and Balsam Poplar)	Select structural	2x4	7 11	7 2	6 8	6 3	9 1	8 3	7 7	7 2
		2x6	12 5	11 4	10 6	9 10	14 3	12 11	12 0	11 4
		2x8	16 5	14 11	13 10	13 0	18 9	17 1	15 10	14 11
		2x10	20 11	19 0	17 8	16 7	24 0	21 9	20 3	19 0
		2x12	25 6	23 2	21 6	20 3	29 2	26 6	24 7	23 2
	No. 1	2x4	7 11	7 2	6 8	6 3	9 1	8 3	7 7	7 2
		2x6	12 5	11 4	10 6	9 10	14 3	12 11	11 10	10 9
		2x8	16 5	14 11	13 10	13 0	18 9	17 1	15 7	14 3
		2x10	20 11	19 0	17 8	16 7	24 0	21 9	19 11	18 2
		2x12	25 6	23 2	21 6	20 3	29 2	26 6	24 2	22 1
	No. 2	2x4	7 7	6 11	6 5	6 0	8 9	7 11	7 4	6 8
		2x6	12 0	10 11	10 1	9 6	13 9	11 11	10 8	9 9
		2x8	15 10	14 4	13 4	12 7	18 1	15 9	14 1	12 10
		2x10	20 2	18 4	17 0	16 0	23 1	20 1	18 0	16 5
		2x12	24 7	22 4	20 9	19 6	28 1	24 6	21 10	20 0
	No. 3	2x4	7 2	6 2	5 6	5 0	7 2	6 2	5 6	5 0
		2x6	10 3	8 11	7 11	7 3	10 3	8 11	7 11	7 3
		2x8	13 7	11 9	10 6	9 7	13 7	11 9	10 6	9 7
		2x10	17 4	15 0	13 5	12 3	17 4	15 0	13 5	12 3
		2x12	21 1	18 3	16 4	14 10	21 1	18 3	16 4	14 10
	Con- struction	2x4	7 4	6 8	6 2	5 8	8 0	6 11	6 2	5 8
	Standard	2x4	6 2	5 4	4 9	4 4	6 2	5 4	4 9	4 4
	Utility	2x4	4 1	3 7	3 2	2 11	4 1	3 7	3 2	2 11

Table A-8
Forming Part of Article 9.23.4.1.

RAFTERS — NOT SUPPORTING CEILING (LIVE LOADS 50 AND 40 lb per sq ft)																		
Commercial Designation	Grade	Nominal Size, in.	LIVE LOAD 50 lb per sq ft								LIVE LOAD 40 lb per sq ft							
			Rafter Spacing								Rafter Spacing							
			12 in.		16 in.		20 in.		24 in.		12 in.		16 in.		20 in.		24 in.	
			ft	in.	ft	in.	ft	in.	ft	in.	ft	in.	ft	in.	ft	in.	ft	in.
Douglas Fir-Larch (includes Douglas Fir and Western Larch)	Select structural	2 x 4	8	3	7	6	7	0	6	7	8	11	8	1	7	6	7	1
		2 x 6	13	0	11	10	10	11	10	3	14	0	12	9	11	10	11	1
		2 x 8	17	2	15	7	14	6	13	6	18	6	16	9	15	7	14	8
		2 x 10	21	11	19	11	18	5	17	3	23	7	21	5	19	11	18	9
		2 x 12	26	8	24	2	22	5	20	11	28	8	26	1	24	2	22	9
	No. 1	2 x 4	8	3	7	6	7	0	6	6	8	11	8	1	7	6	7	1
		2 x 6	13	0	11	8	10	5	9	6	14	0	12	9	11	6	10	6
		2 x 8	17	2	15	4	13	9	12	6	18	6	16	9	15	2	13	10
		2 x 10	21	11	19	7	17	7	16	0	23	7	21	5	19	4	17	8
		2 x 12	26	8	23	10	21	4	19	6	28	8	26	1	23	7	21	6
	No. 2	2 x 4	8	0	7	3	6	6	5	11	8	7	7	10	7	2	6	7
		2 x 6	12	2	10	6	9	5	8	7	13	5	11	7	10	4	9	5
		2 x 8	16	0	13	10	12	5	11	4	17	8	15	3	13	8	12	6
		2 x 10	20	5	17	8	15	10	14	5	22	6	19	6	17	5	15	11
		2 x 12	24	10	21	6	19	3	17	7	27	5	23	9	21	3	19	5
	No. 3	2 x 4	6	3	5	5	4	10	4	5	6	10	5	11	5	4	4	10
		2 x 6	9	2	8	0	7	1	6	6	10	2	8	9	7	10	7	2
		2 x 8	12	2	10	6	9	5	8	7	13	5	11	7	10	4	9	6
		2 x 10	15	6	13	5	12	0	10	11	17	1	14	10	13	3	12	1
		2 x 12	18	10	16	4	14	7	13	4	20	10	18	0	16	1	14	8
	Construction	2 x 4	7	1	6	2	5	6	5	0	7	10	6	9	6	1	5	6
	Standard	2 x 4	5	3	4	6	4	0	3	8	5	9	5	0	4	5	4	1
	Utility	2 x 4	3	8	3	2	2	10	2	7	4	1	3	6	3	2	2	10
Hem-Fir (includes Western Hemlock, Amabilis Fir and Grand Fir)	Select structural	2 x 4	8	0	7	3	6	7	6	0	8	7	7	10	7	3	6	8
		2 x 6	12	7	10	11	9	9	8	11	13	6	12	0	10	9	9	10
		2 x 8	16	7	14	4	12	10	11	9	17	10	15	10	14	2	12	11
		2 x 10	21	2	18	4	16	5	15	0	22	9	20	3	18	1	16	6
		2 x 12	25	9	22	4	20	0	18	3	27	8	24	8	22	0	20	1
	No. 1	2 x 4	7	10	6	10	6	1	5	6	8	7	7	6	6	8	6	1
		2 x 6	11	8	10	1	9	0	8	3	12	10	11	2	9	11	9	1
		2 x 8	15	4	13	4	11	11	10	10	17	0	14	8	13	2	12	0
		2 x 10	19	7	17	0	15	2	13	10	21	8	18	9	16	9	15	4
		2 x 12	23	10	20	8	18	6	16	10	26	4	22	10	20	5	18	7
	No. 2	2 x 4	7	3	6	3	5	7	5	1	8	0	6	11	6	2	5	8
		2 x 6	10	4	9	0	8	0	7	4	11	5	9	11	8	10	8	1
		2 x 8	13	8	11	10	10	7	9	8	15	1	13	1	11	8	10	8
		2 x 10	17	5	15	1	13	6	12	4	19	3	16	8	14	11	13	7
		2 x 12	21	3	18	5	16	5	15	0	23	5	20	3	18	2	16	7
	No. 3	2 x 4	5	3	4	6	4	0	3	8	5	9	5	0	4	5	4	1
		2 x 6	7	10	6	10	6	1	5	7	8	8	7	6	6	9	6	2
		2 x 8	10	5	9	0	8	0	7	4	11	6	9	11	8	10	8	1
		2 x 10	13	3	11	6	10	3	9	4	14	8	12	8	11	4	10	4
		2 x 12	16	2	14	0	12	6	11	5	17	10	15	5	13	10	12	7
	Construction	2 x 4	6	0	5	3	4	8	4	3	6	8	5	9	5	2	4	8
	Standard	2 x 4	4	6	3	11	3	6	3	2	5	0	4	4	3	10	3	6
	Utility	2 x 4	3	0	2	7	2	4	2	1	3	4	2	10	2	7	2	4

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Table A-8 (Cont'd)

RAFTERS — NOT SUPPORTING CEILING (LIVE LOADS 50 AND 40 lb per sq ft)										
Commercial Designation	Grade	Nominal Size, in.	LIVE LOAD 50 lb per sq ft				LIVE LOAD 40 lb per sq ft			
			Rafter Spacing				Rafter Spacing			
			12 in.	16 in.	20 in.	24 in.	12 in.	16 in.	20 in.	24 in.
			ft in.	ft in.	ft in.	ft in.	ft in.	ft in.	ft in.	ft in.
Eastern Hemlock-Tamarack (includes Eastern Hemlock and Tamarack)	Select structural	2 x 4	7 7	6 11	6 5	6 0	8 2	7 5	6 11	6 6
		2 x 6	11 11	10 10	10 1	9 5	12 10	11 8	10 10	10 2
		2 x 8	15 9	14 3	13 3	12 6	16 11	15 5	14 3	13 5
		2 x 10	20 1	18 3	16 11	15 11	21 8	19 8	18 3	17 2
		2 x 12	24 5	22 2	20 7	19 5	26 4	23 11	22 2	20 11
	No. 1	2 x 4	7 7	6 11	6 5	6 0	8 2	7 5	6 11	6 6
		2 x 6	11 11	10 10	10 1	9 2	12 10	11 8	10 10	10 2
		2 x 8	15 9	14 3	13 3	12 2	16 11	15 5	14 3	13 5
		2 x 10	20 1	18 3	16 11	15 6	21 8	19 8	18 3	17 1
		2 x 12	24 5	22 2	20 7	18 10	26 4	23 11	22 2	20 10
	No. 2	2 x 4	7 4	6 8	6 2	5 8	7 11	7 2	6 8	6 3
		2 x 6	11 6	10 1	9 0	8 3	12 5	11 2	9 11	9 1
		2 x 8	15 2	13 4	11 11	10 10	16 4	14 8	13 2	12 0
		2 x 10	19 5	17 0	15 2	13 10	20 11	18 9	16 9	15 4
		2 x 12	23 7	20 8	18 6	16 10	25 5	22 10	20 5	18 7
	No. 3	2 x 4	6 0	5 3	4 8	4 3	6 8	5 9	5 2	4 8
		2 x 6	8 11	7 8	6 10	6 3	9 10	8 6	7 7	6 11
		2 x 8	11 9	10 2	9 1	8 3	12 11	11 2	10 0	9 2
		2 x 10	15 0	13 0	11 7	10 7	16 6	14 4	12 10	11 8
		2 x 12	18 3	15 9	14 1	12 10	20 1	17 5	15 7	14 2
	Con- struction	2 x 4	6 9	5 10	5 3	4 9	7 5	6 5	5 9	5 3
	Standard	2 x 4	5 0	4 4	3 10	3 6	5 6	4 9	4 3	3 11
	Utility	2 x 4	3 4	2 11	2 7	2 4	3 8	3 2	2 10	2 7
Coast Species (includes Douglas Fir, Western Larch, Western Hemlock, Amabilis Fir, Grand Fir and Coast Sitka Spruce)	Select structural	2 x 4	8 0	7 3	6 7	6 0	8 7	7 10	7 3	6 8
		2 x 6	12 4	10 8	9 7	8 9	13 6	11 10	10 7	9 8
		2 x 8	16 4	14 1	12 7	11 6	17 10	15 7	13 11	12 9
		2 x 10	20 10	18 0	16 1	14 8	22 9	19 11	17 9	16 3
		2 x 12	25 4	21 11	19 7	17 11	27 8	24 2	21 8	19 9
	No. 1	2 x 4	7 10	6 10	6 1	5 6	8 7	7 6	6 8	6 1
		2 x 6	11 5	9 10	8 10	8 1	12 7	10 11	9 9	8 11
		2 x 8	15 1	13 0	11 8	10 8	16 7	14 4	12 10	11 9
		2 x 10	19 2	16 8	14 10	13 7	21 2	18 4	16 5	15 0
		2 x 12	23 4	20 3	18 1	16 6	25 9	22 4	20 0	18 3
	No. 2	2 x 4	7 1	6 2	5 6	5 0	7 10	6 9	6 1	5 6
		2 x 6	10 4	9 0	8 0	7 4	11 5	9 11	8 10	8 1
		2 x 8	13 8	11 10	10 7	9 8	15 1	13 1	11 8	10 8
		2 x 10	17 5	15 1	13 6	12 4	19 3	16 8	14 11	13 7
		2 x 12	21 3	18 5	16 5	15 0	23 5	20 3	18 2	16 7
	No. 3	2 x 4	5 3	4 6	4 0	3 8	5 9	5 0	4 5	4 1
		2 x 6	7 10	6 10	6 1	5 7	8 8	7 6	6 9	6 2
		2 x 8	10 5	9 0	8 0	7 4	11 6	9 11	8 10	8 1
		2 x 10	13 3	11 6	10 3	9 4	14 8	12 8	11 4	10 4
		2 x 12	16 2	14 0	12 6	11 5	17 10	15 5	13 10	12 7
	Con- struction	2 x 4	6 0	5 3	4 8	4 3	6 8	5 9	5 2	4 8
	Standard	2 x 4	4 6	3 11	3 6	3 2	5 0	4 4	3 10	3 6
	Utility	2 x 4	3 0	2 7	2 4	2 1	3 4	2 10	2 7	2 4

Continued on next page

Table A-8 (Cont'd)

RAFTERS — NOT SUPPORTING CEILING (LIVE LOADS 50 AND 40 lb per sq ft)																		
Commercial Designation	Grade	Nominal Size, in.	LIVE LOAD 50 lb per sq ft						LIVE LOAD 40 lb per sq ft									
			Rafter Spacing						Rafter Spacing									
			12 in.		16 in.		20 in.		24 in.		12 in.		16 in.		20 in.		24 in.	
			ft	in.	ft	in.	ft	in.	ft	in.	ft	in.	ft	in.	ft	in.	ft	in.
Spruce-Pine-Fir (includes Spruce (all species except Coast Sitka Spruce), Jack Pine, Lodgepole Pine, Ponderosa Pine, Balsam Fir and Alpine Fir)	Select structural	2 x 4	7	6	6	10	6	4	5	10	8	1	7	4	6	10	6	5
		2 x 6	11	10	10	6	9	5	8	7	12	9	11	7	10	4	9	5
		2 x 8	15	7	13	10	12	5	11	4	16	9	15	3	13	8	12	6
		2 x 10	19	11	17	8	15	10	14	5	21	5	19	6	17	5	15	11
		2 x 12	24	2	21	6	19	3	17	7	26	1	23	8	21	3	19	5
	No. 1	2 x 4	7	6	6	8	5	11	5	5	8	1	7	4	6	7	6	0
		2 x 6	11	2	9	8	8	8	7	10	12	4	10	8	9	6	8	8
		2 x 8	14	9	12	9	11	5	10	5	16	3	14	1	12	7	11	6
		2 x 10	18	9	16	3	14	6	13	3	20	9	17	11	16	1	14	8
		2 x 12	22	10	19	9	17	8	16	2	25	3	21	10	19	6	17	10
	No. 2	2 x 4	6	11	6	0	5	4	4	11	7	8	6	7	5	11	5	5
		2 x 6	10	1	8	9	7	10	7	1	11	2	9	8	8	7	7	10
		2 x 8	13	4	11	6	10	4	9	5	14	8	12	9	11	4	10	4
		2 x 10	17	0	14	8	13	2	12	0	18	9	16	3	14	6	13	3
2 x 12		20	8	17	11	16	0	14	7	22	10	19	9	17	8	16	1	
No. 3	2 x 4	5	3	4	6	4	0	3	8	5	9	5	0	4	5	4	1	
	2 x 6	7	6	6	6	5	10	5	4	8	3	7	2	6	5	5	10	
	2 x 8	9	11	8	7	7	8	7	0	10	11	9	6	8	6	7	9	
	2 x 10	12	8	10	11	9	9	8	11	14	0	12	1	10	10	9	10	
	2 x 12	15	5	13	4	11	11	10	10	17	0	14	8	13	2	12	0	
Construction	2 x 4	5	10	5	1	4	6	4	1	6	5	5	7	5	0	4	7	
Standard	2 x 4	4	6	3	11	3	6	3	2	5	0	4	4	3	10	3	6	
Utility	2 x 4	3	0	2	7	2	4	2	1	3	4	2	10	2	7	2	4	
Western Cedars (includes Western Red Cedar and Pacific Coast Yellow Cedar)	Select structural	2 x 4	7	3	6	7	6	1	5	9	7	9	7	1	6	7	6	2
		2 x 6	11	5	10	4	9	5	8	7	12	3	11	2	10	4	9	5
		2 x 8	15	0	13	8	12	5	11	4	16	2	14	8	13	8	12	6
		2 x 10	19	2	17	5	15	10	14	5	20	8	18	9	17	5	15	11
		2 x 12	23	4	21	2	19	3	17	7	25	2	22	10	21	2	19	5
	No. 1	2 x 4	7	3	6	7	5	11	5	5	7	9	7	1	6	7	6	0
		2 x 6	11	5	9	10	8	10	8	1	12	3	10	11	9	9	8	11
		2 x 8	15	0	13	0	11	8	10	8	16	2	14	4	12	10	11	9
		2 x 10	19	2	16	8	14	10	13	7	20	8	18	4	16	5	15	0
		2 x 12	23	4	20	3	18	1	16	6	25	2	22	4	20	0	18	3
	No. 2	2 x 4	7	0	6	2	5	6	5	0	7	6	6	9	6	1	5	6
		2 x 6	10	1	8	9	7	10	7	1	11	2	9	8	8	7	7	10
		2 x 8	13	4	11	6	10	4	9	5	14	8	12	9	11	4	10	4
		2 x 10	17	0	14	8	13	2	12	0	18	9	16	3	14	6	13	3
		2 x 12	20	8	17	11	16	0	14	7	22	10	19	9	17	8	16	1
	No. 3	2 x 4	5	3	4	6	4	0	3	8	5	9	5	0	4	5	4	1
		2 x 6	7	10	6	10	6	1	5	7	8	8	7	6	6	9	6	2
		2 x 8	10	5	9	0	8	0	7	4	11	6	9	11	8	10	8	1
		2 x 10	13	3	11	6	10	3	9	4	14	8	12	8	11	4	10	4
2 x 12		16	2	14	0	12	6	11	5	17	10	15	5	13	10	12	7	
Construction	2 x 4	6	0	5	3	4	8	4	3	6	8	5	9	5	2	4	8	
Standard	2 x 4	4	6	3	11	3	6	3	2	5	0	4	4	3	10	3	6	
Utility	2 x 4	3	0	2	7	2	4	2	1	3	4	2	10	2	7	2	4	

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Table A-8 (Cont'd)

RAFTERS — NOT SUPPORTING CEILING (LIVE LOADS 50 AND 40 lb per sq ft)										
Commercial Designation	Grade	Nominal Size, in.	LIVE LOAD 50 lb per sq ft				LIVE LOAD 40 lb per sq ft			
			Rafter Spacing				Rafter Spacing			
			12 in.	16 in.	20 in.	24 in.	12 in.	16 in.	20 in.	24 in.
			ft in.	ft in.	ft in.	ft in.	ft in.	ft in.	ft in.	ft in.
Northern Species (includes any Canadian softwood covered by the NLGA Standard Grading Rules)	Select structural	2 x 4	7 3	6 7	6 1	5 8	7 9	7 1	6 7	6 2
		2 x 6	11 5	10 1	9 0	8 3	12 3	11 2	9 11	9 1
		2 x 8	15 0	13 4	11 11	10 10	16 2	14 8	13 2	12 0
		2 x 10	19 2	17 0	15 2	13 10	20 8	18 9	16 9	15 4
	No. 1	2 x 12	23 4	20 8	18 6	16 10	25 2	22 10	20 5	18 7
		2 x 4	7 3	6 5	5 9	5 3	7 9	7 1	6 4	5 9
		2 x 6	10 11	9 5	8 5	7 8	12 0	10 5	9 4	8 6
		2 x 8	14 4	12 5	11 1	10 2	15 10	13 9	12 3	11 2
	No. 2	2 x 10	18 4	15 11	14 2	13 0	20 3	17 6	15 8	14 4
		2 x 12	22 4	19 4	17 3	15 9	24 8	21 4	19 1	17 5
	No. 3	2 x 4	6 9	5 10	5 3	4 9	7 5	6 5	5 9	5 3
		2 x 6	9 10	8 6	7 7	6 11	10 10	9 4	8 4	7 8
		2 x 8	12 11	11 2	10 0	9 2	14 3	12 4	11 1	10 1
		2 x 10	16 6	14 3	12 9	11 8	18 3	15 9	14 1	12 10
	No. 3	2 x 12	20 1	17 5	15 7	14 2	22 2	19 2	17 2	15 8
	Construction	2 x 4	5 0	4 4	3 10	3 6	5 6	4 9	4 3	3 11
		2 x 6	7 6	6 6	5 10	5 4	8 3	7 2	6 5	5 10
	Standard	2 x 8	9 11	8 7	7 8	7 0	10 11	9 6	8 6	7 9
		2 x 10	12 8	10 11	9 9	8 11	14 0	12 1	10 10	9 10
	Utility	2 x 12	15 5	13 4	11 11	10 10	17 0	14 8	13 2	12 0
	Standard	2 x 4	4 3	3 8	3 3	3 0	4 8	4 1	3 8	3 4
		2 x 6	7 6	6 6	5 10	5 4	8 3	7 2	6 5	5 10
Northern Aspen (includes Aspen Poplar, Large Tooth Aspen and Balsam Poplar)	Select structural	2 x 4	7 4	6 8	6 2	5 10	7 11	7 2	6 8	6 3
		2 x 6	11 6	10 6	9 5	8 7	12 5	11 4	10 4	9 5
		2 x 8	15 3	13 10	12 5	11 4	16 5	14 11	13 8	12 6
		2 x 10	19 5	17 8	15 10	14 5	20 11	19 0	17 5	15 11
	No. 1	2 x 12	23 8	21 6	19 3	17 7	25 6	23 2	21 3	19 5
		2 x 4	7 4	6 8	5 11	5 5	7 11	7 2	6 7	6 0
		2 x 6	11 2	9 8	8 8	7 10	12 4	10 8	9 6	8 8
		2 x 8	14 9	12 9	11 5	10 5	16 3	14 1	12 7	11 6
	No. 2	2 x 10	18 9	16 3	14 6	13 3	20 9	17 11	16 1	14 8
		2 x 12	22 10	19 9	17 8	16 2	25 3	21 10	19 6	17 10
	No. 3	2 x 4	6 11	6 0	5 4	4 11	7 7	6 7	5 11	5 5
		2 x 6	10 1	8 9	7 10	7 1	11 2	9 8	8 7	7 10
		2 x 8	13 4	11 6	10 4	9 5	14 8	12 9	11 4	10 4
		2 x 10	17 0	14 8	13 2	12 0	18 9	16 3	14 6	13 3
	No. 3	2 x 12	20 8	17 11	16 0	14 7	22 10	19 9	17 8	16 1
	Construction	2 x 4	5 3	4 6	4 0	3 8	5 9	5 0	4 5	4 1
		2 x 6	7 6	6 6	5 10	5 4	8 3	7 2	6 5	5 10
	Standard	2 x 8	9 11	8 7	7 8	7 0	10 11	9 6	8 6	7 9
		2 x 10	12 8	10 11	9 9	8 11	14 0	12 1	10 10	9 10
	Utility	2 x 12	15 5	13 4	11 11	10 10	17 0	14 8	13 2	12 0
	Standard	2 x 4	4 6	3 11	3 6	3 2	5 0	4 4	3 10	3 6
		2 x 6	7 6	6 6	5 10	5 4	8 3	7 2	6 5	5 10
	Utility	2 x 8	9 11	8 7	7 8	7 0	10 11	9 6	8 6	7 9
		2 x 10	12 8	10 11	9 9	8 11	14 0	12 1	10 10	9 10
	Utility	2 x 12	15 5	13 4	11 11	10 10	17 0	14 8	13 2	12 0

Table A-9
Forming Part of Article 9.23.4.1.

RAFTERS — NOT SUPPORTING CEILING (LIVE LOADS 30 AND 20 lb per sq ft)											
Commercial Designation	Grade	Nominal Size, in.	LIVE LOAD 30 lb per sq ft				LIVE LOAD 20 lb per sq ft				
			Rafter Spacing				Rafter Spacing				
			12 in.	16 in.	20 in.	24 in.	12 in.	16 in.	20 in.	24 in.	
			ft in.	ft in.	ft in.	ft in.	ft in.	ft in.	ft in.	ft in.	
Douglas Fir-Larch (includes Douglas Fir and Western Larch)	Select structural	2 x 4	9 10	8 11	8 3	7 9	11 3	10 2	9 6	8 11	
		2 x 6	15 5	14 0	13 0	12 3	17 8	16 0	14 11	14 0	
		2 x 8	20 4	18 6	17 2	16 2	23 3	21 2	19 8	18 6	
		2 x 10	26 0	23 7	21 11	20 7	29 9	27 0	25 1	23 7	
		2 x 12	31 7	28 8	26 8	25 1	36 2	32 10	30 6	28 8	
	No. 1	2 x 4	9 10	8 11	8 3	7 9	11 3	10 2	9 6	8 11	
		2 x 6	15 5	14 0	13 0	11 10	17 8	16 0	14 11	14 0	
		2 x 8	20 4	18 6	17 2	15 8	23 3	21 2	19 8	18 5	
		2 x 10	26 0	23 7	21 11	20 0	29 9	27 0	25 1	23 6	
		2 x 12	31 7	28 8	26 8	24 4	36 2	32 10	30 6	28 7	
	No. 2	2 x 4	9 6	8 7	8 0	7 5	10 10	9 10	9 2	8 7	
		2 x 6	14 11	13 1	11 9	10 8	17 1	15 5	13 9	12 7	
		2 x 8	19 8	17 3	15 5	14 1	22 6	20 4	18 2	16 7	
2 x 10		25 1	22 1	19 9	18 0	28 8	26 0	23 3	21 2		
2 x 12		30 6	26 10	24 0	21 11	34 11	31 7	28 3	25 9		
No. 3	2 x 4	7 9	6 9	6 0	5 6	9 2	7 11	7 1	6 5		
	2 x 6	11 6	9 11	8 11	8 1	13 6	11 8	10 6	9 7		
	2 x 8	15 2	13 1	11 9	10 8	17 10	15 5	13 10	12 7		
Construction	2 x 4	8 10	7 8	6 10	6 3	10 5	9 0	8 1	7 4		
	Standard	2 x 4	6 6	5 8	5 0	4 7	7 8	6 8	5 11	5 5	
	Utility	2 x 4	4 7	4 0	3 7	3 3	5 5	4 8	4 2	3 10	
Hem-Fir (includes Western Hemlock, Amabilis Fir and Grand Fir)	Select structural	2 x 4	9 6	8 7	8 0	7 6	10 10	9 10	9 2	8 7	
		2 x 6	14 11	13 6	12 2	11 1	17 1	15 6	14 4	13 1	
		2 x 8	19 8	17 10	16 0	14 8	22 6	20 5	18 11	17 3	
		2 x 10	25 1	22 9	20 6	18 8	28 8	26 1	24 1	22 0	
		2 x 12	30 6	27 8	24 11	22 9	34 11	31 9	29 4	26 9	
	No. 1	2 x 4	9 6	8 6	7 7	6 11	10 10	9 10	8 11	8 2	
		2 x 6	14 6	12 7	11 3	10 3	17 1	14 10	13 3	12 1	
		2 x 8	19 2	16 7	14 10	13 7	22 6	19 7	17 6	15 11	
		2 x 10	24 6	21 2	18 11	17 4	28 8	24 11	22 4	20 4	
		2 x 12	29 9	25 9	23 1	21 1	34 11	30 4	27 2	24 9	
	No. 2	2 x 4	9 0	7 10	7 0	6 5	10 5	9 3	8 3	7 6	
		2 x 6	12 11	11 2	10 0	9 2	15 3	13 2	11 9	10 9	
		2 x 8	17 1	14 9	13 2	12 1	20 1	17 5	15 7	14 2	
2 x 10		21 9	18 10	16 10	15 5	25 8	22 2	19 10	18 1		
2 x 12		26 6	22 11	20 6	18 9	31 2	27 0	24 2	22 0		
No. 3	2 x 4	6 6	5 8	5 0	4 7	7 8	6 8	5 11	5 5		
	2 x 6	9 10	8 6	7 7	6 11	11 7	10 0	8 11	8 2		
	2 x 8	13 0	11 3	10 0	9 2	15 3	13 3	11 10	10 9		
	2 x 10	16 7	14 4	12 10	11 8	19 6	16 11	15 1	13 9		
	2 x 12	20 2	17 5	15 7	14 3	23 9	20 6	18 4	16 9		
Construction	2 x 4	7 6	6 6	5 10	5 4	8 10	7 8	6 10	6 3		
	Standard	2 x 4	5 8	4 11	4 4	4 0	6 8	5 9	5 2	4 8	
	Utility	2 x 4	3 9	3 3	2 11	2 8	4 5	3 10	3 5	3 1	

Continued on next page

Table A-9 (Cont'd)

RAFTERS — NOT SUPPORTING CEILING (LIVE LOADS 30 AND 20 lb per sq ft)										
Commercial Designation	Grade	Nominal Size, in.	LIVE LOAD 30 lb per sq ft				LIVE LOAD 20 lb per sq ft			
			Rafter Spacing				Rafter Spacing			
			12 in.	16 in.	20 in.	24 in.	12 in.	16 in.	20 in.	24 in.
			ft in.	ft in.	ft in.	ft in.	ft in.	ft in.	ft in.	ft in.
Eastern Hemlock-Tamarack (includes Eastern Hemlock and Tamarack)	Select structural	2x4	9 0	8 2	7 7	7 1	10 4	9 4	8 8	8 2
		2x6	14 2	12 10	11 11	11 3	16 2	14 9	13 8	12 10
		2x8	18 8	16 11	15 9	14 10	21 4	19 5	18 0	16 11
		2x10	23 10	21 8	20 1	18 11	27 3	24 9	23 0	21 8
	No. 1	2x12	29 0	26 4	24 5	23 0	33 2	30 2	28 0	26 4
		2x4	9 0	8 2	7 7	7 1	10 4	9 4	8 8	8 2
		2x6	14 2	12 10	11 11	11 3	16 2	14 9	13 8	12 10
		2x8	18 8	16 11	15 9	14 10	21 4	19 5	18 0	16 11
	No. 2	2x10	23 10	21 8	20 1	18 11	27 3	24 9	23 0	21 8
		2x12	29 0	26 4	24 5	23 0	33 2	30 2	28 0	26 4
	No. 3	2x4	8 8	7 11	7 4	6 10	9 11	9 0	8 4	7 11
		2x6	13 8	12 5	11 3	10 3	15 8	14 2	13 2	12 1
		2x8	18 0	16 4	14 10	13 7	20 7	18 9	17 5	15 11
		2x10	23 0	20 11	18 11	17 4	26 4	23 11	22 2	20 4
	No. 3	2x12	28 0	25 5	23 1	21 1	32 0	29 1	27 0	24 9
	Construction	2x4	7 6	6 6	5 10	5 4	8 10	7 8	6 10	6 3
		2x6	11 1	9 7	8 7	7 10	13 1	11 4	10 1	9 3
		2x8	14 8	12 8	11 4	10 4	17 3	14 11	13 4	12 2
		2x10	18 8	16 2	14 6	13 2	22 0	19 1	17 0	15 6
	Standard	2x12	22 9	19 8	17 7	16 1	26 9	23 2	20 9	18 11
	Utility	2x4	8 4	7 4	6 6	5 11	9 7	8 7	7 8	7 0
		2x6	6 3	5 5	4 10	4 5	7 4	6 4	5 8	5 2
		2x8	4 2	3 8	3 3	2 11	4 11	4 3	3 10	3 6
Coast Species (includes Douglas Fir, Western Larch, Western Hemlock, Amabilis Fir, Grand Fir and Coast Sitka Spruce)	Select structural	2x4	9 6	8 7	8 0	7 6	10 10	9 10	9 2	8 7
		2x6	14 11	13 4	11 11	10 11	17 1	15 6	14 1	12 10
		2x8	19 8	17 7	15 9	14 4	22 6	20 5	18 6	16 11
		2x10	25 1	22 6	20 1	18 4	28 8	26 1	23 8	21 7
	No. 1	2x12	30 6	27 4	24 6	22 4	34 11	31 9	28 9	26 3
		2x4	9 6	8 6	7 7	6 11	10 10	9 10	8 11	8 2
		2x6	14 3	12 4	11 0	10 1	16 9	14 6	13 0	11 10
		2x8	18 9	16 3	14 6	13 3	22 1	19 2	17 1	15 7
	No. 2	2x10	24 0	20 9	18 7	16 11	28 2	24 5	21 10	19 11
		2x12	29 2	25 3	22 7	20 7	34 4	29 9	26 7	24 3
	No. 3	2x4	8 10	7 8	6 10	6 3	10 5	9 0	8 1	7 4
		2x6	12 11	11 2	10 0	9 2	15 3	13 2	11 9	10 9
		2x8	17 1	14 9	13 2	12 1	20 1	17 5	15 7	14 2
		2x10	21 9	18 10	16 10	15 5	25 8	22 2	19 10	18 1
	No. 3	2x12	26 6	22 11	20 6	18 9	31 2	27 0	24 2	22 0
	Construction	2x4	6 6	5 8	5 0	4 7	7 8	6 8	5 11	5 5
		2x6	9 10	8 6	7 7	6 11	11 7	10 0	8 11	8 2
		2x8	13 0	11 3	10 0	9 2	15 3	13 3	11 10	10 9
		2x10	16 7	14 4	12 10	11 8	19 6	16 11	15 1	13 9
	Standard	2x12	20 2	17 5	15 7	14 3	23 9	20 6	18 4	16 9
	Utility	2x4	7 6	6 6	5 10	5 4	8 10	7 8	6 10	6 3
		2x6	5 8	4 11	4 4	4 0	6 8	5 9	5 2	4 8
		2x8	3 9	3 3	2 11	2 8	4 5	3 10	3 5	3 1

Continued on next page

Table A-9 (Cont'd)

RAFTERS — NOT SUPPORTING CEILING (LIVE LOADS 30 AND 20 lb per sq ft)																		
Commercial Designation	Grade	Nominal Size, in.	LIVE LOAD 30 lb per sq ft								LIVE LOAD 20 lb per sq ft							
			Rafter Spacing								Rafter Spacing							
			12 in.		16 in.		20 in.		24 in.		12 in.		16 in.		20 in.		24 in.	
			ft	in.	ft	in.	ft	in.	ft	in.	ft	in.	ft	in.	ft	in.	ft	in.
Spruce-Pine-Fir (includes Spruce (all species except Coast Sitka Spruce), Jack Pine, Lodgepole Pine, Ponderosa Pine, Balsam Fir and Alpine Fir)	Select structural	2 x 4	8	11	8	1	7	6	7	1	10	2	9	3	8	7	8	1
		2 x 6	14	0	12	9	11	9	10	8	16	0	14	7	13	6	12	7
		2 x 8	18	6	16	9	15	5	14	1	21	2	19	3	17	10	16	7
		2 x 10	23	7	21	5	19	9	18	0	27	0	24	6	22	9	21	2
		2 x 12	28	8	26	1	24	0	21	11	32	10	29	10	27	8	25	9
	No. 1	2 x 4	8	11	8	1	7	5	6	9	10	2	9	3	8	7	8	0
		2 x 6	13	11	12	1	10	9	9	10	16	0	14	2	12	8	11	7
		2 x 8	18	4	15	11	14	3	13	0	21	2	18	9	16	9	15	3
		2 x 10	23	5	20	3	18	2	16	7	27	0	23	11	21	4	19	6
		2 x 12	28	6	24	8	22	1	20	2	32	10	29	1	26	0	23	9
No. 2	2 x 4	8	7	7	6	6	8	6	1	9	10	8	10	7	10	7	2	
	2 x 6	12	7	10	11	9	9	8	11	14	10	12	10	11	6	10	6	
	2 x 8	16	7	14	4	12	10	11	9	19	7	16	11	15	2	13	10	
	2 x 10	21	2	18	4	16	5	15	0	24	11	21	7	19	4	17	8	
	2 x 12	25	9	22	4	20	0	18	3	30	4	26	3	23	6	21	5	
No. 3	2 x 4	6	6	5	8	5	0	4	7	7	8	6	8	5	11	5	5	
	2 x 6	9	4	8	1	7	3	6	7	11	0	9	7	8	6	7	9	
	2 x 8	12	4	10	8	9	7	8	9	14	7	12	7	11	3	10	3	
	2 x 10	15	9	13	8	12	3	11	2	18	7	16	1	14	5	13	2	
	2 x 12	19	3	16	8	14	10	13	7	22	7	19	7	17	6	16	0	
Construction	2 x 4	7	4	6	4	5	8	5	2	8	7	7	5	6	8	6	1	
Standard	2 x 4	5	8	4	11	4	4	4	0	6	8	5	9	5	2	4	8	
Utility	2 x 4	3	9	3	3	2	11	2	8	4	5	3	10	3	5	3	1	
Western Cedars (includes Western Red Cedar and Pacific Coast Yellow Cedar)	Select structural	2 x 4	8	7	7	9	7	3	6	10	9	10	8	11	8	3	7	9
		2 x 6	13	6	12	3	11	5	10	8	15	6	14	1	13	0	12	3
		2 x 8	17	10	16	2	15	0	14	1	20	5	18	6	17	2	16	2
		2 x 10	22	9	20	8	19	2	18	0	26	0	23	8	21	11	20	8
		2 x 12	27	8	25	2	23	4	21	11	31	8	28	9	26	9	25	2
	No. 1	2 x 4	8	7	7	9	7	3	6	9	9	10	8	11	8	3	7	9
		2 x 6	13	6	12	3	11	0	10	1	15	6	14	1	13	0	11	10
		2 x 8	17	10	16	2	14	6	13	3	20	5	18	6	17	1	15	7
		2 x 10	22	9	20	8	18	7	16	11	26	0	23	8	21	10	19	11
		2 x 12	27	8	25	2	22	7	20	7	31	8	28	9	26	7	24	3
	No. 2	2 x 4	8	3	7	6	6	10	6	3	9	6	8	7	8	0	7	4
		2 x 6	12	7	10	11	9	9	8	11	14	10	12	10	11	6	10	6
		2 x 8	16	7	14	4	12	10	11	9	19	7	16	11	15	2	13	10
		2 x 10	21	2	18	4	16	5	15	0	24	11	21	7	19	4	17	8
		2 x 12	25	9	22	4	20	0	18	3	30	4	26	3	23	6	21	5
No. 3	2 x 4	6	6	5	8	5	0	4	7	7	8	6	8	5	11	5	5	
	2 x 6	9	10	8	6	7	7	6	11	11	7	10	0	8	11	8	2	
	2 x 8	13	0	11	3	10	0	9	2	15	3	13	3	11	10	10	9	
	2 x 10	16	7	14	4	12	10	11	8	19	6	16	11	15	1	13	9	
	2 x 12	20	2	17	5	15	7	14	3	23	9	20	6	18	4	16	9	
Construction	2 x 4	7	6	6	6	5	10	5	4	8	10	7	8	6	10	6	3	
Standard	2 x 4	5	8	4	11	4	4	4	0	6	8	5	9	5	2	4	8	
Utility	2 x 4	3	9	3	3	2	11	2	8	4	5	3	10	3	5	3	1	

Continued on next page

Table A-9 (Cont'd)

RAFTERS — NOT SUPPORTING CEILING (LIVE LOADS 30 AND 20 lb per sq ft)										
Commercial Designation	Grade	Nominal Size, in.	LIVE LOAD 30 lb per sq ft				LIVE LOAD 20 lb per sq ft			
			Rafter Spacing				Rafter Spacing			
			12 in.	16 in.	20 in.	24 in.	12 in.	16 in.	20 in.	24 in.
			ft in.	ft in.	ft in.	ft in.	ft in.	ft in.	ft in.	ft in.
Northern Species (includes any Canadian softwood covered by the NLGA Standard Grading Rules)	Select structural	2 x 4	8 7	7 9	7 3	6 10	9 10	8 11	8 3	7 9
		2 x 6	13 6	12 3	11 3	10 3	15 6	14 1	13 0	12 1
		2 x 8	17 10	16 2	14 10	13 7	20 5	18 6	17 2	15 11
		2 x 10	22 9	20 8	18 11	17 4	26 0	23 8	21 11	20 4
		2 x 12	27 8	25 2	23 1	21 1	31 8	28 9	26 9	24 9
	No. 1	2 x 4	8 7	7 9	7 2	6 6	9 10	8 11	8 3	7 8
		2 x 6	13 6	11 9	10 6	9 7	15 6	13 10	12 5	11 4
		2 x 8	17 10	15 6	13 11	12 8	20 5	18 3	16 4	14 11
		2 x 10	22 9	19 10	17 9	16 2	26 0	23 4	20 10	19 1
		2 x 12	27 8	24 1	21 7	19 8	31 8	28 5	25 5	23 2
	No. 2	2 x 4	8 3	7 4	6 6	5 11	9 6	8 7	7 8	7 0
		2 x 6	12 3	10 7	9 6	8 8	14 5	12 6	11 2	10 2
		2 x 8	16 2	14 0	12 6	11 5	19 0	16 5	14 8	13 5
		2 x 10	20 7	17 10	15 11	14 7	24 3	21 0	18 9	17 2
		2 x 12	25 1	21 8	19 5	17 8	29 6	25 6	22 10	20 10
	No. 3	2 x 4	6 3	5 5	4 10	4 5	7 4	6 4	5 8	5 2
		2 x 6	9 4	8 1	7 3	6 7	11 0	9 7	8 6	7 9
		2 x 8	12 4	10 8	9 7	8 9	14 7	12 7	11 3	10 3
		2 x 10	15 9	13 8	12 3	11 2	18 7	16 1	14 5	13 2
		2 x 12	19 3	16 8	14 10	13 7	22 7	19 7	17 6	16 0
	Construction	2 x 4	7 1	6 1	5 5	5 0	8 4	7 2	6 5	5 10
	Standard	2 x 4	5 4	4 7	4 1	3 9	6 3	5 5	4 10	4 5
	Utility	2 x 4	3 9	3 3	2 11	2 8	4 5	3 10	3 5	3 1
Northern Aspen (includes Aspen Poplar, Large Tooth Aspen and Balsam Poplar)	Select structural	2 x 4	8 8	7 11	7 4	6 11	10 0	9 1	8 5	7 11
		2 x 6	13 8	12 5	11 6	10 8	15 8	14 3	13 3	12 5
		2 x 8	18 1	16 5	15 3	14 1	20 8	18 9	17 5	16 5
		2 x 10	23 1	20 11	19 5	18 0	26 5	24 0	22 3	20 11
		2 x 12	28 0	25 6	23 8	21 11	32 1	29 2	27 1	25 6
	No. 1	2 x 4	8 8	7 11	7 4	6 9	10 0	9 1	8 5	7 11
		2 x 6	13 8	12 1	10 9	9 10	15 8	14 2	12 8	11 7
		2 x 8	18 1	15 11	14 3	13 0	20 8	18 9	16 9	15 3
		2 x 10	23 1	20 3	18 2	16 7	26 5	23 11	21 4	19 6
		2 x 12	28 0	24 8	22 1	20 2	32 1	29 1	26 0	23 9
	No. 2	2 x 4	8 5	7 6	6 8	6 1	9 7	8 9	7 10	7 2
		2 x 6	12 7	10 11	9 9	8 11	14 10	12 10	11 6	10 6
		2 x 8	16 7	14 4	12 10	11 9	19 7	16 11	15 2	13 10
		2 x 10	21 2	18 4	16 5	15 0	24 11	21 7	19 4	17 8
		2 x 12	25 9	22 4	20 0	18 3	30 4	26 3	23 6	21 5
	No. 3	2 x 4	6 6	5 8	5 0	4 7	7 8	6 8	5 11	5 5
		2 x 6	9 4	8 1	7 3	6 7	11 0	9 7	8 6	7 9
		2 x 8	12 4	10 8	9 7	8 9	14 7	12 7	11 3	10 3
		2 x 10	15 9	13 8	12 3	11 2	18 7	16 1	14 5	13 2
		2 x 12	19 3	16 8	14 10	13 7	22 7	19 7	17 6	16 0
	Construction	2 x 4	7 4	6 4	5 8	5 2	8 7	7 5	6 8	6 1
	Standard	2 x 4	5 8	4 11	4 4	4 0	6 8	5 9	5 2	4 8
	Utility	2 x 4	3 9	3 3	2 11	2 8	4 5	3 10	3 5	3 1

Table A-10
Forming Part of Article 9.23.4.1.

MAXIMUM SPANS ⁽¹⁾ FOR BUILT-UP WOOD BEAMS SUPPORTING NOT MORE THAN ONE FLOOR IN HOUSES														
Commercial Designation	Grade	Supported Joist Length, ⁽¹⁾ ft	Size of Built-Up Beam, in.											
			3-2 x 8		4-2 x 8		3-2 x 10		4-2 x 10		3-2 x 12		4-2 x 12	
			ft	in.	ft	in.	ft	in.	ft	in.	ft	in.	ft	in.
Douglas Fir-Larch (includes Douglas Fir and Western Larch)	No. 1	8	12	0	13	10	15	4	17	8	18	7	21	6
		10	10	9	12	5	13	8	15	10	16	8	19	3
		12	9	9	11	4	12	6	14	5	15	2	17	7
		14	8	10	10	5	11	4	13	4	13	9	16	7
	No. 2	16	7	10	9	9	10	1	12	6	12	3	15	2
		8	10	10	12	6	13	9	15	11	16	9	19	5
		10	9	8	11	2	12	4	14	3	15	0	17	4
		12	8	10	10	2	11	3	13	0	13	8	15	10
Hem-Fir (includes Western Hemlock, Amabilis Fir and Grand Fir)	No. 1	14	8	2	9	5	10	5	12	6	12	8	15	2
		16	7	2	9	1	9	2	11	7	11	1	14	1
		8	10	4	12	0	13	3	15	4	16	1	18	7
		10	9	3	10	9	11	10	13	8	14	5	16	8
	No. 2	12	8	2	9	9	10	5	12	6	12	8	15	2
		14	7	2	9	1	9	2	11	7	11	1	14	1
		16	6	5	8	2	8	2	10	5	10	0	12	8
		8	9	3	10	8	11	9	13	7	14	4	16	7
Eastern Hemlock-Tamarack (includes Eastern Hemlock and Tamarack)	No. 1	10	8	3	9	6	10	6	12	2	12	10	14	10
		12	7	6	8	8	9	7	11	1	11	8	13	6
		14	7	0	8	1	8	11	10	3	10	10	12	6
		16	6	5	7	6	8	2	9	7	10	0	11	8
	No. 2	8	10	4	12	0	13	3	15	4	16	1	18	7
		10	9	3	10	9	11	10	13	8	14	5	16	8
		12	8	6	9	9	10	10	12	6	13	2	15	2
		14	7	10	9	1	10	0	11	7	12	2	14	1
Coast Species (includes Douglas Fir, Western Larch, Western Hemlock, Amabilis Fir, Grand Fir and Coast Sitka Spruce)	No. 1	16	7	4	8	6	9	4	10	10	11	5	13	2
		8	10	2	11	9	12	11	15	0	18	0	20	10
		10	8	4	10	5	13	3	17	4	16	1	18	7
		12	7	2	9	2	9	2	11	8	14	9	17	0
	No. 2	14	6	4	8	0	8	1	10	3	9	10	12	5
		16	5	8	7	2	7	3	9	2	8	10	11	1
		8	9	3	10	8	11	9	13	7	14	4	16	7
		10	8	3	9	6	10	6	12	2	12	10	14	10
Spruce-Pine-Fir (includes Spruce (all species except Coast Sitka Spruce), Jack Pine, Lodgepole Pine, Ponderosa Pine, Balsam Fir and Alpine Fir)	No. 1	12	7	2	8	8	9	2	11	1	11	1	13	6
		14	6	4	8	0	8	1	10	3	9	10	12	5
		16	5	8	7	2	7	3	9	2	8	10	11	1
		8	9	11	11	6	12	8	14	8	15	5	17	10
	No. 2	10	8	11	10	3	11	4	13	1	13	10	15	11
		12	7	8	9	4	9	9	11	11	11	11	14	7
		14	6	9	8	7	8	7	10	11	10	5	13	4
		16	6	0	7	8	7	8	9	9	9	5	11	11
Western Cedars (includes Western Red Cedar and Pacific Coast Yellow Cedar)	No. 1	8	9	0	10	4	11	6	13	3	13	11	16	1
		10	8	0	9	3	10	3	11	10	12	6	14	5
		12	7	4	8	6	9	4	10	10	11	5	13	2
		14	6	9	7	10	8	7	10	0	10	5	12	2
	No. 2	16	6	0	7	4	7	8	9	4	9	5	11	5
		8	9	1	10	6	11	7	13	5	14	1	16	4
		10	8	2	9	7	10	5	12	3	12	8	14	10
		12	7	2	8	10	9	2	11	4	11	1	13	9

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Table A-10 (Cont'd)

MAXIMUM SPANS ⁽¹⁾ FOR BUILT-UP WOOD BEAMS SUPPORTING NOT MORE THAN ONE FLOOR IN HOUSES														
Commercial Designation	Grade	Supported Joist Length, ⁽¹⁾ ft	Size of Built-Up Beam, in.											
			3-2 x 8		4-2 x 8		3-2 x 10		4-2 x 10		3-2 x 12		4-2 x 12	
			ft	in.	ft	in.	ft	in.	ft	in.	ft	in.	ft	in.
Northern Species (includes any Canadian softwood covered by the NLGA Standard Grading Rules)	No. 1	8	9	8	11	3	12	5	14	4	15	1	17	5
		10	8	4	10	0	10	8	12	10	13	0	15	7
		12	7	2	9	2	9	2	11	8	11	1	14	3
		14	6	4	8	0	8	1	10	3	9	10	12	5
		16	5	8	7	2	7	3	9	2	8	10	11	1
	No. 2	8	8	9	10	1	11	2	12	10	13	7	15	8
		10	7	10	9	0	10	0	11	6	12	1	14	0
		12	7	1	8	3	9	1	10	6	11	1	12	9
		14	6	4	7	7	8	1	9	9	9	10	11	10
		16	5	8	7	1	7	3	9	1	8	10	11	1
Northern Aspen (includes Aspen Poplar, Large Tooth Aspen and Balsam Poplar)	No. 1	8	9	11	11	6	12	8	14	8	15	5	17	10
		10	8	4	10	3	10	8	13	1	13	0	15	11
		12	7	2	9	2	9	2	11	8	11	1	14	3
		14	6	4	8	0	8	0	10	3	9	9	12	5
		16	5	8	7	2	7	3	9	2	8	10	11	1
	No. 2	8	9	0	10	4	11	6	13	3	13	11	16	1
		10	8	0	9	3	10	3	11	10	12	6	14	5
		12	7	2	8	6	9	2	10	10	11	1	13	2
		14	6	4	7	10	8	0	10	0	9	9	12	2
		16	5	8	7	2	7	3	9	2	8	10	11	1

Note to Table A-10:

⁽¹⁾ See Appendix A.

Table A-11
Forming Part of Article 9.23.4.1.

MAXIMUM SPANS ⁽¹⁾ FOR BUILT-UP WOOD BEAMS SUPPORTING NOT MORE THAN TWO FLOORS IN HOUSES														
Commercial Designation	Grade	Supported Joist Length, (1) ft	Size of Built-Up Beam, in.											
			3-2 x 8		4-2 x 8		3-2 x 10		4-2 x 10		3-2 x 12		4-2 x 12	
			ft	in.	ft	in.	ft	in.	ft	in.	ft	in.	ft	in.
Douglas Fir-Larch (includes Douglas Fir and Western Larch)	No. 1	8	8	10	10	5	11	4	13	4	13	9	16	3
		10	7	4	9	4	9	4	11	11	11	5	14	6
		12	6	4	8	0	8	0	10	3	9	9	12	5
		14	5	7	7	0	7	1	9	0	8	8	10	11
		16	5	0	6	4	6	5	8	0	7	10	9	9
	No. 2	8	8	2	9	5	10	5	12	0	12	8	14	8
		10	7	3	8	5	9	4	10	9	11	4	13	1
		12	6	4	7	8	8	0	9	10	9	9	11	11
		14	5	7	7	0	7	1	9	0	8	8	10	11
		16	5	0	6	4	6	5	8	0	7	10	9	9
Hem-Fir (includes Western Hemlock, Amabilis Fir and Grand Fir)	No. 1	8	7	2	9	0	9	2	11	7	11	1	14	1
		10	5	11	7	7	7	7	9	8	9	3	11	9
		12	5	2	6	6	6	7	8	3	8	0	10	1
		14	4	7	5	9	5	10	7	4	7	2	8	11
		16	4	2	5	2	5	4	6	7	6	6	8	0
	No. 2	8	7	0	8	1	8	11	10	3	10	10	12	6
		10	5	11	7	2	7	7	9	2	9	3	11	2
		12	5	2	6	6	6	7	8	3	8	0	10	1
		14	4	7	5	9	5	10	7	4	7	2	8	11
		16	4	2	5	2	5	4	6	7	6	6	8	0
Eastern Hemlock-Tamarack (includes Eastern Hemlock and Tamarack)	No. 1	8	8	9	10	1	11	2	12	11	13	7	15	9
		10	7	4	9	1	9	4	11	7	11	5	14	1
		12	6	4	8	0	8	1	10	3	9	10	12	5
		14	5	7	7	0	7	1	9	0	8	8	10	11
		16	5	0	6	4	6	5	8	1	7	10	9	10
	No. 2	8	7	10	9	1	10	0	11	7	12	2	14	1
		10	7	0	8	1	8	11	10	4	10	11	12	7
		12	6	4	7	5	8	1	9	5	9	10	11	6
		14	5	7	6	10	7	1	8	9	8	8	10	7
		16	5	0	6	4	6	5	8	1	7	10	9	10
Coast Species (includes Douglas Fir, Western Larch, Western Hemlock, Amabilis Fir, Grand Fir and Coast Sitka Spruce)	No. 1	8	6	4	8	0	8	1	10	3	9	10	12	5
		10	5	3	6	8	6	9	8	6	8	2	10	4
		12	4	7	5	9	5	10	7	4	7	2	8	11
		14	4	1	5	1	5	3	6	6	6	5	7	11
		16	3	9	4	7	4	9	5	10	5	10	7	2
	No. 2	8	6	4	8	0	8	1	10	3	9	10	12	5
		10	5	3	6	8	6	9	8	6	8	2	10	4
		12	4	7	5	9	5	10	7	4	7	2	8	11
		14	4	1	5	1	5	3	6	6	6	5	7	11
		16	3	9	4	7	4	9	5	10	5	10	7	2
Spruce-Pine-Fir (includes Spruce (all species except Coast Sitka Spruce), Jack Pine, Lodgepole Pine, Ponderosa Pine, Balsam Fir and Alpine Fir)	No. 1	8	6	9	8	7	8	7	10	11	10	5	13	4
		10	5	7	7	1	7	2	9	1	8	9	11	0
		12	4	10	6	1	6	3	7	10	7	7	9	6
		14	4	4	5	5	5	7	6	11	6	9	8	5
		16	3	11	4	10	5	1	6	3	6	2	7	7
	No. 2	8	6	9	7	10	8	7	10	0	10	5	12	2
		10	5	7	7	0	7	2	8	11	8	9	10	11
		12	4	10	6	1	6	3	7	10	7	7	9	6
		14	4	4	5	5	5	7	6	11	6	9	8	5
		16	3	11	4	10	5	1	6	3	6	2	7	7
Western Cedars (includes Western Red Cedar and Pacific Coast Yellow Cedar)	No. 1	8	7	2	8	10	9	2	11	4	11	1	13	9
		10	5	11	7	7	7	7	9	8	9	3	11	9
		12	5	2	6	6	6	7	8	3	8	0	10	1
		14	4	7	5	9	5	10	7	4	7	2	8	11
		16	4	2	5	2	5	4	6	7	6	6	8	0
	No. 2	8	6	9	7	10	8	8	10	0	10	6	12	2
		10	5	11	7	0	7	7	8	11	9	3	10	11
		12	5	2	6	5	6	7	8	2	8	0	9	11
		14	4	7	5	9	5	10	7	4	7	2	8	11
		16	4	2	5	2	5	4	6	7	6	6	8	0

Continued on next page

Table A-11 (Cont'd)

MAXIMUM SPANS ⁽¹⁾ FOR BUILT-UP WOOD BEAMS SUPPORTING NOT MORE THAN TWO FLOORS IN HOUSES														
Commercial Designation	Grade	Supported Joist Length, ⁽¹⁾ ft	Size of Built-Up Beam, in.											
			3-2 x 8		4-2 x 8		3-2 x 10		4-2 x 10		3-2 x 12		4-2 x 12	
			ft	in.	ft	in.	ft	in.	ft	in.	ft	in.	ft	in.
Northern Species (includes any Canadian softwood covered by the NLGA Standard Grading Rules)	No. 1	8	6	4	8	0	8	1	10	3	9	10	12	5
		10	5	3	6	8	6	9	8	6	8	2	10	4
		12	4	7	5	9	5	10	7	4	7	2	8	11
		14	4	1	5	1	5	3	6	6	6	5	7	11
		16	3	9	4	7	4	9	5	10	5	10	7	2
	No. 2	8	6	4	7	7	8	1	9	9	9	10	11	10
		10	5	3	6	8	6	9	8	6	8	2	10	4
		12	4	7	5	9	5	10	7	4	7	2	8	11
		14	4	1	5	1	5	3	6	6	6	5	7	11
		16	3	9	4	7	4	9	5	10	5	10	7	2
Northern Aspen (includes Aspen Poplar, Large Tooth Aspen and Balsam Poplar)	No. 1	8	6	4	8	0	8	1	10	3	9	10	12	5
		10	5	3	6	8	6	9	8	6	8	2	10	4
		12	4	7	5	9	5	10	7	4	7	2	8	11
		14	4	1	5	1	5	3	6	6	6	5	7	11
		16	3	9	4	7	4	9	5	10	5	10	7	2
	No. 2	8	6	4	7	10	8	1	10	0	9	10	12	2
		10	5	3	6	8	6	9	8	6	8	2	10	4
		12	4	7	5	9	5	10	7	4	7	2	8	11
		14	4	1	5	1	5	3	6	6	6	5	7	11
		16	3	9	4	7	4	9	5	10	5	10	7	2

Note to Table A-11:

⁽¹⁾ See Appendix A.

Table A-12
Forming Part of Article 9.23.13.15.

MAXIMUM CLEAR SPANS BETWEEN END SUPPORTS FOR FINK TRUSSES, ft—in.										
Top Member Size, in.*	Bottom Member Size, in.*	Roof Slope	No. 1 Grade Lumber				No. 2 Grade Lumber			
			Roof Snow Load, psf				Roof Snow Load, psf			
			20	30	40	50	20	30	40	50
2 x 4	2 x 4	1 in 4.8	22—2	16—0	—	—	19—2	13—2	—	—
		1 in 4	31—5	26—8	19—9	14—11	26—4	23—5	17—0	12—5
		1 in 3	31—6	29—0	25—0	22—2	29—3	25—3	21—8	19—2
		1 in 2.4	32—2	29—8	25—7	22—9	29—11	25—10	22—3	19—9
	2 x 5	1 in 4.8	25—5	18—10	12—5	—	22—2	15—11	—	—
		1 in 4	30—5	28—0	23—2	18—0	28—2	24—2	20—2	15—4
		1 in 3	31—6	29—0	25—0	22—2	29—3	25—3	21—8	19—2
		1 in 2.4	32—2	29—8	25—7	22—9	29—11	25—10	22—3	19—9
	2 x 6	1 in 4.8	27—11	20—10	14—5	—	24—5	17—11	11—5	—
		1 in 4	30—5	28—0	23—11	19—4	28—2	24—2	20—8	16—8
		1 in 3	31—6	29—0	25—0	22—2	29—3	25—3	21—8	19—2
		1 in 2.4	32—2	29—8	25—7	22—9	29—11	25—10	22—3	19—9
2 x 5	2 x 4	1 in 4.8	26—2	19—5	13—0	—	22—10	16—6	—	—
		1 in 4	31—5	28—5	23—7	18—3	26—4	23—6	20—6	15—8
		1 in 3	34—7	32—0	28—11	26—2	29—5	26—11	24—0	21—7
		1 in 2.4	36—9	32—6	31—8	29—2	31—5	29—3	26—7	24—4
	2 x 5	1 in 4.8	30—5	22—11	16—3	10—10	26—8	19—10	13—5	—
		1 in 4	39—1	33—7	27—10	21—11	33—10	30—4	24—5	19—0
		1 in 3	40—0	34—11	30—0	28—5	35—3	30—4	27—10	24—7
		1 in 2.4	40—0	35—9	30—10	29—3	36—1	31—2	28—7	25—5
	2 x 6	1 in 4.8	33—7	25—7	18—6	13—5	29—7	22—3	15—8	—
		1 in 4	39—1	33—7	29—11	23—9	33—10	31—1	26—5	20—8
		1 in 3	40—0	34—11	30—0	28—5	35—3	31—1	27—10	24—7
		1 in 2.4	40—0	35—9	30—10	29—3	36—1	31—2	28—7	25—5
2 x 6	2 x 4	1 in 4.8	29—2	22—1	15—6	—	24—3	19—1	12—8	—
		1 in 4	31—5	28—5	25—0	20—10	26—4	23—6	20—6	18—0
		1 in 3	34—7	32—0	28—11	26—2	29—5	26—11	24—0	21—7
		1 in 2.4	36—9	34—5	31—8	29—2	31—5	29—3	26—7	24—4
	2 x 5	1 in 4.8	34—4	26—2	19—0	13—11	30—3	22—10	16—2	10—9
		1 in 4	40—0	36—6	31—7	25—1	33—11	30—4	26—4	21—11
		1 in 3	40—0	40—0	36—8	32—6	37—9	34—7	30—11	27—9
		1 in 2.4	40—0	40—0	37—8	33—5	40—0	37—7	32—9	31—0
	2 x 6	1 in 4.8	38—4	29—5	21—8	16—5	33—11	25—9	18—8	13—7
		1 in 4	40—0	40—0	34—3	27—4	40—0	35—6	30—3	24—0
		1 in 3	40—0	40—0	36—8	32—6	40—0	37—1	31—9	30—1
		1 in 2.4	40—0	40—0	37—8	33—5	40—0	38—1	32—9	31—0
Column 1	2	3	4	5	6	7	8	9	10	11

*Nominal dimension.

Table A-13
Forming Part of Article 9.23.13.15.

MAXIMUM CLEAR SPANS BETWEEN END SUPPORTS FOR HOWE TRUSSES, ft—in.										
Top Member Size, in.*	Bottom Member Size, in.*	Roof Slope	No. 1 Grade Lumber				No. 2 Grade Lumber			
			Roof Snow Load, psf				Roof Snow Load, psf			
			20	30	40	50	20	30	40	50
2 x 4	2 x 4	1 in 4.8	31—0	24—0	18—0	13—11	27—3	21—2	15—8	11—11
		1 in 4	31—0	27—11	23—11	21—1	28—1	24—2	20—7	18—2
		1 in 3	31—5	29—0	24—11	22—1	29—2	25—2	21—7	19—2
		1 in 2.4	32—1	29—8	25—7	22—9	29—10	25—10	22—3	19—9
	2 x 5	1 in 4.8	31—7	26—9	20—3	15—10	27—3	23—4	17—9	13—9
		1 in 4	31—7	27—11	23—11	21—1	28—1	24—2	20—7	18—2
		1 in 3	31—7	29—0	24—11	22—1	29—2	25—2	21—7	19—2
		1 in 2.4	32—1	29—8	25—7	22—9	29—10	25—10	22—3	19—9
	2 x 6	1 in 4.8	31—7	27—1	23—1	18—6	27—3	23—4	19—10	16—2
		1 in 4	31—7	27—11	23—11	21—1	28—1	24—2	20—7	18—2
		1 in 3	31—7	29—0	24—11	22—1	29—2	25—2	21—7	19—2
		1 in 2.4	32—1	29—8	25—7	22—9	29—10	25—10	22—3	19—9
2 x 5	2 x 4	1 in 4.8	33—5	27—2	20—7	16—2	27—5	23—6	18—0	14—0
		1 in 4	36—9	32—4	27—9	24—1	30—5	26—6	22—5	19—4
		1 in 3	40—0	34—11	30—0	28—5	34—11	30—3	27—2	23—11
		1 in 2.4	40—0	35—9	30—9	29—2	36—0	31—1	28—7	25—4
	2 x 5	1 in 4.8	37—10	30—9	23—5	18—7	32—8	27—3	20—7	16—2
		1 in 4	39—0	33—6	30—9	27—2	33—9	31—0	26—6	23—4
		1 in 3	40—0	34—11	30—9	28—5	35—2	31—0	27—9	24—7
		1 in 2.4	40—0	35—9	30—9	29—2	36—0	31—1	28—7	25—4
	2 x 6	1 in 4.8	37—10	32—6	27—5	21—11	32—8	30—0	24—3	19—3
		1 in 4	39—0	33—6	30—9	27—2	33—9	31—0	26—6	23—4
		1 in 3	40—0	34—11	30—9	28—5	35—2	31—0	27—9	24—7
		1 in 2.4	40—0	35—9	30—9	29—2	36—0	31—1	28—7	25—4
2 x 6	2 x 4	1 in 4.8	33—5	28—8	22—8	17—11	27—5	23—6	19—7	15—7
		1 in 4	36—9	32—4	27—9	24—1	30—5	26—6	22—5	19—4
		1 in 3	40—0	37—8	33—2	29—5	34—11	31—3	27—2	23—11
		1 in 2.4	40—0	40—0	37—3	33—5	38—1	34—9	30—10	27—7
	2 x 5	1 in 4.8	40—0	33—10	25—11	20—8	35—3	30—1	22—10	18—1
		1 in 4	40—0	40—0	35—1	30—11	39—1	34—1	28—10	24—11
		1 in 3	40—0	40—0	36—8	32—6	40—0	37—0	31—9	30—1
		1 in 2.4	40—0	40—0	37—7	33—5	40—0	38—0	32—8	31—0
	2 x 6	1 in 4.8	40—0	39—8	30—8	24—8	39—11	34—2	27—3	21—9
		1 in 4	40—0	40—0	35—1	30—11	40—0	35—5	30—2	28—6
		1 in 3	40—0	40—0	36—8	32—6	40—0	37—0	31—9	30—1
		1 in 2.4	40—0	40—0	37—7	33—5	40—0	38—0	32—8	31—0
Column 1	2	3	4	5	6	7	8	9	10	11

*Nominal dimension.

INDEX

This index has been prepared for reference convenience. It may not include all references to each topic and may not include all possible subjects.

- Administering the Code, Part 1
- Abbreviations,
 - names of associations, 1.4.1.1.
 - words and phrases, 1.4.2.1.
- Access for fire fighting, 3.2.2.4., 3.2.5.1., 3.2.5.2., 8.2.2.7., 9.10.20.4., 9.10.20.5.
- Access openings through barricades, 8.2.1.3.(3)
- Access to
 - attic spaces, 3.5.4.3.(2), 9.19.2.1.
 - crawl spaces, 3.5.4.3.(4), 9.18.2.1., 9.18.2.2.
 - fire dampers, 6.2.3.9.(6)
 - heating, ventilating and air-conditioning equipment, 6.2.1.4.(1), 9.18.4.2., 9.33.4.7., 9.34.2.2.
 - horizontal service spaces, 3.5.4.3.(3)
 - roof areas, 3.5.4.3.(1), 3.5.4.3.(5)
- Access to exits, 3.3.1.2., 3.3.1.13.(2), 3.3.2.6., 3.3.2.7., 3.3.2.8., 9.9.2.1., 9.9.3.1., 9.9.7. capacity of, 3.3.1.10., 9.9.3.4., 9.9.3.7. from roofs, 3.3.1.2.(1), 9.9.2.1. headroom clearance in, 3.3.1.5., 9.9.3.9. in residential occupancy, 3.3.4.3.(1), 3.3.4.3.(3), 3.3.4.3.(6) width of, 3.3.1.6.(1), 3.3.1.6.(2), 3.3.1.6.(3), 9.9.3.5., 9.9.3.6.
- Adfreezing, design considerations for, 4.2.4.6.(1)
- Aggregate
 - for built-up roofs, 9.27.11.4., 9.27.11.6.
 - for concrete, 9.3.1.3.
 - for stucco, 9.29.2.2.
- Airborne sound rating, 9.11.1., 9.11.2.
- Air-conditioning systems, Part 6, 9.34.1., 9.34.2., 9.34.3., 9.34.4., 9.34.5., 9.34.6.
- Air contaminants, 3.2.6.2., 6.2.2.3., 9.33.2.4., 9.33.2.5.
- Air duct systems (see Ducts)
- Air filters, 6.2.3.14.
- Air intakes, 6.2.3.13., 9.33.4.5., 9.33.4.8., 9.33.4.9., 9.34.5.4., 9.34.6.8., 9.34.6.11., 9.34.6.12.
- Air openings for combustion, 6.2.5.1.(2)
- Air outlets, 6.2.3.13., 9.33.4.3., 9.33.4.6., 9.33.4.8., 9.34.4., 9.34.5.2., 9.34.5.3.
- Air-supported structures, 3.1.4.7., 9.10.2.10.
- Air washers, 6.2.3.14.(2)
- Aisles, 3.3.2.5.
- Alterations, 8.1.1.2.
- Alternative materials, 2.6.1., 2.6.3.
- Aluminum,
 - design and construction of, 4.7.1.
 - siding, 9.28.12.3., 9.28.12.4., 9.28.12.5.
- Anchorage,
 - against overturning, 4.1.3.4.
 - of masonry, 9.20.11.1., 9.20.11.2., 9.20.11.3., 9.20.11.5.
 - of roofs, floors and intersecting walls, 4.1.9.1.(13), 9.20.11.4.
 - to foundations, 9.23.6., 9.24.5.2., 9.36.5.3.
- Annunciators, fire alarm, 3.2.4.1.(11), 3.2.4.1.(12), 3.2.4.4.(8), 3.2.4.4.(10), 3.2.4.5.(1)
- Appliances, installation of (see also Equipment),
 - heating, 6.2.1., 6.2.4., 9.34.2.3., 9.34.2.4., 9.34.9.
 - in means of egress, 3.5.2.1.(1), 9.9.5.6.
 - ventilating, 6.2.1., 6.2.2.
- Application of Code, 1.2.1.1., 1.2.1.2., 1.2.2.1.
- Areas of rooms, 3.6.1.2., 9.5.1., 9.5.3., 9.5.4., 9.5.5., 9.5.6.
- Arena-type buildings, 3.1.2.1.(4)
- Asbestos, 1.5.9.
- Asbestos cement,
 - pipe, 9.14.3.1.
 - siding, 9.23.17.7., 9.28.1.1., 9.28.5.6., 9.28.5.8., 9.28.5.9., 9.28.8.
- Ash storage bins, 6.2.12.2.
- Assembly occupancies,
 - building construction for, 3.2.2.9., 3.2.2.10., 3.2.2.11., 3.2.2.12., 3.2.2.13., 3.2.2.14., 3.2.2.15., 3.2.2.16., 3.2.2.17., 3.2.2.18., 3.2.2.19., 3.2.2.20., 3.2.2.21.
 - classification of, 3.1.2.
 - fire alarm systems for, 3.2.4.1.
 - fire safety within floor areas of, 3.3.1., 3.3.2.
 - high buildings of, 3.2.6.1.(1)
 - outdoor, 3.3.2.11.
 - standpipes and hose systems for, 3.2.5.4.
- Attics (see also Horizontal service space), 3.1.4.4.(12), 3.1.9.1.(5), 3.5.1.1., 3.5.4.1., 9.10.9.13., 9.10.9.14., 9.10.9.24., 9.19.1., 9.19.2.
- Backfilling, 4.2.2.3.(2), 4.2.5.8.(1), 4.2.5.8.(2), 9.12.3., 9.12.4.1.
- Balconies (see also Mezzanines),
 - as horizontal exits, 3.4.8.11.(2), 3.4.8.11.(7)
 - exterior, 3.2.2.5.(1), 3.2.6.2.(8), 9.10.7.6.
 - occupant load of, 3.1.14.1.(2)
- Barrier free building, 3.2.7., 9.9.2.7., 9.9.2.8.
- Basement or cellar, 3.2.2.3., 3.2.2.7., 3.2.5.1.(4), 3.2.7.4., 9.10.2.5., 9.10.8.8., 9.10.8.9., 9.10.9.19., 9.10.11.9.
- crawl spaces considered as, 3.2.2.3.(2), 9.10.8.5.
- used as a storage garage, 3.2.1.3., 9.10.8.9.

- Beams,
glued-laminated, 9.24.4.1.
preservative treatment of, 9.23.2.3.
support on masonry, 9.15.5.2.
- Bedrooms, 9.5.6.
- Boiler room, 3.5.2.2., 3.5.2.7., 6.2.5.1.(2),
9.9.2.5.
- Boilers, solid-fuel burning, 6.2.5.
clearances for, 6.2.5.3.
controls and safety devices for, 6.2.5.4.,
6.2.5.5.
mounting of, 6.2.5.2.
- Bracing, for wood framing, 9.23.18.
- Breeching, solid fuel-burning appliances,
6.3.8.1.
- Building areas, 3.2.2.2.
- Building classification, 3.1.2., 9.10.3.
- Building height, 3.2.1.2., 3.2.2.2., 9.10.8.7.
- Building Services in fire separations and fire
rated assemblies, 3.1.7.
- Business and personal services occupancies,
building construction for, 3.2.2.29.,
3.2.2.30., 3.2.2.31., 3.2.2.32., 9.10.8.
classification of, 3.1.2., 9.10.3.4.
fire alarm systems for, 3.2.4.1., 9.10.18.
fire safety within floor areas of, 3.3.1.,
3.3.5.
high buildings of, 3.2.6.1.(1)
standpipes and hose systems for, 3.2.5.4.,
9.10.2.14.
- Calculations and analysis (see also Plans,
specifications and calculations), 2.4.4.5.
- Carpets, 3.1.10.1.(2)
- Carports, 9.36
- Caulking, 9.7.5., 9.20.15.3., 9.26.5.14., 9.28.4.,
9.29.1.5., 9.30.13.4.
- Cavity walls (see also Masonry), 9.20.6.2.,
9.20.9.8.
- Ceilings, open grid and translucent, below
sprinkler systems, 3.1.11.1.(3)
- Ceiling spaces used as plenums, 6.2.3.2.(4),
9.34.6.13.
- Central alarm and control facility, 3.2.6.8.
- Ceramic tile, 9.30.13., 9.31.6.1.
- Certification, 1.5.5.
- Children's custodial homes, 3.1.2.1.(6)
- Chimney,
flues, 6.3.1.4.(1), 6.3.2.1.(4), 6.3.7., 6.3.8.,
9.21.2.
linings, 6.3.2.1.(2), 6.3.2.1.(3), 6.3.3.1.(4),
6.3.4.1.(2), 9.21.3.
saddles, 9.27.4.8., 9.27.4.9.
- Chimneys, 6.3, 9.21
access ladders to, 6.3.1.6.(1)
clearances for, 6.3.1.1.(8), 6.3.2.1.(6),
6.3.2.1.(7), 6.3.2.1.(10), 6.3.5.1.(8),
6.3.5.1.(9), 6.3.5.1.(10), 6.3.5.1.(11),
9.21.6., 9.26.5.10.
concrete, 6.3.4., 9.21.4.
dampers and draft regulators for, 9.21.1.5.
design of, 9.21.1.1.
factory built, 6.3.6., 9.21.1.3.
flue pipes for, 6.3.7., 9.21.5.
lightning protection for, 6.3.1.5.
masonry, 6.3.2., 6.3.3., 9.21.4.
metal, 6.3.5., 9.21.1.2.
provisions for cleaning of, 6.3.1.4.
rectangular brick, 6.3.2.
- Chutes, linen and refuse, 3.5.3.2., 6.4.1.1.,
8.2.6.2., 9.10.12.
- Cladding (see also Siding, Roofing, and Finish,
interior), Part 5
- Clearance for,
boilers and furnaces, 6.2.5.
boots and register boxes, 6.2.3.8.,
9.34.3.10.
breechings, 6.3.8.1.(7), 6.3.8.1.(8),
6.3.8.1.(9)
chimneys, 6.3.1.1.(8), 6.3.2.1.(6),
6.3.2.1.(7), 6.3.2.1.(10), 6.3.5.1.(8),
6.3.5.1.(9), 6.3.5.1.(10), 6.3.5.1.(11),
9.21.6., 9.26.5.10.
door and window frames, 9.28.10.5.
ducts, 6.2.3.8., 9.34.3.7., 9.34.3.8.,
9.34.3.9.
electric and gas fired ranges, 9.34.10.
fireplaces, 9.22.9.
flue pipes, 6.3.8.1.(7), 6.3.8.1.(8),
6.3.8.1.(9), 9.21.6.5.
furnace plenums, 6.2.3.8., 9.34.3.6.
heat exchangers, 9.34.8.1.
hot water pipes, 6.2.10.6., 9.34.7.3.
service water heaters, 6.2.8.2.
solid fuel-fired appliances, 6.2.6.2.,
9.34.9.2.
supply ducts, 9.34.3.7., 9.34.3.8., 9.34.3.9.
unit heaters, 6.2.8.2.
- Climatic Data, 2.3.1.1., Part 11
- Closures,
fire dampers used as, 3.1.6.5.
fire-protection rating of, 3.1.6.4.(1),
3.1.6.4.(2), 3.1.6.4.(3), 9.10.4.1.,
9.10.14.1.
for chutes, 3.5.3.2.(2), 3.5.3.2.(3),
3.5.3.2.(4)
hold-open devices for, 3.1.6.7.
in exterior wall openings, 3.2.3.4.(2)
in fire separations, 3.1.6., 3.2.9.1.(5),
3.2.9.1.(6), 9.10.14.
installation of, 3.1.6.4.(4), 3.1.6.4.(5)
wired glass and glass block, 3.1.6.8.(2),
3.2.3.4.(2), 9.10.14.5.
- Clothes dryer vents, 9.33.4.13.
- Cold weather requirements, 9.3.1.10.,
9.20.17.1., 9.29.6.1., 9.30.7.10., 9.30.8.9.
- Collar ties, 9.23.13.7.
- Columns, 9.17
- Combustible construction, 3.1.4.1., 3.1.4.2.,
3.1.4.3., 3.1.4.4., 3.1.4.5., 3.2.2.27.(4)
foamed plastics in, 3.1.4.1.(2), 9.30.1.2.
- Combustible materials in noncombustible
construction, 3.1.4.5., 3.1.6.2., 3.1.9.1.(3),
3.1.9.1.(4), 3.2.9.10., 3.3.4.6., 3.3.5.2.,
3.3.6.2., 9.10.6.1.

- Combustion air, 9.22.1.4.
- Commercial cooking equipment, 3.3.1.1.(4), 6.2.2.3.(4), 9.10.2.8.
- Communication systems in high buildings, 3.2.6.8., 3.2.6.9.
- Concealed spaces,
 fire separation of, 3.1.6.3., 3.5.1.3., 3.5.4.2., 9.10.9.13., 9.10.9.14.
 fire stopping of, 3.1.9.1., 9.10.16.4., 9.10.16.5.
 horizontal, 3.1.4.4.(12), 3.1.6.3., 3.1.9.1.(2), 3.1.9.1.(5), 9.10.9.13., 9.10.9.14.
 insulation of, 3.1.9.2.
- Concrete, 9.3.1.
 aggregate, 9.3.1.3.
 as a thermal barrier, 3.1.4.5.(2)
 cantilevered precast steps, 9.8.10.
 design of, 4.2.3.5., 4.5.2., 9.3.1.1.
 foundations, 4.2.3.5., 4.2.3.6., 9.15.1.1., 9.15.2.1.
 prestressed, 4.5.1., 4.5.2.
- Condensation control, 5.2.1., 9.26.5.
- Conduit, electrical, 3.1.7.1., 3.1.8.1.(11)
- Contraction (see Expansion and contraction)
- Conflict of provisions, 2.2.2.
- Connected buildings, 3.2.6.2.(9)
- Connections, fire department,
 for sprinkler systems, 3.2.5.5.(4)
 for standpipe and hose systems, 3.2.5.2.(3), 3.2.5.2.(4), 3.2.5.4.(2), 3.2.5.4.(11)
- Connectors,
 duct (see Ducts, connectors for)
 isolation, 6.2.3.4.
- Construction safety measures, 1.5.3., Part 8
- Construction site, protection of, 8.2.2.
- Construction types, 3.1.4., 9.10.6.
- Contaminants, air, 6.2.2.3., 9.33.2.4., 9.33.2.5.
- Control joints, 9.15.4.7.
- Convalescent homes, 3.1.2.1.(6)
- Convectors, 6.2.9.1., 9.34.8.2.
- Corridors,
 as access to exits, 3.3.1.6., 3.3.1.7., 3.3.1.8., 3.3.2.6.
 dead end, 3.3.1.17., 9.9.7.2.
 dimensions of, 3.3.1.6., 9.9.3.4., 9.9.3.5.
 doors opening onto, 3.3.1.7., 3.3.1.8.
 emergency lighting for, 3.2.8.3.(1), 9.9.11.3.
 exits for, 3.3.1.3.(1)
 fire separation of, 3.3.1.3.(2), 9.10.9.20., 9.10.9.21.
 flame-spread of interior finish of, 3.3.1.11., 9.10.17.2., 9.10.17.4., 9.10.17.5., 9.10.17.6.
 guards on stairs in, 3.3.1.12.
 height and width of, 3.3.1.5., 3.3.1.6., 3.4.3.1.(3), 9.9.3.4., 9.9.3.5., 9.9.3.9.
 illumination of, 3.2.8.1.(1), 3.3.1.6.(4), 9.9.11.2., 9.35.2.9.
 in institutional occupancies, 3.3.3.3.
- transparent doorways and panels in, 3.3.1.13.
 windows in, 3.3.1.13.(5)
- Cooling equipment, 6.2.3.14.(4), 6.2.3.14.(5), 6.2.3.15.(2), 6.2.11.1.
- Covered malls (see Malls, covered)
- Covered way, 8.2.1.2.
- Cranes, loads due to, 4.1.10.4.
- Crawl spaces, 3.5.4., 9.18., 9.34.4.3.(2)
 control of groundwater in, 5.4.3.2.
 floors over, 9.10.2.2., 9.10.9.6.
 heating requirements for, 9.34.2.7.
 insulation of, 9.18.1.3.
 regulated as basement or cellar, 3.2.2.3.(2), 9.10.8.5.
 used for any occupancy, 9.10.8.5.
- Dampers, 3.1.6.4.(5), 3.1.6.5., 9.21.1.5., 9.33.4.9., 9.34.4.5.
 fire, used as closures, 3.1.6.5., 6.2.3.9., 9.10.14.15., 9.10.14.16.
 in fireplaces, 9.22.6.1.
 tests for, 3.1.6.4.(1)
- Dampproofing, 9.13.1., 9.13.2., 9.13.5., 9.13.6.
 of crawl spaces, 9.18.6.1.
 of slabs, 9.13.6.
 of walls, 5.4.2.1., 9.13.5., 9.20.15.
- Day care centres, 3.1.2.1.
- Dead end corridors, 3.3.1.17., 9.9.7.2.
- Dead loads, 4.1, 9.4
- Debris, 8.2.6.
- Decking, 3.1.4.5.(2), 3.1.12.1., 9.23.15.6., 9.24.3., 9.27.9.1.
- Deep foundations,
 allowable loads on, 4.2.7.3.(1), 4.2.7.3.(2)
 design of, 4.2.7.2.
 driving and handling of, 4.2.7.3.(5)
 installation of, 4.2.7.6.
 load testing of, 4.2.7.2.(2)
 location and alignment of, 4.2.7.4., 4.2.7.5.
 structural requirements for, 4.2.7.2., 4.2.7.3.
- Definitions of words and phrases, 1.3.2.
- Deflections, 4.1.1.5., 9.4.5.
- Demolition, 8.1.1.3., 8.1.2.1.
- Design loads, 4.1, 9.4.
- Design, structural, Part 4
- Designer, 4.1.1.2.(2)
- Detectors,
 heat, 3.2.4.4.(2), 3.2.4.4.(3), 9.10.18.4.
 smoke, 3.2.4.4.(2), 3.2.4.4.(4), 3.2.4.4.(6), 3.2.4.4.(7), 9.10.18.4., 9.10.18.5., 9.10.19.
 sprinklers installed in lieu of, 3.2.4.4.(7), 3.2.4.4.(8)
- Diffusers, air, 6.2.3.13.(3), 9.34.5.2., 9.34.5.3.
- Dining rooms, 9.5.4.
- Dimensions, lumber, 3.1.4.4., 9.3.2.7.
- Documents, referenced, 2.2.1., 2.2.2., 2.2.3.
- Doors and Doorways (see also Closures),
 3.1.6.6., 3.1.6.7., 3.3.1.4.(1), 3.3.1.4.(2), 3.3.1.7., 3.3.1.8., 9.6, 9.9.6., 9.10.14.

between a dwelling unit and a garage, 9.10.14.17.
 direction of swing for, 3.3.1.7., 3.4.8.13.(6), 9.9.6.6., 9.9.6.9.
 egress from rooms or suites through, 3.3.1.3.(1), 3.3.1.4.(1), 3.3.1.4.(2), 9.9.7.1., 9.9.7.4.
 exit through, 3.4.6.1.(1), 3.4.6.1.(5), 3.4.8.13., 9.9.6.
 exterior, 9.6.4., 9.6.5.
 for storage garage, 9.6.2.3.
 glass, 3.3.1.13.(1), 3.3.1.13.(4), 3.4.1.4., 9.6.5., 9.9.4.3.
 hardware for, 3.1.6.7., 3.3.1.13.(1), 3.3.2.7., 3.3.5.4., 3.4.8.13.(11), 3.4.8.13.(12), 3.4.8.13.(13), 9.9.6.4., 9.9.6.11., 9.9.6.12., 9.9.6.13.
 height and width of, 3.3.1.8.(1), 3.4.3.1.(6), 3.4.3.1.(8), 9.6.3., 9.9.6.5.
 hold-open devices for, 3.1.6.7.
 in fire separations, 3.1.6.6., 3.1.6.9., 3.3.3.6.(3), 9.10.14.
 in means of egress, 3.3.1.3.(1), 3.3.1.4.(1), 3.3.1.4.(2), 3.3.1.7., 3.3.1.8.(1), 9.9.6.
 in public corridors, 3.3.1.7., 3.3.1.8.(1), 3.3.2.7.(1), 9.9.6.5., 9.9.6.6.
 over landings, 3.4.8.13.(1), 9.8.4.2., 9.8.4.3.
 revolving, 3.4.8.13.(10), 9.9.6.10.
 to service rooms, 3.5.2.7., 9.10.14.12.
 Door stops, 3.1.6.4.(6), 9.10.14.19.
 Downspouts, 9.14.6.4., 9.27.15.
 Draft regulators, 6.2.5.5.(5)
 Drainage, 9.14, 9.16.4., 9.18.5.
 Drainage systems, plumbing, sanitary, 9.32
 Drains, floor, 9.32.4.4., 9.32.4.5.
 Drain, waste, vent piping, 3.1.7.2.(2), 9.10.9.26.
 Drawings (see Plans, specifications and calculations)
 Dry standpipes, 3.2.5.4.(6)
 Dry wells, 9.14.5.
 Ducts, 6.2.3., 9.33.4., 9.34.3., 9.34.6.
 clearances for, 6.2.3.8., 9.34.3.7., 9.34.3.8., 9.34.3.9., 9.34.3.10.
 connecting two fire compartments, 9.10.14.13.
 connectors, for, 6.2.3.2.(3)
 construction of, 6.2.3.2., 9.34.3.1., 9.34.3.2.
 covering for, 6.2.3.6., 9.10.17.8.
 exhaust, 6.2.3.11., 9.33.4.3., 9.33.4.4., 9.33.4.6., 9.33.4.7., 9.33.4.8., 9.33.4.11.
 fittings for, 6.2.3.2., 9.34.5.1.
 in ceiling space, 3.1.7.1.(1), 3.1.7.3., 3.5.4.3.(3), 9.10.5.3.
 in fire rated assemblies, 3.1.7.1.(1), 3.1.7.3., 3.1.8.1.(11), 9.10.5.3.
 in noncombustible construction, 3.1.4.5.(4), 3.1.4.5.(7)
 in slabs, 9.16.7.2.
 insulation of, 6.2.3.6.
 joints and seams for, 6.2.3.5., 9.34.3.12., 9.34.3.13.

lining for, 6.2.3.6., 9.10.17.8.
 materials for, 6.2.3.2.
 piercing fire stops, 3.1.9.1.(9), 9.10.16.7.
 return, 9.34.6.
 supports for, 6.2.3.3.(1), 9.34.3.5., 9.34.3.14.
 supply, 6.2.3., 9.34.3.
 trunk, 9.34.3.14.
 underground, 6.2.3.7., 9.33.4.12.
 Duct-type smoke detectors, 3.2.4.4.(6)
 Dumbwaiter, design, construction, installation and alteration of, 3.5.5.
 Earthquake design, 4.1.9., 9.4.6., 9.20.18.
 Eave protection, 9.27.5.
 Eave troughs, 9.27.15.2.
 Electrical conductors, protection of in high buildings, 3.2.6.3.(2), 3.2.6.10.
 Electrical conduit, 3.1.7.1.
 Electrical equipment, 6.2.1.6., 9.35
 wiring of, 6.2.1.6.
 Electrical outlet boxes, 3.1.4.5.(6), 3.1.7.1.(1), 3.1.7.1.(5), 3.1.7.1.(6)
 Elevators,
 design, construction, installation and alteration of, 3.5.5., 9.10.2.10.
 firefighters, 3.2.6.2.(4), 3.2.6.4.
 for physically handicapped persons, 3.2.7.2.
 in high buildings, 3.2.6.3., 3.2.6.11.(4), 3.5.5.1.(3)
 machinery rooms for, 3.2.1.2.(1), 3.2.2.6.(1)
 Emergency lighting, 3.2.8.3., 9.9.11.3., 9.9.11.4.
 Emergency power supply, 3.2.4.5.(1), 3.2.6.11., 3.2.8.3.(2), 3.2.8.4.(1), 9.9.11.4.
 Entrance to barrier free buildings for physically handicapped persons, 3.2.7.1., 9.9.2.7.
 Enclosures for,
 appliances, 6.2.4.2.(1)
 metal chimney, 6.3.5.1.(12), 6.3.5.1.(13), 6.3.5.1.(14)
 Equipment (see also Appliances),
 cooking, 3.3.1.1.(4), 6.2.2.3.(4), 9.10.2.8.
 electrical, 6.2.1.6.
 fire extinguishing, 8.2.2.1., 8.2.2.2., 8.2.2.3., 8.2.2.4., 8.2.2.5.
 fire protection, 8.2.2.
 heating, ventilating and air-conditioning, Part 6
 odour removal, 6.2.2.1., 6.2.3.14.(8)
 space cooling, 6.2.11., 9.34.2.2.
 space heating, 6.2.4., 9.34.2.2.
 Equivalents, 1.5.4., 2.6
 foundation, 2.6.2.
 materials, 2.6.3.
 test standards, 2.6.4.
 Escalators, design, construction, installation and alteration of, 3.5.5.1., 9.10.2.10.
 Evaporative cooling equipment, 6.2.3.14.(4), 6.2.3.14.(5)
 Excavations, 8.2.3., 9.12
 design of, 4.2.5.

Exhaust ducts (see Ducts)

Exhaust systems, 3.2.9.8., 3.3.1.14.(1),
6.2.3.11., 6.2.3.13., 9.33.2.1., 9.33.2.5.,
9.33.4.3., 9.33.4.4., 9.33.4.5., 9.33.4.6.,
9.33.4.7., 9.33.4.8., 9.33.4.11.

Exits,

access to, 3.3.1.2., 3.3.1.3.(1), 3.3.1.4.,
3.3.1.5., 3.3.1.6., 3.3.1.7., 3.3.1.8.,
3.3.1.9., 3.3.1.10., 3.3.1.13.,
3.4.8.13.(14), 3.4.8.13.(15), 9.9.2.1.,
9.9.7.

aggregate width of, 3.4.3.1.(1), 3.4.3.1.(7),
3.4.3.2., 3.4.3.3.(1), 9.9.3.4., 9.9.3.8.

appliances in, 9.9.5.6.

capacity of, 3.4.3.1.

distance between, 3.4.2.2., 9.9.8.5.

doors for, 3.4.3.4.(2), 3.4.3.4.(3), 3.4.8.13.,
9.9.6.

emergency lighting for, 3.2.8.3.

fire separation of, 3.4.5., 9.9.4.2.

for covered malls, 3.4.2.4.

for mezzanines, 3.4.2.1.(6), 9.9.8.8.

from dwelling units, 9.9.9.

general requirements for, 3.4.1., 9.9.2.

glass doors in, 3.4.1.4.

headroom clearance for, 3.4.3.5., 9.8.3.7.,
9.9.3.9., 9.9.6.4., 9.9.6.5.

horizontal, 3.4.1.3.(1), 3.4.8.11., 9.9.2.9.

interior finish of, 3.4.4.1., 9.10.17.3.

lighting of, 3.4.7.1., 9.9.11.

minimum number, 3.3.2.11.(1), 3.4.2.1.(1),
3.4.2.1.(2), 9.9.8.2.

mirrors prohibited in, 3.4.8.13.(5), 9.9.5.5.

obstructions permitted in, 3.4.3.4., 9.9.5.3.,
9.9.5.4., 9.9.6.2., 9.9.6.4.

service rooms under, 3.5.2.2., 9.9.5.7.

serving interconnected floor spaces,
3.2.9.3.(1), 3.2.9.3.(2), 3.2.9.4.(2)

signs for, 3.4.6., 3.4.8.7., 9.9.10.

stairs for, 3.4.8.9., 3.4.8.10., 9.8.3., 9.8.4.,
9.8.5., 9.8.6., 9.8.7., 9.8.8., 9.8.9.

through a lobby, 3.4.5.1.(4), 3.4.5.1.(5),
9.9.8.7.

travel distance to, 3.4.2.1.(2), 3.4.2.1.(5),
3.4.2.3.(1), 3.4.2.3.(2), 3.4.2.4.(1),
9.9.8.1.

types of, 3.4.1.2., 3.4.8., 9.9.2.2.

unit of exit width for, 3.4.3.3., 9.9.3.7.,
9.9.8.3.

width and height of, 3.4.3., 9.9.3.

windows in, 3.4.5.1.(2), 3.4.5.1.(3),
3.4.8.5.(6), 9.9.4.4.

wired glass or glass block in, 3.4.5.1.(3),
9.9.4.3.

Expansion and contraction,

of heating and cooling systems, 6.2.1.5.,
9.34.7.6.

structural, 4.1.2.1.(1)

Explosive substances (see Hazardous
substances)

Exposing building face, 3.2.3.

area of, 3.2.3.2.(1), 9.10.15.1.(2)

construction of, 3.2.3.5., 9.10.15.7.
equivalent opening factor for, 3.2.3.9.
fire resistance waived for, 9.10.15.8.,
9.10.15.9., 9.10.15.14.

of first storey facing a street, 3.2.3.6.(1),
9.10.15.5.

unlimited openings for, 3.2.3.6.(1),
9.10.15.5.

unprotected openings in, 3.2.3.1.,
3.2.3.5.(1), 3.2.3.5.(2), 3.2.3.6.(1),
3.2.3.8., 3.2.3.9.

Exterior walls, fire resistance rating of,
3.1.5.2.(3)

Extinguishers, portable, 3.2.5.6.

Failures, 1.5.8.

Fans, for heating ventilating and air-conditioning
equipment, 6.2.3.15.

Fibreboard, insulating,
interior finish of, 9.30.11.
wall sheathing, 9.23.16.2.

Fill, 4.2.5.8., 9.15.1.2., 9.16.2.1.

Finish, interior (see also Flame-spread rating),
3.1.4.5., 3.1.10., 3.2.3.13.(1), 3.2.3.14.(1),
3.2.3.16.(5), 3.2.6.7., 3.3.1.11., 3.3.2.3.,
3.3.2.6.(1), 3.3.3.5., 3.3.4.5., 3.3.4.6.(2),
3.3.5.2.(2), 3.3.5.3., 3.3.6.2.(2), 3.3.6.4.,
3.3.7.6., 3.5.2.9., 9.10.17., 9.30

Finished flooring, 9.31

Fire alarm systems, 3.2.4., 3.2.6.2.(6), 9.10.18.
design of, 3.2.4.2:
for covered malls, 3.2.3.13.(1)
for interconnected floor spaces, 3.2.9.6.(1)
in high buildings, 3.2.6.2.(6), 3.2.6.8.
manually operated, 3.2.4.1.(7)
reference standards for, 3.2.4.6.
signal circuits for, 3.2.4.2.
signal to fire department, 3.2.4.3.
supervision of valves for, 3.2.5.4.(12)
to actuate hold-open devices on doors,
3.1.6.7.(6)
types of, 3.2.4.2.
where required, 3.2.4.1.

Fire dampers, 3.1.6.5., 6.2.3.9., 9.10.14.15.,
9.10.14.16.

Fire detectors, 3.2.4.4., 9.10.18.

Fire escapes, 3.4.1.2., 3.4.8.14., 9.9.2.2.,
9.9.2.6.

Fire extinguishing equipment, 3.2.5.4., 3.2.5.5.

Fire fighting,

access for fire truck, 3.2.2.4., 3.2.5.1.,
3.2.5.2., 8.2.2.7., 9.10.20.4., 9.10.20.5.
provisions for, 3.2.5., 9.10.20.
vents in high buildings, 3.2.6.5.

Fire hose cabinets and stations, 3.2.5.4.(7),
3.2.5.4.(8), 3.2.5.4.(9), 3.2.5.4.(10),
3.2.5.4.(13)

Fireplaces, 6.2.6.4., 9.22

Fire protection, 8.2.2., 9.10

Fire protection,

for gas and electric ranges, 9.34.10.:
of electrical conductors, 3.2.6.10.

- Fire protection components, information for, 2.4.3., 3.1.1.3.
- Fire-protection ratings, test methods for closures having, 3.1.6.4.(1)
- Fire-resistance ratings, 3.1.5.
for separation of suites, 3.3.1.1.(1), 3.3.2.2.(6), 3.3.6.6., 9.10.9.17.
in relation to occupancy and height, 9.10.8.
of a storage garage considered as a separate building, 3.2.1.3., 9.10.8.9.
of exterior walls, 3.1.5.2.(3)
of firewalls, 3.1.8.1.(3), 3.1.8.1.(4), 3.1.8.1.(5)
support of assemblies having, 3.1.5.4., 9.10.2.1., 9.10.2.3., 9.10.8.3.
test methods for, 3.1.5.1.(1), 9.10.4.1.
waived, 3.2.2.8.(1), 9.10.9.21., 9.10.9.24.
- Fire-retardant treated wood roof system, 3.1.4.2.(1), 3.1.12.
- Fire safety, size and occupancy requirements, 3.2
- Fire separations, 3.1.3., 3.1.6., 3.3.1.1.(1), 3.3.1.3.(2), 3.3.2.2., 3.3.3.2., 3.3.4.2., 3.3.7.2., 9.10.9.
between suites, 3.3.4.2.(1), 9.10.9.17.
building services in, 3.1.7.
closures in, 3.1.6., 9.10.14.
foamed plastic prohibition, 3.1.6.2.
for various occupancies, 3.2.2., 9.10.9., 9.10.10.
integrity of, 3.1.6.
meeting of exterior walls at, 3.2.3.10., 9.10.13.5.
openings in, 3.1.6.1., 3.1.6.4., 3.1.6.5., 9.10.9.3., 9.10.9.5., 9.10.9.7., 9.10.9.8., 9.10.14.
ratings for, 3.1.5.
service equipment penetrating, 3.1.7., 3.1.8.1.(11), 9.10.9.9., 9.10.9.10.
within horizontal service spaces (see also Concealed spaces), 3.1.6.3., 3.5.4.2., 9.10.9.13., 9.10.9.14.
- Fire separations,
assembly occupancies, 3.1.3.3.(1), 3.1.3.3.(2), 3.3.2.2.
bowling alleys, 3.3.2.14.
crawl spaces, 9.10.9.6.
exits, 3.4.5., 9.9.4.2.
garages, 3.2.1.3., 3.3.7.7.(3), 9.10.9.22., 9.10.9.23.
horizontal service spaces, 3.1.6.3., 9.10.9.13., 9.10.9.14.
industrial occupancies, 3.1.3.3.(2), 3.1.3.3.(4), 3.1.3.3.(6), 3.1.3.3.(9), 3.1.3.3.(10), 3.1.3.3.(11), 3.3.7.2., 9.10.9.16.
institutional occupancies, 3.1.3.3.(5), 3.3.3.2.
interconnected floor spaces, 3.1.3.3.(8)
major occupancies, 3.1.3.3., 9.10.9.15., 9.10.9.16.
multiple occupancies, 3.1.3.3., 9.10.9.
public corridors, 3.3.1.3.(2), 9.10.9.20., 9.10.9.21.
residential occupancies, 3.1.3.3.(3), 3.1.3.3.(4), 3.3.4.2., 9.10.9.15., 9.10.9.16., 9.10.9.17., 9.10.9.19.
service rooms, 3.5.1., 3.5.2., 9.10.10.
stages for theatrical performances, 3.3.2.15.(3), 3.3.2.15.(4)
storage rooms, 3.3.4.2.(3), 9.10.10.10.
suites, 3.3.1.1.(1), 3.3.2.2.(6), 3.3.6.6., 9.10.9.17.
vehicular passageways, 3.2.3.14.
vertical service spaces, 3.5.3.1., 9.10.12.
walkways, 3.2.3.15., 3.2.3.16.
- Fire stop construction, 3.1.9.1.(7)
- Fire stop flap, 3.1.7.3.(2), 6.2.3.10., 9.10.14.14.
- Fire stopping, 3.1.7.2.(1), 3.1.7.3.(1), 3.1.9., 9.10.16.
around pipes and ducts, 9.10.16.7., 9.34.3.3., 9.34.7.4.
of mansard style roofs, 3.1.9.1.(2), 3.1.9.1.(6), 9.10.16.5.
- Firewalls, 3.1.8., 9.10.11.
as party walls, 3.2.3.4.(1), 9.10.11.2.
construction of, 3.1.8., 9.10.11.
continuity of, 3.1.6.1.(1), 9.10.11.7.
fire-resistance rating of, 3.1.8.1.(3), 3.1.8.1.(4), 3.1.8.1.(5), 9.10.11.3.
meeting of exterior walls at, 3.1.8.1.(13), 9.10.11.12.
offset, 3.1.8.1.(14)
openings in, 3.1.8.1.(12), 9.10.11.10.
separating buildings, 3.1.8.1.(9), 3.2.1.1., 9.10.2.4.
structural stability of, 3.1.8.1.(1), 3.1.8.1.(2), 9.10.11.4., 9.10.11.5.
supports for, 3.1.8.1.(10)
- Fixtures, plumbing, 9.32.4.
- Flagmen, 8.2.5.
- Flame-spread rating and smoke developed classifications, 3.1.10.
- Flame-spread rating,
determination of, 3.1.10.1.
test for, 3.1.10.1., 3.1.11.1.(2), 6.2.3.5., 9.10.4.2.
- Flame-spread rating,
assembly occupancies, 3.3.2.3.
bathrooms within suites of residential occupancies, 3.3.4.5., 9.10.17.7.
business and personal services occupancies, 3.3.5.3., 9.10.17.1.
combustible insulation, 3.1.4.5.(2), 3.1.4.5.(3), 9.10.17.8.
corridors, 3.3.1.11., 9.10.17.4., 9.10.17.5.
covered malls, 3.2.3.13.(1)
ducts, linings, and coverings, 6.2.3.6., 9.10.17.8.
exits, 3.4.4., 9.10.17.3.
foamed plastic insulation, 3.1.4.5.(2), 9.30.1.2.
high buildings, 3.2.6.7.
industrial occupancies, 3.3.7.6., 9.10.17.1.
institutional occupancies, 3.3.3.5.

- interconnected floor spaces, 3.2.9.9.
- interior finishes, 3.1.11., 9.10.17.
- lighting elements, 3.1.11.1.(2), 9.10.17.6.
- mercantile occupancies, 3.3.6.4., 9.10.17.1.
- noncombustible construction, 3.1.4.5.(2), 3.1.4.5.(3), 9.10.6.1.
- public corridors, 3.1.11., 9.10.17.4., 9.10.17.5.
- residential occupancies, 3.3.4.5., 9.10.17.1.
- service rooms, 3.5.2.9.
- underground walkways, 3.2.3.16.(5)
- vehicular passageways, 3.2.3.14.(1)
- vertical service spaces, 3.5.3.1.(6)
- Flashing,
 - roof, 9.27.4.
 - wall, 5.4.1.1., 9.20.13., 9.28.3., 9.29.1.5.
- Floor areas,
 - general requirements for, 3.3.1.
 - occupant load of, 3.1.14., 9.9.3.2.
 - requirements for suites in, 3.3.1.3.(1)
 - special requirements for (see specific occupancies)
- Flooring, 9.31
 - ceramic tile, 9.31.6.
 - parquet, 9.31.4.
 - resilient, 9.31.5.
 - underlay, 9.31.2.
 - wood strip, 9.31.3.
- Floors,
 - combustible elements permitted for, 3.1.4.5.(2)
 - of heavy timber construction, 3.1.4.4.
 - supports for, 3.1.4.4., 9.31.1.3.
- Flue pipes, 6.3.8., 9.21.5.
- Flues, chimney, 6.3.2.1.(4), 6.3.7., 9.21.2.
- Foamed plastic, 3.1.6.2.
 - insulation, 3.1.4.5.(2), 3.1.9.1.(2), 3.2.3.5.(3), 6.2.3.6.(4), 6.2.3.6.(5)
 - protection of, 3.1.4.1.(2), 3.1.4.1.(3), 9.30.1.2.
- Footings (see also Shallow foundations), 4.2, 9.15
 - area of for columns, 9.15.3.7.
 - for chimneys, 9.15.3.1., 9.21.4.3.
 - for fireplaces, 9.15.3.1., 9.22.1.2.
 - for non-loadbearing masonry partitions, 9.15.3.9.
 - projection of, 9.15.3.11.
 - strip sizes of, for exterior walls, 9.15.3.4., 9.15.3.5.
 - tile drains for, 9.14
 - trenches for, 9.12.4.
 - width of, 9.15.3.
- Foundations, 4.2, 9.15
 - depth of, 4.2.4.6., 9.12.2.
 - design of, 4.2.4., 9.4.7.5.
 - drawings for, 2.4.4.6., 4.2.2.2.
 - dynamic loading of, 4.2.4.9.
 - eccentric loading of, 4.2.4.8.
 - equivalent approaches to design of, 2.6.2.1.
 - excavations for, 4.2.5., 9.12.1., 9.12.2.
 - footing sizes for, 9.15.3.
 - for garages and carports, 9.36.3.
 - frost action in, 4.2.4.6., 4.2.4.12., 9.12.1.4.
 - granular drainage layer for, 9.14.4.
 - hydrostatic uplift of, 4.2.4.10., 9.16.4.1.
 - materials for, 4.2.3., 9.15.2.1., 9.15.2.2.
 - movements of, 4.2.4.5.
 - on filled ground, 4.2.4.15., 4.2.5.8.(2), 9.15.1.2.
 - on frozen ground, 9.12.1.4.
 - on organic soils, 9.12.1.1., 9.12.1.2., 9.15.1.2.
 - on permafrost, 9.15.7.
 - on rock, 9.4.7., 9.15.1.1.
 - on sloping ground, 4.2.4.7.
 - on swelling and shrinking soils, 4.2.4.13., 9.4.7.6., 9.36.3.2.
 - pier type, 9.15.2.4., 9.15.2.5.
 - piles, 4.2.3.8.
 - raft, 4.2.6.1., 4.2.6.2.
 - review of, 4.2.2.3.
 - site investigation of, 4.2.2.1., 4.2.4.2.
 - special, 4.2.8.
 - structural design of, 4.2.4.16.
 - subsurface investigation for, 4.2.2.1., 4.2.4.2.
 - walls of, 9.4.7.7., 9.15.4.
- Framing,
 - conventional wood-frame construction, 9.23
 - plank frame wall construction, 9.24.6.
 - post, beam and plank construction, 9.24
 - sheet steel stud, 9.25
- Freezing, protection from, 3.2.5.7.
- Fresh air supply, 9.33.2.7.
- Frost penetration, depth of, 2.3.1.2.
- Fuel bins for solid fuel, 6.2.12.1.
- Furnace,
 - capacity, 9.34.2.6., 9.34.2.7.
 - clearances, 6.2.3.8., 6.2.5.3., 9.34.3.6.
 - controls, 6.2.5.5.
 - installation, 9.34.2.3., 9.34.2.4.
 - mounting, 6.2.5.2.
- Furnace room, 3.5.1., 3.5.2., 6.2.5.1.(2), 9.9.2.5., 9.10.10.
- Furring,
 - for interior finish, 9.30.3.1.
 - for metal lath, 9.30.5.7.
 - for siding, 9.28.5.3.
 - for stucco lath, 9.29.4.4.
 - in noncombustible construction, 3.1.4.5.(2)
- Galvanized sheet metal, 9.3.3.2.
- Garages,
 - detached, 9.10.15.9., 9.36.3.3.
 - floors in, 3.3.7.7.(7), 9.10.2.9.
 - for dwelling units, 9.10.9.24., 9.36
 - repair, 3.3.7.7.(11), 9.10.9.22.
 - storage, 3.2.1.3., 3.2.9.1.(5), 3.3.7.7., 9.6.2.3., 9.10.8.9., 9.10.9.22., 9.10.9.23., 9.10.11.9.
 - ventilation of, 3.3.7.7.(4), 6.2.2.2., 9.33.1.4.
- Garbage rooms, 9.9.2.5.

Gas-burning appliances (see Appliances)

Gas vents, 9.21.1.4.

Gasoline dispensing, 3.3.7.8., 9.10.2.7.

Gauges, decimal equivalents for, 6.1.4.1:

Glass,

area, 3.1.6.9., 9.6.5.1., 9.7.2.2., 9.7.4.2.

design, 3.3.1.13., 5.6.1.2., 9.7.6.4.

doors, 3.3.1.13.(1), 3.4.1.4., 9.6.4.2.

in fire separations, 3.1.6.8., 3.1.6.9.,

3.4.5.1.(2), 3.4.5.1.(3), 9.10.14.5.

safety, 3.3.1.13.(1), 3.4.1.4., 3.6.4.3., 9.6.5.

standards, 9.7.4.1.

thickness, 9.6.5.1., 9.7.4.2.

wired, 3.1.6.8., 3.2.3.4.(2), 3.2.3.8.(2),

3.3.1.13.(1), 3.4.5.1.(2), 3.4.5.1.(3),

9.9.4.3., 9.9.4.4., 9.9.4.5., 9.10.14.5.

Glazing, combustible, 3.1.4.5.(3), 3.4.1.5.

Glazing compound, 9.7.5.1.

Grading of site, 9.14.6.1.

Group A Occupancies (see assembly occupancies)

Group B Occupancies (see institutional occupancies)

Group C Occupancies (see residential occupancies)

Group D Occupancies (see business and personal services occupancies)

Grade E Occupancies (see mercantile occupancies)

Group F Occupancies (see industrial occupancies)

Guards, 3.3.1.12., 3.4.8.6., 9.8.8.

around balconies in residential occupancies, 3.3.4.8.

for mechanical equipment, 6.2.1.3.(2)

for ramps, 9.8.8.9.

for windows in public areas, 3.3.1.13.(5), 9.7.6.4.

height of, 3.3.1.12.(1), 3.3.1.12.(2),

3.3.2.10., 3.3.7.7.(6), 9.8.8.3., 9.8.8.4., 9.8.8.5., 9.8.8.6.

loads on, 4.1.10.1.

openings through, 3.3.1.12.(3), 9.8.8.7.

where required, 3.3.1.12., 3.4.8.6.(1), 3.4.8.14.(10), 9.8.8.1., 9.8.8.2.

Gypsum board,

as a thermal barrier, 3.1.4.5.(2)

interior finish, 9.30.8.

wall sheathing, 9.23.16.2.

Gypsum lath, 9.30.4.

Gypsum plaster, 9.30.7.1.

Hallways, within dwelling units, 9.5.8.

Handicapped persons,

provisions for, 3.2.7., 3.6.4.4., 9.9.2.7., 9.9.2.8.

washroom facilities for, 3.2.7.3., 3.6.4.4.

Handrails, 3.4.8.5., 3.4.8.14.(11), 3.4.8.14.(12), 9.8.7.

Hardboard,

exterior siding, 9.28.10.

interior finish of, 9.30.10.

underlay, 9.31.2.

Hardware for doors, 3.4.8.13.(11), 3.4.8.13.(12), 3.4.8.13.(13), 9.9.6.11., 9.9.6.12., 9.9.6.13., 9.10.14.9., 9.10.14.10., 9.10.14.11., 9.10.14.17., 9.10.14.19.

Hazardous substances, 3.2.4.4.(5), 3.2.6.6.(1), 3.3.1.1.(2), 3.3.1.14., 3.3.7.2., 3.3.7.4., 3.5.2.4., 9.10.2.12., 9.33.2.5.

Hearth, fireplace, 9.22.5.

Heat detectors, 3.2.4.4.(2), 3.2.4.4.(3), 9.10.18.4.

Heat exchanger clearance, 9.34.8.1.

Heating appliances (see Appliances)

Heating, ventilating and air-conditioning systems, Part 6, 9.33.4., 9.34

controls and safety devices for, 6.2.5.4., 6.2.5.5., 9.34.2.4.

design of, 3.5.1.2., 6.2.1.1., 9.34.2.1.

plans for, 2.4.5.2.(1)

Heating, ventilating and air-conditioning equipment, installation codes for, 6.2.1.2.(1), 9.34.2.3.

Heavy timber construction, 3.1.4.4., 3.2.3.5.(6), 3.3.2.3.(3), 9.10.6.2.

Heights,

of exits, 3.4.3.5., 9.8.3.7., 9.9.3.9., 9.9.6.5.

of rooms, 3.6.1.1., 9.5.2.

Helicopter landing areas, 4.1.6.6.

High buildings, additional requirements for, 3.2.6.

Hold-open devices, 3.1.6.7., 9.10.14.11.

Horizontal exits, 3.4.1.3.(1), 3.4.8.11., 9.9.2.9.

Horizontal service space,

above fire separations, 3.1.6.3., 3.5.4.2., 9.10.9.13., 9.10.9.14.

ventilation of, 3.5.4.4., 9.18.3.

Hose cabinets, fire, 3.2.5.4.(9), 3.2.5.4.(10), 3.2.5.4.(13)

Hose connections, 3.2.5.4.(2), 3.2.5.4.(10)

Hose stations, fire, 3.2.5.4.(7), 3.2.5.4.(8), 3.2.9.7.

Hot water supply, 9.32.4.3.

Hydrostatic uplift, 4.2.4.10., 9.16.4.1.

Incinerators, 6.2.7., 9.10.10.6., 9.10.10.7., 9.10.10.8., 9.10.10.9.

rooms for, 3.2.4.4.(2), 3.5.2.5., 9.9.2.5., 9.10.10.6.

Industrial accommodation, 2.1.5.1., Part 10

Industrial occupancies

building construction for, 3.2.2.37.,

3.2.2.38., 3.2.2.39., 3.2.2.40.,

3.2.2.41., 3.2.2.42., 3.2.2.43.,

3.2.2.44., 3.2.2.45., 3.2.2.46.,

3.2.2.47., 3.2.2.48., 3.2.2.49.,

3.2.2.50., 3.2.2.51., 3.2.2.52., 9.10.8.

classification of, 3.1.2., 9.10.3.6.

fire alarm systems for, 3.2.4.1., 9.10.18.

fire safety within floor areas of, 3.3.1., 3.3.7.

high buildings of, 3.1.6.1.(1)

- standpipes and hose systems for, 3.2.5.4., 9.10.2.14.
- Insulation, 9.26
 - foamed plastic, 3.1.4.5.(2), 3.1.9.1.(2), 3.2.3.5.(3), 6.2.3.6., 9.30.1.2.
 - in concealed spaces, 3.1.9.1.(2)
 - in noncombustible construction, 3.1.4.5.(2), 3.1.4.5.(7), 3.1.4.5.(9)
 - installation of, 9.26.4.
 - materials, 9.26.3.
 - of ducts, 3.1.4.5.(7), 6.2.3.6.
 - of pipes, 3.1.4.5.(7), 6.2.10.5., 9.34.7.2.
 - of wiring, 3.1.4.5.(9)
 - thermal, 9.26.2.4.
 - vapour barriers for, 9.26.5.
- Institutional occupancies
 - building construction for, 3.2.2.22., 3.2.2.23., 3.2.2.24., 3.2.2.25.
 - classification of, 3.1.2.
 - fire alarm systems for, 3.2.4.1.
 - fire safety within floor areas of, 3.3.1., 3.3.3.
 - high buildings of, 3.2.6.1.(1)
 - standpipes and hose systems for, 3.2.5.4.
- Interior finish (see Flame-spread rating)
- Joints and connections for ducts, 6.2.3.3., 9.34.3.12., 9.34.3.13.
- Joists,
 - floor, 9.23.9.
 - roof and ceiling, 9.23.13.
- Kitchens,
 - access through, 3.3.1.2.(3)
 - area of, in dwelling units, 9.5.5.1.
 - containing commercial cooking equipment, 3.3.1.1.(4), 6.2.2.3.(4), 9.10.2.8.
 - exhaust ducts serving residential, 6.2.3.11.(6)
 - finish, 3.3.2.16.
- Landings (see Stairs)
- Lath,
 - gypsum, 9.30.4.
 - metal, 9.30.5.
 - stucco, 9.29.4.
- Libraries, 3.3.2.13.
- Light diffusers and lenses, 3.1.11.1.(2), 9.10.17.6.
- Lighting, 3.2.8.1., 3.2.8.3.(1)
 - elements, transparent or translucent, 3.1.11.1., 9.10.17.6.
 - exit, 3.2.8.1.(1), 3.4.7.1., 9.9.11.2.
 - fixtures, recessed, 3.2.8.2.
 - for air-supported structures, 3.1.4.7.(13)
 - levels, 3.2.8.1.(2)
 - in public corridors, 3.2.8.1.(1), 3.2.8.3.(1), 3.3.1.6.(4), 9.9.11.2., 9.35.2.9.
 - natural, 9.7.1.1.
 - outlets, 9.35.2.
- Limiting distance, 3.1.5.1.(3), 3.2.3.1., 3.2.3.4., 3.2.3.5., 9.10.15.
- Limit states design, 4.1.4.
 - definition of terms for, 4.1.4.1.(1)
 - effect of factored loads on, 4.1.4.2.(3)
 - importance factors for, 4.1.4.2.(7)
 - load combination factors for, 4.1.4.2.(5)
 - load factors for, 4.1.4.2.(4)
 - serviceability check, 4.1.4.3.(1)
 - strength and stability check, 4.1.4.2.(1)
- Linen chutes, 3.5.3.2., 6.4.1.1., 9.10.12.
- Liners,
 - chimney, 9.21.3.
 - fireplace, 9.22.2.1.
- Linings for air ducts and plenums, 6.2.3.6.
- Lintels,
 - in masonry walls, 9.20.5.2., 9.20.5.3.
 - wood, 9.23.12.
- Live loads, 4.1, 9.4
- Living rooms, 9.5.3.1.
- Loads, 4.1, 9.4
 - combination, 4.1.3.1.
 - concentrated, 4.1.6.4., 9.4.2.1.
 - dead, 4.1.5.
 - deflections under, 4.1.1.5.
 - due to inertia forces, 4.1.10.2.
 - due to partitions, 4.1.5.1.
 - due to use and occupancy, 4.1.6., 9.4.2.
 - during construction, 4.1.1.3.(2), 4.1.1.3.(3)
 - dynamic, 4.1.10.3.(2)
 - earthquake, 4.1.9., 9.4.6.
 - eccentric, on foundations, 4.2.4.8.
 - for covered ways, 8.2.1.2.(1)
 - ice, 4.1.7.3.(1)
 - impact, 4.1.10.3.(1)
 - occupant, 3.1.14.
 - on crane runway rails, 4.1.10.4.(1)
 - on guards, 4.1.10.1.
 - on interior walls and partitions, 4.1.8.4.(1)
 - rain, 4.1.7.5.
 - snow, 4.1.7.1., 4.1.7.2., 4.1.7.3.(1), 4.1.7.4.(1), 4.1.7.5.(3), 9.4.3.
 - structural, 4.1, 9.4
 - variation with tributary area, 4.1.6.3.(5), 4.1.6.3.(6)
 - vibrations, 4.1.1.6., 4.1.10.3.(2)
 - wind, 4.1.8., 9.4.4.
- Log construction, 9.37
- Lumber (see also Wood)
 - dimensions, 3.1.4.4., 9.3.2.7.
 - grades, 9.3.2.1.
- Machinery rooms,
 - building height exception for, 3.2.1.2.(1), 9.10.8.6.
 - fire separations for, 3.5.2.2., 3.5.2.3., 3.5.2.4.(1), 9.10.10.
- Malls, covered, 3.2.3.13.(1), 3.2.5.4.(3), 9.10.2.10.
 - exits for, 3.4.2.4.
 - standpipes and hose systems for, 3.2.5.4.(3)
- Masonry,
 - as a thermal barrier, 3.1.4.5.(2)
 - chimney, 6.3.2., 6.3.3., 9.21.4.
 - design and construction of, 4.4
 - veneer, 9.20.5.5.
 - walls, 9.20

Materials, 2.5.1., 2.5.2., 2.6.1.1., 2.6.1.3., 2.6.3., 2.7.4., 3.1.9.1.(7), 9.3
 equivalents, 2.6.3.1.
 storage, 2.5.2.
 testing, 2.6.1.3., 2.6.4.1.

Means of egress, 3.3.1.2., 3.3.1.3.(1), 3.3.1.4., 3.4, 9.9

Mechanical exhaust systems, 3.2.9.8.

Medical gas piping systems, 3.6.5., 9.38.1.1.

Membrane fire protection, openings in, 3.1.7.3.(2), 9.10.5.

Mercantile occupancies,
 building construction for, 3.2.2.33., 3.2.2.34., 3.2.2.35., 3.2.2.36., 9.10.8.
 classification of, 3.1.2., 9.10.3.5.
 fire alarm systems for, 3.2.4.1., 9.10.18.
 fire safety within floor areas of, 3.3.1., 3.3.6.
 high buildings of, 3.1.6.1.(1)
 obstructions in, 3.3.6.5.
 standpipes and hose systems for, 3.2.5.4., 9.10.2.14.

Metal, sheet, thickness equivalents of, 6.1.4.1., 9.3.3.1.

Mezzanines, 3.2.9.1.(1), 3.2.9.1.(4), 9.10.13.2., 9.10.13.3.
 exits for, 3.4.2.1.(6), 9.9.8.8.
 fire-resistance rating of, 3.2.9.1.(1), 9.10.8.1.
 in calculating building height, 3.2.1.2.(3), 3.2.1.2.(4), 3.2.1.2.(5), 3.2.1.2.(6), 9.10.8.7.
 occupant load of, 3.1.14.1.(2), 9.9.3.2.

Minimum lighting levels, 3.2.8.1.(1)

Mobile homes, 9.9.8.9., 9.34.2.8.

Mobile home parks, sanitary facilities for, 3.6.4.2.(14), 3.6.4.2.(15)

Moving walks, 3.2.9.1.(7), 9.8.1.3.

Multiple occupancy requirements, 3.1.3., 9.10.9.16.

Nailing,
 rafters and joists, 9.23.13.11.
 siding, 9.28.5.9.
 wood-frame construction, 9.23.3., 9.23.13.11.
 wood strip flooring, 9.31.3.4.

Noncombustible construction, 3.1.4.5., 3.2.9.2., 9.10.6.1.
 combustible materials in, 3.1.4.5., 3.2.9.10.
 support of, 3.1.5.4., 9.10.2.3.
 sprinklers in lieu of structural fire resistance in, 3.2.2.8.

Notification, 1.5.2.

Numbering system, 1.1.2.

Occupancies (see also entries under specific occupancies),
 classification of, 3.1.2., 9.10.3.
 multiple, 3.1.3., 9.10.9.16.
 special, 3.2.2.1.(2)

Occupancy combinations, prohibition of, 3.1.3.2.

Occupancy permission, 1.5.6.

Occupant load,
 determination of, 3.1.14., 3.4.3.2.(1), 9.9.3.2.
 high, 3.3.2.7.(1), 3.4.8.13.(11)

Oil-burning appliances (see Appliances)

Openings,
 closures for (see Closures)
 for access through barricade, 8.2.1.3.(3)
 furnace rooms, 6.2.5.1.(2)
 for escalators and moving walkways, 3.2.9.1.(7)
 in exterior walls, 3.2.3.1., 3.2.3.4.(2), 3.2.3.5., 3.2.9.12., 3.3.6.3., 3.3.7.5., 3.4.8.11.(9), 9.10.13.1., 9.10.13.5., 9.10.15.
 in fire separations, 3.1.6.1.(2), 3.2.9.1.(5), 3.2.9.1.(6), 3.2.9.1.(8)
 in firewalls, 9.10.11.10., 9.10.11.11.
 in guards, 3.3.1.12.(3), 9.8.8.7.
 in walls above adjacent roofs, 3.2.3.11., 9.10.13.4.
 unprotected (see Unprotected openings)

Operating suite, 3.3.1.4.(5)

Outdoor installations, 6.2.4.2.(2)

Panel-type underlay, 9.31.2.

Parapets,
 design of, 5.3.5., 9.20.6.7.
 for firewalls, 3.1.8.1.(7), 3.1.8.1.(9), 9.10.11.7.

Parging (see also Stucco),
 above-grade masonry, 9.20.15.1.
 for dampproofing, 9.13.5.1.
 for waterproofing, 9.13.3.1.

Parking garages (see Garages)

Particleboard,
 interior finish, 9.30.12.
 subflooring, 9.23.14.3.
 underlay, 9.31.2.3.

Partitions,
 of combustible construction, 3.3.4.6., 3.3.5.2., 3.3.6.2., 9.23.10.
 masonry, 9.20.6.4., 9.20.10.1.

Party wall, 3.2.3.4.(1), 9.10.11.1., 9.10.11.2.

Passageway, 3.3.1.9.(1)
 exterior, 3.2.2.5.(2)
 vehicular, 3.2.3.14.(1)

Penthouse, 3.2.1.2.(1), 3.2.2.6., 9.10.8.6.

Permafrost, 4.2.4.12., 9.15.7.

Permits, 1.5.1., 1.5.11.

Pilasters, 9.15.5.3., 9.20.8.4.

Piles, 4.2.3.8.

Pipes,
 clearances of, 6.2.10.6., 9.34.7.3.
 combustible, 3.1.4.5.(5), 3.1.7.2., 9.10.9.26.
 drainage, 9.14
 for heating and cooling systems, 6.2.10.
 in heating systems, 9.34.7.
 in storage bins, 6.2.12.
 metal, 9.16.7.1.
 penetrating fire separations, 3.1.7.2., 3.1.8.1.(11), 9.10.9.9., 9.10.9.10., 9.10.9.26.

- piercing fire stops, 3.1.9.1.(9)
- Piping systems, non-flammable medical gas, 3.6.5.
- Plank construction,
 - for decking, 9.24.3.2.
 - for walls, 9.24.6.
- Plans, specifications and calculations, 2.4
 - for fire protection components, 2.4.3.
 - for foundations, 2.4.4.6., 2.4.4.7.
 - for heating, ventilating and air-conditioning systems, 2.4.5.2.(1)
 - site, 2.4.2.
 - structural, 2.4.4.
- Plastering, 9.30.7.
- Plastic,
 - foamed (see Foamed plastics)
 - light diffusers and lenses, 3.1.11.1.(2), 9.10.17.6.
 - pipe (see Pipes, combustible)
- Plates,
 - sill, 3.1.6.6.(2), 9.23.7.
 - wall, 9.23.11.
- Plenum, ceiling assembly used as a, 3.1.7.3.(3)
- Plenums in ceilings, 6.2.3.2.(4)
- Plumbing, Part 7,
 - combustible fixtures, 3.1.4.5.(11)
 - facilities required, 3.6.4., 7.1.3., 9.32
- Plywood,
 - decking, 9.34.3.1.
 - finish, 9.30.9.
 - fire-retardant treated, 3.1.12.1.(1)
 - for firestopping, 3.1.9.1.(7)
 - roof sheathing, 9.23.15., 9.24.3.1.
 - siding, 9.28.9.
 - subflooring, 9.23.14.2., 9.23.14.5., 9.23.14.6., 9.24.3.1.
 - underlay, 9.31.2.
 - wall sheathing, 9.23.16.2.
- Police stations, 3.1.2.1.(5)
- Polyester roofing, 9.27.14.
- Portable extinguishers, 3.2.5.6.
- Post, beam and plank construction, 9.24
- Potable water system, 9.32.3.1.
- Power supply, emergency, 3.2.6.11., 3.2.8.3.(2), 3.2.8.4.(1)
- Pressure vessels, 6.1.2.2.(2)
- Prestressed concrete, 4.5
- Professional seals, 1.5.1.6., 1.5.1.7.
- Prohibitions, 1.5.10.
 - of occupancy combinations, 3.1.3.2.
- Projection rooms, 6.2.3.17.
- Protected floor space, 3.2.9.4.
- Protection from freezing, 6.2.1.4.(3)
- Protection of public during construction, Part 8
- Public corridors (see Corridors)
- Public property, 8.2.4.
- Public way, 8.2.1.
- Radiation from interior fires, control of, 3.2.3.
- Radiators, 6.2.9.1., 9.34.8.2.
- Rafters, 9.23.13.
 - Ramps, 3.3.1.9.(1), 3.4.1.2., 3.4.2.3.(5), 3.4.3.1.(7), 3.4.3.1.(8), 3.4.8.2.(1), 3.4.8.5.(1), 3.4.8.5.(2), 3.4.8.5.(4), 3.4.8.6.(1), 3.4.8.7., 3.4.8.8., 9.8.8.9.
 - Ranges (see Heating, ventilating and air-conditioning systems)
 - Receptacles, electrical, 9.35.3.1.
 - Recessed lighting fixtures, 3.2.8.2.
 - Referenced documents, 2.2
 - Refrigerating systems, 6.2.11.1.
 - Refuge areas in high buildings, 3.2.6.2.(5)
 - Refuse bins, 3.5.3.2.(9), 3.5.3.2.(10), 9.10.12.8., 9.10.12.9., 9.10.12.10.
 - Refuse chutes, 3.5.3.2., 6.4.1.1., 8.2.6.2., 9.10.12.
 - Refuse rooms or bins, design of, 3.5.3.2.(6), 3.5.3.2.(9), 3.5.3.2.(10), 9.10.12.9.
 - Registers and outlets,
 - for warm air heating, 9.34.4.
 - in garages, 9.34.4.5.
 - over pipeless furnace, 9.34.3.11.
 - Reinforced concrete, 4.5
 - Relief valves, 6.2.8.1.(2), 6.2.8.1.(3)
 - Residential occupancies,
 - building construction for, 3.2.2.26., 3.2.2.27., 3.2.2.28., 9.10.8.
 - classification of, 3.1.2., 9.10.3.3.
 - fire alarm systems for, 3.2.4.1., 9.10.18.
 - fire safety within floor areas of, 3.3.1., 3.3.4.
 - high buildings of, 3.2.6.1.(1)
 - smoke alarms for, 3.2.4.8., 9.10.19.
 - standpipes and hose systems for, 3.2.5.4., 9.10.2.14.
 - Resilient flooring, 9.31.5.
 - Restaurants, ventilation of, 6.2.2.3.(4)
 - Return air systems, 9.34.6.
 - Review, 2.7
 - general, 2.7.1.
 - of construction, 2.7.2.
 - off-site, 2.7.5.
 - of shop drawings, 2.7.3.
 - of workmanship and materials, 2.7.4.
 - Risers, 3.4.8.9.(1), 3.4.8.9.(2), 9.8.3.1.
 - Roof covering, 3.1.13., 3.2.3.12.
 - Roof decking (see Decking)
 - Roof and ceiling framing, 3.1.4.4., 9.23.13.
 - joists, 9.23.13.
 - rafters, 9.23.13.
 - trusses, 9.4.3.3., 9.23.13.14., 9.23.13.15., 9.23.13.16., 9.23.13.17., 9.23.13.18.
 - ventilation, 9.19.1.
 - Roofing, 3.1.13., 3.2.3.12., 5.3.4., 9.27
 - asphalt shingles for, 9.27.7., 9.27.8.
 - built-up, 9.27.11.
 - fire protection of, 3.1.13.
 - limiting slopes for, 9.27.3.
 - metal, 9.27.13.
 - selvage, 9.27.12.
 - wood shingles and shakes for, 9.27.9., 9.27.10.
 - Roofs,
 - access from, 3.3.1.2.(1)

- appliances mounted on, 3.5.2.1.(3), 6.2.3.15.(2), 9.10.2.13.
- combustible elements permitted for, 3.1.4.5.(2)
- considered as walls, 3.2.1.4., 9.10.2.6.
- drains for, 9.27.15.
- guards around, 3.3.1.12.(1), 9.8.8.1.
- fire exposure from, 3.2.3.11., 3.2.3.12.
- fire-retardant treated wood for, 3.1.12.
- of heavy timber construction, 3.1.4.4.
- sheathing for, 9.23.15.
- sprinklers in lieu of structural fire resistance for, 3.2.2.8.
- Rooftop enclosures, 3.2.1.2.(1), 3.2.2.6.
- Room and space dimensions, 3.6.1., 9.5
- Run, stair, 3.4.8.9., 9.8.3.1.
- Safety (see Construction safety measures)
- Safety glass, 3.3.1.13.(1), 3.4.1.4., 3.6.4.3., 9.6.5.
- Safety requirements within floor areas, 3.3
- Sanitary drainage systems, 9.32.5.
- Scope, 1.2
- Seismic loads, 4.1.9., 9.4.6.
- Self-closing devices, 3.1.6.7.(1), 3.4.8.13.(7), 9.10.14.10.
- Service facilities, installation of, 3.5.1.2., 6.2.3., 6.2.4.
- Service rooms, 3.2.1.2.(1), 3.2.2.6.(1), 3.2.4.4.(2), 3.5.2., 6.2.5.1.(2), 9.9.2.5., 9.9.5.7., 9.10.10., 9.10.14.12.
- Service water heaters, 6.1.2.2.(1), 6.2.6.3., 9.32.6.
- Sewage disposal, 9.32.5.
- Shafts,
 - opening into an interconnected floor space, 3.2.9.3.(3)
 - penetrating fire separations, 3.1.6.3., 3.5.3.1.(1), 9.10.12.3.
 - pipe, 9.34.7.5.
 - service, 3.5.3., 9.10.12.
- Shakes, wood, 9.27.10., 9.28.7.
- Shallow foundations,
 - damaged unit, 4.2.6.4.
 - design of, 4.2.6.1.
 - incorrect placement of, 4.2.6.3.
 - support of, 4.2.6.2.
- Shear walls, earthquake design of, 4.1.9.1.(8)
- Sheathing,
 - roof, 9.23.15., 9.24.3.1.
 - wall, 9.23.16.
- Sheathing paper, 9.23.17., 9.24.6.10., 9.24.6.11.
- Shingles,
 - asbestos-cement, 9.28.5.6., 9.28.8.
 - asphalt, 9.27.7., 9.27.8., 9.28.1.3.
 - eave protection for, 9.27.5., 9.27.9.9.
 - wood, 9.27.9., 9.28.1.1., 9.28.7.
- Sidewalks, 8.2.4.
- Siding,
 - asbestos-cement, 9.23.17.7., 9.28.8.
 - attachment of, 9.28.5.
 - hardboard, 9.23.17.7., 9.28.10.
 - lumber, 9.28.6.
 - metal, 9.23.17.8., 9.28.12.
 - plywood, 9.23.17.7., 9.28.9.
 - vinyl, 9.28.13.
 - waferboard, 9.23.17.7., 9.28.11.
 - wood shingles and shakes for, 9.28.7.
- Signal circuits, fire alarm, 3.2.4.
- Signs, means of egress, 3.4.6., 9.9.10.
- Sill plate, 3.1.6.6.(2), 9.23.7.
- Skylight assemblies, 3.1.4.5.(2), 3.2.3.11., 9.10.13.4.
- Slabs on ground, 9.13.1.3., 9.13.6., 9.16
- Smoke alarms, 3.2.4.8., 9.10.19.
- Smoke control in high buildings, 3.2.6.2., 3.2.6.5., 3.2.6.12.
- Smoke detectors, 3.1.6.7.(3), 3.2.4.4.(2), 3.2.4.4.(4), 3.2.4.4.(6), 3.2.4.4.(9), 3.2.9.6.(1), 3.5.2.8.(2), 9.10.18.3., 9.10.18.4., 9.10.18.5.
- Smoke developed classifications, 3.1.10., 3.2.3.16.(5)
- Snow loads, 4.1.7., 9.4.3.
- Soils,
 - design properties of, 4.2.4., 9.4.7.
 - excavations in, 4.2.5., 9.12
 - identification and classification of, 4.2.4.3.
 - subsurface investigation of, 4.2.4.2.
 - swelling and shrinking, 4.2.4.13., 9.4.7.6.
- Sound, control of, 3.3.4.7., 9.11
- Space frame, earthquake design of, 4.1.9.1.(8)
- Space heaters (see Heating, ventilating and air-conditioning systems)
- Spans, wood rafters, joists and beams, 9.23.4., 9.23.12.4., 9.24.6.8.
- Spatial separation between buildings, 3.2.3., 9.10.15.
- Special structures, 3.2.2.1.(2)
- Sprinkler systems, 2.4.3.2., 3.1.4.4.(12), 3.1.6.7.(4), 3.1.9.1.(5), 3.1.11.1.(3), 3.2.3.8.(1), 3.2.3.11., 3.2.3.13.(1), 3.2.4.3.(1), 3.2.4.4.(5), 3.2.4.4.(7), 3.2.4.4.(8), 3.2.5.1.(5), 3.2.5.5., 3.2.6.2.(6), 3.2.6.6.(1), 3.2.9.1.(7), 3.2.9.5.(1), 3.3.1.3.(2), 3.3.1.3.(3), 3.3.1.11.(2), 3.3.1.11.(3), 3.3.2.2.(2), 3.3.2.6.(1), 3.3.2.13.(1), 3.3.2.15.(2), 3.3.3.2.(2), 3.3.3.3.(3), 3.3.4.2.(2), 3.3.4.2.(3), 3.3.5.2.(1), 3.3.6.2.(1), 3.5.2.6., 3.5.2.8., 3.5.3.2.(6), 9.10.2.14., 9.10.9.21., 9.10.12.10.
- Stages, theatrical, 3.3.2.15.
- Stairs (see also Escalators), 3.3.1.9., 3.4.8., 9.9.1.2.
 - cantilevered precast concrete, 9.8.10.
 - construction of, wood, 9.8.9.2., 9.8.9.3.
 - curved, 3.3.1.9.(2), 9.8.5.
 - dimensions of, 3.4.3., 9.8.3.
 - exit, 3.4.3.2.(5), 3.4.3.2.(6), 3.4.8., 6.2.1.7., 9.8.1.2., 9.34.2.11.
 - handrails and guards for, 3.4.8.5., 3.4.8.6., 9.8.7., 9.8.8.

- landings for, 3.4.3.2.(6), 3.4.8.4., 3.4.8.13.(1), 9.8.4.
- non-skid finish for, 3.4.8.2.(1), 9.8.9.5.
- rise and run for, 3.4.8.9., 9.8.3.1.
- treads for, 3.4.8.2.(1), 3.4.8.9., 9.8.1.3.
- winders for, 3.4.8.10., 9.8.5.3.
- Stairways, 3.3.1.9.
 - headroom clearance for, 3.4.3.5., 9.8.3.7.
 - lighting for, 3.4.7.1., 9.35.2.4., 9.35.2.5.
 - rooftop enclosures for, 3.2.2.6.(2)
 - unenclosed between storeys, 3.2.9.1.(8), 9.10.9.7.
 - weather protection for, 3.3.7.7.(2), 9.8.2.3.
 - width of, 3.4.3.1., 3.4.3.2., 3.4.3.3., 9.8.3.5., 9.8.3.6.
- Standards for fire alarm systems, 3.2.4.6.
- Standpipes and hose systems,
 - installation of, 3.2.5.4.(4), 8.2.2.3.
 - where required, 3.2.5.4.(1)
- Steel,
 - columns, 9.10.15.10.
 - design and construction of, 4.6
 - fire protection of, 3.2.2.1.(3)
 - in foundations, 4.2.3.7.
 - siding, 9.28.12.1., 9.28.12.2.
 - studs, 9.25
- Stoker controls, 6.2.5.4., 6.2.5.5.
- Storage bins, 6.2.12.
- Storage of Materials, 2.5.2.
- Storage room,
 - fire separation of, 3.3.4.2.(3), 9.10.10.10.
 - wood storage lockers permitted in, 3.3.4.6.(3)
- Stoves (see also Heating, ventilating and air-conditioning systems), 6.2.6.1., 6.2.6.2., 9.34.9.
- Streets, use of, 8.2.4.
- Stress reversal, 4.1.3.3.
- Structural loads and procedures, 4.1, 9.4
- Structures, special, 3.2.2.1.(2)
- Stucco, 9.29
- Studs, wall, 9.23.10., 9.24.5.4., 9.25
- Subflooring, 9.23.14.
- Suites, separation of, 3.3.1.1.(1), 3.3.2.2.(6), 3.3.6.6., 9.10.9.17.
- Sumps, 9.14.5.2.
- Supply outlets, air, 9.34.4.
- Tape for joints in air duct systems, 6.2.3.5.
- Temperature,
 - indoor design, 9.34.2.6.
 - outdoor design, 6.2.1.3., 9.34.2.6.
 - supply air, 9.34.4.6.
 - unsafe, 9.34.2.5.
- Tents, 3.1.4.7., 9.10.2.10.
- Termites, protection against, 9.3.2.10., 9.12.1.1., 9.16.8.1., 9.18.4.1.
- Tests, 1.5.4.
 - fire protection, 3.1.6.4.(1), 9.10.4.1.
 - fire-resistance, 3.1.5.1.(1), 9.10.4.1.
 - flame-spread rating, 3.1.10.1., 3.1.11.1.(2), 9.10.4.2.
 - for control of smoke movement in high buildings, 3.2.6.12.
 - load, 2.6.2.1.(1), 4.2.4.1.(1), 9.23.13.18.
 - of elevator controls, 3.5.5.1.(2)
 - roof covering, 3.1.13.1.
 - smoke developed classification, 3.1.10.1.
 - sound transmission, 9.11.1.1.
- Thermal barrier, 3.1.4.5.(2)
- Thermal insulation, 9.26.2.4.
- Tile,
 - drainage, 9.14.2.1., 9.14.3.
 - floor, 9.31.5., 9.31.6.
 - wall, 9.30.13.
- Traffic control, 8.2.5.
- Transformer vaults, 3.5.2.8., 9.10.2.10.
- Travel distance, 3.3.1.4.(2), 3.4.2.1.(2), 3.4.2.1.(5), 3.4.2.2., 3.4.2.3.(1), 3.4.2.3.(2), 3.4.2.4.(1), 9.9.8.1., 9.9.8.2., 9.9.8.4.
- Travelling cables in noncombustible construction, 3.1.4.5.(8)
- Treads (see Stairs)
- Trusses, 9.4.3.3., 9.23.13.14., 9.23.13.15., 9.23.13.16., 9.23.13.17., 9.23.13.18.
- Turnstiles, 9.9.5.4.
- Underground walkways, 3.2.3.16.
- Underlay,
 - beneath flooring, 9.31.2.
 - beneath shingles, 9.27.6.
- Unit of exit width, 3.4.3.2.(3), 9.9.3.7.
- Unprotected openings, 3.2.3., 9.10.15.
 - in an exposing building face, 3.2.3.1., 3.2.3.5., 3.2.3.6., 3.2.3.8., 9.10.15.
 - in exterior walls, 3.2.3., 9.10.15.
 - in floors, 3.2.9.1.(5), 3.2.9.1.(6), 3.2.9.1.(8)
 - unlimited, 3.2.3.6.
- Unsafe condition, 1.5.7., 1.5.9.1.(3).
- Valves, supervision of water control valves in standpipes and hose systems, 3.2.5.4.(12)
- Valves, relief, 6.2.8.1.(2), 6.2.8.1.(3)
- Vapour barriers, 5.2, 5.5.1.1., 5.6.1.1., 9.26.5.
- Vehicule passageway, 3.2.3.14.(1)
- Ventilation, 3.3.1.14., 3.5.2.8.(5), 3.5.2.8.(6), 3.5.4.4., 6.1.2.1., 6.2.1.1., 6.2.1.3., 6.2.1.4., 6.2.2., 9.18.3., 9.19.1., 9.33
- Venting,
 - chimney, 6.3.1., 9.21
 - explosion, 3.3.1.14., 9.33.2.5.
 - for fire fighting in high buildings, 3.2.6.5., 3.2.6.11.(4)
 - heating appliances, 6.3.1.1.(3), 6.3.1.1.(5), 6.3.1.1.(7), 9.21.1.4., 9.21.1.6.
 - of chutes, 3.5.3.2.(3), 9.10.12.12.
 - soffit, 9.19.1.
- Vertical service spaces, 3.5.3., 9.10.12.
- Vestibules, 3.2.9.3., 3.3.7.7.(13), 3.3.7.7.(14), 3.3.7.7.(15), 3.4.8.11.(2)
- Voice communication system, 3.2.6.9.
- Waferboard,
 - for fire stopping, 3.1.9.1.(7)
 - interior finish, 9.30.12.

- roof sheathing, 9.23.15.1., 9.23.15.3.
- siding, 9.28.11.
- subflooring, 9.23.14.2.
- underlay, 9.31.2.
- wall sheathing, 9.23.16.
- Walkways, 9.10.2.10.
 - moving, 3.2.9.1.(7), 9.8.1.3.
 - separation of buildings by, 3.2.3.15.
 - underground, 3.2.3.16.
- Walls,
 - bracing of, 9.23.18.
 - combustible elements permitted for, 3.1.4.
 - exposed to adjoining roof, 3.2.3.11.
 - exterior, fire-resistance rating of, 3.2.3.5., 9.10.8.1., 9.10.15.7., 9.10.15.8., 9.10.15.9.
 - exterior, meeting at a fire separation, 3.2.3.10.
 - exterior, meeting at a firewall, 3.1.8.1.(13)
 - exterior, meeting at an external angle, 3.2.3.10.
 - foundation, 4.2, 9.15.4.
 - framing for, 9.23.10., 9.25
 - masonry, 9.20
 - of noncombustible construction, 3.1.4.5., 9.10.6.1.
 - parapet, 3.1.8.1.(7), 9.10.11.7., 9.20.6.7.
 - party, 3.2.3.4.(1), 9.10.11.1., 9.10.11.2.
 - plank frame, 9.24.6.
 - post and beam, 9.24.4., 9.24.5.
- Washroom facilities for handicapped persons, 3.2.7.3., 3.6.4.4.
- Waste material, 8.2.6.
- Waterclosets, 3.6.4., 9.32.4.
- Watercloset rooms, 9.6.2.1., 9.9.2.5.
- Waterproofing and dampproofing, 5.4.2., 9.13, 9.20.15.
- Water supply, 9.32.3.
 - for firefighting, 3.2.5.3.
 - for standpipes, 3.2.5.4.(4)
- Water systems, 9.32.3., 9.32.4.
 - potable, 9.32.3.1.
- Weep holes, 9.20.14.
- Wells, water, 9.14.5.
- Wind loads, 4.1.8., 9.4.4.
- Winders, 3.4.8.10., 9.8.5.3.
- Windows (see also Unprotected openings),
 - 3.1.4.5.(3), 3.3.1.13.(5), 3.3.3.8., 3.4.8.5.(6), 3.6.2.1., 9.7
 - factory-sealed double-glazed, 9.7.5.1.
 - in exits, 9.9.4.4.
 - in public spaces, 3.3.1.13.(5), 9.7.2.3.
 - minimum glass area of, 9.7.2.2.
 - minimum glass thickness of, 9.7.4.2.
 - standards for, 9.7.3.1.
- Wired glass (see Glass)
- Wiring, electrical, 3.1.7.1.
 - in noncombustible construction, 3.1.4.5.(9)
- Wood,
 - columns, 3.1.4.4.(3), 3.1.4.4.(7), 9.10.15.10., 9.17.4., 9.36.5.2.
 - design and construction, 3.1.4.4., 4.3, 9.10.6.2., 9.23, 9.24
 - dimensions, 3.1.4.4.(2), 9.3.2.7.
 - fire-retardant treated, 3.1.4.2., 3.1.12.
 - flooring, 9.31.3.
 - floor supports, 3.1.4.4.(3), 9.31.1.3.
 - foundations, 4.2.3.1., 4.2.3.2.
 - preservative treatment of, 4.2.3.2.
 - products, 9.3.2.
 - shingles and shakes, 9.27.9., 9.28.7.
 - siding, 9.28.6.
- Working stress design, 4.1.3.
 - load combination for, 4.1.3.1.
 - from overturning and sliding, 4.1.3.4.
 - probability factors for, 4.1.3.2.(1)
 - stress reversal of, 4.1.3.3.
- Workmanship, 2.7.4.
- Yard, 3.2.5.2.(6)

APPENDIX A

EXPLANATORY MATERIAL FOR THE NATIONAL BUILDING CODE 1980

(Appendix A contains explanatory material that applies to the requirements of this Code. The bold-face reference numbers that introduce each item apply to the requirements in the main body of the Part to which the explanatory material is applicable. The bold-face captions following these reference numbers describe the subjects to which the references apply.)

Definition for 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 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.

Article 2.3.1.1.

Data for municipalities not listed in the Supplement may be obtained by writing to "Head, Energy and Industrial Application Section, Canadian Climate Service, Environment Canada, 4905 Dufferin Street, Downsview, Ontario M3H 5T4.

Part 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 impractical. 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 impractical 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 practical 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 anticipated 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.

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.

Subsection 3.1.2.

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 alternate regulations which multiple occupancy classification may present.

Sentence 3.1.6.3.(2) CEILING MEMBRANE RATINGS

In construction assemblies that utilize membrane ceiling protection and which have been assigned a fire-resistance rating on the basis of a fire test, the membrane is only 1 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 evaluate specifically the performance of this element.

Clause 3.2.2.8.(1)(c) SPRINKLERING OF ROOF ASSEMBLIES

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 by other Articles in the Code. For example, where a building is required to be sprinklered, the requirements in NFPA 13 for the installation of sprinklers requires concealed spaces to be sprinklered when combustible assemblies are exposed within the space (with certain exceptions). For the purpose of satisfying this Clause, however, sprinklers are required only beneath the membrane.

Article 3.2.3.1. TIME OF FIRE DEPARTMENT RESPONSE

The requirements of this Article are aimed at combating fire spread by thermal radiation provided adequate fire fighting is envisaged. It has been found that periods of 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.

Sentence 3.2.3.5.(3) NONCOMBUSTIBLE CLADDING

Article 3.1.4.5. requires all exterior cladding in buildings of noncombustible construction to be noncombustible including buildings 3 storeys or less in building height. This Sentence is a further restriction on the types of noncombustible cladding permitted in buildings over 3 storeys in height.

Sentence 3.2.4.2.(4)

It is intended that the key or special device mentioned in Clause (d) be immediately available to all persons on duty who have been given authority to sound a general fire alarm.

Sentence 3.2.4.2.(8)

A 2 stage fire alarm system is intended only for those buildings in which there are least 2 persons on duty at all times with authority to sound a general fire alarm.

Sentence 3.2.4.2.(10)

In a 2 stage system the second stage is the general alarm which, it is assumed, will be sounded throughout the portion of the building to be evacuated.

Sentence 3.2.5.3. WATER SUPPLIES

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.

Subsection 3.2.6. HIGH BUILDINGS

Experience with high buildings has shown that the time required for complete evacuation can exceed that which is considered necessary for the safe egress of all occupants. Studies of the "chimney effect" and observations of smoke movement in actual fires have shown that present measures for containing a fire on any 1 storey will not usually prevent the movement of smoke through elevator, stair and other vertical shafts to the upper floors of a high building. Occupants of high buildings, and particularly those on upper storeys, may therefore be faced with severe smoke conditions from fires occurring in storeys below them before their own evacuation is possible. The measures described in this Subsection 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 all fire situations will be under the direct control of the officer-in-charge of the fire department facility responding to the fire, who will determine the location of the fire, direct smoke control measures and, by means of the central control facility and the voice communication system, arrange for the safe movement of building occupants who have been alerted to the emergency condition by the fire alarm system.

This Subsection contains only those items that relate to the design and construction of a building. Operation of the facilities and recommended actions to be taken by the building owner, occupant and fire department are subjects covered by the National Fire Code of Canada.

Measures that relate to limiting or controlling the movement of smoke caused by a building fire are described in Chapter 3, "Measures for Fire Safety in High Buildings" of the Supplement to the NBC 1980. Adoption of 1 of these measures is considered to be an acceptable means of complying with the requirements of this Subsection. It is not, however, intended that these measures should be regarded as excluding any other equally effective measure that may be developed.

Sentences 3.2.6.2.(2) to (4)

The requirements of Sentences (2), (3) and (4) may be met by use of measures B, D, F, H or I described in Chapter 3, "Measures for Fire Safety in High Buildings" of the Supplement to the NBC 1980.

Sentence 3.2.6.2.(5)

The requirements in Sentence (5) may be met by use of Measures K or L, described in Chapter 3, "Measures for Fire Safety in High Buildings" of the Supplement to the NBC 1980.

Sentence 3.2.6.2.(6)

The requirements in Sentence (6) may be met by use of Measure A, described in Chapter 3, "Measures for Fire Safety in High Buildings" of the Supplement to the NBC 1980.

Sentence 3.2.6.2.(7)

The requirements of Sentence (7) may be met by use of Measures C, E, G or J, described in Chapter 3, "Measures for Fire Safety in High Buildings" of the Supplement to the NBC 1980.

Sentence 3.2.6.2.(8)

The requirements of Sentence (8) may be met by use of Measure M, described in Chapter 3, "Measures for Fire Safety in High Buildings" of the Supplement to the NBC 1980.

Sentence 3.2.6.2.(9)

The requirements of Sentence (9) may be met by use of Measure N, described in Chapter 3, "Measures for Fire Safety in High Buildings" of the Supplement to the NBC 1980.

Article 3.2.7.3.

Where buildings are designed to accommodate handicapped persons, the requirements in the ACNBC publication, "Building Standards for the Handicapped 1980" may be used as a guide for facilities in addition to the facilities required by this Code.

Sentence 3.2.9.6.(1)

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.

Section 3.3

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.

Sentence 3.4.1.1.(1)

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 practical 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 practical 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.

Clause 3.4.3.2.(6)(a)

The objective of Clause 3.4.3.2.(6)(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.

Sentence 4.1.1.3.(1) STRUCTURAL INTEGRITY

Information on structural integrity can be found in the Commentary on Progressive Collapse and Structural Integrity in Chapter 4 of the "Supplement to the NBC 1980."

Sentence 4.1.1.5.(2) 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 1980."

Sentences 4.1.1.5.(5) and (6) LATERAL DEFLECTION OF TALL BUILDINGS

The limitation of 1/500 drift per storey may be exceeded if it can be established that the drift as calculated will not result in damage to non-structural elements. Information on lateral deflection of tall buildings may be found in the Commentary on Wind Loads in Chapter 4 of the "Supplement to the NBC 1980."

Sentence 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 1980."

Sentence 4.1.1.6.(2) LATERAL VIBRATIONS AND ACCELERATIONS 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 1980."

Sentence 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 1980."

Article 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 1980."

Subsection 4.1.4. LIMIT STATES DESIGN

This Subsection on limit states design is being introduced as an alternative procedure to existing design methods. Design standard committees for the different structural materials for buildings are planning to base their standards on a unified limit states philosophy, with common safety and serviceability criteria for all materials and types of construction. To coordinate these developments a CSA/NBC Joint Liaison Committee on Limit States Design has been formed, which is made up of representatives of all committees on structural and foundation standards. This Subsection is the result of the development of common safety and serviceability criteria by this committee, as approved by the Associate Committee on the National Building Code. It contains load factors, load combination factors and importance factors which are common to all construction materials. The performance factors which take into account the type of construction are stipulated in the structural standards which have introduced Limit States Design. CSA S16, "Steel Structures for Buildings" and CSA S136, "Cold Formed Steel Structural Members" now have limit states design standards paralleling working stress design standards. CAN3-A23.3-M77, "Code for the Design of Concrete Structures for Buildings" already has a form of limit states design similar to that given in this Subsection, but contains load factors, performance factors and rules for load combinations different from those given in this Subsection. Because of this, CAN3-A23.3 should be followed as required in Sentence 4.1.4.2.(8). Committees on other structural standards such as wood and masonry plan to introduce limit states design at a later date.

Information on limit states design can be found in the Commentary on Limit States Design in Chapter 4 of the "Supplement to the NBC 1980."

Sentence 4.1.6.3.(6) TRIBUTARY AREA

Information on tributary area can be found in the Commentary on Tributary Area in Chapter 4 to the "Supplement of the NBC 1980."

Table 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 areas and basements. Where appropriate the designer should refer to CAN3-S6-M78, "Design of Highway Bridges."

Sentence 4.1.7.3.(1) 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 1980."

Sentence 4.1.7.5.(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 1980."

Sentence 4.1.8.1.(2) and (3) PRESSURE COEFFICIENTS 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 1980."

Sentence 4.1.8.1.(5) 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 1980."

Sentence 4.1.8.1.(6) and 4.1.8.2.(1) 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 1980."

Sentence 4.1.9.1.(1) DYNAMIC APPROACH TO EFFECTS OF EARTHQUAKES

Information on an appropriate dynamic approach consistent with the specified acceleration ratio including a recommended response spectrum and ductility factors can be found in the Commentary on Dynamic Analysis for the Seismic Response of Buildings in Chapter 4 of the "Supplement to the NBC 1980."

Sentence 4.1.9.1.(3) DIRECTION OF FORCES

Information on the direction of earthquake forces can be found in Commentary J of Chapter 4 of the "Supplement to the NBC 1980."

Sentence 4.1.9.1.(4) HORIZONTAL GROUND ACCELERATIONS

Within seismic Zone 3, peak horizontal ground accelerations corresponding to 1 in 100 probability of exceedance can be larger than the assumed constant value. Information concerning the calculation of acceleration for special sites is contained in the Commentary on Effects of Earthquakes in Chapter 4 of the "Supplement to the NBC 1980."

Sentence 4.1.9.1.(7) and Table 4.1.9.A. NUMERICAL COEFFICIENT, K

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 1980."

Table 4.1.9.B. AMPLIFICATION FACTORS

Where soil deposits of very loose and loose coarse-grained soils and very soft and soft fine-grained soils are of the order of 90 m or more, amplification factors greater than those given in Table 4.1.9.B. may arise in the case of tall buildings. The possibility of ground failure beneath the structure due to excessive settlement or liquefaction of very loose sands and loss of strength of sensitive clays is to be taken into account.

Table 4.1.9.C. HORIZONTAL FORCE FACTOR, S_p

Lower values of S_p may be used for machinery, fixtures and equipment, pipes, tanks, towers, chimneys, smokestacks and penthouses when connected to or forming part of a building if the lower values can be proven by analysis.

Sentence 4.1.9.1.(21) MODAL COUPLING

Severe modal coupling may occur in symmetrical or nearly symmetrical structures when the fundamental lateral and torsional periods are nearly equal. Information on this phenomenon is given in the Commentary on Effects of Earthquakes in Chapter 4 of the "Supplement to the NBC 1980."

Sentence 4.1.9.1.(23) DYNAMIC ANALYSIS FOR EARTHQUAKE DESIGN

Information on a dynamic analysis can be found in the Commentary on Dynamic Analysis for the Seismic Response of Buildings in Chapter 4 of the "Supplement to the NBC 1980."

Sentence 4.1.9.1.(24) 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 1980."

Article 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.

Article 4.2.2.3. 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 situations the authority having jurisdiction may wish to order that the review be done by the designer.

Article 4.2.4.1. 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.

Article 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 1980."

Article 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 1980."

Article 4.2.7.1. DEEP FOUNDATION UNITS

A deep foundation unit can be pre-manufactured or cast-in-place; it can be driven, jacked, jettied, screwed, bored or excavated; it can be of wood, concrete or steel or a combination thereof.

Sentence 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 1980."

Article 4.5.2.1. PRECAST CONCRETE

CAN3-A23.3-M77, "Code for the Design of Concrete Structures for Buildings" requires that precast concrete members be constructed in plants conforming to CSA A251-1971, "Qualification Code for the Manufacturers of Architectural and Structural Precast Concrete."

Article 4.6.2.2. WELDED CONSTRUCTION

Qualification for fabricators and erectors of welded construction is found in Clause 27.3 of CSA S16-1969, "Steel Structures for Buildings" and Clause 23.3 of CAN. 3-S16.1-M78, "Steel Structures for Buildings — Limit States Design."

Article 5.6.1.2. 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 1980."

Article 5.6.1.4. 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 1980."

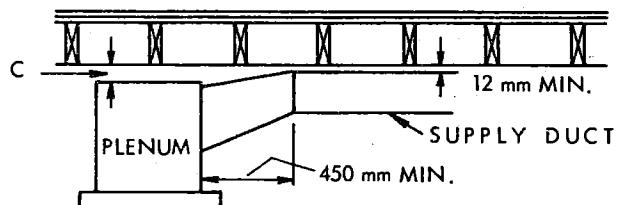
Sentence 6.2.2.3.(3) NFPA PUBLICATIONS PERTAINING TO THE HEATING, VENTILATING AND AIR-CONDITIONING OF SPACES CONTAINING HAZARDOUS GASES, DUSTS OR LIQUIDS

- NFPA 30-1977 Flammable and Combustible Liquids Code
- NFPA 32-1974 Drycleaning Plants
- NFPA 33-1977 Spray Application Using Flammable and Combustible Materials
- NFPA 34-1974 Dip Tanks Containing Flammable or Combustible Liquids
- NFPA 35-1976 Manufacture of Organic Coatings
- NFPA 36-1974 Solvent Extraction Plants
- NFPA 40-1974 Storage and Handling of Cellulose Nitrate Motion Picture Film
- NFPA 48-1974 Storage, Handling and Processing of Magnesium
- NFPA 50A-1973 Gaseous Hydrogen Systems at Consumer Sites
- NFPA 50B-1973 Liquefied Hydrogen Systems at Consumer Sites
- NFPA 51-1977 Design and Installation of Oxygen-Fuel Gas Systems for Welding and Cutting
- NFPA 51A-1974 Acetylene Cylinder Charging Plants
- NFPA 60-1973 The Installation and Operation of Pulverized Fuel Systems
- NFPA 61A-1973 Manufacturing and Handling Starch
- NFPA 61B-1973 Prevention of Fire and Dust Explosions in Grain Elevators and Bulk Grain Handling Facilities
- NFPA 61C-1973 Prevention of Fire and Dust Explosions in Feed Mills
- NFPA 63-1975 Prevention of Dust Explosions in Industrial Plants
- NFPA 65-1975 Processing and Finishing of Aluminum
- NFPA 66-1973 Pneumatic Conveying Systems for Handling Feed, Flour, Grain and Other Agricultural Dusts
- NFPA 68-1974 Guide for Explosion Venting
- NFPA 69-1973 Explosion Prevention Systems
- NFPA 81-1976 Fur Storage, Fumigation and Cleaning
- NFPA 86A-1977 Ovens and Furnaces, Design, Location and Equipment
- NFPA 86B-1974 Industrial Furnaces, Design, Location and Equipment
- NFPA 88A-1973 Parking Structures
- NFPA 88B-1973 Repair Garages
- NFPA 91-1973 Installation of Blower and Exhaust Systems for Dust, Stock and Vapor Removal or Conveying
- NFPA 96-1978 Installation of Equipment for the Removal of Smoke and Grease-Laden Vapors from Commercial Cooking Equipment
- NFPA 204-1968 Guide for Smoke and Heat Venting
- NFPA 303-1975 Marinas and Boatyards
- NFPA 307-1967 Recommendations for the Operation of Marine Terminals
- NFPA 321-1976 Basic Classification of Flammable and Combustible Liquids
- NFPA 325M-1977 Fire Hazard Properties of Flammable Liquids, Gases and Volatile Solids
- NFPA 395-1977 Storage of Flammable and Combustible Liquids on Farms and Isolated Construction Projects
- NFPA 409-1975 Aircraft Hangers
- NFPA 416-1975 Construction and Protection of Airport Terminal Buildings
- NFPA 481-1974 Production, Processing, Handling and Storage of Titanium
- NFPA 482M-1974 Zirconium
- NFPA 490-1975 Storage of Ammonium Nitrate
- NFPA 651-1974 Manufacture of Aluminum or Magnesium Powder

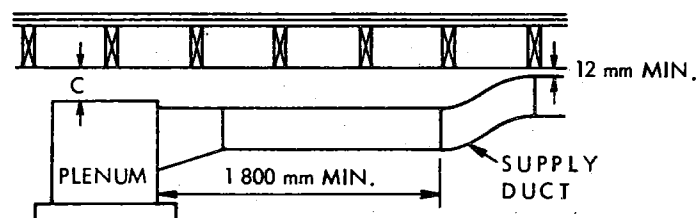
- NFPA 653-1971 Prevention of Dust Explosions in Coal Preparation Plants
- NFPA 654-1975 Prevention of Dust Explosions in the Plastics Industry
- NFPA 655-1971 Prevention of Sulfur Fires and Explosions
- NFPA 656-1971 Prevention of Dust Ignition in Spice Grinding Plants
- NFPA 664-1971 Prevention of Dust Explosions in Woodworking and Wood Floor Manufacturing Plants.

Sentence 6.2.2.2.(1) GARAGE VENTILATION

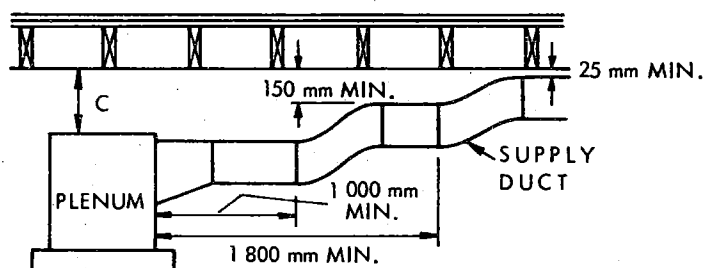
Ticket and attendant booths of parking garages should be pressurized with a supply of uncontaminated air.

Article 6.2.3.8. 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 ARTICLE 9.34.3.7.

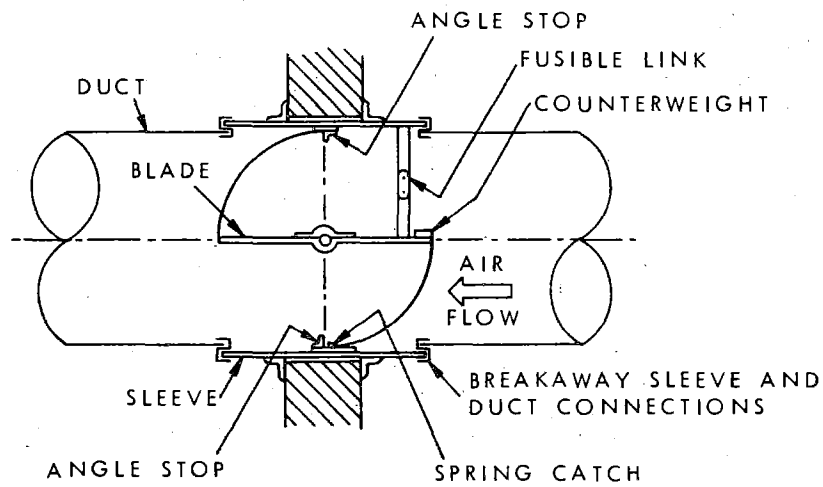


- (b) APPLICABLE TO FORCED-AIR FURNACES WHERE PERMISSIBLE CLEARANCE C ABOVE PLENUM IS MORE THAN 75 mm BUT NOT MORE THAN 150 mm REFER TO ARTICLE 9.34.3.8.

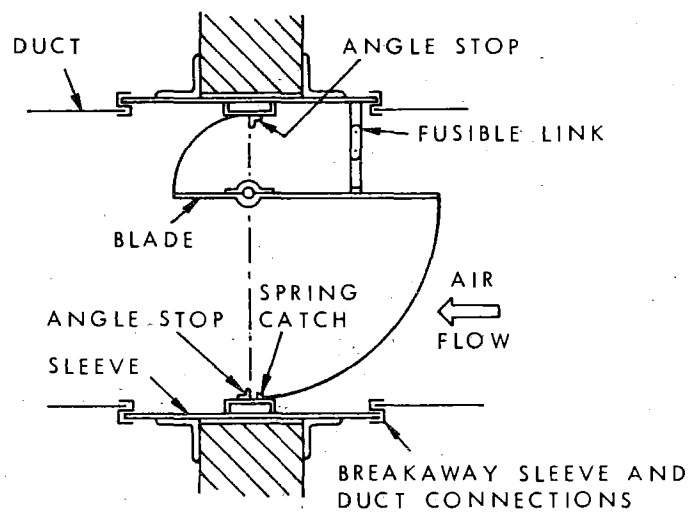


- (c) APPLICABLE TO FORCED-AIR FURNACES WHERE PERMISSIBLE CLEARANCE C ABOVE PLENUM IS MORE THAN 150 mm REFER TO ARTICLE 9.34.3.9.

Article 6.2.3.9. TYPICAL SINGLE-BLADE FIRE DAMPERS

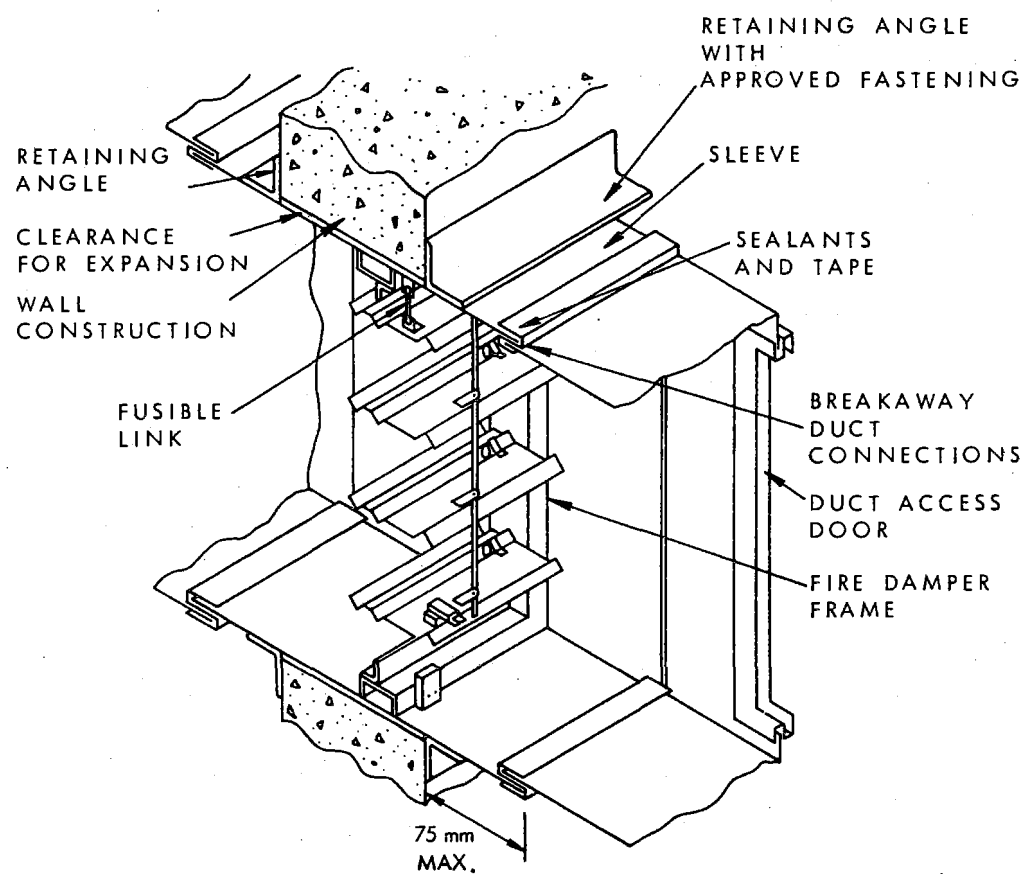


(a) ROUND DUCT



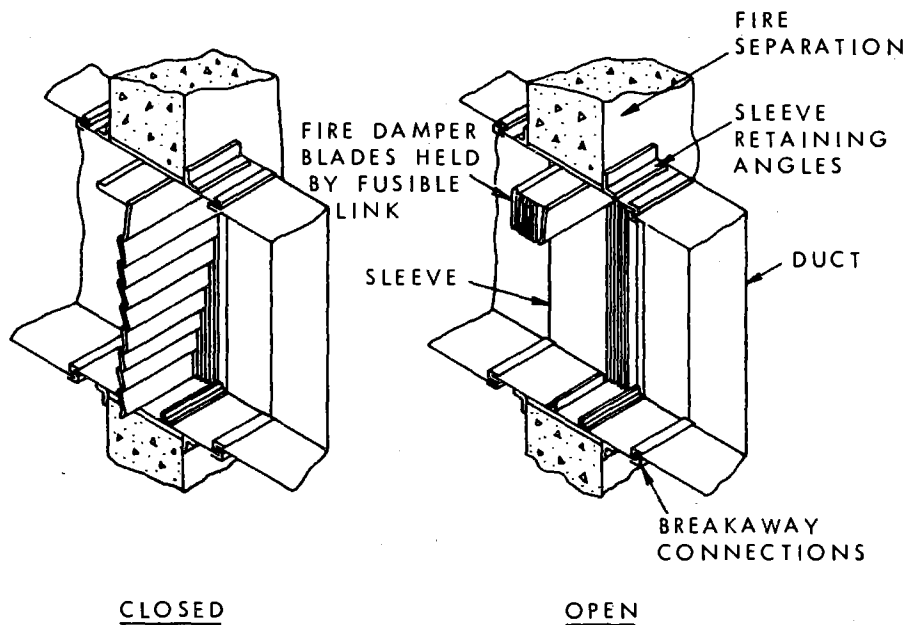
(b) RECTANGULAR DUCT

BR 5256-2

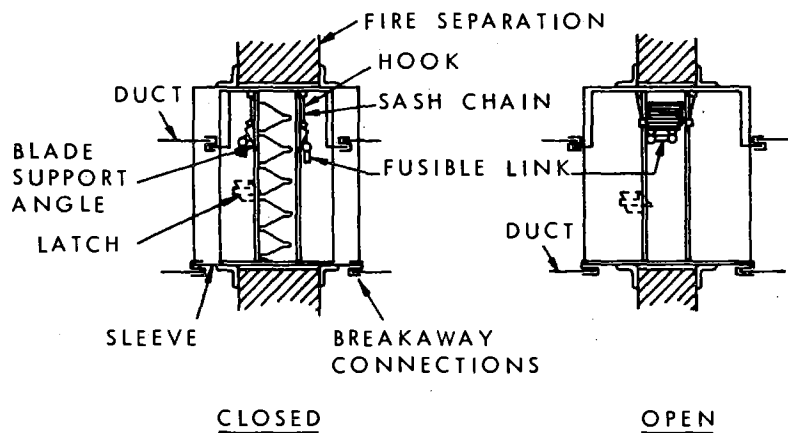
Article 6.2.3.9. (Cont'd) TYPICAL MULTIPLE-BLADE FIRE DAMPER

BR 5256-3

Article 6.2.3.9. (Cont'd) TYPICAL CURTAIN-TYPE FIRE DAMPERS



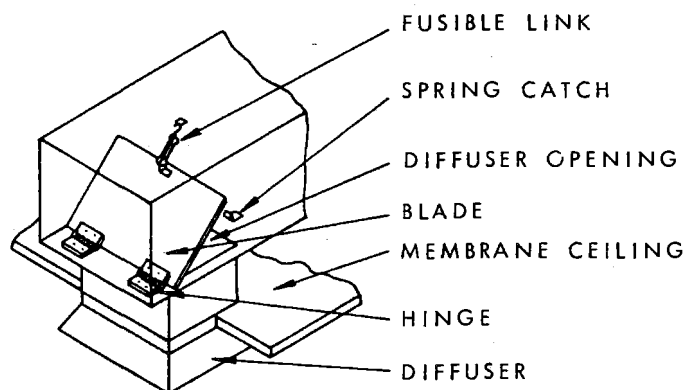
(a) INTERLOCKING BLADE TYPE



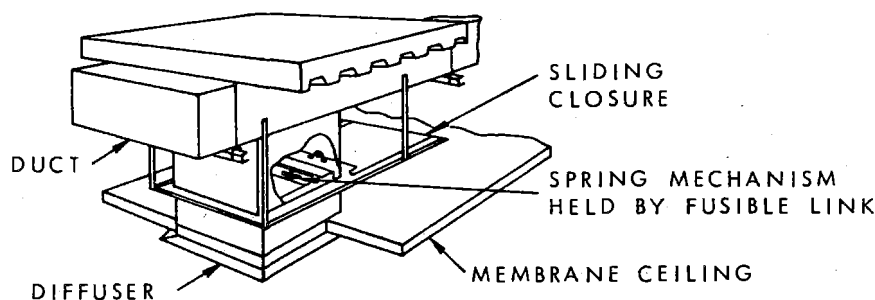
(b) HINGED OR FOLDED TYPE

BR 5256-4

Sentence 6.2.3.10.(1) TYPICAL FIRE STOP FLAPS



(a) HINGED TYPE



(b) SLIDING TYPE

BR5256-5

Sentence 6.2.3.13.(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.

Clause 6.2.5.1.(2)(b) AIR OPENINGS FOR COMBUSTION AND VENTILATION

Boiler or furnace room openings for outside air intake are necessary for combustion air and draft requirements. It may be necessary to increase the proportion of required openings to provide ventilation air for the boiler or furnace rooms. In any event, the combustion and ventilation air must not be drawn from an adjoining room or space separated from the boiler or furnace room by a fire door or other door that may become closed, either accidentally or purposely, as in a fire emergency. (See the following table.)

Sentence 6.2.5.1.(2) AIR OPENINGS FOR COMBUSTION AND VENTILATION FOR INSTALLATIONS NOT EXCEEDING 120 kW IN ANY ONE ENCLOSURE

Appliance Location	Area of Openings Required Based on Total Input Rating of all Appliances in Enclosure		
	Oil Fired Appliances	Propane and Natural Gas Fired Appliances	Solid Fuel Fired Appliances
Unconfined space with average construction	None required	None required when natural infiltration provides adequate combustion air and safe ambient air temperatures	3 300 mm ² /kW
Unconfined space with tight construction	440 mm ² /kW ⁽¹⁾	440 mm ² /kW	3 300 mm ² /kW
Confined space supplied by air within the building	2 openings each at least 2 200 mm ² /kW	2 openings each at least 2 200 mm ² /kW	3 300 mm ² /kW
Confined space supplied by air from outdoors either directly or by means of vertical ducts	2 openings each at least 550 mm ² /kW	2 openings each at least 550 mm ² /kW	3 300 mm ² /kW
Confined space supplied by air from outdoors by means of horizontal ducts	2 openings each at least 1 100 mm ² /kW	2 openings each at least 1 100 mm ² /kW	3 300 mm ² /kW
Confined space with ventilation air supplied from inside the building and combustion air from outdoors	2 openings each at least 2 200 mm ² /kW and 1 opening at least 440 mm ² /kW		3 300 mm ² /kW
Column 1	2	3	4

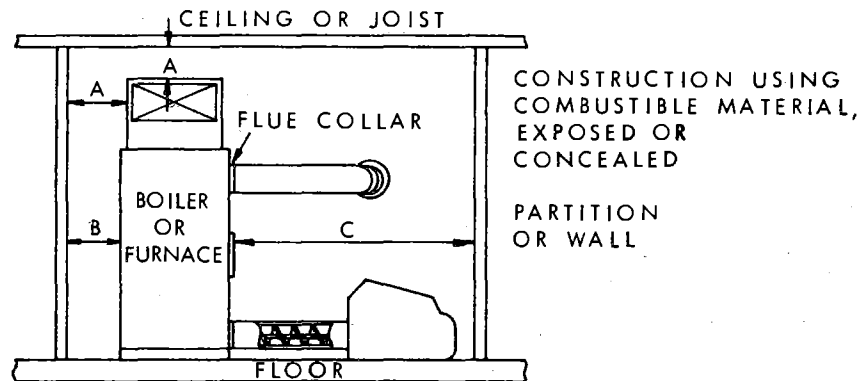
Note to Table:

⁽¹⁾ Includes the area of opening allowed for normal infiltration. (See also Article 9.34.2.1.)

Sentence 6.2.5.1.(2) AIR OPENINGS FOR COMBUSTION AND VENTILATION FOR INSTALLATIONS EXCEEDING 120 kW IN ANY ONE ENCLOSURE

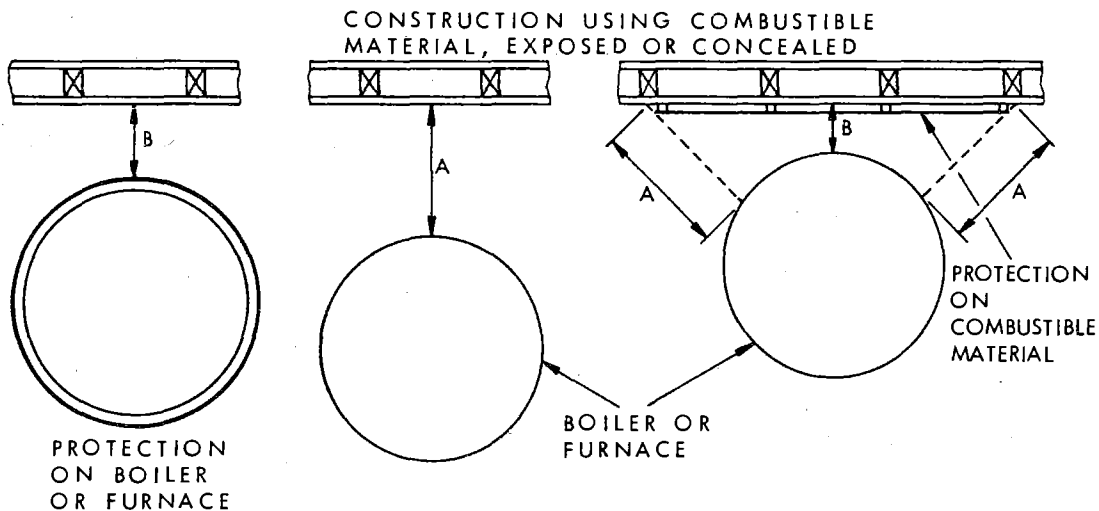
Appliance Location	Area of Openings Required Based on Total Input Rating of all Appliances in Enclosure		
	Oil Fired Appliances	Propane and Natural Gas Fired Appliances	Solid Fuel Fired Appliances
Appliance room adjacent to outside walls where combustion air is provided by natural ventilation from outdoors	1 opening at least 160 mm ² /kW and at least 7 700 mm ²		3 300 mm ² /kW
Appliance room not adjacent to outside walls	Subject to the authority having jurisdiction		3 300 mm ² /kW
Where combustion air is provided by natural ventilation from outdoors		1 or more openings totalling at least 550 mm ² /kW up to 120 kW and additional area at least 160 mm ² /kW in excess of 120 kW	3 300 mm ² /kW
Where combustion air is by mechanical draft and there are no draft regulators or draft hoods in the same room		1 or more openings totalling at least 75 mm ² /kW	3 300 mm ² /kW
Column 1	2	3	4

Sentences 6.2.5.3.(1), (2) and (3) MINIMUM CLEARANCES FOR BOILERS AND FURNACES USING SOLID FUEL



A = ABOVE AND SIDES OF
BONNET OR PLENUM
B = JACKET SIDES AND REAR
C = FRONT

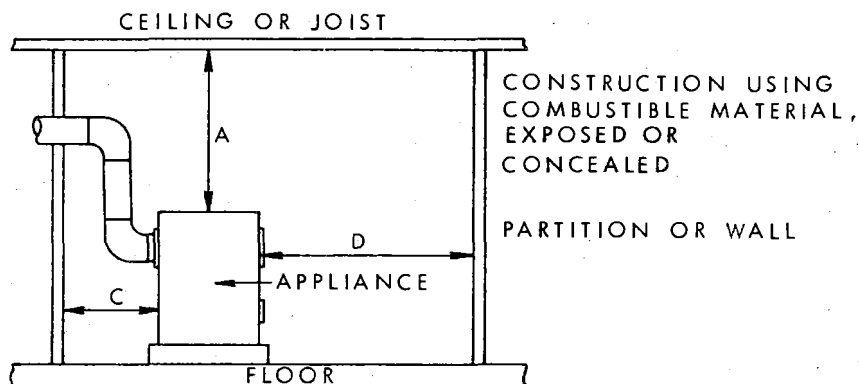
(a) BASIC CLEARANCES (TABLE 6.2.5.A.)



A = THE REQUIRED CLEARANCE WITH NO PROTECTION, SPECIFIED IN
TABLE 6.2.5.A.
B = THE REDUCED CLEARANCE PERMITTED IN ACCORDANCE WITH
TABLE 6.2.5.B.

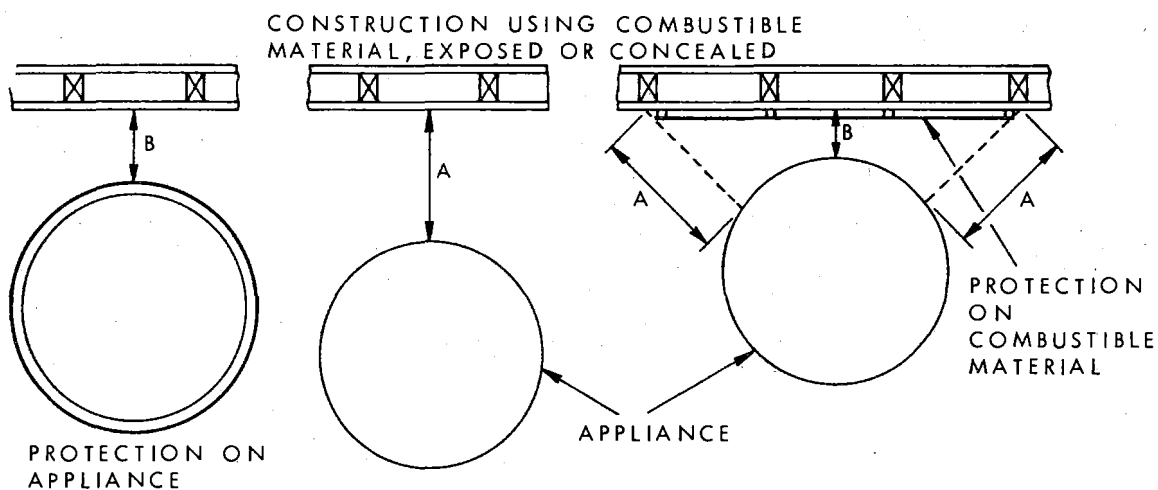
(b) CLEARANCES WITH PROTECTION (TABLE 6.2.5.B.)

Sentences 6.2.6.2.(1), (2) and (3) MINIMUM CLEARANCES FOR STOVES, RANGES, SPACE HEATERS AND SERVICE WATER HEATERS USING SOLID FUEL



A = TOP
B = SIDES (NOT SHOWN)
C = REAR
D = FRONT

(a) BASIC CLEARANCES (TABLE 6.2.6.A.)

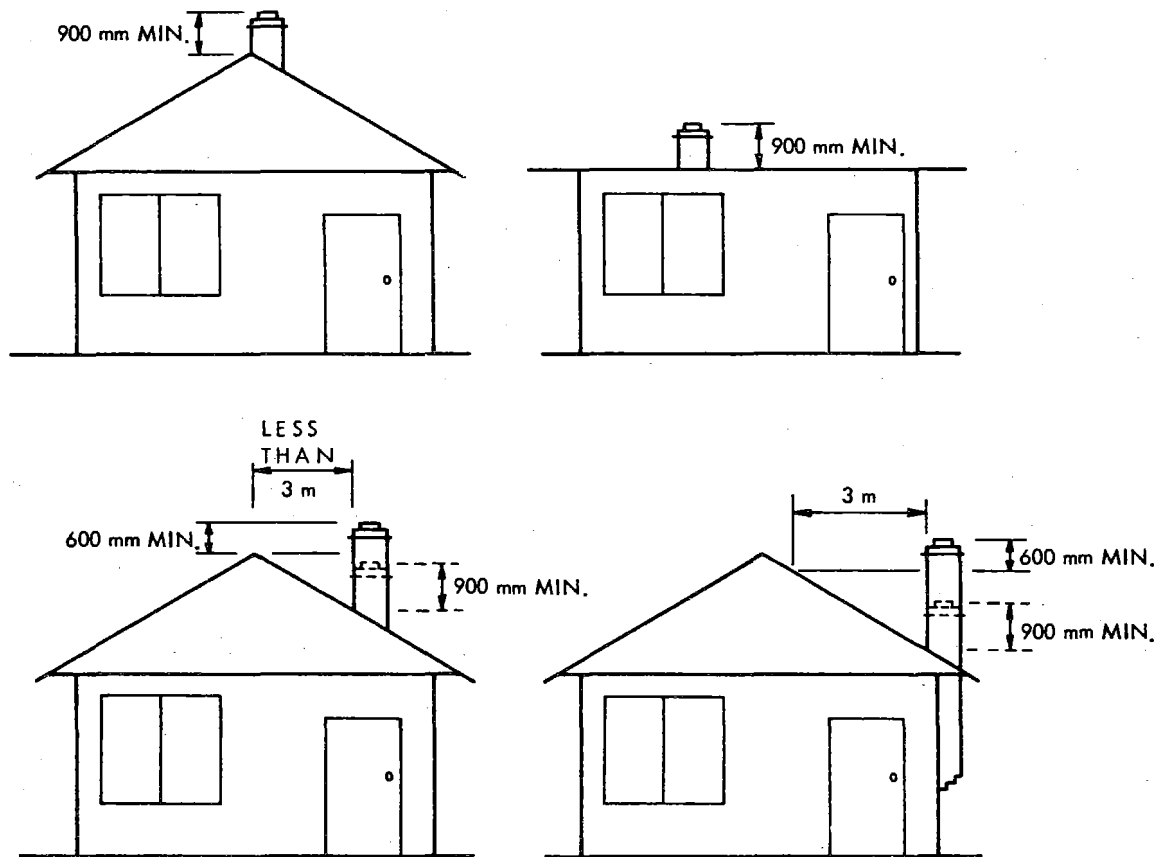


A = THE REQUIRED CLEARANCE WITH NO PROTECTION, SPECIFIED IN TABLE 6.2.6.A.
B = THE REDUCED CLEARANCE PERMITTED IN ACCORDANCE WITH TABLE 6.2.6.B.

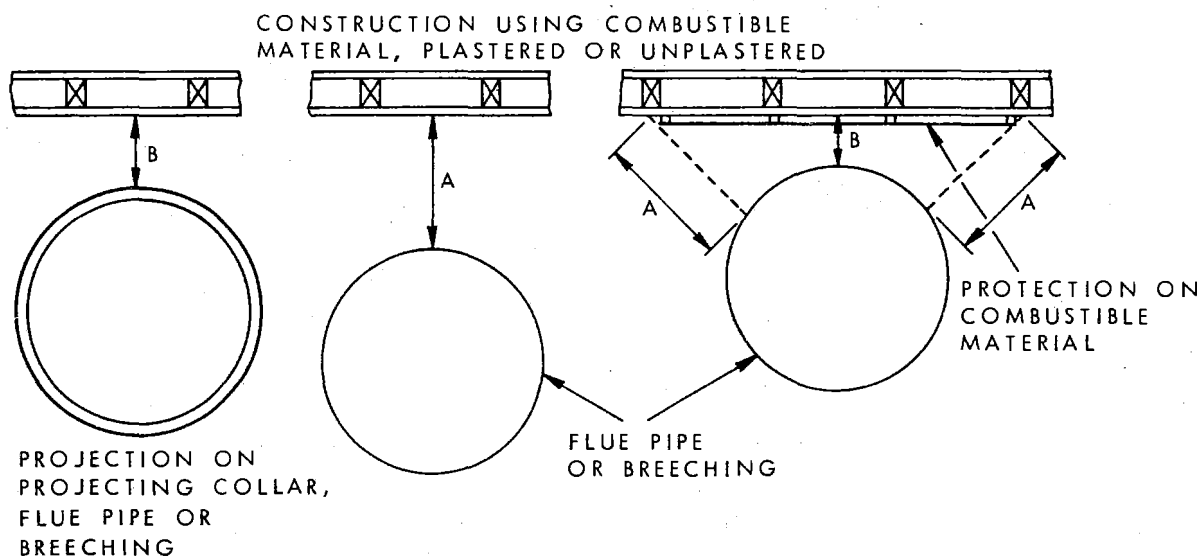
(b) CLEARANCES WITH PROTECTION (TABLE 6.2.6.B.)

Sentence 6.2.10.5.(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 as an economy measure to reduce heat losses. 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.

Sentence 6.3.1.1.(8) LOCATION OF CHIMNEY TOP

**Sentences 6.3.8.1.(7), (8) and (9) MINIMUM CLEARANCES (WITH PROTECTION)
FOR PROJECTING FLUE COLLARS, FLUE PIPES
AND BREECHING SERVING
SOLID-FUEL-BURNING APPLIANCES**



- A = THE REQUIRED CLEARANCE WITH NO PROTECTION, SPECIFIED IN
SENTENCE 6.3.8.1.(7)
- B = THE REDUCED CLEARANCE PERMITTED IN ACCORDANCE WITH
SENTENCE 6.3.8.1.(8)

BR 5256-9

Article 8.1.2.1. APPLICATION

The use of streets or public property and control of vehicular traffic during construction or demolition is normally controlled by regulations of authorities other than the building department (i.e. police department).

Article 9.3.2.1. GRADE MARKING OF LUMBER

Lumber is generally marketed by grouping species in commercial species combinations as identified in the following table. The maximum allowable spans for these 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 a commercial species combination is based on the weakest species in the combination, the use of the span is permitted for any individual species included in the combination.

Article 9.3.2.1. (Cont'd)

SPECIES DESIGNATIONS AND ABBREVIATIONS

Commercial Designations of Species or Species Combination	Abbreviation Permitted on Grade Stamps	Species Included
Douglas Fir-Larch	D Fir-L (N)	Douglas Fir, Western Larch
Hem-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
Eastern Hemlock-Tamarack	Hem-Tam (N)	Eastern Hemlock, Tamarack
Western Cedars	W Cedar (N)	Pacific Coast Yellow Cedar, Western Red Cedar
Northern Aspen	N. Aspen	Aspen Poplar, Largetooth Aspen, Balsam Poplar
Coast Species	Coast Species	Douglas Fir, Western Larch, Western Hemlock, Amabilis Fir, Coast Sitka Spruce
Northern Species	North Species	Any Canadian softwood covered by the NLGA Standard Grading Rules
Douglas Fir	D Fir (N)	Douglas Fir
Western Hemlock	W Hem (N)	Western Hemlock
Western Red Cedar	WR Cedar (N)	Western Red Cedar
Coast Sitka Spruce	C Sitka	Coast Sitka Spruce
Jack Pine	J Pine (N)	Jack Pine
Lodgepole Pine	L Pine (N)	Lodgepole Pine
Ponderosa Pine	P Pine	Ponderosa Pine
Red Pine	R Pine	Red Pine
Western White Pine	WW Pine	Western White Pine
Eastern White Pine	East Pine Pine (N) EW Pine (N)	Eastern White Pine
Alpine Fir	Alpine Fir (N)	Alpine Fir
Aspen Poplar	Aspen (N)	Aspen Poplar

Fascimiles of typical grade marks of lumber associations and grading agencies certified by the Canadian Lumber Standards (CLS) Administrative Board to grade mark lumber in Canada are shown in the following table. Certification by the CLS Administrative Board applies to the inspection, grading and grade marking of lumber, including mill supervisory service, in accordance with CSA Standard O141-1970, "Softwood Lumber."

Article 9.3.2.1. (Cont'd)

The grade mark of a CLS certified 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 certified agency under whose supervision the grading and marking was done.

Canadian lumber is graded to the NLGA Standard Grading Rules for Canadian Lumber, published by the National Lumber Grades Authority. The NLGA rules specify standard grade names and grade name abbreviations for use in grade marks to provide positive identification of lumber grades. In a similar fashion standard species names or standard species abbreviations, symbols or marks are provided in the rules for use in grade marks.

Grade marks denote the moisture content of lumber at the time of surfacing. "S-DRY" in the mark indicates the lumber was surfaced at a moisture content not exceeding 19 per cent. "MC 15" indicates a moisture content not exceeding 15 per cent. "S-GRN" in the grade mark signifies that the lumber was surfaced at a moisture content higher than 19 per cent at a size to allow for natural shrinkage during seasoning.

Each mill or grader is assigned a permanent number. The point of origin of lumber is identified in the grade mark by use of a mill or grader number or by the mill name or abbreviation. The CLS certified agency under whose supervision the lumber was grade marked is identified in the mark by the registered symbol of the agency.

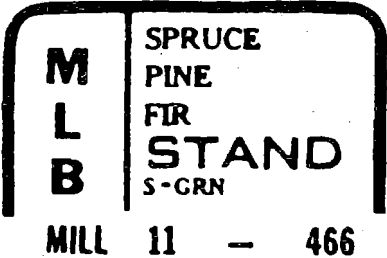
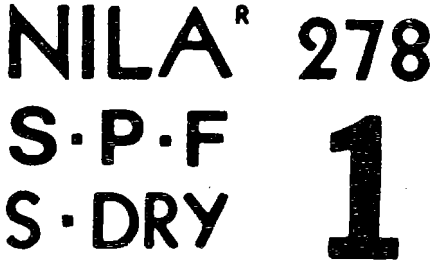
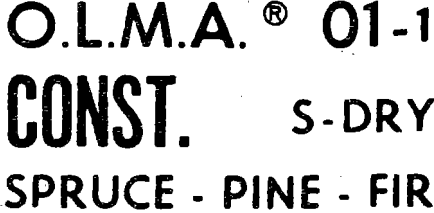
Article 9.3.2.1. (Cont'd)

**FACSIMILES OF GRADE MARKS USED BY CANADIAN LUMBER
MANUFACTURING ASSOCIATIONS AND AGENCIES AUTHORIZED
TO GRADE MARK LUMBER IN CANADA**

FACSIMILE OF GRADE MARK	ASSOCIATION OR AGENCY												
A.F.P.A.[®] 00 S—P—F S-DRY STAND	Alberta Forest Products Assoc. 204 - 11710 Kingsway Avenue Edmonton, Alberta T5G 0X5												
<table border="1"> <tr> <td align="center" colspan="2">SEL STR</td> </tr> <tr> <td align="center">SISA[®]</td> <td align="center">ALIB[®]</td> </tr> <tr> <td align="center">EPINETTE PIN - SAPIN</td> <td align="center">SPRUCE PINE - FIP</td> </tr> <tr> <td align="center" colspan="2">NOM ET/OU N° DU MOULIN MILL'S NAME AND/OR NUMBER</td> </tr> <tr> <td align="center">CLASS</td> <td align="center">R1-1108 GRDR</td> </tr> <tr> <td align="center">R VERT</td> <td align="center">S GRN</td> </tr> </table>	SEL STR		SISA [®]	ALIB [®]	EPINETTE PIN - SAPIN	SPRUCE PINE - FIP	NOM ET/OU N° DU MOULIN MILL'S NAME AND/OR NUMBER		CLASS	R1-1108 GRDR	R VERT	S GRN	Service d'inspection des sciages de l'Atlantique Atlantic Lumber Inspection Bureau A Branch of Quebec Lumber Manufacturers Association 580 Grande-Allée Est Suite 540 Québec, Québec G1R 2K2
SEL STR													
SISA [®]	ALIB [®]												
EPINETTE PIN - SAPIN	SPRUCE PINE - FIP												
NOM ET/OU N° DU MOULIN MILL'S NAME AND/OR NUMBER													
CLASS	R1-1108 GRDR												
R VERT	S GRN												
CLA S-P-F 100 No. 1 S-GRN.	Canadian Lumbermen's Association 27 Goulburn Avenue Ottawa, Ontario K1N 8C7												
LMA[®] 1 S-GRN 1 D FIR-N	Cariboo Lumber Mfrs. Association 301 - 197 2nd Avenue North Williams Lake, B.C. V2G 1Z5												
W.F.[®] W.CEDAR S-GRN.-(N) 100 No 3	Council of Forest Industries of British Columbia 1500 - 1055 West Hastings Street Vancouver, B.C. V6E 2H1												

Article 9.3.2.1. (Cont'd)

**FACSIMILES OF GRADE MARKS USED BY CANADIAN LUMBER
MANUFACTURING ASSOCIATIONS AND AGENCIES AUTHORIZED
TO GRADE MARK LUMBER IN CANADA**

FACSIMILE OF GRADE MARK	ASSOCIATION OR AGENCY
 ILMA[®] S-DRY 1 00 S-P-F	Interior Lumber Manufacturers Association 295 - 333 Martin Street Penticton, B.C. V2A 5K7
 CFPA[®] 00 S-P-F S-DRY CONST	Central Forest Products Association 14-G 1975 Corydon Avenue Winnipeg, Manitoba R3P 0R1
 MLB SPRUCE PINE FIR STAND S-GRN MILL 11 - 466	Maritime Lumber Bureau P.O. Box 459 Amherst, Nova Scotia B4H 4A1
 NILA[®] 278 S-P-F 1 S-DRY	Northern Interior Lumber Sector 514 - 550 Victoria Street Prince George, B.C. V2L 2K1
 O.L.M.A.[®] 01-1 CONST. S-DRY SPRUCE - PINE - FIR	Ontario Lumber Manufacturers Association Suite 414 - 159 Bay Street Toronto, Ontario M5J 1J7

Article 9.3.2.1. (Cont'd)

**FACSIMILES OF GRADE MARKS USED BY CANADIAN LUMBER
MANUFACTURING ASSOCIATIONS AND AGENCIES AUTHORIZED
TO GRADE MARK LUMBER IN CANADA**

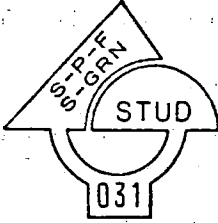
FACSIMILE OF GRADE MARK	ASSOCIATION OF AGENCY
S. T. B. ® 101 S-P-F CONST. S-GRN	Saskatchewan Forest Products Corporation 550 First Avenue East Prince Albert, Saskatchewan S6V 2A5
	L'association des manufacturiers de bois de sciage du Québec Quebec Lumber Manufacturers Association 580 Grande-Allée Est Suite 540 Québec, Québec G1R 2K2
No 1  S-DRY D FIR (N) NLGA RULE	MacDonald Inspection 125 East 4th Avenue Vancouver, B.C. V5T 1G4
NLGA RULE  No 1 S-GRN HEM-FIR-N	Pacific Lumber Inspection Bureau Suite 1130 - 1411 Fourth Avenue Bldg. Seattle, Washington 98101 B.C. Division Office 1460 - 1055 West Hastings Street Vancouver, B.C. V6E 2G8
 IO CONST S-P-F S-GRN	N.W.T. Grade Stamping Agency P.O. Box 2157 Yellowknife, N.W.T. X0E 1J7

Table 9.3.2.A. LUMBER GRADING

To identify board grades the paragraph number of the NLGA rules under which the lumber is graded must be shown in the grade mark. Paragraph 113 is equivalent to WWPA rules and paragraph 114 is equivalent to WCLIB rules. When graded in accordance with WWPA or WCLIB rules, the grade mark will not contain a paragraph number.

Table 9.4.7.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.

Table 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 soil moisture content.

Article 9.23.4.1. SPAN TABLES FOR WOOD JOISTS AND RAFTERS**General**

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 kN/m² design snow load, use spans for 1.5 kN/m² and 600 mm o.c. spacing but space members 300 mm o.c., or use spans for 2.0 kN/m² and 600 mm o.c. spacing but space members 400 mm o.c.
- (2) For a 3.5 kN/m² design snow load, use spans for 2.5 kN/m² and 600 mm o.c. spacing but space members 400 mm o.c.
- (3) For a 4.0 kN/m² design snow load, use spans for 2.0 kN/m² and 600 mm o.c. spacing but space members 300 mm o.c.

Use of Tables

The allowable spans in the span tables are measured from face or edge of support to 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 (i.e. 38 mm x 114 mm, 38 mm x 165 mm, etc.) may be estimated by straight line interpolation in the tables. Spans for 38 mm x 114 mm lumber of Construction, Standard or Utility grades may be 30 per cent greater than the spans listed for 38 mm x 89 mm lumber.

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 Section 4.3.

Spans for wood joists, rafters and beams which fall outside the scope of these tables, including those for U.S. species and individual species not marketed in the commercial species

combinations described in the Span Tables, can be calculated in conformance with CSA O86-1976, "Code for the Engineering Design of Wood."

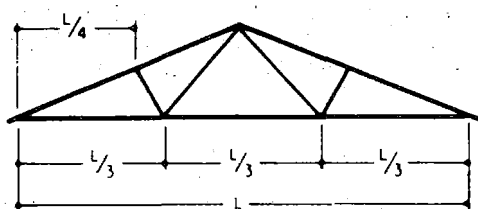
Table 9.23.4.A. MAXIMUM SPANS FOR STEEL BEAMS SUPPORTING FLOORS IN DWELLINGS

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.

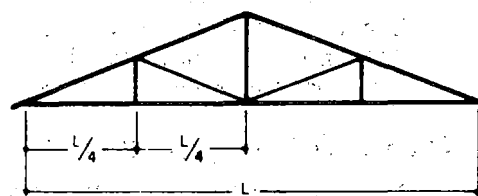
For supported joist lengths intermediate between those shown in the table, straightline interpolation may be used in determining the maximum beam span.

Article 9.23.13.15. SPAN TABLES FOR WOOD ROOF TRUSSES

In these Tables the term "Fink" truss refers to the common "W" type truss and the term "Howe" truss refers to the type which has a vertical member extending from its peak. Schematic drawings of the simplest version of each type are shown in the following diagrams. Each type may have web members additional to those shown, so that the distances between panel points are decreased in these cases.



Fink Truss



Howe Truss

The span tables in this Appendix have been calculated for wood species equivalent in strength to Spruce, Balsam Fir, Lodgepole Pine, Ponderosa Pine and Alpine Fir. The spans can therefore be safely used for the stronger species such as Douglas Fir, Western Larch, Western Hemlock, Amabilis Fir, Grand Fir, Pacific Coast Yellow Cedar, Tamarack, Jack Pine and Eastern Hemlock. The spans are not appropriate for the weaker species which include Western Red Cedar, Red Pine, Western White Pine, Eastern White Pine, Poplar and Eastern White Cedar.

The spans are based on 600 mm o.c. truss spacing.

The span tables for wood roof trusses have been calculated for 1.0, 1.5, 2.0 and 2.5 kN/m² design roof snow loads, assuming the design roof snow load to be 60 per cent of the ground snow load, and are designed to meet the performance criteria in Article 9.23.13.18. Originally, the criteria were based on a design snow load of 80 per cent of the ground snow load, using a factor of safety of 2.0. Subsequent roof snow load observations indicated a factor of 60 per cent of the ground snow load to be more appropriate, and in order to maintain the same degree of safety the factor of safety was increased from 2.0 to 2½. The following Table provides a comparison between the ground snow load and the roof snow load.

Roof snow load, kN/m ²	1.0	1.5	2.0	2.5
Equivalent ground snow load, kN/m ²	1.7	2.5	3.3	4.2

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 calculated as the product of the truss spacing and snow load in the span tables divided by the design snow load

for the locality where the trusses are to be used. The following are examples of how this principle can be applied:

- (1) For 3.0 kN/m² design snow load, use spans for 1.5 kN/m² design snow load but space trusses 300 mm o.c., or use spans for 2.0 kN/m² design snow load but space trusses 400 mm o.c.
- (2) For 3.5 kN/m² design snow load, use spans for 2.5 kN/m² design snow load but space trusses 400 mm o.c.
- (3) For 4.0 kN/m² design snow load, use spans for 2.0 kN/m² but space trusses 300 mm o.c.

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 kN/m² 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.

Article 9.23.14.3. WATER ABSORPTION TEST

A method for determining water absorption is described in ASTM D 1037-72a, "Standard Methods of Evaluating the Properties of Wood-Base Fiber and Particle Panel Materials." The treatment to reduce water absorption may be considered to be acceptable if a 300 mm x 300 mm sample when treated on all sides and edges does not increase in weight by more than 6 per cent when tested in the horizontal position.

Table 9.29.4.A. STUCCO LATH

Paper-backed welded wire lath may also be used on horizontal surfaces provided its characteristics are suitable for such application.

Tables A-10 and A-11 WOOD BEAMS

Supported joist length means $\frac{1}{2}$ the sum of the joist spans on both sides of the beam. For supported joist lengths intermediate between those shown in the tables, straight line interpolation may be used in determining the maximum beam span.

APPENDIX B

IMPERIAL CONVERSION OF METRIC VALUES IN TEXT

IMPERIAL CONVERSIONS OF METRIC VALUES IN ALBERTA REVISIONS

Code Reference	Metric Units	Imperial Units	Code Reference	Metric Units	Imperial Units
1.2.2.1.(1)(f)	10 m ²	108 sq. ft.	3.3.7.8.(1)	38°C	100°F
1.3.2. (foamed plastic interior trim)	320 kg/m ³	20 lb/cu. ft.	3.3.7.8.(2)	38°C	100°F
1.5.1.5.(3)(a)(i)	300 m ²	3,229 sq. ft.	3.4.2.1.(7)	150 m ²	1,615 sq. ft.
1.5.1.5.(3)(a)(ii)	150 m ²	1,615 sq. ft.	3.4.3.5.(1)	2 100 mm	6.9 ft.
1.5.1.5.(3)(a)(iii)	100 m ²	1,076 sq. ft.	3.5.4.3.(1)	4 m	13 ft.
1.5.1.5.(3)(c)(i)	400 m ²	4,306 sq. ft.	3.6.4.2.(16)	14 m ²	151 sq. ft.
1.5.1.5.(3)(c)(ii)	200 m ²	2,153 sq. ft.	3.6.4.2.(19)	1 400 mm	4.6 ft.
1.5.1.5.(3)(c)(iii)	130 m ²	1,615 sq. ft.	3.6.4.2.(19)	800 mm	31.5 in.
1.5.1.5.(3)(d)(i)	500 m ²	5,382 sq. ft.	3.6.4.2.(21)	900 mm	35.4 in.
1.5.1.5.(3)(d)(ii)	250 m ²	2,691 sq. ft.	6.2.2.2.(3)(b)	1 m	3.3 ft.
1.5.1.5.(3)(d)(iii)	165 m ²	1,776 sq. ft.	6.2.3.16.(1)	50 mm	2 in.
1.5.1.6.(2)(b)	28 m ²	301 sq. ft.	6.2.3.16.(2)	900 mm	35.4 in.
1.5.1.6.(2)(c)(i)	28 m ²	301 sq. ft.	6.2.3.16.(2)	25 mm	1 in.
1.5.1.6.(2)(c)(ii)	400 m ²	4,306 sq. ft.	6.2.3.16.(2)	0.04 W·m ⁻¹ ·°C ⁻¹	0.28 Btu inch/(sq. ft.-h-°F)
2.1.5.1.(2)(a)	1 200 m ²	12,916 sq. ft.	6.2.3.17.(1)	16 mm	0.63 in.
2.1.5.1.(2)(b)	600 m ²	6,458 sq.ft.	6.2.3.17.(2)	300 mm	11.8 in.
3.1.4.1.(3)(c)(i)	5°C	41°F	6.2.3.17.(4)	18°C	64°F
3.1.4.1.(4)	0.48 mm	0.019 in.	6.2.3.17.(4)	24°C	75°F
3.1.4.1.(4)	750°C	1,382°F	6.2.3.17.(5)	0.12 m ³ /s	254 cfm
3.1.4.1.(5)	0.48 mm	0.019 in.	6.2.3.17.(5)	0.06 m ³ /s	127 cfm
3.1.4.1.(5)	750°C	1,382°F	6.2.3.17.(11)	0.14 m ³ /s	297 cfm
3.1.4.4.(4)	64 mm	3 in.*	6.2.3.17.(11)	54°C	129°F
3.1.4.4.(4)(a)	64 mm	3 in.*	8.2.1.2.(1)(h)	1 200 mm	3.9 ft.
3.1.4.4.(4)(a)	38 mm	2 in.*	8.2.2.5.(1)(a)(iii)	500 m ²	5,382 sq. ft.
3.1.4.4.(4)(b)	64 mm	3 in.*	8.2.2.5.(1)(a)(iii)	500 m ²	5,382 sq. ft.
3.1.4.4.(5)	64 mm	3 in.*	9.4.3.1.	1 kPa	21 psf
3.1.4.4.(5)	38 mm	2 in.*	9.6.2.3.	1 980 mm	6.5 ft.
3.1.4.4.(5)	89 mm	4 in.*	9.6.2.3.	760 mm	29.9 in.
3.1.4.4.(5)(a)	19 mm	1 in.*	9.6.3.3.	300 mm	11.8 in.
3.1.4.4.(5)(a)	12.5 mm	½ in.	9.8.3.1.	200 mm	7.9 in.
3.1.4.4.(5)(a)	12.5 mm	½ in.	9.8.3.1.	210 mm	8.3 in.
3.1.4.4.(5)(b)	15 mm	⅝ in.	9.8.3.1.	235 mm	9.3 in.
3.1.4.4.(6)(a)	28 mm	1⅛ in.	9.8.5.4.(b)	150 mm	5.9 in.
3.1.4.4.(6)(b)(i)	38 mm	2 in.*	9.8.5.4.(c)	230 mm	9.1 in.
3.1.4.4.(6)(b)(ii)	38 mm	2 in.*	9.8.5.4.(d)	200 mm	7.9 in.
3.1.4.4.(6)(b)(ii)	64 mm	3 in.*	9.9.7.2.	3 m	9.8 ft.
3.1.4.5.(2)(j)	600 mm	23.6 in.	9.10.2.7.(1)	38°C	100°F
3.1.6.8.(2)(d)(iii)	11 m ²	118 sq. ft.	9.10.2.7.(2)	38°C	100°F
3.1.6.8.(2)(d)(iii)	22 m ²	237 sq. ft.	9.10.9.28.(d)	1 m ²	11 sq. ft.
3.2.2.19.(2)(f)	6 m	19.4 ft.	9.10.14.2.(3)	6 mm	0.23 in.
3.2.2.20.(2)(f)	6 m	19.4 ft.	9.10.14.2.(3)	3 mm	0.12 in.
3.2.4.4.(11)	1 m ²	11 sq. ft.	9.10.14.3.	38 mm	2 in.*
3.2.4.4.(12)	800 mm	31.5 in.	9.10.14.5.(1)(a)	6 mm	0.23 in.
3.2.5.4.(13)	5 mm	0.2 in.	9.10.14.5.(1)(c)	1.35 mm	0.05 in.
3.2.6.4.(1)	2.2 m ²	24 sq. ft.	9.10.14.5.(1)(c)	20 mm	0.78 in.
3.2.6.4.(1)	900 kg	1,984 lb.	9.10.14.5.(1)(d)(i)	0.84 m ²	9 sq. ft.
3.3.1.4.(5)(a)	150 m ²	1,615 sq. ft.	9.10.14.5.(1)(d)(i)	1.4 m	4.5 ft.
3.3.1.4.(5)(b)	15 m	48.6 ft.	9.10.14.5.(1)(d)(ii)	7.5 m ²	81 sq. ft.
3.3.1.17.	3 m	9.7 ft.	9.10.14.5.(1)(d)(iii)	11 m ²	118 sq. ft.
3.3.2.2.(4)	1 m ²	11 sq. ft.	9.10.14.14.	1.6 mm	0.06 in.
3.3.2.2.(5)	800 mm	31.5 in.	9.20.5.5.	90 mm	3.5 in.
3.3.3.2.(3)	1 m ²	11 sq. ft.	9.27.15.3.(2)(c)	150 mm	5.9 in.
3.3.3.2.(4)	800 mm	31.5 in.	9.27.15.3.(2)(d)	15 m	48.6 ft.
3.3.3.3.(5)(b)	2 100 mm	6.9 ft.	9.27.15.3.(2)(d)	30 m	97.2 ft.
			9.27.15.3.(2)(e)	900 m ²	9,688 sq. ft.

* Nominal dimension

Code Reference	Metric Units	Imperial Units	Code Reference	Metric Units	Imperial Units
9.33.2.8.(1)	0.008 m ²	12.4 sq. in.	10.3.1.3.(1)(b)	4.7 m ²	50 sq. ft.
9.33.2.8.(2)	0.008 m ²	12.4 sq. in.	10.4.1.2.	38 mm	2 in.*
9.33.2.8.(2)	0.033 m ²	51.2 sq. in.	10.4.1.2.	64 mm	3 in.*
9.33.2.8.(3)	0.033 m ²	51.2 sq. in.	10.4.1.2.	400 mm	15.7 in.
9.34.3.1.(1)	50 mm	2 in.	10.4.1.5.(2)(a)	14 kg/m ³	0.87 lb/cu. ft.
9.34.3.1.(2)	900 mm	35.4 in.	10.4.1.7.(2)	80 m ²	861 sq. ft.
9.34.3.1.(2)	25 mm	1 in.	10.4.1.7.(2)	10 m	33 ft.
9.34.3.1.(2)	0.04	0.28 Btu inch/ (sq. ft.·h·°F)	10.4.4.1.	0.5 m ²	5.4 sq. ft.
	W·m ⁻¹ ·°C ⁻¹		10.4.4.1.	560 mm	22 in.
9.34.7.3.	15 mm	0.6 in.	10.4.4.1.	1 m	3.3 ft.
9.35.3.2.	10 m	32.4 ft.	10.4.6.1.	25 m	82 ft.
9.37.2.2.	1.8 m	5.9 ft.	10.4.6.2.	50 m	164 ft.
10.1.1.3.(a)	1 200 m ²	12,916 sq. ft.	10.4.7.1.(1)(a)	4.5 m ³	159 cu. ft.
10.1.1.3.(b)	600 m ²	6,458 sq. ft.	10.4.7.1.(1)(b)	0.005 m ³ /s	10.5 cfm
10.1.1.4.	100 m ²	1,076 sq. ft.	10.4.7.1.(1)(b)	300 kPa	6,266 lb/sq. ft.
10.1.1.9.(1)(a)	75 m ²	807 sq. ft.	10.5.1.1.	20°C	68°F
10.2.2.1.(1)	2 kPa	42 lb/sq. ft.	10.5.1.1.	-45°C	-49°F
10.2.2.2.	0.7 kPa	14.6 lb/sq. ft.	10.5.1.1.	25 km/h	15.5 mph
10.3.1.1.	2.1 m	6.9 ft.	10.5.2.5.	50 mm	2 in.
10.3.1.2.	2 m	6.6 ft.	10.6.2.1.	10 m	32.8 ft.
10.3.1.2.	1.9 m	6.2 ft.	10.6.2.2.	15 m	49.2 ft.
10.3.1.3.(1)(a)	7.4 m ²	80 sq. ft.	10.6.6.1.	90 N	20.2 lb.

* Nominal dimension

IMPERIAL CONVERSIONS OF METRIC VALUES IN TEXT

Code Reference	Metric Units	Imperial Units	Code Reference	Metric Units	Imperial Units
Subsection 2.1.2.	600 m ²	6,458 sq ft	3.1.4.7.(4)	120 m ²	1,292 sq ft
Subsection 2.1.3.	600 m ²	6,458 sq ft	3.1.4.7.(6)	3 m	9 ft 10 in.
3.1.2.1.(4)	1 500 m ²	16,146 sq ft	3.1.6.4.(7)	11 m ²	118 sq ft
3.1.2.1.(5)	600 m ²	6,458 sq ft	3.1.6.4.(7)	3.7 m	12 ft 2 in.
Table 3.1.2.A.,	50 Kg/m ²	10 lb/sq ft	3.1.6.4.(8)	22 m ²	237 sq ft
Column 3	1 200 MJ/m ²	124,246 Btu/sq ft	3.1.6.4.(8)	6 m	19 ft 8 in.
3.1.4.1.(2)	650°C	1,202°F	3.1.6.5.(5)	760°C	1,400°F
3.1.4.4.(3)(a)(i)	191 mm	8 in.*	3.1.6.5.(5)(a)	1.2 m	3 ft 11 in.
3.1.4.4.(3)(a)(ii)	140 mm	6 in.*	3.1.6.5.(5)(a)	130 cm ²	20 sq in
3.1.4.4.(3)(a)(ii)	191 mm	8 in.*	3.1.6.5.(5)(b)	500 mm	20 in.
3.1.4.4.(3)(b)(i)	203 mm	8 in.	3.1.6.6.(3)	6 mm	¼ in.
3.1.4.4.(3)(b)(ii)	178 mm	7 in.	3.1.6.6.(3)	3 mm	⅛ in.
3.1.4.4.(4)(a)(ii)	140 mm	6 in.*	3.1.6.8.(2)(a)	6 mm	¼ in.
3.1.4.4.(4)(a)(ii)	241 mm	10 in.*	3.1.6.8.(2)(b)	25 mm	1 in.
3.1.4.4.(4)(b)	191 mm	8 in.*	3.1.6.8.(2)(b)	0.45 mm	0.0178 in.
3.1.4.4.(4)(c)	191 mm	8 in.*	3.1.6.8.(2)(b)	13 mm	½ in.
3.1.4.4.(5)(a)	140 mm	6 in.*	3.1.6.8.(2)(b)	0.40 mm	0.0158 in.
3.1.4.4.(5)(a)	191 mm	8 in.*	3.1.6.8.(2)(c)	1.35 mm	0.053 in.
3.1.4.4.(5)(a)	140 mm	6 in.*	3.1.6.8.(2)(c)	20 mm	¾ in.
3.1.4.4.(5)(b)(i)	89 mm	4 in.*	3.1.6.8.(2)(d)(i)	0.84 m ²	9 sq ft
3.1.4.4.(5)(b)(i)	140 mm	6 in.*	3.1.6.8.(2)(d)(i)	1.4 m	4 ft 7 in.
3.1.4.4.(5)(b)(ii)	64 mm	3 in.*	3.1.6.8.(2)(d)(ii)	7.5 m ²	81 sq ft
3.1.4.4.(5)(b)(iii)	38 mm	2 in.*	Table 3.1.6.(b),		
3.1.4.4.(5)(c)	64 mm	3 in.*	Column 3	250°C	482°F
3.1.4.4.(6)	64 mm	3 in.*	Table 3.1.6.(b),	8 000 cm ²	1,240 sq in
3.1.4.4.(6)	38 mm	2 in.*	Column 4	645 cm ²	1,000 sq in
3.1.4.4.(6)	89 mm	4 in.*	3.1.7.1.(3)	25 mm	1 in.
3.1.4.4.(6)(a)	19 mm	1 in.*	3.1.7.1.(4)	50 mm	2 in.
3.1.4.4.(6)(a)	12.5 mm	½ in.	3.1.7.1.(5)	160 cm ²	25 sq in
3.1.4.4.(6)(b)	15 mm	⅝ in.	3.1.7.3.(2)(a)	930 cm ²	144 sq in
3.1.4.4.(7)	28 mm	1 ⅜ in.	3.1.7.3.(2)(c)	2 m	6 ft 7 in.
3.1.4.4.(7)(a)	38 mm	2 in.*	3.1.7.3.(2)(d)	130 cm ²	20 sq in
3.1.4.4.(7)(b)	38 mm	2 in.*	3.1.8.1.(7)(a)	150 mm	5 ⅞ in.
3.1.4.4.(7)(b)	64 mm	3 in.*	3.1.8.1.(7)(b)	900 mm	35 in.
3.1.4.5.(2)(a)(ii)	1 mm	0.036 in.	3.1.8.1.(9)	3 m	9 ft 10 in.
3.1.4.5.(2)(a)(iv)	38 mm	2 in.*	3.1.9.1.(2)(b)	3 m	9 ft 10 in.
3.1.4.5.(2)(e)(i)	12.7 mm	½ in.	3.1.9.1.(3)	10 m ²	108 sq ft
3.1.4.5.(2)(e)(v)	139°C	282°F	3.1.9.1.(4)	2 m ²	22 sq ft
3.1.4.5.(2)(f)	18 m	59 ft 1 in.	3.1.9.1.(5)(a)	600 m ²	6,458 sq ft
3.1.4.5.(2)(f)(i)	15.9 mm	⅝ in.	3.1.9.1.(5)(a)	60 m	197 ft
3.1.4.5.(2)(f)(ii)	75 mm	3 in.	3.1.9.1.(5)(b)	300 m ²	3,229 sq ft
3.1.4.5.(2)(f)(iii)	139°C	282°F	3.1.9.1.(5)(b)	20 m	65 ft 7 in.
3.1.4.5.(2)(h)(i)	9 m ²	97 sq ft	3.1.9.1.(6)	20 m	65 ft 7 in.
3.1.4.5.(2)(h)(i)	3 m	9 ft 10 in.	3.1.9.1.(7)(a)(i)	760°C	1,400°F
3.1.4.5.(2)(h)(ii)	2.5 m	8 ft 2 in.	3.1.9.1.(7)(a)(ii)	38 mm	1 ½ in.
3.1.4.5.(2)(i)	300 mm	12 in.	3.1.9.1.(7)(a)(iii)	12.5 mm	½ in.
3.1.4.5.(3)(b)(ii)	1 m	3 ft 3 in.	3.1.9.1.(7)(a)(iii)	12.7 mm	½ in.
3.1.4.5.(3)(f)	1 mm	0.036 in.	3.1.9.1.(7)(a)(iii)	19 mm	¾ in.
3.1.4.5.(3)(g)	25 mm	1 in.	3.1.9.1.(7)(a)(iii)	38 mm	1 ½ in.
3.1.4.5.(3)(h)(i)	25 mm	1 in.	3.1.9.2.(1)(c)	20 m	65 ft 7 in.
3.1.4.5.(9)(b)	25 mm	1 in.	3.1.11.1.(2)(d)	1 m ²	11 sq ft
3.1.4.6.	64 mm	2 ½ in.	3.1.11.1.(2)(d)	1.2 m	47 in.
3.1.4.7.(2)	3 m	9 ft 10 in.	3.1.12.1.(1)(c)	19 mm	¾ in.
3.1.4.7.(3)	3 m	9 ft 10 in.	3.1.12.1.(1)(d)	0.05 mm	0.002 in.
			Table 3.1.14.A.	—	**

*Nominal dimension

**See Appendix C

Code Reference	Metric Units	Imperial Units	Code Reference	Metric Units	Imperial Units
3.2.1.2.(3)(c)	1 070 mm	42 in.	Table 3.2.2.D.	—	**
3.2.2.1.(3)(a)	2 m	6 ft 7 in.	3.2.2.26.(2)(a)	500 m ²	5,382 sq ft
3.2.2.1.(3)(a)	3 m	9 ft 10 in.	Table 3.2.2.E.	—	**
3.2.2.1.(3)(b)	2 m	6 ft 7 in.	3.2.2.27.(2)(a)	500 m ²	5,382 sq ft
3.2.2.1.(3)(g)(i)	3 m	9 ft 10 in.	3.2.2.27.(2)(c)	500 m ²	5,382 sq ft
3.2.2.1.(3)(g)(ii)	1 m	3 ft 3 in.	3.2.2.28.(2)(a)	500 m ²	5,382 sq ft
3.2.2.3.(2)(a)	1.8 m	5 ft 11 in.	3.2.2.28.(2)(c)	500 m ²	5,382 sq ft
3.2.2.4.(2)	15 m	49 ft 3 in.	Table 3.2.2.F.	—	**
3.2.2.4.(3)	15 m	49 ft 3 in.	3.2.2.29.(2)(a)	500 m ²	5,382 sq ft
3.2.2.9.(1)(b)	5 m	16 ft 5 in.	Table 3.2.2.G.	—	**
3.2.2.10.(1)(d)	600 m ²	6,458 sq ft	3.2.2.30.(2)(a)	500 m ²	5,382 sq ft
3.2.2.11.(2)(a)	500 m ²	5,382 sq ft	3.2.2.30.(2)(c)	500 m ²	5,382 sq ft
3.2.2.11.(2)(c)	500 m ²	5,382 sq ft	3.2.2.30.(2)(f)(i)	2 400 m ²	25,833 sq ft
3.2.2.12.(1)(b)(i)	400 m ²	4,306 sq ft	3.2.2.30.(2)(f)(i)	3 000 m ²	32,292 sq ft
3.2.2.12.(1)(b)(ii)	500 m ²	5,382 sq ft	3.2.2.30.(2)(f)(i)	3 600 m ²	38,750 sq ft
3.2.2.12.(1)(b)(iii)	600 m ²	6,458 sq ft	Table 3.2.2.H.	—	**
3.2.2.13.(1)(c)(i)	400 m ²	4,306 sq ft	3.2.2.31.(2)(a)	500 m ²	5,382 sq ft
3.2.2.13.(1)(c)(ii)	500 m ²	5,382 sq ft	3.2.2.31.(2)(c)	500 m ²	5,382 sq ft
3.2.2.13.(1)(c)(iii)	600 m ²	6,458 sq ft	3.2.2.32.(2)(a)	500 m ²	5,382 sq ft
Table 3.2.2.A.	—	**	3.2.2.32.(2)(c)	500 m ²	5,382 sq ft
3.2.2.14.(2)(a)	500 m ²	5,382 sq ft	Table 3.2.2.I.	—	**
3.2.2.14.(2)(c)	500 m ²	5,382 sq ft	3.2.2.33.(2)(a)	500 m ²	5,382 sq ft
3.2.2.14.(2)(f)(i)	800 m ²	8,611 sq ft	Table 3.2.2.J.	—	**
3.2.2.14.(2)(f)(i)	1 000 m ²	10,764 sq ft	3.2.2.34.(2)(a)	500 m ²	5,382 sq ft
3.2.2.14.(2)(f)(i)	1 200 m ²	12,917 sq ft	3.2.2.34.(2)(c)	500 m ²	5,382 sq ft
3.2.2.15.(2)(a)	500 m ²	5,382 sq ft	3.2.2.34.(2)(f)(i)	1 500 m ²	16,146 sq ft
3.2.2.15.(2)(c)	500 m ²	5,382 sq ft	3.2.2.34.(2)(f)(ii)	2 400 m ²	25,833 sq ft
3.2.2.15.(3)	3 200 m ²	34,445 sq ft	3.2.2.34.(2)(f)(ii)	3 000 m ²	32,292 sq ft
3.2.2.15.(3)	6 400 m ²	68,889 sq ft	3.2.2.34.(2)(f)(ii)	3 600 m ²	38,750 sq ft
3.2.2.16.(2)(a)	500 m ²	5,382 sq ft	3.2.2.35.(1)(a)	1 500 m ²	16,146 sq ft
3.2.2.16.(2)(c)	500 m ²	5,382 sq ft	Table 3.2.2.K.	—	**
3.2.2.17.(1)(b)(i)	1 000 m ²	10,764 sq ft	3.2.2.35.(2)(a)	500 m ²	5,382 sq ft
3.2.2.17.(1)(b)(ii)	1 250 m ²	13,455 sq ft	3.2.2.35.(2)(c)	500 m ²	5,382 sq ft
3.2.2.17.(1)(b)(iii)	1 500 m ²	16,146 sq ft	3.2.2.36.(2)(b)(ii)	500 m ²	5,382 sq ft
3.2.2.17.(2)(a)	500 m ²	5,382 sq ft	Table 3.2.2.L.	—	**
3.2.2.17.(2)(c)	500 m ²	5,382 sq ft	3.2.2.37.(2)(a)	500 m ²	5,382 sq ft
3.2.2.18.(1)(b)(i)	2 400 m ²	25,833 sq ft	3.2.2.37.(2)(c)	500 m ²	5,382 sq ft
3.2.2.18.(1)(b)(ii)	3 000 m ²	32,292 sq ft	Table 3.2.2.M.	—	**
3.2.2.18.(1)(b)(iii)	3 600 m ²	38,750 sq ft	3.2.2.38.(2)(b)(ii)	500 m ²	5,382 sq ft
3.2.2.18.(2)(a)	500 m ²	5,382 sq ft	Table 3.2.2.N.	—	**
3.2.2.18.(2)(c)	500 m ²	5,382 sq ft	3.2.2.39.(2)(a)	500 m ²	5,382 sq ft
3.2.2.18.(2)(e)(i)	1 200 m ²	12,917 sq ft	3.2.2.39.(2)(c)	500 m ²	5,382 sq ft
3.2.2.18.(2)(e)(i)	1 500 m ²	16,146 sq ft	Table 3.2.2.O.	—	**
3.2.2.18.(2)(e)(i)	1 800 m ²	19,375 sq ft	3.2.2.40.(2)(b)(ii)	500 m ²	5,382 sq ft
Table 3.2.2.B.	—	**	Table 3.2.2.P.	—	**
3.2.2.19.(2)(a)	500 m ²	5,382 sq ft	3.2.2.41.(2)(a)	500 m ²	5,382 sq ft
3.2.2.19.(2)(c)	500 m ²	5,382 sq ft	Table 3.2.2.Q.	—	**
3.2.2.20.(2)(a)	500 m ²	5,382 sq ft	3.2.2.42.(2)(a)	500 m ²	5,382 sq ft
3.2.2.20.(2)(c)	500 m ²	5,382 sq ft	3.2.2.42.(2)(c)	500 m ²	5,382 sq ft
3.2.2.21.(2)(b)(ii)	6 m	19 ft 8 in.	3.2.2.42.(2)(f)(i)	1 600 m ²	17,222 sq ft
3.2.2.22.(2)(a)	500 m ²	5,382 sq ft	3.2.2.42.(2)(f)(i)	2 000 m ²	21,528 sq ft
3.2.2.22.(2)(c)	500 m ²	5,382 sq ft	3.2.2.42.(2)(f)(i)	2 400 m ²	25,833 sq ft
3.2.2.23.(1)(b)	250 m ²	2,691 sq ft	Table 3.2.2.R.	—	**
3.2.2.23.(1)(c)	500 m ²	5,382 sq ft	3.2.2.43.(2)(a)	500 m ²	5,382 sq ft
Table 3.2.2.C.	—	**	3.2.2.43.(2)(c)	500 m ²	5,382 sq ft

**See Appendix C

Code Reference	Metric Units	Imperial Units	Code Reference	Metric Units	Imperial Units
Table 3.2.2.S.	—	**	3.2.5.1.(4)	900 mm	35 in.
3.2.2.44.(2)(a)	500 m ²	5,382 sq ft	3.2.5.2.(1)	600 m ²	6,458 sq ft
3.2.2.44.(2)(c)	500 m ²	5,382 sq ft	3.2.5.2.(2)	3 m	9 ft 10 in.
3.2.2.45.(2)(b)(ii)	500 m ²	5,382 sq ft	3.2.5.2.(2)	15 m	49 ft 3 in.
Table 3.2.2.T.	—	**	3.2.5.2.(3)(b)	90 m	295 ft
3.2.2.46.(2)(a)	500 m ²	5,382 sq ft	3.2.5.2.(3)(c)	45 m	148 ft
3.2.2.46.(2)(c)	500 m ²	5,382 sq ft	3.2.5.2.(5)	45 m	148 ft
Table 3.2.2.U.	—	**	3.2.5.2.(6)(a)	6 m	19 ft 8 in.
3.2.2.47.(2)(a)	500 m ²	5,382 sq ft	3.2.5.2.(6)(b)	12 m	39 ft 4 in.
3.2.2.47.(2)(c)	500 m ²	5,382 sq ft	3.2.5.2.(6)(c)	5 m	16 ft 5 in.
3.2.2.47.(2)(f)(i)	2 400 m ²	25,833 sq ft	3.2.5.2.(6)(d)	15 m	49 ft 3 in.
3.2.2.47.(2)(f)(i)	3 000 m ²	32,292 sq ft	3.2.5.2.(6)(f)	90 m	295 ft
3.2.2.47.(2)(f)(i)	3 600 m ²	38,750 sq ft	3.2.5.4.(1)(a)	14 m	45 ft 11 in.
Table 3.2.2.V.	—	**	3.2.5.4.(1)(b)	14 m	45 ft 11 in.
3.2.2.48.(2)(a)	500 m ²	5,382 sq ft	Table 3.2.5.A.	—	**
3.2.2.49.(2)(a)	500 m ²	5,382 sq ft	3.2.5.4.(2)	25 m	82 ft
3.2.2.49.(2)(c)	500 m ²	5,382 sq ft	3.2.5.4.(2)	4 000 m ²	43,056 sq ft
3.2.2.50.(1)(b)	22 m	72 ft 2 in.	3.2.5.4.(3)	5 m	16 ft 5 in.
3.2.2.50.(1)(c)	10 000 m ²	107,639 sq ft	3.2.5.4.(5)	30 L/s	396 gpm
3.2.2.50.(1)(e)	60 m	197 ft	3.2.5.4.(11)	45 m	148 ft
Table 3.2.2.W.	—	**	3.2.5.5.(4)	45 m	148 ft
3.2.2.51.(2)(a)	500 m ²	5,382 sq ft	3.2.6.1.(1)(a)(i)	36 m	118 ft
3.2.2.51.(2)(c)	500 m ²	5,382 sq ft	3.2.6.1.(1)(a)(ii)	18 m	59 ft 1 in.
3.2.2.52.(2)(a)	500 m ²	5,382 sq ft	3.2.6.1.(1)(a)(ii)	550 mm	22 in.
3.2.2.52.(2)(c)	500 m ²	5,382 sq ft	3.2.6.1.(1)(b)	18 m	59 ft 1 in.
3.2.3.4.(2)	1.2 m	3 ft 11 in.	3.2.6.1.(1)(c)	18 m	59 ft 1 in.
Table 3.2.3.A.	—	**	3.2.6.2.(5)(b)	75 m	246 ft
Table 3.2.3.B.	—	**	3.2.6.2.(5)(c)	0.5 m ²	5 sq ft
3.2.3.5.(3)(c)	650°C	1,202°F	3.2.6.2.(5)(c)	1.5 m ²	16 sq ft
3.2.3.5.(4)	3 m	9 ft 10 in.	3.2.6.2.(5)(d)	550 mm	22 in.
3.2.3.5.(5)	3 m	9 ft 10 in.	3.2.6.2.(5)(e)	550 mm	22 in.
3.2.3.5.(6)	3 m	9 ft 10 in.	3.2.6.2.(7)(a)	75 m	246 ft
3.2.3.6.(1)(a)	3 m	9 ft 10 in.	3.2.6.2.(7)(b)	3.6 times the area in square metres	0.33 times the area in square feet
3.2.3.6.(1)(b)	9 m	29 ft 6 in.	3.2.6.2.(8)(a)	36 m	118 ft
3.2.3.7.(1)(c)	3 m	9 ft 10 in.	3.2.6.2.(8)(b)(i)	1.5 m	4 ft 11 in.
3.2.3.9.	$F_{EO} = \frac{(T_u + 273)^4}{(T_e + 273)^4}$	$F_{EO} = \frac{(T_u + 460)^4}{(T_e + 460)^4}$	3.2.6.2.(8)(b)(ii)	0.5 m ²	5 sq ft
3.2.3.9.	Celsius	Fahrenheit	3.2.6.4.(2)	2.2 m ²	24 sq ft
3.2.3.9.	892°C	1,638°F	3.2.6.4.(2)	900 kg	1,984 lb
3.2.3.9.	927°C	1,701°F	3.2.6.6.(1)(d)	1 000 m ²	10,764 sq ft
3.2.3.9.	1 010°C	1,850°F	3.2.6.9.(1)	36 m	118 ft
3.2.3.10.	1 m	39 in.	3.2.6.11.(4)(a)	36 m	118 ft
3.2.3.11.	5 m	16 ft 5 in.	3.2.8.1.(1)	50 lx	4.6 foot candles
3.2.3.12.	1 000 m ²	10,764 sq ft	3.2.8.3.(1)	10 lx	0.9 foot candles
3.2.3.13.(1)	9 m	29 ft 6 in.	3.2.9.1.(4)(c)	500 m ²	5,382 sq ft
3.2.3.13.(1)(f)	6 m	19 ft 8 in.	3.2.9.1.(7)(a)	10 m ²	108 sq ft
3.2.3.16.(4)	100 m	328 ft	3.2.9.3.(1)(a)	1.8 m	5 ft 11 in.
3.2.5.1.(1)	25 m	82 ft	3.2.9.3.(1)(d)	30 m	98 ft 5 in.
3.2.5.1.(2)	15 m	49 ft 3 in.	3.2.9.5.(3)(b)	500 mm	20 in.
3.2.5.1.(2)	1 100 mm	43 in.	3.2.9.5.(4)(a)	1.8 m	5 ft 11 in.
3.2.5.1.(2)	550 mm	22 in.	3.2.9.5.(4)(b)	150 mm	5 7/8 in.
3.2.5.1.(2)	900 mm	35 in.	3.2.9.5.(4)(b)	300 mm	12 in.
3.2.5.1.(4)	25 m	82 ft	3.2.9.5.(4)(c)	0.62 L/s/metre	2.5 gpm/foot
3.2.5.1.(4)	1 100 mm	43 in.	3.2.9.5.(4)(c)	0.91 L/s	12 gpm
3.2.5.1.(4)	550 mm	22 in.			

**See Appendix C

Code Reference	Metric Units	Imperial Units	Code Reference	Metric Units	Imperial Units
3.2.9.10.	5 m	16 ft 5 in.	3.3.2.10.(1)(c)	660 mm	26 in.
3.2.9.10.	16 g/m ³	1 lb/1,000 cu ft	3.3.2.10.(2)	1.2 m	47 in.
3.2.9.11.(1)	metres	feet	3.3.2.10.(2)(a)	1 070 mm	42 in.
3.2.9.11.(1)	$\left(1 - \frac{H_s}{36}\right) \times \left(45 - \frac{H_b}{4}\right)$	$\left(1 - \frac{H_s}{120}\right) \times \left(150 - \frac{H_b}{4}\right)$	3.3.2.10.(2)(b)	920 mm	36 in.
3.2.9.11.(1)	18 m	59 ft 1 in.	3.3.2.10.(3)	600 mm	24 in.
3.2.9.11.(1)	108 m	354 ft	3.3.2.10.(3)	840 mm	33 in.
3.2.9.11.(1)	9 m	29 ft 6 in.	3.3.2.10.(4)	300 mm	12 in.
3.2.9.12.	3 m	9 ft 10 in.	3.3.2.11.(2)	45 m	147 ft 8 in.
3.3.1.3.(2)(c)	5 m	16 ft 5 in.	3.3.2.11.(3)	25 m	82 ft
Table 3.3.1.A.	—	**	3.3.2.11.(5)(b)	1 200 mm	47 in.
3.3.1.6.(1)	1 100 mm	43 in.	3.3.2.11.(5)(b)	750 mm	30 in.
3.3.1.6.(2)	1 100 mm	43 in.	3.3.2.11.(6)(b)	230 mm	9 in.
3.3.1.8.(1)(a)	813 mm	32 in.	3.3.2.11.(6)(c)	250 mm	9 7/8 in.
3.3.1.8.(1)(b)	609 mm	24 in.	3.3.2.12.(1)(a)	250 mm	9 7/8 in.
3.3.1.8.(1)(b)	1 219 mm	48 in.	3.3.2.12.(1)(b)	280 mm	11 in.
3.3.1.9.(2)	150 mm	5 7/8 in.	3.3.2.12.(2)	280 mm	11 in.
3.3.1.9.(2)	200 mm	7 7/8 in.	3.3.2.12.(2)	450 mm	18 in.
3.3.1.10.(1)(a)	550 mm	22 in.	3.3.2.12.(3)(b)	25 mm	1 in.
3.3.1.10.(1)(b)	550 mm	22 in.	3.3.2.13.(1)	250 m ²	2,691 sq ft
3.3.1.10.(1)(c)	550 mm	22 in.	3.3.2.13.(1)	10 m	32 ft 10 in.
3.3.1.12.(1)	1 070 mm	42 in.	3.3.2.13.(2)	2.1 m	6 ft 11 in.
3.3.1.12.(1)(b)	1 070 mm	42 in.	3.3.2.14.(2)	150 m ²	2,691 sq ft
3.3.1.12.(1)(c)	600 mm	24 in.	3.3.2.15.(4)(a)	20 m	65 ft 7 in.
3.3.1.12.(2)	920 mm	36 in.	3.3.2.15.(4)(b)	20 m	65 ft 7 in.
3.3.1.12.(2)	1 070 mm	42 in.	3.3.3.3.(4)	2 400 mm	7 ft 11 in.
3.3.1.12.(3)	100 mm	4 in.	3.3.3.3.(5)(b)	1 100 mm	43 in.
3.3.1.12.(3)	200 mm	7 7/8 in.	3.3.3.6.(5)	30 m	98 ft 5 in.
3.3.1.13.(5)	1 m	39 in.	3.3.4.2.(2)	6 m	19 ft 8 in.
3.3.2.4.(1)(c)	400 mm	16 in.	3.3.4.3.(1)	1.5 m	4 ft 11 in.
3.3.2.5.(2)	1 100 mm	43 in.	3.3.4.3.(2)(b)	6 m	19 ft 8 in.
3.3.2.5.(2)(a)	750 mm	30 in.	3.3.4.6.(2)	1 mm	0.036 in.
3.3.2.5.(2)(b)	900 mm	35 in.	3.3.4.8.	100 mm	4 in.
3.3.2.5.(3)	25 mm/m	1 1/2 in./5 ft	3.3.4.8.	900 mm	35 in.
3.3.2.5.(5)	6 m	19 ft 8 in.	3.3.5.2.(1)(b)	500 m ²	5,382 sq ft
3.3.2.5.(6)	45 m	148 ft	3.3.5.2.(2)(a)	1 mm	0.036 in.
3.3.2.5.(7)	1 100 mm	43 in.	3.3.5.2.(2)(d)	38 mm	1 1/2 in.
3.3.2.5.(9)(b)	110 mm	4 3/8 in.	3.3.6.2.(1)(b)	500 m ²	5,382 sq ft
3.3.2.5.(9)(c)	200 mm	7 7/8 in.	3.3.6.2.(2)(a)	1 mm	0.036 in.
3.3.2.5.(9)(d)(i)	6 mm	1/4 in.	3.3.6.2.(2)(d)	38 mm	1 1/2 in.
3.3.2.5.(9)(d)(ii)	430 mm	17 in.	3.3.6.3.	1 m	39 in.
3.3.2.5.(9)(e)	230 mm	9 in.	3.3.6.5.	750 mm	29 1/2 in.
3.3.2.5.(9)(e)	250 mm	9 7/8 in.	3.3.7.5.	1 m	39 in.
3.3.2.5.(9)(f)	430 mm	17 in.	3.3.7.7.(5)	2 m	6 ft 7 in.
3.3.2.5.(9)(g)	800 mm	32 in.	3.3.7.7.(6)	150 mm	5 7/8 in.
3.3.2.7.(1)	90 N	20.2 lb	3.3.7.7.(6)	1 070 mm	42 3/8 in.
3.3.2.9.(1)	450 mm	18 in.	3.3.7.7.(8)	15 m	49 ft
3.3.2.9.(2)	760 mm	30 in.	3.3.7.7.(10)	1 m	39 in.
3.3.2.9.(2)	550 mm	22 in.	3.3.7.7.(15)(a)	1.8 m	5 ft 11 in.
3.3.2.9.(3)	300 mm	11 3/8 in.	3.3.7.7.(15)(b)	14 m ³ /h	0.75 cu ft/min
3.3.2.10.(1)(a)	760 mm	30 in.	Table 3.4.2.A.	—	**
3.3.2.10.(1)(a)	920 mm	36 in.	3.4.2.2.(1)(a)	9 m	29 ft 6 in.
3.3.2.10.(1)(b)	660 mm	26 in.			
3.3.2.10.(1)(b)	600 mm	24 in.			
3.3.2.10.(1)(c)	450 mm	18 in.			

**See Appendix C

Code Reference	Metric Units	Imperial Units	Code Reference	Metric Units	Imperial Units
3.4.2.2.(1)(b)	9 m	29 ft 6 in.	3.4.8.8.(2)	300 mm	11 7/8 in.
3.4.2.3.(1)(a)	25 m	82 ft	3.4.8.8.(3)	900 mm	35 1/2 in.
3.4.2.3.(1)(b)	45 m	148 ft	3.4.8.9.(1)	millimetres	inches
3.4.2.3.(1)(c)	40 m	131 ft	3.4.8.9.(1)	45 000	70
3.4.2.3.(1)(d)	30 m	98 ft 5 in.	3.4.8.9.(1)	48 500	75
3.4.2.3.(2)	60 m	197 ft	3.4.8.9.(1)	200 mm	7 7/8 in.
3.4.2.4.(1)(a)	60 m	197 ft	3.4.8.9.(1)	125 mm	4 7/8 in.
3.4.2.4.(1)(b)	3.6 m	11 ft 10 in.	3.4.8.9.(1)	230 mm	9 in.
3.4.3.1.(2)	900 mm	35 in.	3.4.8.9.(3)	250 mm	9 7/8 in.
3.4.3.1.(3)	1 100 mm	43 in.	3.4.8.9.(3)	25 mm	1 in.
3.4.3.1.(4)	1 100 mm	43 in.	3.4.8.11.(1)	0.5 m ²	5 sq ft
3.4.3.1.(5)	1 100 mm	43 in.	3.4.8.11.(1)	1.5 m ²	16 sq ft
3.4.3.1.(6)(a)	1 219 mm	48 in.	3.4.8.11.(1)	2.5 m ²	27 sq ft
3.4.3.1.(6)(b)	610 mm	24 in.	3.4.8.11.(2)	100 mm	4 in.
3.4.3.1.(6)(c)	813 mm	32 in.	3.4.8.11.(8)	1.2 m	47 in.
3.4.3.2.(2)	550 mm	22 in.	3.4.8.11.(8)	100 mm	4 in.
3.4.3.2.(3)	millimetres	inches	3.4.8.11.(9)	1.8 m	5 ft 11 in.
3.4.3.2.(3)	550	22	3.4.8.12.(2)	500 mm	20 in.
3.4.3.2.(3)	300 mm	12 in.	3.4.8.12.(2)	1 070 mm	42 in.
3.4.3.2.(6)(a)	0.3 m ²	3 sq ft	3.4.8.13.(1)	300 mm	12 in.
3.4.3.2.(6)(b)	0.5 m ²	5 sq ft	3.4.8.13.(2)	300 mm	12 in.
3.4.3.4.(2)	50 mm	2 in.	3.4.8.13.(3)	150 mm	5 7/8 in.
3.4.3.4.(3)	750 mm	30 in.	3.4.8.13.(11)	90 N	20 lb
3.4.3.4.(4)	100 mm	4 in.	3.4.8.13.(12)	90 N	20 lb
3.4.3.5.(1)	2 150 mm	7 ft 1 in.	3.4.8.14.(3)	89 mm	3 1/2 in.
3.4.3.5.(2)	2 050 mm	6 ft 9 in.	3.4.8.14.(3)	38 mm	1 1/2 in.
3.4.3.5.(3)	2 030 mm	6 ft 8 in.	3.4.8.14.(4)	1 100 mm	43 in.
3.4.3.5.(4)	1 980 mm	6 ft 6 in.	3.4.8.14.(4)	550 mm	22 in.
3.4.5.1.(2)(a)	10 m	32 ft 10 in.	3.4.8.14.(4)	900 mm	35 in.
3.4.5.1.(2)(b)	2 m	6 ft 7 in.	3.4.8.14.(5)	3 m	9 ft 10 in.
3.4.5.1.(3)	3 m	9 ft 10 in.	3.4.8.14.(5)	10 m	32 ft 10 in.
3.4.5.1.(5)(a)	4.5 m	14 ft 9 in.	3.4.8.14.(5)	1.8 m	5 ft 11 in.
3.4.5.1.(5)(b)	15 m	49 ft 3 in.	3.4.8.14.(6)	210 mm	8 3/8 in.
3.4.6.1.(1)(d)	25 m	82 ft	3.4.8.14.(6)	220 mm	8 5/8 in.
3.4.6.1.(3)(a)	114 mm	4 1/2 in.	3.4.8.14.(7)	1 950 mm	6 ft 5 in.
3.4.6.1.(3)(a)	19 mm	3/4 in.	3.4.8.14.(8)	1 m ²	11 sq ft
3.4.6.1.(3)(b)	150 mm	5 7/8 in.	3.4.8.14.(9)	550 mm	22 in.
3.4.6.1.(3)(b)	19 mm	3/4 in.	3.4.8.14.(10)	920 mm	36 in.
3.4.8.2.(2)	10 m	32 ft 10 in.	3.4.8.14.(11)	460 mm	18 in.
3.4.8.4.(1)	3.6 m	11 ft 10 in.	3.4.8.14.(12)	550 mm	22 in.
3.4.8.4.(1)	2.4 m	7 ft 11 in.	3.5.2.1.(2)(a)	400 m ²	4,306 sq ft
3.4.8.4.(2)	1 100 mm	43 in.	3.5.2.1.(4)(b)	400 m ²	4,306 sq ft
3.4.8.5.(1)	1 100 mm	43 in.	3.5.2.2.	100 kPa (gauge)	15 psi (gauge)
3.4.8.5.(2)	2 200 mm	7 ft 3 in.	3.5.2.8.(5)	40°C	104°F
3.4.8.5.(2)	1 650 mm	5 ft 5 in.	3.5.2.8.(8)	100 mm	4 in.
3.4.8.5.(4)	800 mm	32 in.	3.5.3.2.(3)	1 m	39 in.
3.4.8.5.(4)	920 mm	36 in.	3.5.3.2.(5)(a)	750 mm	30 in.
3.4.8.5.(5)	40 mm	1 5/8 in.	3.5.4.3.(1)	550 mm	22 in.
3.4.8.5.(6)	1 070 mm	42 in.	3.5.4.3.(1)	900 mm	35 in.
3.4.8.6.(2)	920 mm	36 in.	3.5.4.3.(2)	600 mm	24 in.
3.4.8.6.(2)	1 070 mm	42 in.	3.5.4.3.(2)	550 mm	22 in.
3.4.8.6.(3)	10 m	32 ft 10 in.	3.5.4.3.(2)	900 mm	35 in.
3.4.8.6.(3)	1 500 mm	4 ft 11 in.	3.5.4.3.(3)	1 200 mm	47 in.
3.4.8.6.(4)	100 mm	4 in.	3.5.4.3.(3)	600 mm	24 in.
3.4.8.6.(4)	200 mm	7 7/8 in.	3.5.4.3.(3)	300 mm	12 in.

Code Reference	Metric Units	Imperial Units	Code Reference	Metric Units	Imperial Units
3.5.4.3.(4)	550 mm	22 in.			
3.5.4.3.(4)	900 mm	35 in.			
3.6.4.2.(4)	500 mm	20 in.			
4.1.5.1.(3)	1 kN/m ²	21 psf	6.2.2.2.(6)	900 mm	35 in.
4.1.6.3.(2)	1 200 mm	47 in.	6.2.3.1.(1)	2 m ³ /s	4,238 cfm
4.1.6.3.(5)	80 m ²	861 sq ft	6.2.3.1.(2)	2 m ³ /s	4,238 cfm
4.1.6.3.(5)	$0.5 + \sqrt{20/A}$	$0.5 + 15\sqrt{A}$	6.2.3.2.(2)(d)	120°C	248°F
4.1.6.3.(5)	square metres	square feet	6.2.3.2.(3)(b)	4 m	13 ft 1 in.
4.1.6.3.(6)	20 m ²	215 sq ft	6.2.3.2.(4)(b)	760°C	1,400°F
4.1.6.3.(6)	$0.3 + \sqrt{9.8/B}$	$0.3 + 10\sqrt{B}$	6.2.3.4.(1)(a)	250 mm	9 7/8 in.
4.1.6.3.(6)	square metres	square feet	6.2.3.4.(1)(c)	120°C	248°F
Table 4.1.6.A.	—	**	6.2.3.6.(1)	120°C	248°F
4.1.6.4.	750 mm	30 in.	6.2.3.9.(3)	30°C	54°F
Table 4.1.6.B.	—	**	6.2.3.10.(1)	1.47 mm	0.058 in.
4.1.6.5.	1.75 kN for each linear metre	120 lb for each linear foot	6.2.3.10.(1)	1.6 mm	0.063 in.
4.1.6.5.	2.2 kN	495 lb	6.2.3.10.(2)	30°C	54°F
4.1.6.5.	0.75 metre	2.5 ft	6.2.3.13.(2)	2 m	6 ft 7 in.
4.1.7.1.	1 kN/m ²	21 psf	6.2.3.13.(2)	15 mm	5/8 in.
4.1.7.3.(1)(e)	5 m	16 ft	6.2.3.13.(5)	15 mm	5/8 in.
4.1.7.4.(1)(b)	metres	feet	6.2.3.14.(4)	12 m	39 ft 4 in.
4.1.7.4.(1)(b)	4	25	6.2.3.14.(4)	30 m	98 ft 5 in.
4.1.7.4.(1)(b)	kN/m ²	pounds/square foot	6.2.3.14.(5)	55 m ³	1,942 cu ft
			6.2.4.1.(1)(b)	120 kW	409,458 Btu/hr
			6.2.4.1.(2)	120 kW	409,458 Btu/hr
4.1.8.1.(5)(b)	$(h/10)^{1/5}$	$(h/30)^{1/5}$	6.2.4.2.(2)(b)	1.2 m	47 in.
4.1.8.1.(5)(b)	metres	feet	6.2.4.2.(2)(c)	3 m	9 ft 10 in.
Table 4.1.8.A	—	**	6.2.4.2.(2)(c)	5 m	16 ft 5 in.
4.1.8.2.(1)	120 m	394 ft	6.2.5.1.(2)(b)	3.3 mm ² /W	1 1/2 sq in/1,000 Btu/hr
4.1.9.1.(6)	$0.09 h_p/\sqrt{D}$	$0.05 h_p/\sqrt{D}$	6.2.5.2.(1)(c)	90 mm	3 1/2 in.
4.1.9.1.(6)	metres	feet	6.2.5.2.(2)(a)	90 mm	3 1/2 in.
Table 4.1.9.B., Column 1	15 m	49 ft	6.2.5.2.(2)(a)	0.56 mm	0.022 in.
4.1.9.1.(16)	38°C	100°F	6.2.5.2.(3)(a)	450 mm	18 in.
4.1.9.3.(1)	60 m	197 ft	6.2.5.2.(5)(a)	100 mm	3 7/8 in.
4.1.9.3.(4)(c)	200 kg/m ²	41 lb/sq ft	6.2.5.2.(6)	0.56 mm	0.022 in.
4.1.9.3.(4)(c)	3 m	9 ft 10 in.	6.2.5.2.(6)	6 mm	1/4 in.
4.1.10.1.(1)(a)	0.6 kN/m	41 lb/lin ft	6.2.5.2.(6)	450 mm	18 in.
4.1.10.1.(1)(a)	0.9 kN	202 lb	6.2.5.2.(6)	150 mm	5 7/8 in.
4.1.10.1.(1)(b)	1.5 kN/m	103 lb/lin ft	Table 6.2.5.A.	—	**
4.1.10.1.(1)(c)	3.6 kN/m	247 lb/lin ft	Table 6.2.5.B.	—	**
4.1.10.1.(1)(d)	4.4 kN/m	302 lb/lin ft	6.2.5.5.(1)(b)(i)	120°C	248°F
	11 kN	2,473 lb	6.2.5.5.(2)	120°C	248°F
	500 mm	20 in.	6.2.5.5.(4)	120°C	248°F
4.1.10.1.(1)(e)	0.55 kN	124 lb	6.2.5.5.(5)(a)(ii)	32 Pa	1/8 in. water
4.1.10.1.(1)(f)	2.2 kN/m	151 lb/lin ft	6.2.5.5.(6)	120°C	248°F
4.1.10.1.(2)	1 kN/m ²	21 psf	6.2.5.5.(7)	300 mm	12 in.
4.1.10.1.(2)	0.45 kN	101 lb	6.2.5.5.(7)	250 mm	9 7/8 in.
4.1.10.1.(4)	1.5 kN/m	103 lb/lin ft	Table 6.2.6.A.	—	**
4.1.10.2.	0.3 kN/m	21 lb/lin ft	Table 6.2.6.B.	—	**
4.1.10.2.	0.15 kN/m	10 lb/lin ft	6.2.8.2.	25 mm	1 in.
Table 6.1.4.A.	—	**	6.2.10.5.(2)	120°C	248°F
			6.2.10.5.(6)	70°C	158°F
			6.2.10.5.(7)	12.7 mm	1/2 in.
			6.2.10.5.(7)	139°C	250°F
			Table 6.2.10.A.	—	**

**See Appendix C

Code Reference	Metric Units	Imperial Units	Code Reference	Metric Units	Imperial Units
6.2.10.7.(1)	120°C	248°F	8.2.5.3.(1)(a)	6 mm	¼ in.
6.2.10.7.(1)	50 mm	2 in.	8.2.5.3.(1)(b)	450 mm	18 in.
6.2.10.7.(2)	25 mm	1 in.	8.2.5.3.(1)(b)	1.2 m	47 in.
6.2.12.1.(2)	50°C	122°F	8.2.5.3.(1)(c)	150 mm	5⅞ in.
6.2.12.1.(5)	50°C	122°F	8.2.5.3.(1)(d)	150 mm	5⅞ in.
6.3.1.1.(2)	120 kW	409,458 Btu/hr	9.3.1.5.	14 MPa	2,030 psi
6.3.1.1.(8)(a)	900 mm	35 in.	9.3.1.6.	20 MPa	2,900 psi
6.3.1.1.(8)(b)	600 mm	24 in.	9.3.1.7.	100 mm	4 in.
6.3.1.1.(8)(b)	3 m	9 ft 10 in.	9.3.1.7.	50 mm	2 in.
6.3.1.4.(3)	600 mm	24 in.	Table 9.3.1.A.	—	**
6.3.1.4.(3)	900 mm	35 in.	9.3.1.10.	5°C	41°F
6.3.1.6.	2.5 m	8 ft 2 in.	9.3.1.10.	10°C	50°F
6.3.2.1.(2)(d)	0.30 mm	0.012 in.	9.3.1.10.	25°C	77°F
6.3.2.1.(2)(d)	540°C	1,004°F	Table 9.3.2.A.	114 mm	5 in.*
6.3.2.1.(3)(b)	600 mm	24 in.	9.4.2.1.	750 mm	30 in.
6.3.2.1.(4)(a)	75 mm	3 in.	Table 9.4.2.A.	—	**
6.3.2.1.(4)(b)	89 mm	3½ in.	Table 9.4.2.B.	—	**
6.3.2.1.(5)(a)	290 mm	11⅞ in.	9.4.3.1.	1 kN/m²	21 psf
6.3.2.1.(5)(b)	150 mm	5⅞ in.	9.4.3.2.	4.3 m	14 ft 1 in.
6.3.2.1.(5)(d)	25 mm	1 in.	9.4.3.2.	1 kN/m²	21 psf
6.3.2.1.(6)	50 mm	2 in.	9.4.3.3.	6 m	19 ft 8 in.
6.3.2.1.(6)	12 mm	½ in.	9.4.3.3.	12 m	39 ft 4 in.
6.3.2.1.(7)	150 mm	5⅞ in.	9.4.3.3.	600 mm	24 in.
6.3.2.1.(9)	25 mm	1 in.	9.4.3.4.	600 m²	6,458 sq ft
6.3.2.1.(10)	12 mm	½ in.	9.4.6.1.	600 m²	6,458 sq ft
6.3.5.1.(4)	3.2 mm	⅛ in.	9.4.6.2.	600 m²	6,458 sq ft
6.3.5.1.(5)(b)	320°C	608°F	9.4.7.1.	1 m	39 in.
6.3.5.1.(7)	540°C	1,004°F	9.4.7.1.	300 mm	12 in.
6.3.5.1.(7)	114 mm	4½ in.	9.4.7.1.	25 mm	1 in.
6.3.5.1.(7)	7.5 m	24 ft 7 in.	Table 9.4.7.A.	—	**
6.3.5.1.(7)	540°C	1,004°F	9.4.7.7.	480 kg/m³	30 lb/cu ft
6.3.5.1.(8)(a)	900 mm	35 in.	Table 9.5.2.A.	—	**
6.3.5.1.(8)(b)	1.8 m	5 ft 11 in.	9.5.2.2.	2.15 m	7 ft 1 in.
6.3.5.1.(8)(c)	100 mm	3⅞ in.	9.5.2.3.	2 m	6 ft 7 in.
6.3.5.1.(9)	900 mm	35 in.	9.5.3.1.	13.5 m²	145 sq ft
6.3.5.1.(10)	300 mm	12 in.	9.5.3.1.	3 m	9 ft 10 in.
6.3.5.1.(10)	230 mm	9 in.	9.5.3.1.	11 m²	118 sq ft
6.3.5.1.(11)	150 mm	5⅞ in.	9.5.4.1.	3.25 m²	35 sq ft
6.3.8.1.(1)	1 100°C	2,012°F	9.5.4.1.	7 m²	75 sq ft
6.3.8.1.(2)	300°C	572°F	9.5.4.2.	2.3 m	7 ft 7 in.
Table 6.3.8.A.	—	**	9.5.4.3.	1.7 m	5 ft 7 in.
6.3.8.1.(7)	450 mm	18 in.	9.5.5.1.	4.2 m²	45 sq ft
Table 6.3.8.B.	—	**	9.5.5.1.	3.7 m²	40 sq ft
8.2.1.1.(1)(b)	2 m	6 ft 7 in.	9.5.6.1.	7 m²	75 sq ft
8.2.1.2.(1)(a)	2.5 m	8 ft 2 in.	9.5.6.1.	6 m²	65 sq ft
8.2.1.2.(1)(b)	1.5 m	4 ft 11 in.	9.5.6.1.	2 m	6 ft 7 in.
8.2.1.2.(1)(c)	2.4 kN/m²	50 psf	9.5.6.2.	9.8 m²	106 sq ft
8.2.1.2.(1)(f)	1 070 mm	42 in.	9.5.6.2.	8.8 m²	95 sq ft
8.2.1.3.	2 m	6 ft 7 in.	9.5.6.2.	2.7 m	8 ft 10 in.
8.2.1.3.	1.8 m	5 ft 11 in.	9.5.6.3.	4.2 m²	45 sq ft
8.2.1.5.(1)(a)	3 m	9 ft 10 in.	9.5.6.3.	2 m	6 ft 7 in.
8.2.2.4.(1)(d)	500 m²	5,382 sq ft	9.5.6.4.	7 m²	75 sq ft
8.2.5.2.(1)(b)	450 mm	18 in.	9.5.6.4.	4.6 m²	50 sq ft
8.2.5.2.(1)(b)	500 mm	20 in.	9.5.6.4.	2 m	6 ft 7 in.
8.2.5.2.(1)(c)	1 m	39 in.	9.5.8.1.	860 mm	34 in.

*Nominal dimension

**See Appendix C

Code Reference	Metric Units	Imperial Units	Code Reference	Metric Units	Imperial Units
9.5.8.1.	4.3 m	14 ft 1 in.	9.8.8.6.	600 mm	24 in.
9.5.8.1.	710 mm	28 in.	9.8.8.7.	100 mm	3 $\frac{7}{8}$ in.
Table 9.6.3.A.	—	**	9.8.8.7.	200 mm	7 $\frac{7}{8}$ in.
9.6.3.2.	810 mm	32 in.	9.8.8.8.	100 mm	3 $\frac{7}{8}$ in.
9.6.3.2.	2 030 mm	6 ft 8 in.	9.8.8.8.	900 mm	35 in.
Table 9.6.5.A.	—	**	9.8.9.1.	150 mm	5 $\frac{7}{8}$ in.
9.6.5.2.	500 mm	20 in.	9.8.9.2.	90 mm	3 $\frac{1}{2}$ in.
9.6.5.3.	0.5 m ²	5 sq ft	9.8.9.2.	235 mm	9 $\frac{1}{4}$ in.
9.6.5.3.	900 mm	35 in.	9.8.9.2.	25 mm	1 in.
Table 9.7.2.A.	0.37 m ²	4 sq ft	9.8.9.2.	38 mm	1 $\frac{1}{2}$ in.
Table 9.7.2.A.	0.55 m ²	6 sq ft	9.8.9.2.	900 mm	35 in.
Table 9.7.2.A.	600 m	24 in.	9.8.9.2.	600 mm	24 in.
Table 9.7.4.A.	—	**	9.8.9.2.	1 200 mm	47 in.
9.7.6.2.	1 070 mm	42 in.	9.8.9.3.	25 mm	1 in.
9.7.6.4.	1 m	39 in.	9.8.9.3.	750 mm	30 in.
			9.8.9.3.	38 mm	1 $\frac{1}{2}$ in.
			9.8.10.2.	200 mm	7 $\frac{7}{8}$ in.
			Table 9.9.3.A.	—	**
9.8.3.3.	200 mm	7 $\frac{7}{8}$ in.	9.9.3.4.	1 100 mm	43 in.
9.8.3.3.	125 mm	4 $\frac{7}{8}$ in.	9.9.3.4.	900 mm	35 in.
9.8.3.3.	230 mm	9 in.	9.9.3.5.	1 100 mm	43 in.
9.8.3.3.	250 mm	9 $\frac{7}{8}$ in.	9.9.3.7.	millimetres	inches
			9.9.3.7.	550	22
			9.9.3.7.	300 mm	12 in.
			9.9.3.9.	2.15 m	7 ft 1 in.
9.8.3.4.	250 mm	9 $\frac{7}{8}$ in.	9.9.4.3.	0.8 m ²	9 sq ft
9.8.3.4.	25 mm	1 in.	9.9.4.5.	3 m	9 ft 10 in.
9.8.3.5.	900 mm	35 in.	9.9.5.4.	750 mm	30 in.
9.8.3.6.	860 mm	34 in.	9.9.5.7.	100 kPa	14.5 psig
9.8.3.7.	1.95 m	6 ft 5 in.	9.9.6.2.	50 mm	2 in.
9.8.3.7.	2.05 m	6 ft 9 in.	9.9.6.2.	550 mm	22 in.
9.8.4.1.	900 mm	35 in.	9.9.6.3.	750 mm	30 in.
9.8.4.1.	1 100 mm	43 in.	9.9.6.4.	1 980 mm	6 ft 6 in.
9.8.4.5.	3.6 m	11 ft 10 in.	9.9.6.5.	2 030 mm	6 ft 8 in.
9.8.4.6.	1.95 m	6 ft 5 in.	9.9.6.5.	810 mm	32 in.
9.8.4.6.	2.05 m	6 ft 9 in.	9.9.6.5.	600 mm	24 in.
9.8.5.2.	200 mm	7 $\frac{7}{8}$ in.	9.9.6.5.	1 200 mm	47 in.
9.8.5.2.	150 mm	5 $\frac{7}{8}$ in.	9.9.6.7.	300 mm	12 in.
9.8.6.2.	300 mm	12 in.	9.9.6.8.	150 mm	5 $\frac{7}{8}$ in.
9.8.6.3.	900 mm	35 in.	9.9.6.13.	90 N	20 lb
9.8.7.1.	1 100 mm	43 in.			
9.8.7.4.	800 mm	31 in.	Table 9.9.7.B.	—	**
9.8.7.4.	900 mm	35 in.	9.9.8.2.	40 m	131 ft
9.8.7.5.	40 mm	1 $\frac{5}{8}$ in.	9.9.8.2.	30 m	98 ft
9.8.7.7.	100 mm	3 $\frac{7}{8}$ in.	9.9.8.2.	45 m	148 ft
9.8.8.1.	600 mm	24 in.	9.9.8.7.	5 m	16 ft 5 in.
9.8.8.3.	1 070 mm	42 in.	9.9.8.7.	15 m	49 ft 3 in.
9.8.8.4.	900 mm	35 in.	9.9.9.2.	1 m	39 in.
9.8.8.4.	1 070 mm	42 in.	9.9.9.2.	0.55 m	22 in.
9.8.8.5.	800 mm	31 in.	9.9.9.2.	7 m	23 ft
9.8.8.5.	900 mm	35 in.	9.9.10.6.	20 mm	$\frac{3}{4}$ in.
9.8.8.6.	150 mm	5 $\frac{7}{8}$ in.	9.9.10.6.	150 mm	5 $\frac{7}{8}$ in.
9.8.8.6.	1 070 mm	42 in.	9.9.10.6.	115 mm	4 $\frac{1}{2}$ in.

**See Appendix C

Code Reference	Metric Units	Imperial Units	Code Reference	Metric Units	Imperial Units
9.9.11.4.	10 lx	1 foot candle	9.10.14.18.	45 mm	1 3/4 in.
9.9.11.4.	1 W/m ²	1 W/10 sq ft	Table 9.10.15.A.	—	**
9.10.3.6.	50 kg/m ²	10 lb/sq ft	9.10.15.5.	9 m	29 ft 6 in.
9.10.3.6.	1 200 MJ/m ²	100,000 BTU/sq ft	9.10.15.6.	3 m	9 ft 10 in.
9.10.3.8.	50 kg/m ²	10 lb/sq ft	9.10.15.8.	1.2 m	47 in.
9.10.3.8.	1 200 MJ/m ²	100,000 BTU/sq ft	9.10.15.8.	0.6 m	2 ft
9.10.4.4.	1.2 m	47 in.	9.10.15.9.	0.6 m	2 ft
9.10.5.3.	2 m	6 ft 7 in.	9.10.15.10.	3 m	9 ft 10 in.
9.10.5.3.	900 cm ²	1 sq ft	9.10.15.11.	3 m	9 ft 10 in.
9.10.5.3.	130 cm ²	20 sq in.	9.10.16.2.	3 m	9 ft 10 in.
9.10.7.2.	2 m	6 ft 7 in.	9.10.16.4.	300 m ²	3,229 sq ft
9.10.7.2.	3 m	9 ft 10 in.	9.10.16.4.	20 m	65 ft 7 in.
9.10.7.7.	3 m	9 ft 10 in.	9.10.16.5.	20 m	65 ft 7 in.
9.10.7.7.	1 m	39 in.	9.10.16.6.	0.91 mm	0.036 in.
9.10.7.8.	3 m	9 ft 10 in.	9.10.16.6.	6 mm	1/4 in.
9.10.8.5.	1.8 m	5 ft 11 in.	9.10.16.6.	12.7 mm	1/2 in.
9.10.8.7.	1 070 mm	42 in.	9.10.16.6.	12 mm	1/2 in.
9.10.8.8.	600 m ²	6,458 sq ft	9.10.16.6.	19 mm	1 in.*
9.10.9.10.	25 mm	1 in.	9.10.16.6.	38 mm	2 in.*
9.10.9.10.	160 cm ²	25 in ²	9.10.20.1.	1 100 mm	43 in.
9.10.9.21.	5 m	16 ft 5 in.	9.10.20.1.	550 mm	22 in.
9.10.10.5.	400 m ²	4,305 sq ft	9.10.20.1.	900 mm	35 in.
9.10.11.7.	150 mm	5 7/8 in.	9.10.20.3.	25 m	82 ft
9.10.11.7.	900 mm	35 in.	9.10.20.3.	1 100 mm	43 in.
9.10.11.7.	3 m	9 ft 10 in.	9.10.20.3.	550 mm	22 in.
9.10.11.10.	250°C	482°F	9.10.20.3.	900 mm	35 in.
9.10.11.10.	645 cm ²	0.7 sq ft	9.10.21.5.	10 m	32 ft 10 in.
9.10.12.6.	0.41 mm	0.016 in.	9.10.21.11.	19 mm	3/4 in.
9.10.12.6.	0.48 mm	0.019 in.	9.10.21.11.	4 500 L	990 gal.
9.10.12.7.	750 mm	30 in.	9.10.21.11.	5 L/s	66 gpm
9.10.12.12.	1 000 cm ²	1 sq ft	9.10.21.11.	300 kPa	44 psig
9.10.12.12.	1 m	39 in.	Table 9.11.2.A.	—	**
9.10.13.1.	1 m	39 in.	Table 9.11.2.B.	—	**
9.10.13.4.	5 m	16 ft 5 in.	9.12.1.1.	300 mm	12 in.
9.10.13.5.	1.2 m	47 in.	Table 9.12.2.A.	1.2 m	47 in.
9.10.14.2.	45 mm	1 3/4 in.	9.12.2.5.	50 m ²	538 sq ft
9.10.14.2.	6 mm	1/4 in.	9.12.3.3.	600 mm	24 in.
9.10.14.2.	3 mm	1/8 in.	9.12.3.3.	250 mm	9 7/8 in.
9.10.14.3.	45 mm	1 3/4 in.	9.12.4.1.	10 MPa	1,450 psi
9.10.14.3.	38 mm	1 1/2 in.	9.13.3.1.	6 mm	1/4 in.
9.10.14.5.	6 mm	1/4 in.	9.13.4.1.	75 mm	3 in.
9.10.14.5.	1.35 mm	0.053 in.	9.13.5.1.	6 mm	1/4 in.
9.10.14.5.	20 mm	3/4 in.	9.13.5.3.	0.05 mm	0.002 in.
9.10.14.8.	11 m ²	118 sq ft	9.13.5.3.	100 mm	3 7/8 in.
9.10.14.8.	3.7 m	12 ft 2 in.	9.13.6.2.	0.15 mm	0.006 in.
9.10.14.14.	1.47 mm	0.058 in.	9.13.6.2.	Type S	45 lb
9.10.14.14.	1.59 mm	1/16 in.	9.13.6.2.	100 mm	3 7/8 in.
9.10.14.14.	30°C	54 F°	9.13.6.3.	0.05 mm	0.002 in.
9.10.14.15.	760°C	1,400°F	9.14.3.2.	100 mm	3 7/8 in.
9.10.14.15.	130 cm ²	20 sq in.	9.14.3.4.	6 mm	1/4 in.
9.10.14.15.	1.2 m	47 in.	9.14.3.4.	10 mm	3/8 in.
9.10.14.16.	760°C	1,400°F	9.14.3.4.	0.10 mm	0.004 in.
9.10.14.16.	500 mm	20 in.	9.14.3.5.	150 mm	5 7/8 in.
			9.14.4.1.	4 mm	No. 4 sieve
				4 mm	No. 4 sieve

*Nominal dimension

**See Appendix C

Code Reference	Metric Units	Imperial Units	Code Reference	Metric Units	Imperial Units
9.14.4.2.	125 mm	4 $\frac{7}{8}$ in.	9.16.2.1.	2 mm	No. 10 sieve
9.14.4.2.	300 mm	12 in.	9.16.2.2.	125 mm	4 $\frac{7}{8}$ in.
9.14.4.4.	125 mm	4 $\frac{7}{8}$ in.	9.16.2.2.	2 mm	No. 10 sieve
9.14.5.2.	750 mm	30 in.	9.16.5.1.	75 mm	3 in.
9.14.5.2.	0.25 m ²	2.7 sq ft	9.16.6.1.	75 mm	3 in.
9.14.5.3.	5 m	16 ft 5 in.	9.16.6.1.	20 mm	3/4 in.
9.15.2.1.	14 MPa	2,030 psi	9.16.6.2.	150 mm	5 $\frac{7}{8}$ in.
9.15.2.2.	7.5 MPa	1,088 psi	9.16.7.2.	50 mm	2 in.
9.15.2.2.	12.5 MPa	1,813 psi	9.17.1.1.	5 m	16 ft 5 in.
9.15.2.5.	3.5 m	11 ft 6 in.	9.17.1.1.	2.4 kN/m ²	50 psf
9.15.2.5.	4.3 m	14 ft 1 in.	9.17.3.1.	73 mm	2 $\frac{7}{8}$ in.
9.15.3.3.	4.9 m	16 ft 1 in.	9.17.3.1.	4.76 mm	3/16 in.
9.15.3.3.	2.4 kN/m ²	50 psf	9.17.3.3.	100 mm x 100 mm	4 in. x 4 in.*
Table 9.15.3.A.	—	**	9.17.3.3.	6.35 mm	1/4 in.
9.15.3.4.	65 mm	2 $\frac{1}{2}$ in.	9.17.4.1.	184 mm	8 in.*
9.15.3.5.	130 mm	5 $\frac{1}{8}$ in.	9.17.4.1.	140 mm x 140 mm	6 in. x 6 in.*
9.15.3.6.	100 mm	3 $\frac{7}{8}$ in.	9.17.4.2.	38 mm	2 in.*
9.15.3.9.	200 mm	7 $\frac{7}{8}$ in.	9.17.4.2.	9.52 mm	3/8 in.
9.15.3.9.	5.5 m	18 ft 1 in.	9.17.4.2.	450 mm	18 in.
9.15.3.9.	100 mm	3 $\frac{7}{8}$ in.	9.17.4.2.	76 mm	3 in.
9.15.3.9.	2.7 m	8 ft 10 in.	9.17.4.2.	300 mm	12 in.
9.15.3.10.	100 mm	3 $\frac{7}{8}$ in.	9.17.4.3.	0.05 mm	0.002 in.
Table 9.15.4.A.	—	**	9.17.4.3.	Type S	45 lb
9.15.4.1.	2.5 m	8 ft 2 in.	9.17.5.2.	290 mm x 290 mm	12 in. x 12 in.*
9.15.4.2.	1.2 m	47 in.	9.17.5.2.	240 mm x 380 mm	10 in. x 16 in.*
9.15.4.3.	150 mm	5 $\frac{7}{8}$ in.	9.17.6.2.	200 mm x 200 mm	7 $\frac{7}{8}$ in. x 7 $\frac{7}{8}$ in.
9.15.4.4.	350 mm	14 in.	9.17.6.2.	230 mm	9 in.
9.15.4.4.	90 mm	3 $\frac{1}{2}$ in.	9.18.2.1.	500 mm x 700 mm	20 in. x 28 in.
9.15.4.5.	90 mm	3 $\frac{1}{2}$ in.	9.18.2.1.	550 mm x 900 mm	22 in. x 35 in.
9.15.4.5.	200 mm	7 $\frac{7}{8}$ in.	9.18.3.2.	0.1 m ²	1 sq ft
9.15.4.5.	900 mm	35 in.	9.18.3.2.	50 m ²	538 sq ft
9.15.4.7.	25 m	82 ft	9.18.4.1.	300 mm	12 in.
9.15.4.7.	15 m	49 ft 3 in.	9.18.4.1.	450 mm	18 in.
9.15.5.1.	50 mm	2 in.	9.18.4.2.	600 mm	24 in.
9.15.5.1.	38 mm x 89 mm	2 in. x 4 in.*	9.18.4.2.	900 mm	35 in.
9.15.5.1.	12 mm	1/2 in.	9.18.6.1.	50 mm	2 in.
9.15.5.2.	190 mm	8 in.*	9.18.6.1.	10 MPa	1,450 psi
9.15.5.3.	140 mm	6 in.*	9.18.6.1.	Type S	45 lb
9.15.5.3.	90 mm	4 in.*	9.18.6.1.	0.10 mm	0.004 in.
9.15.5.3.	290 mm	12 in.*	9.18.6.1.	100 mm	3 $\frac{7}{8}$ in.
9.15.5.3.	200 mm	8 in.*	9.19.1.3.	38 mm x 38 mm	2 in. x 2 in.*
9.15.7.3.	600 mm	24 in.	9.19.1.3.	25 mm	1 in.
9.15.7.5.	50 m ²	538 sq ft	9.19.2.1.	600 mm	24 in.
9.15.7.5.	150 mm	5 $\frac{7}{8}$ in.	9.19.2.1.	550 mm x 900 mm	22 in. x 35 in.
9.15.7.7.	150 mm	5 $\frac{7}{8}$ in.	9.19.2.1.	500 mm x 700 mm	20 in. x 28 in.
9.15.7.9.	75 mm	3 in.	9.20.1.1.	11 m	36 ft 1 in.
9.15.7.9.	600 mm	24 in.			
9.15.7.9.	150 m ²	1,615 sq ft			
9.15.7.9.	1 m	39 in.			
9.15.7.9.	300 mm	12 in.			
9.15.7.11.	3 m	9 ft 10 in.			
9.15.7.12.	300 mm	12 in.			
9.15.7.13.	140 mm x 140 mm	6 in. x 6 in.*			
9.16.2.1.	125 mm	4 $\frac{7}{8}$ in.			

*Nominal dimension

**See Appendix C

Code Reference	Metric Units	Imperial Units	Code Reference	Metric Units	Imperial Units
Table 9.20.2.A.	—	**	9.20.9.8.	600 mm	24 in.
9.20.4.1.	12 mm	½ in.	9.20.9.8.	100 mm	3⅞ in.
9.20.4.1.	20 mm	¾ in.	9.20.9.8.	900 mm	35 in.
Table 9.20.5.A.	—	**	9.20.9.8.	300 mm	12 in.
9.20.6.1.	140 mm	5½ in.	9.20.9.8.	460 mm	18 in.
9.20.6.1.	2.8 m	9 ft 2 in.	9.20.9.9.	75 mm	3 in.
9.20.6.1.	4.6 m	15 ft 1 in.	9.20.9.9.	0.41 mm	0.016 in.
9.20.6.1.	190 mm	7½ in.	9.20.9.9.	22 mm	⅞ in.
9.20.6.1.	90 mm	3½ in.	Table 9.20.9.A.	—	**
9.20.6.2.	90 mm	3½ in.	9.20.9.11.	3.76 mm	0.148 in.
9.20.6.2.	75 mm	3 in.	9.20.9.11.	75 mm	3 in.
9.20.6.2.	50 mm	2 in.	9.20.9.11.	600 mm	24 in.
9.20.6.2.	100 mm	3⅞ in.	9.20.9.11.	190 mm	8 in.*
9.20.6.2.	230 mm	9 in.	9.20.9.11.	150 mm	5⅞ in.
9.20.6.2.	7.6 m	24 ft 11 in.	9.20.11.1.	2 m	6 ft 7 in.
9.20.6.2.	330 mm	13 in.	9.20.11.1.	1 m	39 in.
9.20.6.2.	6 m	19 ft 8 in.	9.20.11.1.	40 mm x	1½ in. x 3/16 in.
9.20.6.4.	65 mm	2½ in.		4.76 mm	
9.20.6.5.	75 mm	3 in.	9.20.11.2.	4.76 mm x	3/16 in. x 1½ in.
9.20.6.5.	11 m	36 ft 1 in.		40 mm	
9.20.6.5.	25 mm	1 in.	9.20.11.2.	800 mm	31 in.
9.20.6.5.	90 mm	3½ in.	9.20.11.3.	4.76 mm	3/16 in.
9.20.6.7.	300 mm	12 in.	9.20.11.3.	900 mm	35 in.
9.20.7.1.	500 mm	20 in.	9.20.11.4.	12.7 mm	½ in.
9.20.7.2.	190 mm	8 in.*	9.20.11.4.	2.4 m	7 ft 10 in.
9.20.7.3.	190 mm	8 in.*	9.20.11.4.	90 mm	3½ in.
9.20.7.3.	100 mm	3⅞ in.	9.20.11.4.	38 mm	2 in.*
9.20.7.3.	750 mm	30 in.	9.20.11.5.	90 mm	3½ in.
9.20.7.3.	500 mm	20 in.	9.20.11.6.	300 mm	12 in.
9.20.7.4.	600 mm	24 in.	9.20.12.1.	25 mm	1 in.
9.20.8.1.	50 mm	2 in.	9.20.12.2.	25 mm	1 in.
9.20.8.1.	38 mm	2 in.*	9.20.12.3.	90 mm	3½ in.
9.20.8.2.	57 mm	2¼ in.	9.20.12.3.	12 mm	½ in.
9.20.8.2.	38 mm	1½ in.	9.20.12.3.	25 mm	1 in.
9.20.8.2.	50 mm	2 in.	9.20.13.1.	1.73 mm	0.068 in.
9.20.8.3.	90 mm	3½ in.	9.20.13.1.	0.33 mm	0.013 in.
9.20.8.3.	40 mm	1⅞ in.	9.20.13.1.	0.36 mm	0.014 in.
9.20.8.4.	190 mm	8 in.*	9.20.13.1.	0.46 mm	0.018 in.
9.20.8.4.	50 mm x	2 in. x 1¼ in.	9.20.13.1.	0.48 mm	0.019 in.
	300 mm		9.20.13.2.	1.73 mm	0.068 in.
9.20.8.4.	100 mm x	4 in. x 12 in.*	9.20.13.2.	0.33 mm	0.013 in.
	290 mm		9.20.13.2.	0.36 mm	0.014 in.
9.20.8.5.	30 mm	1⅞ in.	9.20.13.2.	0.46 mm	0.018 in.
9.20.9.1.	3.76 mm	0.148 in.	9.20.13.2.	Type S	45 lb
9.20.9.1.	460 mm	18 in.	9.20.13.2.	0.15 mm	0.006 in.
9.20.9.1.	150 mm	5⅞ in.	9.20.13.2.	0.05 mm	0.002 in.
9.20.9.3.	600 mm	24 in.	9.20.13.6.	25 mm	1 in.
9.20.9.3.	900 mm	35 in.	9.20.13.7.	150 mm	5⅞ in.
9.20.9.3.	90 mm	3½ in.	9.20.14.1.	600 mm	24 in.
9.20.9.5.	17.8 mm ²	0.028 sq in	9.20.15.1.	100 mm	3⅞ in.
9.20.9.5.	50 mm	2 in.	9.20.15.4.	25 mm	1 in.
9.20.9.6.	25 mm	1 in.	9.20.17.1.	5°C	41°F
9.20.9.7.	300 mm	12 in.	9.21.1.1.	12 m	39 ft 4 in.
9.20.9.7.	900 mm	35 in.	9.21.1.1.	813 cm ²	130 sq in.
9.20.9.7.	460 mm	18 in.	9.21.1.1.	120 kW	409,457 Btu/hr

*Nominal dimension

**See Appendix C

Code Reference	Metric Units	Imperial Units	Code Reference	Metric Units	Imperial Units
Table 9.21.2.A.	—	**	9.23.2.3.	150 mm	5 7/8 in.
9.21.2.5.	225 mm	8 7/8 in.	Table 9.23.3.A.	—	**
9.21.2.5.	200 mm	7 7/8 in.	9.23.3.4.	50 mm	2 in.
9.21.2.5.	300 mm	12 in.	9.23.3.4.	0.41 mm	0.016 in.
9.21.3.2.	15.9 mm	5/8 in.	9.23.3.4.	1.2 m	47 in.
9.21.3.2.	1 100°C	2,012°F	9.23.3.4.	63 mm	2 1/2 in.
9.21.3.4.	190 mm	7 1/2 in.	9.23.3.5.	1.6 mm	0.063 in.
9.21.3.6.	200 mm	7 7/8 in.	9.23.3.5.	9.5 mm	3/8 in.
9.21.3.6.	50 mm	2 in.	9.23.3.5.	3.2 mm	0.126 in.
9.21.4.4.	900 mm	35 in.	9.23.3.5.	11.1 mm	7/16 in.
9.21.4.4.	600 mm	24 in.	Table 9.23.3.B.	—	**
9.21.4.4.	3 m	9 ft 10 in.	Tables A-1 to A-11	—	**
9.21.4.4.	200 mm	7 7/8 in.	Table 9.23.4.A.	—	**
9.21.4.5.	25 mm	1 in.	9.23.5.1.	50 mm	2 in.
9.21.4.7.	75 mm	3 in.	9.23.5.3.	40 mm	1 5/8 in.
9.21.4.8.	75 mm	3 in.	9.23.5.4.	50 mm	2 in.
9.21.4.8.	90 mm	3 1/2 in.	9.23.6.2.	12.7 mm	1/2 in.
Table 9.21.5.A.	—	**	9.23.6.2.	2.4 m	7 ft 10 in.
9.21.6.1.	50 mm	2 in.	9.23.6.2.	100 mm	3 7/8 in.
9.21.6.1.	12 mm	1/2 in.	9.23.6.4.	4.3 m	14 ft 1 in.
9.21.6.2.	150 mm	5 7/8 in.	9.23.6.4.	12.7 mm	1/2 in.
9.21.6.4.	12 mm	1/2 in.	9.23.6.4.	500 N/m	34 lb/lin foot
9.21.6.5.	450 mm	18 in.	9.23.7.1.	38 mm x 89 mm	2 in. x 4 in.*
9.21.6.5.	400°C	752°F	9.23.7.2.	25 mm	1 in.
9.21.6.5.	230 mm	9 in.	9.23.8.1.	89 mm	3 1/2 in.
9.21.6.5.	450 mm	18 in.	9.23.8.3.	38 mm	2 in.*
Table 9.21.6.A.	—	**	9.23.8.4.	150 mm	5 7/8 in.
9.21.6.6.	290 mm	12 in.	9.23.8.6.	38 mm	2 in.*
9.22.2.1.	50 mm	2 in.	9.23.8.6.	89 mm	3 1/2 in.
9.22.2.1.	25 mm	1 in.	9.23.8.6.	450 mm	18 in.
9.22.3.1.	190 mm	7 1/2 in.	9.23.8.6.	100 mm to	3 3/8 in. to 5 7/8 in.
9.22.3.1.	50 mm	2 in.	9.23.8.7.	150 mm	5 7/8 in.
9.22.3.1.	140 mm	5 1/2 in.	9.23.8.7.	38 mm	2 in.*
9.22.3.2.	90 mm	3 1/2 in.	9.23.8.7.	12.7 mm	1/2 in.
9.22.3.2.	190 mm	7 1/2 in.	9.23.8.7.	1.2 m	47 in.
9.22.5.1.	400 mm	16 in.	9.23.8.7.	600 mm	24 in.
9.22.5.1.	200 mm	7 7/8 in.	9.23.9.1.	38 mm	1 1/2 in.
9.22.5.2.	140 mm	5 1/2 in.	9.23.9.1.	19 mm x 89 mm	1 in. x 4 in.*
9.22.5.2.	100 mm	3 7/8 in.	9.23.9.3.	38 mm x 64 mm	2 in. x 3 in.*
9.22.7.2.	190 mm	7 1/2 in.	9.23.9.3.	38 mm x 38 mm	2 in. x 2 in.*
9.22.7.2.	140 mm	5 1/2 in.	9.23.9.3.	89 mm	3 1/2 in.
9.22.9.1.	150 mm	5 7/8 in.	9.23.9.4.	38 mm x 38 mm	2 in. x 2 in.*
9.22.9.1.	38 mm	1 1/2 in.	9.23.9.4.	6.3 mm	1/4 in.
9.22.9.1.	300 mm	11 3/4 in.	9.23.9.4.	600 mm	24 in.
9.22.9.2.	50 mm	2 in.	9.23.9.4.	12 mm	1/2 in.
9.22.9.3.	100 mm	3 7/8 in.	9.23.9.5.	2.1 m	6 ft 11 in.
9.22.9.3.	50 mm	2 in.	9.23.9.5.	19 mm x 64 mm	1 in. x 3 in.*
9.22.9.4.	50 mm	2 in.	9.23.9.5.	38 mm x 38 mm	2 in. x 2 in.*
9.22.9.4.	25 mm	1 in.	9.23.9.5.	25 mm x 3.2 mm	1 in. x 1/8 in.*
9.23.1.1.	600 mm	24 in.	9.23.9.5.	19 mm x 89 mm	1 in. x 4 in.*
9.23.1.2.	2.4 kN/m ²	50 psf	9.23.9.6.	1.2 m	47 in.
9.23.1.3.	2.4 kN/m ²	50 psf	9.23.9.6.	3.2 m	10 ft 6 in.
9.23.2.2.	12 mm	1/2 in.	9.23.9.7.	800 mm	31 in.
9.23.2.3.	0.05 mm	0.002 in.	9.23.9.7.	2 m	6 ft 7 in.
9.23.2.3.	Type S	45 lb	9.23.9.9.	1.8 m	5 ft 11 in.

*Nominal dimension

**See Appendix C

Code Reference	Metric Units	Imperial Units	Code Reference	Metric Units	Imperial Units
9.23.9.9.	200 mm	7 7/8 in.	9.23.13.10.	38 mm x 140 mm	2 in. x 6 in.*
9.23.9.9.	38 mm x 89 mm	2 in. x 4 in.*	9.23.13.10.	1.2 m	47 in.
9.23.9.9.	1.2 m	47 in.	9.23.13.10.	38 mm x 89 mm	2 in. x 4 in.*
9.23.9.12.	900 mm	35 in.	Table 9.23.13.A.	—	**
9.23.9.12.	600 mm	24 in.	9.23.13.13.	25 mm	1 in.
9.23.9.13.	400 mm	16 in.	9.23.13.14.	12.19 mm	40 ft
9.23.9.13.	38 mm x 184 mm	2 in. x 8 in.*	9.23.13.14.	600 mm	24 in.
9.23.9.13.	600 mm	24 in.	9.23.13.15.	600 mm	24 in.
9.23.9.13.	38 mm x 235 mm	2 in. x 10 in.*	Tables A-12 and A-13	—	**
9.23.10.2.	2.1 m	6 ft 11 in.	9.23.13.16.	3.05 m	10 ft
Table 9.23.10.A.	—	**	9.23.13.16.	38 mm x 114 mm	2 in. x 5 in.*
9.23.11.1.	38 mm	2 in.*	9.23.13.16.	3.66 m	12 ft
9.23.11.1.	19 mm	3/4 in.	9.23.13.16.	38 mm x 140 mm	2 in. x 6 in.*
9.23.11.5.	50 mm	2 in.	9.23.13.17.	1.83 m	6 ft
9.23.11.6.	75 mm x 150 mm x 0.91 mm	3 in. x 5 7/8 in. x 0.036 in.	9.23.13.17.	19 mm x 89 mm	1 in. x 4 in.*
9.23.11.6.	19 mm x 89 mm x 300 mm	1 in. x 4 in.* x 12 in.	9.23.13.17.	63 mm	2 1/2 in.
9.23.11.6.	63 mm	2 1/2 in.	9.23.13.17.	38 mm x 89 mm	2 in. x 4 in.*
9.23.11.8.	75 mm x 150 mm x 0.91 mm	3 in. x 5 7/8 in. x 0.036 in.	Table 9.23.13.B.	4.3 m	14 ft 1 in.
9.23.11.8.	63 mm	2 1/2 in.	9.23.14.4.	38 mm x 38 mm	2 in. x 2 in.*
9.23.12.1.	38 mm	2 in.*	Table 9.23.14.A.	—	**
9.23.12.2.	38 mm	2 in.*	9.23.14.7.	19 mm	3/4 in.
9.23.12.3.	82 mm	3 1/4 in.	9.23.14.7.	12.5 mm	1/2 in.
9.23.12.3.	450 mm	18 in.	9.23.14.7.	12.7 mm	1/2 in.
9.23.12.4.	38 mm x 64 mm	2 in. x 3 in.*	9.23.14.7.	600 mm	24 in.
9.23.12.4.	4.9 m	16 ft 1 in.	9.23.14.9.	400 mm	16 in.
9.23.12.4.	9.8 m	32 ft 2 in.	9.23.15.3.	184 mm	8 in.*
Table 9.23.12.A.	—	**	9.23.15.4.	2 mm	1/16 in.
9.23.12.4.	89 mm	4 in.*	9.23.15.4.	286 mm	12 in.*
9.23.12.4.	38 mm	2 in.*	9.23.15.5.	38 mm x 38 mm	2 in. x 2 in.*
9.23.12.5.	38 mm x 64 mm	2 in. x 3 in.*	Table 9.23.15.A.	—	**
9.23.12.5.	64 mm	3 in.*	9.23.15.7.	11.1 mm	7/16 in.
9.23.12.5.	38 mm	2 in.*	9.23.15.7.	400 mm	16 in.
9.23.12.5.	19 mm	3/4 in.	9.23.15.7.	0.33 mm	0.013 in.
9.23.12.5.	2.4 m	7 ft 10 in.	9.23.15.7.	0.61 mm	0.024 in.
9.23.13.3.	38 mm	1 1/2 in.	Table 9.23.16.A.	—	**
9.23.13.4.	17.5 mm	11/16 in.	9.23.16.3.	3.2 mm	0.126 in.
9.23.13.4.	200 mm x 75 mm	7 7/8 in. x 3 in.	9.23.16.3.	11.1 mm	7/16 in.
9.23.13.4.	0.41 mm	0.016 in.	9.23.16.5.	2 mm	1/16 in.
9.23.13.4.	1.2 m	47 in.	9.23.17.4.	100 mm	3 7/8 in.
9.23.13.4.	63 mm	2 1/2 in.	9.23.17.5.	150 mm	5 7/8 in.
9.23.13.6.	50 mm	2 in.	9.23.18.3.	19 mm x 89 mm	1 in. x 4 in.*
9.23.13.6.	38 mm	1 1/2 in.	9.23.18.3.	63 mm	2 1/2 in.
9.23.13.7.	38 mm x 89 mm	2 in. x 4 in.*	9.24.1.1.	600 mm	24 in.
9.23.13.7.	2.4 m	7 ft 10 in.	9.24.3.1.	38 mm	2 in.*
9.23.13.7.	19 mm x 89 mm	1 in. x 4 in.*	9.24.3.2.	200 mm	8 in.*
9.23.13.8.	38 mm x 89 mm	2 in. x 4 in.*	9.24.4.3.	38 mm	1 1/2 in.
			9.24.5.2.	1.19 mm	0.047 in.
			9.24.5.3.	300 mm	12 in.
			9.24.5.3.	9.5 mm	3/8 in.
			9.24.5.3.	450 mm	18 in.
			9.24.6.1.	38 mm	2 in.*

*Nominal dimension

**See Appendix C

Code Reference	Metric Units	Imperial Units	Code Reference	Metric Units	Imperial Units
9.24.6.1.	3.6 m	11 ft 10 in.	9.27.4.3.	600 mm	24 in.
9.24.6.2.	250 mm	10 in.*	9.27.4.3.	Type S	45 lb
9.24.6.2.	2.4 m	7 ft 10 in.	9.27.4.3.	Type M	90 lb
Table 9.24.6.A.	—	**	9.27.4.3.	457 mm	18 in.
9.24.6.5.	750 mm	30 in.	9.27.4.3.	450 mm	18 in.
9.24.6.6.	40 mm	1½ in.	9.27.4.3.	25 mm	1 in.
9.24.6.8.	4.9 m	16 ft 1 in.	9.27.4.3.	914 mm	36 in.
9.24.6.8.	9.8 m	32 ft 2 in.	9.27.4.3.	100 mm	3⅞ in.
Table 9.24.6.B.	—	**	9.27.4.4.	25 mm	1 in.
9.25.1.5.	10 mm	⅜ in.	9.27.4.4.	150 mm	5⅞ in.
Table 9.25.2.A.	—	**	9.27.4.4.	100 mm	3⅞ in.
9.25.2.2.	0.50 mm	0.020 in.	9.27.4.4.	75 mm	3 in.
9.25.2.3.	0.45 mm	0.018 in.	9.27.4.5.	75 mm	3 in.
9.25.2.3.	25 mm	1 in.	9.27.4.6.	150 mm	5⅞ in.
9.25.2.4.	1 200 mm	47 in.	9.27.4.6.	25 mm	1 in.
9.25.2.4.	63 mm	2½ in.	9.27.4.6.	100 mm	3⅞ in.
9.25.2.4.	0.50 mm	0.020 in.	9.27.4.7.	150 mm	5⅞ in.
9.25.2.4.	91 mm	3⅞ in.	9.27.4.8.	750 mm	30 in.
9.25.2.4.	0.85 mm	0.033 in.	9.27.4.9.	150 mm	5⅞ in.
9.25.2.5.	400 mm	16 in.	9.27.5.1.	914 mm	36 in.
Table 9.25.2.B.	—	**	9.27.5.1.	300 mm	12 in.
9.25.3.1.	50 mm	2 in.	9.27.5.2.	0.15 mm	0.006 in.
9.25.3.1.	600 mm	24 in.	9.27.5.2.	480 mm	18⅞ in.
9.25.3.1.	300 mm	12 in.	9.27.5.2.	Type S	45 lb
9.25.3.1.	63 mm	2½ in.	9.27.5.2.	100 mm	3⅞ in.
9.25.3.1.	25 mm	1 in.	9.27.5.3.	900 mm	35 in.
9.25.3.3.	12 mm	½ in.	9.27.6.1.	0.195 kg/m²	4 lb/square
9.25.3.7.	2.4 m	7 ft 10 in.	9.27.6.1.	0.05 mm	0.002 in.
9.26.4.5.	50 mm	2 in.	9.27.6.2.	50 mm	2 in.
9.26.4.7.	6 mm	¼ in.	9.27.6.2.	100 mm	3⅞ in.
9.26.4.7.	12 mm	½ in.	9.27.7.2.	12 mm	½ in.
9.26.4.9.	12 mm	½ in.	9.27.7.2.	300 mm	12 in.
9.26.4.9.	0.18 m²·°C/W	1 ft²·hr.°F/Btu	9.27.7.2.	Type M	90 lb
9.26.5.2.	6 ng/Pa.s.m	4 perm-inches	9.27.7.2.	304 mm	12 in.
9.26.5.6.	25 mm	1 in.	9.27.7.3.	50 mm	2 in.
9.26.5.6.	100 mm	3⅞ in.	9.27.7.4.	1 metre	39 in.
9.26.5.13.	100 mm	3⅞ in.	9.27.7.5.	25 mm to	
9.27.2.2.	12 mm	½ in.		40 mm	1 in. to 1½ in.
9.27.2.2.	9.5 mm	⅜ in.	9.27.7.5.	12 mm	½ in.
9.27.2.2.	2.95 mm	0.0116 in.	9.27.7.6.	25 mm	1 in.
9.27.2.2.	4.8 mm	3/16 in.	9.27.7.7.	100 mm	3⅞ in.
9.27.2.2.	2.0 mm	0.079 in.	9.27.7.7.	150 mm	5⅞ in.
9.27.2.3.	19 mm	¾ in.	9.27.7.7.	25 mm	1 in.
9.27.2.3.	1.6 mm	0.063 in.	9.27.8.2.	200 mm	7⅞ in.
9.27.2.3.	25 mm	1 in.	9.27.8.3.	0.5 L/m²	1 gal./100 sq ft
9.27.2.3.	11 mm	7/16 in.	9.27.8.3.	1 kg/m²	20 lb/100 sq ft
9.27.2.3.	29 mm	1⅛ in.	9.27.8.4.	100 mm	3⅞ in.
9.27.2.3.	1.6 mm	0.063 in.	9.27.8.4.	50 mm	2 in.
9.27.2.3.	9.5 mm	⅜ in.	9.27.8.5.	25 mm	1 in.
Table 9.27.3.A.	480 mm	19 in.	9.27.8.5.	50 mm	2 in.
9.27.4.1.	1.73 mm	0.068 in.	9.27.8.6.	300 mm	12 in.
9.27.4.1.	0.33 mm	0.013 in.	9.27.8.6.	25 mm	1 in.
9.27.4.1.	0.36 mm	0.014 in.	9.27.8.6.	40 mm	1⅝ in.
9.27.4.1.	0.46 mm	0.018 in.	9.27.8.6.	50 mm	2 in.
9.27.4.1.	0.48 mm	0.019 in.	9.27.9.4.	400 mm	16 in.

*Nominal dimension

**See Appendix C

Code Reference	Metric Units	Imperial Units	Code Reference	Metric Units	Imperial Units
9.27.9.4.	75 mm	3 in.	9.28.5.5.	7.9 mm	5/16 in.*
9.27.9.4.	350 mm	14 in.	9.28.5.6.	14.3 mm	9/16 in.
9.27.9.5.	6 mm	¼ in.	9.28.5.6.	9.5 mm	¾ in.
9.27.9.5.	38 mm	1½ in.	9.28.5.6.	11.1 mm	7/16 in.
9.27.9.6.	19 mm	¾ in.	9.28.5.7.	38 mm x	
9.27.9.6.	38 mm	1½ in.		9.5 mm	2 in.* x ¾ in.
Table 9.27.9.A.	—	**	9.28.5.8.	89 mm x	
9.27.10.1.	450 mm	18 in.		9.5 mm	4 in.* x ¾ in.
9.27.10.1.	100 mm	3¾ in.	9.28.5.8.	20 mm	¾ in.
9.27.10.1.	350 mm	14 in.	Table 9.28.5.A.	—	**
9.27.10.1.	32 mm	1¼ in.	9.28.5.11.	19 mm	¾ in.
9.27.10.1.	9 mm	¾ in.	9.28.5.11.	25 mm	1 in.
9.27.10.2.	900 mm	35 in.	9.28.6.2.	14.3 mm	9/16 in.
9.27.10.2.	300 mm	12 in.	9.28.6.2.	286 mm	12 in.*
9.27.10.2.	450 mm	18 in.	9.28.6.3.	5 mm	3/16 in.
9.27.10.3.	6 mm	¼ in.	9.28.6.3.	12 mm	½ in.
9.27.10.3.	40 mm	1½ in.	9.28.6.3.	184 mm	8 in.*
9.27.10.4.	20 mm	¾ in.	9.28.6.3.	14.3 mm	9/16 in.
9.27.10.4.	40 mm	1½ in.	9.28.6.3.	286 mm	12 in.*
9.27.10.5.	190 mm	7½ in.	9.28.6.4.	1 mm per	
9.27.10.5.	450 mm	18 in.		16 mm	1/16 in/1 inch
9.27.10.5.	250 mm	9¾ in.	9.28.6.4.	9.5 mm	¾ in.
9.27.10.5.	600 mm	24 in.	9.28.6.4.	25 mm	1 in.
Table 9.27.11.A.	—	**	9.28.6.4.	12 mm	½ in.
9.27.11.4.	6 mm to 15 mm	¼ in. to ½ in.	9.28.7.2.	65 mm	2½ in.
9.27.11.6.	per sq m	per sq ft	9.28.7.2.	350 mm	14 in.
9.27.11.6.	15 kg	33 lb	9.28.7.3.	20 mm	¾ in.
9.27.11.6.	10 kg	22 lb	9.28.7.3.	25 mm	1 in.
9.27.11.9.	50 mm	2 in.	9.28.7.3.	50 mm	2 in.
9.27.13.1.	0.33 mm	0.013 in.	9.28.7.4.	40 mm	1½ in.
9.27.13.1.	0.35 mm	0.014 in.	9.28.7.5.	12 mm	½ in.
9.27.13.1.	0.46 mm	0.018 in.	Table 9.28.7.A.	—	**
9.27.13.1.	0.48 mm	0.019 in.	9.28.8.2.	8.06 kg/m²	165 lb/square
9.28.2.2.	200 mm	7¾ in.	9.28.8.2.	4.75 mm	3/16 in.
9.28.2.3.	50 mm	2 in.	9.28.8.2.	400 mm	16 in.
9.28.2.4.	10 mm	¾ in.	9.28.8.2.	6 mm	¼ in.
9.28.3.1.	1.73 mm	0.068 in.	9.28.8.2.	600 mm	24 in.
9.28.3.1.	0.33 mm	0.013 in.	9.28.8.2.	3.15 mm	¼ in.
9.28.3.1.	0.35 mm	0.014 in.	9.28.8.3.	25 mm	1 in.
9.28.3.1.	0.46 mm	0.018 in.	9.28.8.4.	25 mm	1 in.
9.28.3.1.	0.48 mm	0.019 in.	9.28.9.2.	6 mm	¼ in.
9.28.3.1.	1.02 mm	0.040 in.	Table 9.28.9.A.	—	**
9.28.3.4.	50 mm	2 in.	9.28.9.4.	2 mm	1/16 in.
9.28.5.2.	38 mm x 38 mm	2 in. x 2 in.*	9.28.9.4.	25 mm	1 in.
9.28.5.2.	600 mm	24 in.	9.28.9.5.	2 mm	1/16 in.
9.28.5.3.	19 mm x 38 mm	1 in. x 2 in.*	9.28.9.5.	25 mm	1 in.
9.28.5.3.	19 mm x 64 mm	1 in. x 3 in.*	9.28.10.2.	6.0 mm	¼ in.
9.28.5.3.	400 mm	16 in.	9.28.10.2.	7.5 mm	5/16 in.
9.28.5.3.	19 mm x 89 mm	1 in. x 4 in.*	9.28.10.2.	400 mm	16 in.
9.28.5.3.	600 mm	24 in.	9.28.10.2.	9.0 mm	¾ in.
9.28.5.4.	14.3	9/16 in.	9.28.10.2.	10.5 mm	¾ in.
9.28.5.4.	12.5 mm	½ in.	9.28.10.2.	1.5 mm	1/16 in.
9.28.5.4.	15.9 mm	¾ in.	9.28.10.3.	5 mm	3/16 in.
9.28.5.5.	14.3 mm	9/16 in.	9.28.10.3.	25 mm	1 in.
9.28.5.5.	7.5 mm	5/16 in.*	9.28.10.4.	5 mm	3/16 in.

*Nominal dimension

**See Appendix C

Code Reference	Metric Units	Imperial Units	Code Reference	Metric Units	Imperial Units
9.28.10.4.	25 mm	1 in.	9.30.4.6.	25 mm	1 in.
9.28.10.5.	3 mm	1/8 in.	9.30.4.6.	9.5 mm	3/8 in.
9.28.11.2.	7.9 mm	5/16 in.	9.30.4.6.	28 mm	1 1/8 in.
9.28.11.2.	9.5 mm	3/8 in.	9.30.4.6.	12.7 mm	1/2 in.
9.28.11.2.	400 mm	16 in.	9.30.4.6.	1.6 mm	0.063 in.
9.28.11.2.	12.7 mm	1/2 in.	9.30.4.6.	19 mm	3/4 in.
9.28.11.2.	600 mm	24 in.	9.30.4.6.	—	**
9.28.11.3.	3 mm	1/8 in.	Table 9.30.5.A.	—	—
9.28.11.3.	25 mm	1 in.	9.30.5.3.	1.6 mm	0.063 in.
9.28.11.4.	3 mm	1/8 in.	9.30.5.3.	400 mm	16 in.
9.28.12.2.	0.33 mm	0.013 in.	9.30.5.3.	2.9 mm	0.114 in.
9.28.12.4.	0.58 mm	0.023 in.	9.30.5.4.	3.2 mm	0.126 in.
9.28.12.4.	0.46 mm	0.018 in.	9.30.5.4.	38 mm	1 1/2 in.
9.29.1.4.	200 mm	7 7/8 in.	9.30.5.4.	25 mm	1 in.
Table 9.29.2.A.	—	**	9.30.5.4.	150 mm	5 7/8 in.
9.29.3.2.	3.2 mm	0.126 in.	9.30.5.5.	2 mm	0.079 in.
9.29.3.2.	11.1 mm	7/16 in.	9.30.5.5.	38 mm	1 1/2 in.
9.29.3.2.	1.98 mm	0.078 in.	9.30.5.5.	19 mm	3/4 in.
9.29.3.3.	25 mm	1 in.	9.30.5.5.	150 mm	5 7/8 in.
9.29.3.3.	38 mm	1 1/2 in.	9.30.5.6.	25 mm	1 in.
9.29.4.2.	1.19 mm	0.047 in.	9.30.5.6.	12 mm	1/2 in.
9.29.4.2.	150 mm	5 7/8 in.	9.30.5.7.	6 mm	1/4 in.
Table 9.29.4.A.	—	**	9.30.6.2.	50 mm	2 in.
9.29.4.4.	6 mm	1/4 in.	9.30.6.3.	150 mm x	—
9.29.4.5.	50 mm	2 in.	9.30.7.3.	450 mm	5 7/8 in. x 18 in.
9.29.4.5.	150 mm	5 7/8 in.	9.30.7.10.	10 mm	3/8 in.
9.29.4.7.	150 mm	5 7/8 in.	9.30.8.2.	10°C to 20°C	50°F to 68°F
9.29.4.7.	400 mm	16 in.	9.30.8.2.	9.5 mm	3/8 in.
9.29.4.7.	100 mm	3 7/8 in.	9.30.8.2.	400 mm	16 in.
9.29.4.7.	600 mm	24 in.	9.30.8.2.	12.7 mm	1/2 in.
9.29.4.7.	20 fasteners/m ²	16 fasteners/sq yd	9.30.8.2.	600 mm	24 in.
9.29.4.8.	150 mm	5 7/8 in.	Table 9.30.8.A.	—	**
9.29.4.8.	400 mm	16 in.	9.30.8.4.	2.3 mm	0.091 in.
9.29.4.8.	100 mm	3 7/8 in.	9.30.8.4.	5.5 mm	7/32 in.
9.29.4.8.	600 mm	24 in.	9.30.8.5.	180 mm	7 1/8 in.
9.29.6.1.	10°C	50°F	9.30.8.5.	200 mm	7 7/8 in.
9.29.6.2.	15 mm	5/8 in.	9.30.8.5.	50 mm	2 in.
9.29.6.3.	6 mm	1/4 in.	9.30.8.5.	300 mm	11 3/4 in.
9.29.6.4.	6 mm	1/4 in.	9.30.8.5.	10 mm	3/8 in.
9.29.6.5.	3 mm	1/8 in.	9.30.8.7.	9.5 mm	3/8 in.
9.30.2.1.	1.8 m	5 ft 11 in.	9.30.8.7.	150 mm	5 7/8 in.
9.30.2.1.	1.2 m	47 in.	9.30.8.8.	300 mm	12 in.
9.30.2.1.	400 mm	16 in.	9.30.8.8.	400 mm	16 in.
Table 9.30.3.A.	—	**	9.30.8.9.	10°C	50°F
9.30.3.2.	51 mm	2 in.	Table 9.30.9.A.	—	**
9.30.4.2.	9.5 mm	3/8 in.	9.30.9.1.	0.4 mm	1/64 in.
9.30.4.2.	400 mm	16 in.	9.30.9.3.	38 mm	1 1/2 in.
9.30.4.2.	12.7 mm	1/2 in.	9.30.9.3.	150 mm	5 7/8 in.
9.30.4.2.	600 mm	24 in.	9.30.9.3.	300 mm	12 in.
9.30.4.4.	406 mm	16 in.	9.30.10.2.	3.2 mm	1/8 in.
9.30.4.4.	400 mm	16 in.	9.30.10.2.	6 mm	1/4 in.
9.30.4.4.	610 mm	24 in.	9.30.10.2.	400 mm	16 in.
9.30.4.5.	32 mm	1 1/4 in.	9.30.10.2.	9 mm	3/8 in.
9.30.4.5.	2.29 mm	0.090 in.	9.30.10.2.	600 mm	24 in.
9.30.4.5.	7.5 mm	19/64 in.	9.30.10.3.	38 mm	1 1/2 in.
			9.30.10.3.	150 mm	5 7/8 in.

**See Appendix C

Code Reference	Metric Units	Imperial Units	Code Reference	Metric Units	Imperial Units
9.30.10.3.	300 mm	12 in.	9.34.3.7.	450 mm	18 in.
9.30.11.2.	11.1 mm	7/16 in.	9.34.3.8.	75 mm	3 in.
9.30.11.2.	400 mm	16 in.	9.34.3.8.	150 mm	5 7/8 in.
9.30.11.2.	12.7 mm	1/2 in.	9.34.3.8.	1.8 m	5 ft 11 in.
9.30.11.3.	2.6 mm	0.102 in.	9.34.3.8.	12 mm	1/2 in.
9.30.11.3.	20 mm	3/4 in.	9.34.3.9.	150 mm	5 7/8 in.
9.30.11.3.	100 mm	3 7/8 in.	9.34.3.9.	1 m	39 in.
9.30.11.3.	200 mm	7 7/8 in.	9.34.3.9.	25 mm	1 in.
9.30.12.2.	6.35 mm	1/4 in.	9.34.3.9.	1.8 m	5 ft 11 in.
9.30.12.2.	400 mm	16 in.	9.34.3.9.	8 mm	5/16 in.
9.30.12.2.	9.5 mm	3/8 in.	9.34.3.10.	6 mm	1/4 in.
9.30.12.2.	600 mm	24 in.	9.34.3.11.	100 mm	3 7/8 in.
9.30.12.3.	38 mm	1 1/2 in.	9.34.3.12.	25 mm	1 in.
9.30.12.3.	150 mm	5 7/8 in.	9.34.4.2.	40 m ²	431 sq ft
9.30.12.3.	300 mm	12 in.	9.34.4.3.	1.8 m	5 ft 11 in.
9.31.1.3.	19 mm x 38 mm	1 in. by 2 in.*	9.34.4.4.	3 kW	10,236 Btu/hr
9.31.2.3.	6 mm	1/4 in.	9.34.4.5.	1.2 m	47 in.
9.31.2.4.	150 mm	5 7/8 in.	9.34.4.6.	70°C	158°F
9.31.2.4.	200 mm	7 7/8 in.	9.34.6.2.	600 mm	24 in.
9.31.2.5.	19 mm	3/4 in.	9.34.6.11.	18 kW	64,419 Btu/hr
9.31.2.5.	6 mm	1/4 in.	9.34.7.3.	12 mm	1/2 in.
9.31.2.5.	22 mm	7/8 in.	9.34.7.3.	90°C	194°F
9.31.2.5.	7.9 mm	5/16 in.	9.34.7.3.	120°C	248°F
9.31.2.5.	1.2 mm	0.047 in.	9.34.7.3.	25 mm	1 in.
9.31.2.5.	4.7 mm	3/16 in.	Table 9.34.9.A.	—	**
9.31.2.5.	28 mm	1 1/8 in.	9.34.9.3.	100 mm	3 7/8 in.
9.31.2.5.	9.5 mm	3/8 in.	9.34.9.4.	0.56 mm	0.022 in.
9.31.2.6.	200 mm	7 7/8 in.	9.34.9.4.	6 mm	1/4 in.
Table 9.31.3.A.	—	**	9.34.9.4.	450 mm	18 in.
9.31.3.4.	25 mm	1 in.	9.34.9.4.	150 mm	5 7/8 in.
Table 9.31.3.B.	—	**	9.34.10.1.	750 mm	30 in.
9.31.3.5.	7.9 mm	5/16 in.	9.34.10.2.	6 mm	1/4 in.
9.31.3.5.	29 mm	1 1/8 in.	9.34.10.2.	0.33 mm	0.013 in.
9.31.3.5.	1.19 mm	0.047 in.	9.34.10.2.	125 mm	4 7/8 in.
9.31.3.5.	4.7 mm	3/16 in.	9.34.10.2.	600 mm	24 in.
9.32.6.1.	60°C to 75°C	140°F to 167°F	9.34.10.3.	450 mm	18 in.
9.33.1.1.	2 m ³ /s	4,238 cfm	9.34.10.3.	9.5 mm	3/8 in.
9.33.1.2.	2 m ³ /s	4,238 cfm	9.35.2.6.	30 m ²	323 sq ft
9.33.2.1.	0.05 m ³ /s	106 cfm	Table 9.35.2.A.	—	**
9.33.2.1.	2.5 mm	0.1 in.	9.35.3.1.	1.8 m	5 ft 11 in.
Table 9.33.3.A.	—	**	9.35.3.1.	900 mm	35 in.
9.33.4.9.	127 mm	5 in.	9.35.3.1.	300 mm	12 in.
9.34.1.1.	120 kW	409,458 Btu/hr	9.35.3.5.	4.5 m	14 ft 9 in.
9.34.1.1.	2 m ³ /s	4,238 cfm	9.35.3.7.	10 m	32 ft 10 in.
9.34.1.2.	120 kW	409,458 Btu/hr	9.36.3.3.	50 m ²	538 sq ft
9.34.1.2.	2 m ³ /s	4,238 cfm	9.36.3.4.	150 mm	5 7/8 in.
9.34.2.6.	22°C	72°F	9.36.3.4.	25 mm	1 in.
9.34.2.7.	18°C	64°F	9.36.3.4.	190 mm x	
9.34.2.7.	15°C	59°F	190 mm	7 1/2 in. x 7 1/2 in.	
9.34.3.1.	600 mm	24 in.	9.36.5.2.	89 mm x 89 mm	4 in. x 4 in.*
9.34.3.2.	300 mm	12 in.			
Table 9.34.3.A.	—	**			
9.34.3.4.	6 mm	1/4 in.			
9.34.3.7.	75 mm	3 in.			
9.34.3.7.	12 mm	1/2 in.			

*Nominal dimension

**See Appendix C

APPENDIX C

IMPERIAL CONVERSION OF METRIC VALUES IN TABLES

IMPERIAL CONVERSION OF METRIC VALUES IN TABLES

Table 3.1.14.A.
Forming Part of Article 3.1.14.1.

Type of Use of <i>Floor Area</i> or Part Thereof	Area per Person, sq ft
Assembly uses	
space with fixed seats	See Clause (1)(a)
space with nonfixed seats	8
stages for theatrical performances	8
space with nonfixed seats and tables	10
standing space	4
stadia and grandstands	6
bowling alleys, pool and billiard rooms	100
classrooms	20
school shops and vocational rooms	100
reading or writing rooms or lounges	20
dining, beverage and cafeteria space	13
laboratories in schools	50
Institutional uses	
surgical and obstetrical areas	125
wards containing more than 2 beds	50
detention quarters	125
Residential uses	
houses	See Clause (1)(b)
dormitories	50
Business and personal services uses	
personal service shops	50
offices	100
Mercantile uses	
retail sales floors at ground, basement or cellar	30
other floors	60
Industrial uses	
manufacturing or process rooms	50
storage garages	495
storage spaces (warehouse)	301
aircraft hangars	495
Other uses	
cleaning and repair of goods	50
kitchens	100
storage	495
Column 1	2

Table 3.2.2.A.
Forming Part of Sentence 3.2.2.14.(1)

No. of Storeys	Unsprinklered Maximum Area, sq ft		
	Facing 1 Street	Facing 2 Streets	Facing 3 Streets
1	17,222	21,528	25,833
2	8,611	10,764	12,917
Column 1	2	3	4

Table 3.2.2.B.
Forming Part of Sentence 3.2.2.19.(1)

No. of Storeys	Unsprinklered Maximum Area, sq ft		
	Facing 1 Street	Facing 2 Streets	Facing 3 Streets
1	43,056	53,820	64,583
2	21,528	26,910	32,292
Column 1	2	3	4

Table 3.2.2.C.
Forming Part of Sentence 3.2.2.24.(1)

No. of Storeys	Unsprinklered Maximum Area, sq ft	Sprinklered Maximum Area, sq ft
1	10,764	25,833
2	5,382	17,222
Column 1	2	3

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

No. of Storeys	Unsprinklered Maximum Area, sq ft		
	Facing 1 Street	Facing 2 Streets	Facing 3 Streets
1	12,917	16,146	19,375
2	9,688	12,109	14,531
3	6,458	8,073	9,688
Column 1	2	3	4

Table 3.2.2.E.
Forming Part of Sentence 3.2.2.27.(1)

No. of Storeys	Unsprinklered Maximum Area, sq ft		
	Facing 1 Street	Facing 2 Streets	Facing 3 Streets
1	unlimited	unlimited	unlimited
2	64,583	unlimited	unlimited
3	43,056	53,820	64,583
4	32,292	40,365	48,438
5	25,833	32,292	38,750
6	21,528	26,910	32,292
Column 1	2	3	4

Table 3.2.2.F.
Forming Part of Sentence 3.2.2.29.(1)

No. of Storeys	Unsprinklered Maximum Area, sq ft		
	Facing 1 Street	Facing 2 Streets	Facing 3 Streets
1	10,764	13,455	16,146
2	8,611	10,764	12,917
Column 1	2	3	4

Table 3.2.2.G.
Forming Part of Sentence 3.2.2.30.(1)

No. of Storeys	Unsprinklered Maximum Area, sq ft		
	Facing 1 Street	Facing 2 Streets	Facing 3 Streets
1	51,667	64,583	77,500
2	25,833	32,292	38,750
3	17,222	21,528	25,833
Column 1	2	3	4

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

No. of Storeys	Unsprinklered Maximum Area, sq ft		
	Facing 1 Street	Facing 2 Streets	Facing 3 Streets
1	unlimited	unlimited	unlimited
2	77,500	unlimited	unlimited
3	51,667	64,583	77,500
4	38,750	48,438	58,125
5	30,139	38,750	46,500
6	25,833	32,292	38,750
Column 1	2	3	4

Table 3.2.2.I.
Forming Part of Sentence 3.2.2.33.(1)

No. of Storeys	Unsprinklered Maximum Area, sq ft		
	Facing 1 Street	Facing 2 Streets	Facing 3 Streets
1	10,764	13,455	16,146
2	6,458	8,073	9,688
Column 1	2	3	4

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

No. of Storeys	Unsprinklered Maximum Area, sq ft		
	Facing 1 Street	Facing 2 Streets	Facing 3 Streets
1	16,146	16,146	16,146
2	12,917	16,146	16,146
3	8,611	10,764	12,917

No. of Storeys	Sprinklered Maximum Area, sq ft		
	Facing 1 Street	Facing 2 Streets	Facing 3 Streets
1	51,667	64,583	77,500
2	25,833	32,292	38,750
3	17,222	21,528	25,833
Column 1	2	3	4

Table 3.2.2.K.
Forming Part of Sentence 3.2.2.35.(1)

No. of Storeys	Sprinklered Maximum Area, sq ft		
	Facing 1 Street	Facing 2 Streets	Facing 3 Streets
1	unlimited	unlimited	unlimited
2	80,729	unlimited	unlimited
3	53,820	67,274	80,729
4	40,365	50,461	60,547
5	32,292	40,365	48,438
6	26,910	33,637	40,365
Column 1	2	3	4

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

No. of Storeys	Unsprinklered Maximum Area, sq ft		
	Facing 1 Street	Facing 2 Streets	Facing 3 Streets
1	8,611	10,764	12,917
2	4,306	5,382	6,458
Column 1	2	3	4

Table 3.2.2.M.
Forming Part of Sentence 3.2.2.38.(1)

No. of Storeys	Sprinklered Maximum Area, sq ft		
	Facing 1 Street	Facing 2 Streets	Facing 3 Streets
1	25,833	32,292	38,750
2	12,917	16,146	19,375
3	8,611	10,764	12,917
Column 1	2	3	4

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

No. of Storeys	Unsprinklered Maximum Area, sq ft		
	Facing 1 Street	Facing 2 Streets	Facing 3 Streets
1	25,833	32,292	38,750
2	12,917	16,146	19,375
3	8,611	10,764	12,917
4	6,458	8,073	9,688
Column 1	2	3	4

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

No. of Storeys	Sprinklered Maximum Area, sq ft		
	Facing 1 Street	Facing 2 Streets	Facing 3 Streets
1	64,583	80,729	96,875
2	32,292	40,365	48,438
3	21,528	26,910	32,292
4	16,146	20,182	24,219
Column 1	2	3	4

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

No. of Storeys	Unsprinklered Maximum Area, sq ft		
	Facing 1 Street	Facing 2 Streets	Facing 3 Streets
1	10,764	13,455	16,146
2	6,458	8,073	9,688

No. of Storeys	Sprinklered Maximum Area, sq ft		
	Facing 1 Street	Facing 2 Streets	Facing 3 Streets
1	32,292	40,365	48,438
2	12,917	16,146	19,375
Column 1	2	3	4

Table 3.2.2.Q.
Forming Part of Sentence 3.2.2.42.(1)

No. of Storeys	Unsprinklered Maximum Area, sq ft		
	Facing 1 Street	Facing 2 Streets	Facing 3 Streets
1	34,445	43,056	51,667
2	17,222	21,528	25,834
3	11,517	14,424	17,222
4	8,611	10,764	12,917
Column 1	2	3	4

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

No. of Storeys	Unsprinklered Maximum Area, sq ft		
	Facing 1 Street	Facing 2 Streets	Facing 3 Streets
1	64,583	80,729	96,875
2	32,292	40,365	48,438
3	21,528	26,910	32,292
4	16,146	20,182	24,219
Column 1	2	3	4

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

No. of Storeys	Unsprinklered Maximum Area, sq ft		
	Facing 1 Street	Facing 2 Streets	Facing 3 Streets
1	96,875	121,094	145,313
2	48,438	60,547	72,656
3	32,292	40,365	48,438
4	24,219	30,273	36,328
5	19,375	24,219	29,063
6	16,146	20,182	24,219
Column 1	2	3	4

Table 3.2.2.T.
Forming Part of Sentence 3.2.2.46.(1)

No. of Storeys	Unsprinklered Maximum Area, sq ft		
	Facing 1 Street	Facing 2 Streets	Facing 3 Streets
1	17,222	21,528	25,833
2	8,611	10,764	12,917

No. of Storeys	Sprinklered Maximum Area, sq ft		
	Facing 1 Street	Facing 2 Streets	Facing 3 Streets
1	51,667	64,583	77,500
2	17,222	21,528	25,833
Column 1	2	3	4

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

No. of Storeys	Unsprinklered Maximum Area, sq ft		
	Facing 1 Street	Facing 2 Streets	Facing 3 Streets
1	51,667	64,583	77,500
2	25,833	32,292	38,750
3	17,222	21,528	25,833
4	12,917	16,146	19,375
Column 1	2	3	4

Table 3.2.2.V.
Forming Part of Sentence 3.2.2.48.(1)

No. of Storeys	Unsprinklered Maximum Area, sq ft		
	Facing 1 Street	Facing 2 Streets	Facing 3 Streets
1	60,278	75,347	90,417
Column 1	2	3	4

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

No. of Storeys	Unsprinklered Maximum Area, sq ft		
	Facing 1 Street	Facing 2 Streets	Facing 3 Streets
1	unlimited	unlimited	unlimited
2	77,500	96,875	116,250
3	51,667	64,583	77,500
4	38,750	48,438	58,125
5	31,000	38,750	46,500
6	25,833	32,292	38,750
Column 1	2	3	4

TABLE 3.2.3.A
Forming Part of Subsection 3.2.3.

[illegible]

Forming Part of Subsection 3.2.3.

[illegible]

Table 3.2.5.A.
Forming Part of Sentence 3.2.5.4.(1)

Occupancy Classification	Building Area, sq ft		
	1 storey	2 storeys	3 storeys
A	26,910	21,528	16,146
B (except hospitals)	21,528	16,146	10,764
Hospitals	5,382	5,382	5,382
C	21,528	16,146	10,764
D	43,056	32,292	21,528
F, Division 1	10,764	10,764	10,764
F, Division 2	21,528	16,146	10,764
F, Division 3	32,292	21,528	10,764
Column 1	2	3	4

Table 3.3.1.A.
Forming Part of Sentence 3.3.1.4.(1)

Occupancy of Room or Suite	Maximum Area of Room or Suite, sq ft	Maximum Distance to Egress Door ft—in.
Group A	1,615	49—3
Group B	807	32—10
Group C	1,076 ⁽¹⁾	49—3 ⁽¹⁾
Group D	2,153	82—0
Group E	1,615	49—3
Group F, Division 2	1,615	32—10
Group F, Division 3	2,153	49—3
Column 1	2	3

Note to Table 3.3.1.A.:

⁽¹⁾ See Sentence 3.3.4.2.(6) for *dwelling units*.

Table 3.4.2.A.
Forming Part of Sentence 3.4.2.1.(2)

Occupancy of Floor Area	Maximum Floor Area, sq ft	Maximum Travel Distance, ft—in.
Group A	1,615	49—3
Group B	807	32—10
Group C	1,076	49—3
Group D	2,153	82—0
Group E	1,615	49—3
Group F, Division 2	1,615	32—10
Group F, Division 3	2,153	49—3
Column 1	2	3

Table 4.1.6.A.
Forming Part of Sentence 4.1.6.3.(1)

Use of Area of Floor or Roof	Minimum Specified Load, psf
Assembly areas with fixed seats that have backs over at least 80 per cent of the assembly area and including Auditoria Churches Classrooms (also without fixed seats) Courtrooms Lecture halls Theatres and other areas with similar uses	50
Assembly areas other than those listed above, including Arenas Balconies Churches Dance floors Dining areas Foyers and entrance halls Grandstands, reviewing stands and bleachers Gymnasias Museums Promenades Rinks Stadia Stages Theatres and other areas with similar uses	100
Attics having limited accessibility so that there is no storage of equipment or material	10
Balconies, exterior and interior	100
Corridors, lobbies and aisles over 4 ft wide (except upper floor corridors of residential areas of apartments, hotels and motels)	100
Corridors, lobbies and aisles not over 4 ft in width and all upper floor corridors of residential areas only of apartments, hotels and motels	(1)
Equipment areas and service rooms including Generator rooms Mechanical equipment exclusive of elevators Machine rooms Pump rooms Transformer vaults Ventilating or air-conditioning equipment	75 ⁽²⁾
Column 1	2

Table 4.1.6.A. (Cont'd)

Use of Area of Floor or Roof	Minimum Specified Load, psf
<i>Exits</i> and fire escapes	100
Factories	125 ⁽²⁾
Garages for	
Passenger cars	50
Unloaded buses and light trucks	125
Loaded buses and trucks and all other trucking spaces	251
Kitchens (other than residential)	100
Libraries	
Stack rooms	150
Reading and study rooms	61
Office areas in office <i>buildings</i> and other <i>buildings</i> (not including record storage and computer rooms) located in	
Basement and first floor	100
Floors above first floor	50
Operating rooms and laboratories	75
Recreation areas that cannot be used for assembly purposes including	
Billiard rooms	
Bowling alleys	
Pool rooms	75
Residential areas	
Sleeping and living quarters in apartments, hotels, motels, boarding schools, colleges and hospitals	40
Retail and wholesale areas	100
Roofs	21 ⁽³⁾
Sidewalks and driveways over areaways and basements	251
Storage areas	100 ⁽²⁾
Toilet areas	50
Underground slabs with earth cover	(2)
Warehouses	100 ⁽²⁾
Column 1	2

Notes to Table 4.1.6.A.:

⁽¹⁾ See Sentence 4.1.6.3.(2).⁽²⁾ See Sentence 4.1.6.3.(3).⁽³⁾ See Article 4.1.7.1.

Table 4.1.6.B.
Forming Part of Article 4.1.6.4.

Area of Floor or Roof	Minimum Concentrated Load, lb
Roof surfaces	292
Floors of classrooms	1,012
Floors of offices, manufacturing <i>buildings</i> , hospital wards and stages	2,023
Floors and areas used by passenger cars	2,473
Floors and areas used by vehicles not exceeding 7,937 lb gross weight	4,047
Floors and areas used by vehicles exceeding 7,937 lb but not exceeding 19,841 lb gross weight	8,093
Floors and areas used by vehicles exceeding 19,841 lb gross weight	12,140
Driveways and sidewalks over areaways and basements	12,140
Column 1	2

Table 4.1.8.A.
Forming Part of Sentence 4.1.8.1.(4)

Height, ft	Exposure Factor
0 to 39	1.0
Over 39 to 66	1.1
Over 66 to 98	1.2
Over 98 to 144	1.3
Over 144 to 210	1.4
Over 210 to 279	1.5
Over 279 to 459	1.6
Over 459 to 787	1.8
Over 787 to 1,312	2.0
Column 1	2

Table 6.1.4.A.
Forming Part of Article 6.1.4.1.

Gauge No.	Minimum Thickness of Sheet Metal, in.			
	Galvanized Steel	Uncoated Steel	Stainless Steel	Aluminum Alloy
	GSG	MSG	USSG	B&SG
6	—	0.184	—	0.146
7	—	0.171	—	0.128
8	0.159	0.156	0.158	0.115
9	0.144	0.142	0.142	0.106
10	0.129	0.127	0.129	0.094
11	0.114	0.112	0.115	0.084
12	0.099	0.097	0.100	0.074
13	0.084	0.082	0.086	0.065
14	0.070	0.067	0.071	0.057
15	0.065	0.060	0.064	0.050
16	0.058	0.053	0.057	0.044
17	0.053	0.047	0.051	0.039
18	0.047	0.043	0.045	0.034
19	0.041	0.038	0.039	0.030
20	0.036	0.033	0.034	0.026
21	0.033	0.030	0.030	0.023
22	0.030	0.027	0.027	0.021
23	0.027	0.024	0.024	0.019
24	0.024	0.021	0.022	0.016
25	0.021	0.018	0.019	0.014
26	0.019	0.016	0.016	0.012
27	0.017	0.014	0.014	0.011
28	0.016	0.013	0.014	0.009
29	0.014	—	0.012	0.008
30	0.013	—	0.011	0.008
Column 1	2	3	4	5

Table 6.2.5.A.
Forming Part of Article 6.2.5.3.

MINIMUM CLEARANCES TO COMBUSTIBLE MATERIAL FOR FURNACES AND BOILERS USING SOLID FUEL				
Type of <i>Furnace</i> or <i>Boiler</i>	Minimum Clearance, in			
	Above and Sides of Bonnet or <i>Plenum</i>	Jacket Sides and Rear	Front	Projecting <i>Flue</i> Collar
Automatically stoker fired, <i>forced-air</i> <i>furnace</i>	5 $\frac{7}{8}$	5 $\frac{7}{8}$	47	(1)
Steam <i>boilers</i> limited to 15 psi (Gauge) max.	5 $\frac{7}{8}$	5 $\frac{7}{8}$	47	(1)
Hot water <i>boilers</i> limited to 248°F max. of the water-wall type or having a jacket or lining of masonry or other <i>acceptable</i> insulating material	5 $\frac{7}{8}$	5 $\frac{7}{8}$	47	(1)
Hot water <i>boilers</i> and <i>forced-air</i> <i>furnaces</i> not limited to 248°F max.	18	18	47	(1)
Steam <i>boilers</i> limited between 15 psi (Gauge) and 51 psi (Gauge)	18	18	47	(1)
Steam <i>boilers</i> not limited to 51 psi (Gauge) max. but not over 409,458 Btu/hr rated heat input	18	18	47	(1)
Other <i>boilers</i> and <i>forced-air</i> <i>furnaces</i>	35	35	94	35
Column 1	2	3	4	5

Note to Table 6.2.5.A:

(1) See Sentence 6.3.8.1.(7).

Table 6.2.5.B.
Forming Part of Article 6.2.5.3.

MINIMUM CLEARANCES TO COMBUSTIBLE MATERIAL WITH SPECIFIED FORMS OF PROTECTION FOR FURNACES AND BOILERS USING SOLID FUEL, in.				
Minimum Protection for <i>Combustible</i> Material	Where in Table 6.2.5.A. the minimum clearance is:			
	18 in.		5$\frac{7}{8}$ in.	
	Above and Sides of Bonnet or <i>Plenum</i>	Jacket Sides and Rear	Above and Sides of Bonnet or <i>Plenum</i>	Jacket Sides and Rear
$\frac{1}{4}$ in. asbestos millboard spaced out 1 in. by <i>noncombustible</i> material	15	9	3	2
0.013 in. sheet metal on $\frac{1}{4}$ in. asbestos millboard	12	9	3	2
0.013 in. sheet metal spaced out 1 in. by <i>noncombustible</i> material	9	5 $\frac{7}{8}$	2	2
0.013 in. sheet metal on $\frac{1}{8}$ in. asbestos millboard spaced out 1 in. by <i>noncombustible</i> material	9	5 $\frac{7}{8}$	2	2
1 $\frac{5}{8}$ in. asbestos-cement covering on heating <i>appliances</i>	9	5 $\frac{7}{8}$	2	1
$\frac{1}{4}$ in. asbestos millboard on 1 in. mineral wool batts reinforced with wire mesh or equivalent	5 $\frac{7}{8}$	5 $\frac{7}{8}$	2	2
0.027 in. sheet metal on 1 in. mineral wool batts reinforced with wire mesh or equivalent	3 $\frac{7}{8}$	3	2	2
$\frac{1}{4}$ in. asbestos-cement board or $\frac{1}{4}$ in. asbestos millboard	18	18	3 $\frac{7}{8}$	3 $\frac{7}{8}$
$\frac{1}{4}$ in. cellular asbestos	18	18	3	3
Column 1	2	3	4	5

Table 6.2.6.A.
Forming Part of Article 6.2.6.2.

Appliances	Minimum Clearance, in.			
	Top	Sides	Rear	Front
<i>Stoves and ranges</i> without refractory lining: fire box side other side	30	35 18	35	47
<i>Stoves and ranges</i> with refractory lining: fire box side other side	30	24 18	24	47
<i>Space heaters</i> with an air space between the outside of the fire chamber and the external casing to allow air circulation	35	12	12	47
<i>Space heaters</i> other than above	35	35	35	47
Column 1	2	3	4	5

Table 6.2.6.B.
Forming Part of Article 6.2.6.2.

MINIMUM CLEARANCES TO COMBUSTIBLE MATERIAL WITH SPECIFIED FORMS OF PROTECTION FOR STOVES, RANGES, SPACE HEATERS AND SERVICE WATER HEATERS USING SOLID FUEL, in.					
Minimum Protection for Combustible Material	Where the Minimum Clearance in Table 6.2.6.A. is:				
	12 in.	18 in.	24 in.	30 or 35 in.	
	Sides and Rear	Sides	Sides	Top	Sides and Rear
¼ in. asbestos millboard spaced out 1 in. by <i>noncombustible</i> material	5⅞	9	12	30	18
0.013 in. sheet metal on ¼ in. asbestos millboard	5⅞	9	12	24	18
0.013 in. sheet metal spaced out 1 in. by <i>noncombustible</i> material	3⅞	5⅞	7⅞	18	12
¼ in. asbestos millboard on 1 in. mineral wool batts reinforced with wire mesh or equivalent	3⅞	5⅞	7⅞	18	12
0.027 in. sheet metal on 1 in. mineral wool batts reinforced with wire mesh or equivalent	2	3⅞	7⅞	18	12
Column 1	2	3	4	5	6

Table 6.2.10.A.
Forming Part of Article 6.2.10.6.

Steam or Water Temperature, °F	Minimum Clearance, in.
up to 248	$\frac{5}{8}$
above 248	1
Column 1	2

Table 6.3.8.A.
Forming Part of Sentence 6.3.8.1.(4)

Diameter of Flue Pipe, in.	Minimum Thickness of Metal, in.	
	Uncoated Steel	Galvanized Steel
Below 6	0.016	0.016
6 to 8 (incl.)	0.021	0.019
Over 8 to 10	0.027	0.024
Over 10 to 12	0.033	0.030
Over 12 to 16	0.043	0.036
Over 16	0.067	0.058
Column 1	2	3

Table 6.3.8.B.
Forming Part of Sentence 6.3.8.1.(8)

Minimum Protection for <i>Combustible</i> Material	Minimum Clearance with Protection, in.
$\frac{1}{4}$ in. asbestos millboard spaced out 1 in. by <i>noncombustible</i> material	12
0.013 in. sheet metal on $\frac{1}{4}$ in. asbestos millboard	12
0.013 in. sheet metal spaced out 1 in. by <i>noncombustible</i> material	9
0.013 in. sheet metal on $\frac{1}{8}$ in. asbestos millboard spaced out 1 in. by <i>noncombustible</i> material	9
$1\frac{1}{8}$ in. asbestos-cement or mineral wool covering on <i>flue pipe</i> or <i>breeching</i>	9
0.027 in. sheet metal on 1 in. mineral wool batts reinforced with wire mesh or equivalent	$3\frac{1}{8}$
Column 1	2

Table 9.3.1.A.
Forming Part of Article 9.3.1.7.

CONCRETE MIXES, BY VOLUME			
Concrete Strength, psi	Cement, part	Sand, parts	Coarse Aggregate
2,030	1	2	4 parts
	1	—	6 parts pit run gravel
2,465	1	2	3½ parts up to 1½ in. in size
	1	—	5½ parts pit run gravel
Column 1	2	3	4

Table 9.4.2.A.
Forming Part of Article 9.4.2.1.

UNIFORM DESIGN LOADS FOR FLOORS	
Use of Area of Floor	Minimum Design Live Load, psf
Corridors	(1)
Balconies, residential, not used as passage ways	40 ⁽²⁾
Balconies, other types	100
Equipment rooms	75 ⁽³⁾
Exits	100
Factories	125 ⁽³⁾
Garages	
for passenger cars	50
for unloaded buses and light trucks	125
for loaded trucks and buses and all trucking spaces	251
Kitchens	
other than domestic type	100
Office areas	
basements	100
all other storeys	50
Laboratories	75
<i>Residential occupancies</i>	
attics not accessible by a stairway	10
attics accessible by a stairway	29
bedrooms	29
all other rooms	40
stairs within dwelling units	40
<i>Mercantile occupancies</i>	100
Driveways not supported by the ground	251
Sidewalks not supported by the ground and adjacent to driveways that may be subject to loads from cars or trucks	251
Walks not supported by the ground and not subject to loads from cars or trucks	100
Storage areas	100 ⁽³⁾
Water-closet rooms except in residential occupancies	50
Column 1	2

Notes to Table 9.4.2.A.:

(1) See Article 9.4.2.3.

(2) See Article 9.4.2.4.

(3) See Article 9.4.2.2.

Table 9.4.2.B.
Forming Part of Article 9.4.2.1.

CONCENTRATED DESIGN LOADS FOR FLOORS	
Use of Area of Floor	Minimum Concentrated Design Load, lb
Floors of offices, manufacturing buildings	2,023
Floors and areas used by passenger cars	2,473
Floors and areas used by vehicles not exceeding 7,937 lb gross weight and walks not subject to vehicular traffic over basements, cellars or other open areas	4,047
Floors and areas used by vehicles exceeding 7,937 lb but not exceeding 19,842 lb gross weight	8,093
Floors and areas used by vehicles exceeding 19,842 lb gross weight	12,140
Driveways or sidewalks adjacent to driveways over basements, cellars or other open areas	12,140
Column 1	2

Table 9.4.7.A.
Forming Part of Article 9.4.7.2.

Type and Condition of Soil or Rock	Maximum Allowable Bearing Pressure, psf
Dense or compact sand or gravel ⁽¹⁾	3,133
Loose sand or gravel ⁽¹⁾	1,044
Dense or compact silt ⁽¹⁾	2,089
Stiff clay ⁽¹⁾	3,133
Firm clay ⁽¹⁾	1,566
Soft clay ⁽¹⁾	835
Till	4,177
Clay shale	6,266
Sound rock	10,443
Column 1	2

Note to Table 9.4.7.A.:

⁽¹⁾ See Appendix A.

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	7 ft 7 in. over at least 75 per cent of the required floor area with a clear height of 6 ft 11 in. at any point over the required area
Bedroom or bedroom space	7 ft 7 in. over at least 50 per cent of the required floor area or 6 ft 11 in. over all of the required floor area Any part of the floor having a clear height of less than 4 ft 7 in. shall not be considered in computing the required floor area
Unfinished basement or cellar including laundry area therein	6 ft 5 in. under beams in laundry areas and in any location that would normally be used for passage to laundry and required storage areas
Bathroom, water-closet room or laundry area above <i>grade</i>	6 ft 11 in. 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	6 ft 11 in.
Column 1	2

Table 9.6.3.A.
Forming Part of Article 9.6.3.1.

MINIMUM SIZE OF DOORS		
At Entrance to:	Width, in.	Height, ft—in.
<i>Dwelling unit</i> (required entrance) Vestibule or entrance hall	32	6—6
Stairs to a floor level that contains a finished space All doors in at least one line of passage from the exterior to the basement Utility rooms	32	6—6
Walk-in closet	24	6—6
Bathroom, water-closet room, shower room	24	6—6
Rooms located off hallways that are permitted to be 28 in. wide	24	6—6
Rooms not mentioned above, exterior balconies	30	6—6
Column 1	2	3

Table 9.6.5.A.
Forming Part of Article 9.6.5.1.

GLASS SIZE FOR DOORS	
Minimum Glass Thickness, in.	Maximum Area, ft ²
0.079	2.7
0.118	5.4
0.157	10.8
0.197	13.5
0.236	not limited
Column 1	2

Table 9.7.4.A.
Forming Part of Article 9.7.4.2.

MAXIMUM GLASS PERIMETER FOR VARIOUS THICKNESSES, in.			
Minimum Glass Thickness of Inner and Outer Panes, in.	Sash Type or Fixed Glazing	Factory-Sealed Double Glazing	
		Fused Edges	Other than Fused Edges
0.079	120	180	150
0.118	168	252	210
0.157	240	360	300
0.197	280	420	350
0.236	339	509	424
0.315	no limit	no limit	no limit
Column 1	2	3	4

Table 9.9.3.A.
Forming Part of Article 9.9.3.2.

MAXIMUM AREA PER PERSON TO BE ASSUMED IN CALCULATING OCCUPANT LOAD	
<i>Occupancy or Use of Floor Area</i>	<i>Max. Area per Person, sq ft</i>
Residential	
<i>Dwelling units</i>	(1)
Dormitories	50
Business and personal services	
Shops	50
Offices	100
Mercantile	
Retail sales floors at <i>grade</i> , cellar or basement	30
Other mercantile uses	60
Industrial	
Manufacturing or process rooms	50
<i>Storage garage</i>	495
Warehouse storage space	301
Other storage space	495
Aircraft hangars	495
Other uses	
Cleaning and repair	50
Kitchens	100
Column 1	2

Note to Table 9.9.3.A.:

(1) See Article 9.9.3.3.

Table 9.9.7.A.
Forming Part of Article 9.9.7.2.

<i>Occupancy</i>	<i>Maximum Length of Dead-End Public Corridor, ft—in.</i>	<i>Maximum Occupant Load Served By Dead- End Public Corridor</i>
Group C	19—8	—
Group D	29—6	30
Group E	0	—
Group F	29—6	30
Column 1	2	3

Table 9.9.7.B.
Forming Part of Article 9.9.7.4.

<i>Occupancy of Room, Suite or Floor Area</i>	<i>Maximum Area of Room, Suite or Floor Area, sq ft</i>	<i>Maximum Distance to Egress Door, ft—in.</i>
Group C (except dwelling units)	1,076	49—3
Group D	2,153	82—0
Group E	1,615	49—3
Group F, Division 2	1,615	32—10
Group F, Division 3	2,153	49—3
Column 1	2	3

Table 9.10.15.A.
Forming Part of Article 9.10.15.1.

MAXIMUM PERCENTAGE OF UNPROTECTED OPENINGS IN EXTERIOR WALLS													
<i>Occupancy Classification of Building</i>	<i>Maximum Area of Exposing Building Face,</i>	<i>Limiting Distance</i>											
		<i>Less than 4 ft</i>	<i>4 ft</i>	<i>6 ft</i>	<i>8 ft</i>	<i>10 ft</i>	<i>15 ft</i>	<i>20 ft</i>	<i>30 ft</i>	<i>40 ft</i>	<i>50 ft</i>	<i>60 ft</i>	<i>80 ft</i>
<i>Residential, business and personal services, and low hazard industrial</i>	Up to 300 sq ft	0	8	11	17	25	54	100	—	—	—	—	—
	301 to 400 sq ft	0	7	10	15	21	43	75	100	—	—	—	—
	401 to 500 sq ft	0	7	10	14	19	36	62	100	—	—	—	—
	501 to 1,000 sq ft	0	7	8	11	13	23	37	76	100	—	—	—
	Over 1,000 sq ft	0	7	8	9	10	14	20	37	60	90	100	—
<i>Mercantile and medium hazard industrial</i>	Up to 300 sq ft	0	4	6	9	12	27	48	100	—	—	—	—
	301 to 400 sq ft	0	4	5	7	11	21	38	86	100	—	—	—
	401 to 500 sq ft	0	4	5	7	9	18	31	70	100	—	—	—
	501 to 1,000 sq ft	0	4	4	5	7	12	18	38	66	100	—	—
	Over 1,000 sq ft	0	4	4	4	5	8	10	18	30	45	63	100
Column 1	2	3	4	5	6	7	8	9	10	11	12	13	14

BUILDING STANDARDS
for the
HANDICAPPED
1980



Extracts from the document issued by the
Associate Committee on the National Building Code
National Research Council of Canada
Ottawa

that are to be read in conjunction with the
Alberta Building Code 1981.

TABLE OF CONTENTS

	Page
Preface	
List of Abbreviations	
Section 1 Scope	1
Section 2 Site Development	1
Section 3 Buildings	1
Section 4 Dwelling Units	4
Appendix	
Index	

PREFACE

One in every seven Canadians has a disability associated with aging or a physical impairment.

The full integration of disabled people into society implies the adoption of appropriate standards which provide for all necessary aspects of public and private accessibility. The term accessibility is used in its broadest sense with the intent of facilitating use by persons in wheelchairs and by ambulatory people with all types of handicaps including visual impairment.

The implementation of the standards in this document will enable persons with physical or sensory disabilities to utilize buildings and facilities more independently. While these standards attempt to identify the needs of handicapped users, their implementation will make buildings safer and more accessible for everyone.

The Appendix contains supplementary material and diagrams to assist the designer. The first line of each item in the Appendix contains in bold-face type the reference to the requirement in this document to which the supplementary material is applicable. These references have been placed in numerical order to ensure that they are easily found when they are referred to in the text.

LIST OF ABBREVIATIONS

Abbreviations of words and phrases in this document have the following meanings:

°	degree(s)
lx	lux (illuminance)
m	metre(s)
min.	minimum
mm	millimetre(s)
N	newton(s)

SECTION 1 SCOPE

SUBSECTION 1.1 GENERAL

1.1.1. These Standards apply to the design of buildings and to associated site development for use by physically handicapped persons.

1.1.2. In designing buildings and building sites to accommodate physically handicapped persons, the designer shall take into consideration the requirements of persons with aging or other physical or sensory disabilities, with wheelchair use generally being the most limiting design condition. (See Appendix)

SECTION 2 SITE DEVELOPMENT

SUBSECTION 2.1 WALKS (See Appendix)

2.1.1. Walks that are required to accommodate physically handicapped persons shall conform to Articles 2.1.2. to 2.1.6. (See also Subsection 3.2.7. and Article 9.9.2.9. of the Alberta Building Code 1981.)

2.1.2. Exterior walks shall have nonslip surfaces.

2.1.3. Exterior walks shall form a continuous surface and shall not have abrupt changes in level such as steps and curbs.

2.1.4. Exterior walks shall be at least 920 mm in width.

2.1.5. Where the gradient of a walk exceeds 1 in 20 it shall be designed according to the requirements for a ramp. (See Article 3.3.1.)

2.1.6. Obstructions such as signs, guy wires, trees and parking meters shall not be permitted along outdoor walkways where they create a potential hazard to the user of the walkway, particularly to blind persons.

SUBSECTION 2.2 PARKING AREAS (See Appendix)

2.2.1. Where parking spaces are required to be provided for physically handicapped persons, such spaces shall be at least 3.7 m wide, hard surfaced and level, located near an accessible entrance and shall be identified for the use of physically handicapped persons.

SECTION 3 BUILDINGS

SUBSECTION 3.1 ENTRANCES (See Appendix)

3.1.1. Doorways and ramps at the entrance to a building which accommodate physically handicapped persons shall conform to Subsections 3.2 and 3.3, respectively.

3.1.2. Vestibules required to accommodate physically handicapped persons shall be designed to allow the movement of wheelchairs between the doors.

3.1.3. Where a building is required to have a principal entrance to accommodate physically handicapped persons, signs shall be installed where necessary to indicate the location of the principal entrance that is suitable. (See Appendix)

3.1.4. Where a facility is required to accommodate physically handicapped persons, such facility shall be identified by a sign consisting of the international symbol of accessibility for handicapped persons and such other graphic or written directions as are needed to indicate clearly the intended facility. (See Appendix)

SUBSECTION 3.2 DOORS AND DOORWAYS (See Appendix)

3.2.1. Except as required in Subsection 4.3, doorways required to accommodate physically handicapped persons shall have a clear opening, free of protruding hardware, of at least 762 mm

when the door is in the open position.

3.2.2. Thresholds that are not flush with the floor in doorways that are required to accommodate physically handicapped persons shall not exceed 13 mm in height and shall be sloped to facilitate the passage of wheelchairs.

3.2.3. Door closers shall be of a type that permits the door being opened with a minimum of effort and that is slow closing to allow uninterrupted passage of a wheelchair.

SUBSECTION 3.3 RAMPS AND STAIRS (See Appendix)

3.3.1. Where ramps are required to accommodate physically handicapped persons, the ramps shall conform to the requirements of Articles 3.3.2. to 3.3.8.

3.3.2. Ramps shall have a nonslip surface.

3.3.3. Ramp surfaces shall have a minimum width of 914 mm.

3.3.4. Gradients for ramps shall not exceed 1 in 12, except that the authority having jurisdiction may permit a steeper slope where it is not practicable to provide a slope of 1 in 12, but in no case shall the slope exceed 1 in 8.

3.3.5. A level area of 1.52 m by 1.52 m shall be provided at the bottom of a ramp.

3.3.6. A level area of at least 1.52 m by 1.52 m shall be provided on the top of a ramp leading to a door so that at least 305 mm projects beyond the latch edge of the door opening, except that where the door opens away from the ramp, the depth of the level area may be reduced to 914 mm. (See Appendix)

3.3.7. Where there are abrupt changes in the direction of a ramp, or where the ramp exceeds 9 m in length, it shall have a level landing at intervals of not more than 9 m measuring at least 1.22 m long and of at least the same width as the ramp.

3.3.8. All ramps and landings shall be equipped so they can be illuminated to average levels of at least 50 lx at floor level.

SUBSECTION 3.4 HANDRAILS (See Appendix)

3.4.1. Except as provided in Articles 3.4.2. and 3.4.3., ramps shall have a suitable handrail on at least 1 side which shall extend at least 300 mm beyond the top and bottom of the ramp. This extension shall be located so that it does not constitute a hazard. (See also Sentences 3.4.8.5.(1) to (5) of the Alberta Building Code 1981.

3.4.2. Ramps with a gradient steeper than 1 in 12 shall have 2 handrails spaced not less than 865 mm and not more than 1 015 mm apart.

3.4.3. No handrails are required for ramps where the ramp height does not exceed 200 mm.

SUBSECTION 3.5 ELEVATORS (See Appendix)

3.5.1. Where elevators are required to accommodate physically handicapped persons, the requirements of Articles 3.5.2. and 3.5.3. shall apply.

3.5.2. The uppermost button in the elevator cab control panel shall be located not more than 1.52 m above floor level.

3.5.3. At least 1 handrail shall be provided in each elevator car.

SUBSECTION 3.6 TOILET ROOMS (See Appendix)

3.6.1. Where a special toilet room is provided for the use of handicapped persons of both sexes and their attendants, in lieu of facilities for handicapped persons in washrooms used by the general public, the special toilet rooms shall conform to Articles 3.6.2. to 3.6.7.

3.6.2. Doors to the special toilet rooms referred to in Article 3.6.1. shall be capable of being locked from the inside.

3.6.3. Special toilet rooms shall contain at least 1 water closet and associated grab bars conforming to Subsection 3.8 and 1 lavatory conforming to Subsection 3.9.

3.6.4. Where vestibules are provided, doors in vestibules shall conform to Articles 3.1.2., 3.2.1. and 3.2.2.

3.6.5. Special toilet rooms shall have no dimension less than 1.68 m.

3.6.6. Fixture clearance shall conform to the requirements in Subsections 3.7 to 3.9, inclusive.

3.6.7. The door to the special toilet room shall be identified for use by physically handicapped persons. (See Appendix for Article 3.1.4.)

SUBSECTION 3.7 WATER CLOSET STALLS (See Appendix)

3.7.1. Where a washroom is required to be installed for use by physically handicapped persons, at least 1 water closet stall shall conform to Articles 3.7.2. to 3.7.9.

3.7.2. Water closet stalls shall be at least 1.37 m in width by 1.52 m in depth.

3.7.3. The water closet stall door shall be a minimum of 813 mm in width and shall swing outward.

3.7.4. Doors on water closet stalls shall be capable of being locked from the inside and provision shall be made for closing the door from within the stall, for example by a pull mounted near the hinged side of the door. (See Appendix)

3.7.5. Except as provided in Article 3.7.6., the water closet shall be located 457 mm from the centre of the fixture to an adjacent side wall.

3.7.6. At least 914 mm shall be provided from the centre line of a water closet to an adjacent wall on at least 1 side of the water closet.

3.7.7. The water closet stall shall be provided with a grab bar conforming to Article 3.7.8.

3.7.8. Grab bars shall have a diameter of not less than 45 mm and not more than 50 mm. The space between the bar and the wall shall be approximately 45 mm. Such grab bars shall be mounted at the side of the water closet approximately 400 mm from the centre line of the water closet.

3.7.9. A coat hook with rounded edges shall be mounted 1.52 m above the floor on a side wall, projecting not more than 25 mm from the wall.

SUBSECTION 3.8 WATER CLOSETS (See Appendix)

3.8.1. Where a water closet stall is installed for use by physically handicapped persons, at least 1 water closet in such stall shall conform to Articles 3.8.2. to 3.8.5.

3.8.2. Water closet seats shall not exceed 457 mm in height above floor level.

3.8.3. Water closet seats with spring-up action shall not be used.

3.8.4. Flushing controls shall be hand operated, of the lever type and easily accessible to a wheelchair user.

3.8.5. A back support shall be provided for each water closet.

SUBSECTION 3.9 LAVATORIES

3.9.1. Where a washroom is required for use by physically handicapped persons, lavatories and soap and towel dispensers shall be installed in conformance with Articles 3.9.2. to 3.9.7.

3.9.2. Lavatories shall have a clearance of 660 mm beneath the bottom of the lavatory to a point at least 254 mm in from its front.

3.9.3. Waste outlet pipes which constitute a burn hazard shall be insulated.

3.9.4. Lavatory faucet handles shall be of the lever type.

3.9.5. Lavatories shall be mounted a minimum of 457 mm from the side wall to the centre of the fixture.

3.9.6. Soap dispensers, shelving or other projections in a lavatory that may cause injury to users, particularly blind persons, shall be located in such a position that they will not create a hazard.

3.9.7. Soap and towel dispensers shall be located so that they are accessible to physically handicapped persons, including persons in wheelchairs. The dispensers shall be not more than 1 m above the floor.

SUBSECTION 3.10 PUBLIC TELEPHONES

3.10.1. Public telephones provided for use by physically handicapped persons shall meet the requirements of Articles 3.10.2. to 3.10.5.

3.10.2. The booth or enclosure shall be located so that it can be entered by a person in a wheelchair and shall be suitably identified for use by physically handicapped persons.

3.10.3. The dial, handset and coin deposit slots shall be mounted not more than 1.22 m above the floor.

3.10.4. Telephones for use by persons with hearing difficulties shall be designed so that they may be used by persons with or without hearing aids.

3.10.5. A telephone directory shelf shall be mounted approximately 750 mm above the floor.

SECTION 4 DWELLING UNITS

SUBSECTION 4.1 GENERAL (See Appendix)

4.1.1. Dwelling units required to be designed for the use of physically handicapped persons shall conform to Articles 4.1.2. to 4.15.1.

4.1.2. All living areas and essential facilities in and related to the dwelling unit shall be accessible to persons in wheelchairs.

SUBSECTION 4.2 GARAGES, CARPORTS AND PARKING SPACES

4.2.1. A garage, carport or parking space serving a dwelling unit for physically handicapped persons shall be at least 3.7 m wide, hard surfaced and located near an accessible entrance. The parking space shall be level and connected to the dwelling unit by a continuous hard surface path.

SUBSECTION 4.3 WALKS

4.3.1. Walks shall have a width of at least 914 mm with a gradient of not more than 1 in 20, constructed without steps or abrupt changes in level.

SUBSECTION 4.4 RAMPS

4.4.1. Ramps shall conform with the requirements of Subsection 3.3.1.

SUBSECTION 4.5 ENTRANCES

4.5.1. At least 1 entrance to each dwelling unit shall be designed for use by persons in wheelchairs.

SUBSECTION 4.6 DOORS AND DOORWAYS

4.6.1. Doorways at the entrance to the dwelling unit and at the entrance to each room shall conform to Subsection 3.2, except that where doors or openings are located at right angles to a hallway that is less than 1 015 mm in width, such doors or openings shall provide a clear opening of not less than 865 mm. All other doorways shall provide a clear opening of at least 760 mm.

SUBSECTION 4.7 HALLWAYS

4.7.1. The clear width of a hallway shall be at least 965 mm.

SUBSECTION 4.8 KITCHENS (See Appendix)

- 4.8.1.** A clearance of at least 1.37 m shall be provided in front of base cabinets, work surfaces, counter tops and appliances.
- 4.8.2.** Knee space shall be provided under the sink to accommodate persons in wheelchairs. Adequate thermal protection shall be provided on exposed pipes and traps to prevent burns.
- 4.8.3.** Base cabinets shall be provided with a toe space of at least 150 mm in depth and 220 mm in height.

SUBSECTION 4.9 BATHROOMS (See Appendix)

- 4.9.1.** Bathrooms shall be designed to allow access by a person in a wheelchair to each fixture.
- 4.9.2.** The access area to a bathtub shall be at least 762 mm wide by 1 067 mm in length to allow adequate space for transfer from a wheelchair.
- 4.9.3.** Clearance at one side and in front of a water closet shall be at least 762 mm.
- 4.9.4.** Lavatories shall have a clearance of 660 mm under the bowl to a point at least 254 mm from the front of the fixture.
- 4.9.5.** Faucet handles shall be of the lever or cross type.
- 4.9.6.** Pipes which may constitute a burn hazard shall be insulated.
- 4.9.7.** Where a shower is installed as a separate fixture, the shower stall shall be at least 914 mm wide by 1.22 m deep. The sill of such stalls shall be designed to permit easy entrance of a wheelchair.
- 4.9.8.** Grab bars shall be provided at the water closet, bathtub and shower and shall be adequately anchored.

SUBSECTION 4.10 CLOTHES CLOSETS

- 4.10.1.** Floors in clothes closets shall be at the same level as the floor of the room they serve.

SUBSECTION 4.11 BEDROOMS

- 4.11.1.** At least 1 bedroom shall be specially designed to allow free movement of a wheelchair within the bedroom.

SUBSECTION 4.12 LAUNDRY FACILITIES

- 4.12.1.** A clearance of at least 1.37 m shall be provided in front of laundry tubs, automatic washers and dryers.

SUBSECTION 4.13 CONTROLS

- 4.13.1.** Controls for lights, cooking, heating and ventilation equipment, windows, draperies, communication systems and all similar controls of frequent or essential use shall be placed within reach of persons in wheelchairs. (See Appendix for Subsection 4.5.)
- 4.13.2.** Electrical receptacles shall be at least 457 mm above the floor.
- 4.13.3.** Electrical receptacles for counter top use in kitchens and bathrooms shall be located so that they will be accessible to persons in wheelchairs.

SUBSECTION 4.14 WINDOWS

- 4.14.1.** Openable windows shall be designed and located so that they can be easily opened by persons in wheelchairs. Opening mechanisms shall allow easy operation.

SUBSECTION 4.15 SHARED FACILITIES

- 4.15.1.** Shared recreation and service facilities in multi-family occupancies shall be accessible to persons in wheelchairs.

APPENDIX

SUPPLEMENTARY MATERIAL for Building Standards for the Handicapped 1980

(This Appendix contains notes and diagrams that apply to the requirements of this document. The bold-face reference numbers that introduce each item apply to the requirements in the main body of the document to which this material is applicable. The bold-face captions following these reference numbers describe the subjects to which the references apply.)

Article 1.1.2. GENERAL INFORMATION ON DESIGNING FOR PHYSICALLY HANDICAPPED PERSONS

For the purposes of this publication, a person is handicapped when he has a loss of bodily function which decreases his ability to move throughout the community in a normal manner.

Such losses include weakness, paralysis or absence of 1 or more limbs, loss of balance and co-ordination, spastic muscles, and painful, stiff or deformed joints.

Walking aids, including canes, crutches, braces and artificial limbs, may prevent the free use of arms and hands for other purposes. In addition, loss of function of other parts of the body including visual and hearing defects and poor exercise tolerance associated with heart or lung disease will interfere with mobility. More than one such disability may be present in one individual. The likelihood of disabilities occurring increases markedly with age. Because the non-ambulatory person or wheelchair user has the greatest number of mobility problems, additional information concerning the wheelchair is presented below.

Wheelchair Dimensions

The dimensions of common models vary as follows:

	Range of Dimensions	Usual Dimensions
Length	850 mm to 1 220 mm	1 070 mm
Width when open	470 mm to 760 mm	660 mm
Width when collapsed	230 mm to 370 mm	280 mm
Height of seat above floor	360 mm to 510 mm	460 mm
Height of armrest from floor	500 mm to 850 mm	750 mm
Height of handle from floor	840 mm to 1 360 mm	940 mm

Functioning of a Wheelchair

The average space for turning through 180° is 1.52 m by 1.52 m. A minimum width of 1.52 m is required for 2 wheelchairs to pass each other.

Functioning of an Adult in a Wheelchair

The upward reach from the floor ranges from 1.37 m to 1.98 m with an average reach being equal to 1.52 m. The average horizontal working reach at a bench or table is 460 mm beyond the front edge of the seat. The average forward reach upwards, as when using a wall mounted dial telephone, is 1.22 m. Removable arm rests may increase some of these dimensions slightly. Transference from the chair to a car, bed or water closet is usually achieved either by a slide, after removing an arm rest, or off the front corner of the wheelchair. Ideally, the 2 seats should be level. In any event, the chair seat should not be more than 80 mm higher than the seat or bed.

Designing for Children

The preceding dimensions are for adults of average stature. In designing buildings for children, it may be necessary to alter some dimensions, such as the height of handrails.

Section 2. SITE DEVELOPMENT

Almost any building can be made accessible to physically handicapped persons by planning the site, so that terraces, retaining walls and winding walks are used effectively. 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 physically handicapped persons do not have to pass behind parked cars. Particular attention should be paid to the junction of walkways with driveways, parking areas and other walks. The provision of nonslip surfaces on steps, walks and floors greatly assist those with semi-ambulatory disabilities.

Subsection 2.2 PARKING AREAS

Zoning or parking Bylaws should include requirements for parking for the physically handicapped.

Article 2.1.4.

Although the minimum width for walks is 914 mm, it is highly desirable that, where space allows, they be 1.52 m in width to allow wheelchair users to pass each other.

Subsection 3.1 BUILDINGS

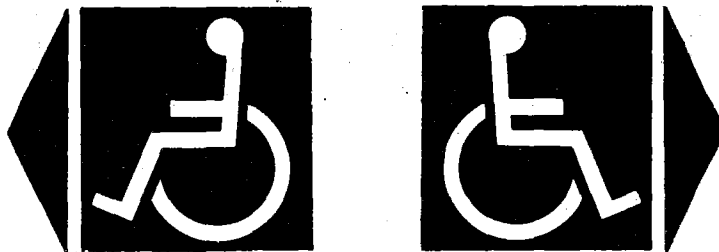
As much of the building as possible should be accessible to physically handicapped persons, especially areas used by the public. Special attention should be given to the accessibility of entrances, washrooms and elevators. The international symbol of accessibility for handicapped persons was adopted in 1969 by the International Society for the Rehabilitation of the Disabled to indicate that building services are accessible to the physically handicapped.

It is essential that the finish of all floors should have nonslip qualities even when standard flooring materials are used. Highly polished finishes should be avoided. Particular attention should be given to the selection of materials used on vestibule and entrance hallway floors, as these may become dangerous when wet. A minimum of wax should be used on the maintenance of floors to prevent surplus amounts being transferred to the soles of shoes. Nonslip waxes containing fine abrasive particles are recommended. Any temporary floor covering material should be of a kind that does not constitute a tripping hazard.

Carpet flooring should be compact with a dense surface of loop pile or felt type and should be attached to subsurfaces so as to allow wheelchairs to move freely without excessive friction, bunching or binding.

Article 3.1.3.

This symbol when displayed on a building indicates to physically handicapped persons that they will have reasonable freedom of movement within that building. An arrowhead can be added to either side of the symbol to indicate direction or the location of an accessible ground level entrance.

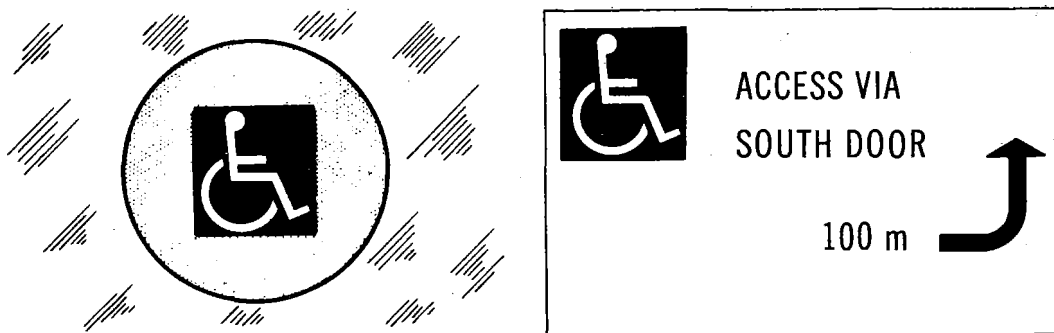


Article 3.1.4.

These symbols can be used to notify physically handicapped persons that rest room and other facilities that are so marked have been made accessible to them, and to indicate their location.



The background (shown here as black) is blue in the official symbol, but for aesthetic purposes different colours can be used. Where the colour will not be clear when the sign is in position because of lighting conditions, for example, the sign can be centred on a white background made from self-adhesive decorator vinyl covering, which adheres to glass and is waterproof. The design of the symbol allows for easy reproduction in many building materials.



(Additional information on the availability and use of this international symbol can be obtained from: The Canadian Rehabilitation Council for the Disabled, Suite 2110, One Yonge Street, Toronto, Ontario M5E 1E8.)

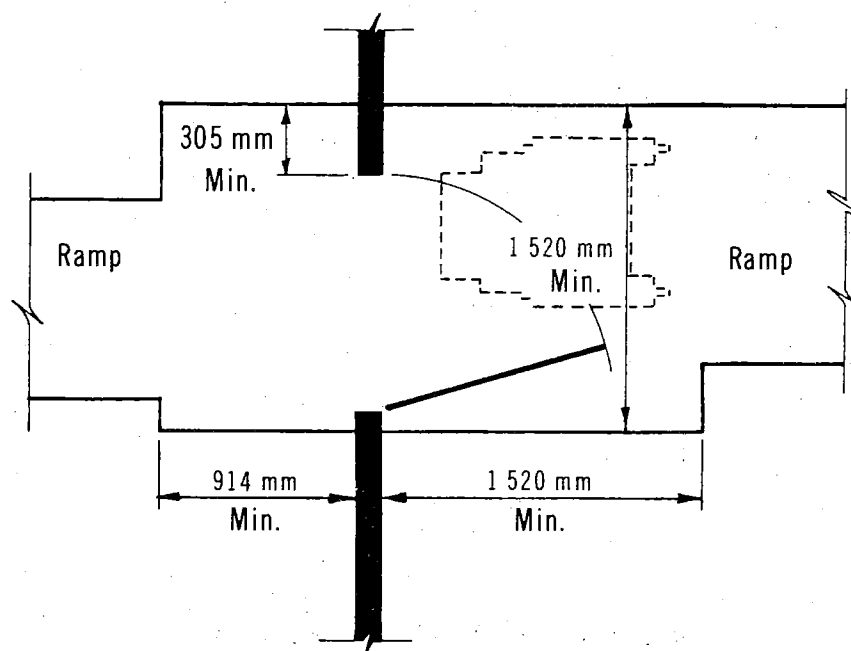
Subsection 3.2 DOORS AND DOORWAYS

Doors that require little strength to operate, that have an easily gripped handle, that are reasonably wide and that do not have a threshold can be safely used by most people. Space for wheelchair manoeuvring should be provided on both sides of the door. Door handles should be of the lever type. The door operating pressure should not exceed 22.5 N.

Subsection 3.3 RAMPS AND STAIRS

A change in the level of a walk or floor area becomes a major problem for people with physical disabilities. Flat surfaces are desirable, but if a change in level occurs, a ramp of low slope should be used. As the slope of the ramp decreases, the number of people who can safely use the ramp increases; a slope of 1 in 12 is the suggested maximum. Provision of a nonslip surface at all times is essential. Where a ramp is located outside a building, it should be protected from snow and ice accumulation by providing a roof, snow melting device or other means.

Article 3.3.6. LEVEL AREAS AT END OF RAMPS LEADING TO DOORWAYS



Article 3.3.9. STAIR DESIGN

Stairs should have plain faces. Open risers or nosings projecting out over the face of closed risers are not recommended. Colour contrast should be maintained between treads and risers and at the top and bottom of each flight of stairs.

Subsection 3.4 HANDRAILS

Although Article 3.4.1. permits a handrail on only one side if the ramp slope is 1 in 12 or less, it is preferable to have handrails on both sides regardless of the slope.

Subsection 3.5 ELEVATORS

Barrier free buildings of more than 600 m² of building area with more than 1 storey should have an elevator or other acceptable means of access from one floor to another for persons in wheelchairs.

Subsection 3.6 SPECIAL TOILET ROOMS

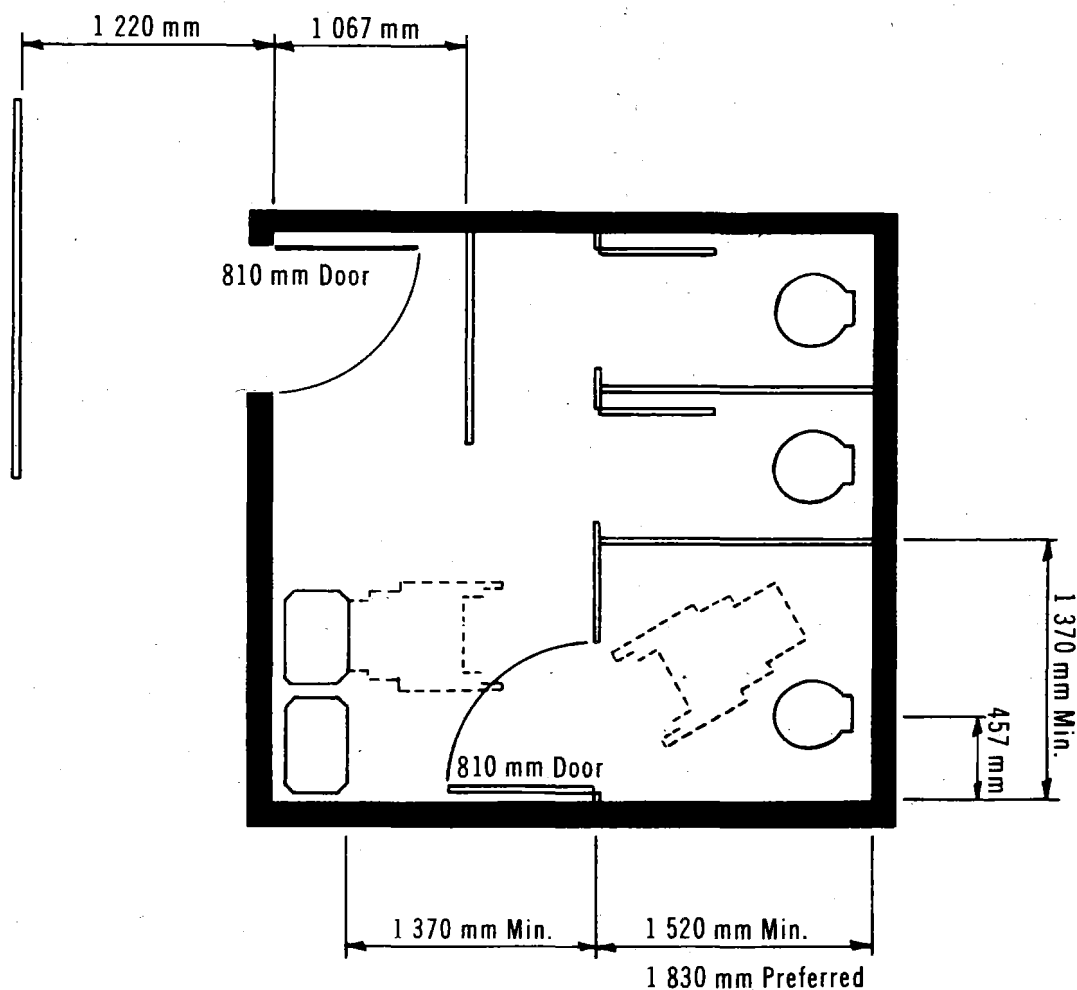
There are several ways of arranging the fixtures in a special toilet room to accommodate wheelchair use. One important factor is to provide sufficient clear area to manoeuvre a wheelchair without obstruction in front of the lavatory, in front of the water closet and on one side of the water closet. (An area of 762 mm by 1 067 mm is necessary to manoeuvre a wheelchair.)

A second factor is to maintain the minimum distances of fixtures from walls and from other fixtures. The centre line of a lavatory should be located at least 381 mm from a wall or another fixture, and the centre line of a water closet at least 457 mm from a wall or fixture. The door should open outwards. If the door opens inwards it should not interfere with the clear manoeuvring area.

Subsection 3.7 WATER CLOSET STALLS

Water closet stall doors should preferably swing outward against a side wall. A handle located on the hinged side of the door to facilitate closing from the inside may be replaced by a full width horizontal handle or self closing device. Grab bars are equally as effective when installed in a horizontal position or mounted diagonally between 600 mm and 1.3 m from the floor at the side of the water closet and 150 mm forward of the seat. In existing buildings, water closet stalls for persons with physical disabilities can be provided by combining 2 standard water closet stalls into 1 by removing the common partition, the second water closet and fitting a suitable door.

Minimum Clearances for Screens



Plan view of water closet stall

Subsection 3.8 WATER CLOSETS

Wall-mounted toilet fixtures or floor models with receding bases are desirable because they provide the least amount of obstruction.

The back support required in Article 3.8.5. may be of a fixed type or can be provided by the seat lid. It should be fixed or should rest approximately 5° from the vertical.

Subsection 3.9 LAVATORIES

Where mirrors are provided, they should be mounted with the lower edge not more than 1 m above the floor.

Subsection 4.1 GENERAL (DWELLING UNITS)

As more and more handicapped persons are living in normal surroundings, dwelling units in multi-family housing as well as individual housing should be designed to be accessible and usable by physically handicapped persons. Article 3.2.7.4. of the Alberta Building Code 1981 stipulates the number of dwelling units that are required to have facilities to accommodate disabled persons. In all other types of residential occupancies, whether institutional or commercial sleeping accommodations, it is recommended that a minimum of 5 per cent of the units provided should be accessible and usable by disabled persons.

Single-storey dwellings, either on the floor level close to grade or on floors accessible by ramps or elevators, are acceptable.

In elevator equipped residential buildings, all shared facilities should be accessible and usable by handicapped persons. This includes site development, car parking, recreational facilities, service facilities, designated building entrances, vestibules, lobbies, administration offices, mail rooms, lounges, laundries, storage lockers, elevators and dwelling unit entrances.

Where balconies are provided in individual dwelling units, they should be made accessible.

(For additional design guidelines refer to "Housing the Handicapped," NHA 5076, published by Canada Mortgage and Housing Corporation.)

Subsection 4.2 GARAGES, CARPORTS AND PARKING SPACES

Where a garage is provided for use by physically handicapped persons, the door should be electrically operated.

Subsection 4.6 DOORS AND DOORWAYS

Lever type door hardware facilitates use by handicapped persons. The end of the lever should be angled inwards so as not to catch on clothing.

Subsection 4.8 KITCHENS

Appropriate working surface levels may vary with the type of handicap, but generally the counter surface should be at a height of 840 mm for the average worker in a seated position. A retractable cutting board (or boards) should be provided as an accessible auxiliary work surface. The kitchen sink counter should be designed to provide clearance for wheelchairs with arms. A 250 mm open shelf should be provided under the sink 380 mm from the floor.

As the upper kitchen cabinets are only partially accessible to persons in wheelchairs, an open shelf should be provided below these cabinets. A pantry should also be provided to ensure adequate food storage space.

Where kitchen ranges are provided, the controls should be accessible without having to reach over the burners or elements. Separate counter top elements and ovens usually provide better accessibility for physically handicapped cooks. In all cases, the counter surface and burner top should be at the same level.

Faucet handles should be of the lever or cross type.

Subsection 4.9 BATHROOMS

An important factor of arranging the fixtures in a bathroom to accommodate wheelchair use is to provide enough floor space to manoeuvre a wheelchair without obstruction in front of the lavatory, beside the bathtub and on one side of the water closet. (An area of 762 mm by 1 067 mm is necessary to manoeuvre a wheelchair.) The centre line of water closets should be located 457 mm from a side wall or other fixture and the centre line of lavatories should be located a minimum of 381 mm from a side wall or other fixture.

The bathroom door should either open outwards or be a sliding door. If the bathroom door opens inwards it should not infringe on the clear manoeuvring area. Where built-in vanities are used, they should allow for knee space and should not obstruct wheelchair movement at the floor level.

All bathroom accessories should be accessible.

Grab bars should be securely attached to the framing members or masonry. The type and arrangement of grab bars within dwelling unit bathrooms may vary with the type of handicap of the occupant and should preferably be decided upon in consultation with the future occupant of the dwelling. Vertical or diagonal grab bars should not be used around the bathtub or shower. An eye bolt adequately anchored to the ceiling should be provided for the suspension of a chain or stirrup grip for use by handicapped persons getting into and out of the bathtub.

Installation of telephone-type showers in the bathtub is recommended for use by handicapped persons.

A thermostat control should be provided for the bathtub and shower.

Subsection 4.10 CLOTHES CLOSETS

Clothes closets should have adjustable hanging rods.

Subsection 4.12 LAUNDRY FACILITIES

Automatic washers and dryers should be of the front-loading type.

Subsection 4.14 WINDOWS

Window sills should be no higher than 760 mm so as to provide an exterior view from a seated position.

INDEX TO BUILDING STANDARDS FOR THE HANDICAPPED 1980

A Application, 1 B Bathrooms, 5-6 access to bathtub in, 5 faucet handles for, 5 grab bars for, 6 hot water pipes for, 5 lavatories for, 5 shower stall for, 6 water closet clearance in, 5 Bedrooms, 6 C Carport, 5 Clothes closets, 6 Coat hook, 3 Controls, of frequent or essential use, 6 D Design, general, 1 Dispensers, 4 Door closers, 2 Doors in vestibules, 3 on water closet stalls, 3 to special toilet rooms, 3 Doorways, 1, 2, 5 Dwelling units, 4-5, 6 E Electrical controls, switches and convenience outlets, 6 Elevators, 2-3 Entrances, 1, 5 Exits, 1, 2 F Fixture clearance, 3 Floors, in clothes closets, 6 G Garages, 5 Grab bars, 3, 6 H Hallways, 5 Handrails, 2, 3 K Kitchens, space in, 5	L Laundry facilities, 6 Lavatories, 4 O Obstructions, 1 P Parking spaces, design and dimensions of, 1, 5 R Ramps design of, 2, 5 gradient for, 2 handrails for, 2 landings for, 2 lighting of, 2 surface of, 2 width of, 2 Receptacles, 6 S Shared facilities, 6 Shower, 6 Signs for building entrances, 1 facilities, 1 Special toilet rooms, 3 fixtures for, 3 size of, 3 Stairs, 2 T Telephones, public, 4 Thresholds, 2 V Vestibules, 1, 3 W Walks, requirements for, 1, 5 Water closet back support for, 4 design of, 4 flushing controls for, 4 seats for, 4 Water closet stalls design of, 3 doors on, 3 location of, 3 size of, 3 Windows, 6

THE SUPPLEMENT

to the

NATIONAL BUILDING CODE

of Canada

1980

CHAPTER 2

FIRE-PERFORMANCE RATINGS

REVISED TO CONFORM TO THE ALBERTA BUILDING CODE 1981

TABLE OF CONTENTS

	Page
SECTION 1 GENERAL	
Subsection 1.1 Introduction	25
Subsection 1.2 Interpretation of Test Results	26
Subsection 1.3 Aggregates Used in Concrete	26
Subsection 1.4 Types of Concrete	26
Subsection 1.5 Equivalent Thickness	27
Subsection 1.6 Contribution of Plaster or Gypsum Wallboard	
Finish to Fire Resistance of Masonry or Concrete ...	27
Subsection 1.7 Tests on Floors and Roofs	29
Subsection 1.8 Moisture Content	29
Subsection 1.9 Permanence and Durability	29
Subsection 1.10 Structural Steel	29
Subsection 1.11 Restraint Effects	30

SECTION 2 FIRE-RESISTANCE RATINGS

Subsection 2.1	Masonry and Concrete Walls	31
Subsection 2.2	Reinforced and Prestressed Concrete Floor and Roof Slabs	32
Subsection 2.3	Wood and Steel Framed Walls, Floors and Roofs	33
Subsection 2.4	Solid Wood Walls, Floors and Roofs	41
Subsection 2.5	Solid Plaster Partitions	43
Subsection 2.6	Protected Steel Columns	44
Subsection 2.7	Individually Protected Steel Beams	48
Subsection 2.8	Reinforced Concrete Columns	49
Subsection 2.9	Reinforced Concrete Beams	51
Subsection 2.10	Prestressed Concrete Beams	51

SECTION 3 FLAME-SPREAD RATINGS AND SMOKE DEVELOPED CLASSIFICATIONS

Subsection 3.1	Interior Finish Materials	52

SECTION 4 NONCOMBUSTIBILITY

Subsection 4.1	Test Method	56
Subsection 4.2	Materials Classified as Combustible	56
Subsection 4.3	Materials Classified as Noncombustible	56
APPENDIX A	Fire Test Reports	57
APPENDIX B	List of Referenced Standards	58

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 Alberta Building Code 1981.

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.

SUBSECTION 1.1 INTRODUCTION

1.1.1.(1) The fire-performance ratings set out in this document are for use with the Alberta Building Code 1981. 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 Alberta Building Code 1981. Additional requirements, where appropriate, are described in other Sections of this Chapter.

(2) Section 2 of this Chapter contains fire-resistance ratings for walls, floors, roofs, columns and beams related to the standard methods of test to which reference is made in Part 3 of the Alberta Building Code 1981.

(3) Section 3 contains flame-spread ratings and smoke developed classifications for surface materials related to the standard methods of test referred to in Part 3 of the Alberta Building Code 1981.

(4) Section 4 describes noncombustibility in building materials when tested in accordance with the specification CAN4-S114-78, "Standard Method of Test for Determination of Non-Combustibility in Building Materials."

(5) Where the term "gypsum wallboard" is used in this Chapter, it is intended to include "gypsum backing board" and "gypsum base for veneer plaster" as described in CSA A82.27-M1977, "Gypsum Board Products."

(6) 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-M1977, "Gypsum Board Products."

1.1.2. The standard fire tests to which reference is made in the Alberta Building Code 1981 are the basis for compliance with the Alberta Building Code 1981 requirements.

The ratings shown in this document apply if more specific test values are not available. The construction of an assembly that is the subject of an individual test report must be followed in all essential details if the fire resistance reported is to be applied as a fire-resistance rating for use in the Alberta Building Code 1981.

1.1.3. 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 Division of Building Research, National Research Council of Canada, included in the bibliography listed in Appendix A to this Chapter.

1.1.4. 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.

SUBSECTION 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 Alberta Building Code 1981. 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 Alberta Building Code 1981.

SUBSECTION 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.

SUBSECTION 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 Types S, N, L, L₁, 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 must 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 retained on a 5 mm sieve using the method of grading aggregates described in CAN3-A23.1-M77, "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 must conform to ASTM C330-77, "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, should be rated on the basis of the values shown for Type L concrete.

SUBSECTION 1.5 EQUIVALENT THICKNESS

1.5.1. The thickness of solid-unit masonry and concrete described in this Chapter is 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 accordance with Articles 1.5.2. and 1.5.3.

1.5.2. Where a plaster finish is used, the equivalent thickness of a wall, floor, column or beam protection is 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.

1.5.3.(1) Except as provided in Article 2.1.5., the equivalent thickness of a hollow masonry unit is 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. Net volume is determined as described in Sentences (2) to (3).

(2) For a concrete masonry unit, the unit is enclosed by plywood to form a rectangular box whose inside dimensions are equal to the maximum overall dimensions of the unit. All core spaces and voids created by setbacks and indentations in the outer surface of the unit are filled with No. 10 lead shot, 1.78 mm diam and having a bulk density of 6.64 g/cm³. The lead shot fill is then weighed.

$$\text{The net volume of the unit } V_n = V_p - \frac{M}{6.64}$$

where

V_p = the volume of the rectangular box in cubic centimetres.

M = the mass of the lead shot filling material in grams.

(3) The net volume of cored bricks and hollow clay tiles is determined by direct measurement.

(4) Gross volume of a masonry unit is equal to the length of the unit multiplied by the height of the unit multiplied by the thickness of the unit.

SUBSECTION 1.6 CONTRIBUTION OF PLASTER OR GYPSUM WALLBOARD FINISH TO FIRE RESISTANCE OF MASONRY OR CONCRETE

1.6.1.(1) Except as provided in Sentences (2) and (3) and Article 1.6.2., the contribution of plaster or gypsum wallboard finishes to the fire resistance of masonry or concrete wall, floor or roof assembly is determined by multiplying the actual thickness of the finish by the factor shown in Table 1.6.A., depending on the type of masonry or concrete to which it is applied. This corrected thickness is then included in the "equivalent thickness" as described in Subsection 1.5.

(2) Where plaster or gypsum wallboard 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 plaster or gypsum wallboard is applied only on the non-fire-exposed side of walls constructed of hollow clay tile, 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.

Table 1.6.A.
Forming Part of Sentence 1.6.1.(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, Types N and S	Cored Clay Brick, Clay Tile, Monolithic Concrete, Type L40S and Unit Masonry, Type L ₁ 20S	Concrete Unit Masonry, Types L ₁ and 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

1.6.2. When applied to the fire-exposed side, the contribution of gypsum lath and plaster or gypsum wallboard finishes to the fire resistance of masonry or concrete wall, floor or roof assemblies is determined from Table 2.3.A. or 2.3.B.

1.6.3.(1) Gypsum plastering is required to conform to CSA A82.30-M1980, "Interior Furring, Lathing and Gypsum Plastering."

(2) Portland cement-sand plaster must be applied in 2 coats; the first coat should contain 1 part portland cement to 2 parts sand by volume, and the second coat should contain 1 part portland cement to 3 parts sand by volume.

(3) Plaster must be securely bonded to the wall or ceiling.

(4) The thickness of plaster applied without metal lath directly to masonry or concrete must not exceed 13 mm on ceilings and 16 mm on walls.

(5) Where the thickness of plaster on masonry or concrete exceeds 38 mm, wire mesh with 1.57 mm diam wire and openings not exceeding 50 mm by 50 mm must be embedded midway in the plaster.

1.6.4. Gypsum wallboard and gypsum lath applied to masonry or concrete walls shall be secured to wood or steel furring members in conformance with Article 2.3.11.

1.6.5. 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 1 h fire-resistance rating is required for a monolithic concrete wall of Type S aggregate with 13 mm gypsum-sand plaster on each face.

- (a) The minimum equivalent thickness of Type S monolithic concrete needed to give a 1 h fire-resistance rating = 90 mm (Table 2.1.A.).
- (b) The contribution of 13 mm gypsum sand plaster on each face of the concrete = $13 \times 1.25 = 16$ mm (See Article 1.6.1.).
- (c) The total contribution of plaster = $2 \times 16 = 32$ mm.
- (d) The minimum equivalent thickness of concrete required = $90 \text{ mm} - 32 \text{ mm} = 58 \text{ mm}$.
- (e) Since the contribution of the plaster to the equivalent thickness of the assembly does not exceed twice the equivalent thickness of the concrete itself, then the conditions of Sentence 1.6.1.(2) are met.

Example (2)

A 2 h fire-resistance rating is required for a hollow masonry wall of Type N concrete with 12.7 mm gypsum wallboard on each face.

- (a) 12.7 mm gypsum wallboard on the fire-exposed side is assigned 15 min in Table 2.3.A. (See Article 1.6.2.).
- (b) The fire resistance required of the balance of the assembly is $120 \text{ min} - 15 \text{ min} = 105 \text{ min}$.
- (c) Interpolating between 1½ 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 of 12.7 mm gypsum wallboard on the non-fire-exposed side using Table 1.6.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 h 20 min. As this is more than 1 h the conditions of Sentence 1.6.1.(2) are met and the rating of 2 h is justified.

SUBSECTION 1.7 TESTS ON FLOORS AND ROOFS

1.7.1. 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.

SUBSECTION 1.8 MOISTURE CONTENT

1.8.1. 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.

1.8.2. 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.

SUBSECTION 1.9 PERMANENCE AND DURABILITY

1.9.1. 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 is made in the test as to the permanence or durability of the assembly.

SUBSECTION 1.10 STRUCTURAL STEEL

1.10.1. Structural steel fails at elevated temperatures because of excessive plastic deformation or creep and loss of strength, which causes the deflection of a member to reach unacceptable levels.

1.10.2. The tests on which the ratings for structural steel in this Chapter are based were for carbon steel members. Other steels may exhibit slightly better or worse performances than carbon steels. These differences in performance are, however, insignificant as far as the ratings in this Chapter are concerned.

SUBSECTION 1.11 RESTRAINT EFFECTS

1.11.1 It is known that both edge restraint of a floor or roof and end restraint of a beam can significantly extend the time before collapse in a standard test. As a result, certain changes have been made in ULC-S101-1977, "Standard Methods of Fire Endurance Tests of Building Construction and Materials."

1.11.2 In fire tests of floors, roofs and beams it is now necessary to state whether the rating applies to a restrained or to an unrestrained assembly. Whether or not a restrained rating can be applied depends on the type of construction and on the location in a building as described in Appendix A1 of ULC-S101-1977, "Standard Methods of Fire Endurance Tests of Building Construction and Materials." Acceptance criteria for unrestrained and restrained assemblies are described in Subsections 1.11.3. and 1.11.4.

1.11.3.(1) To obtain an unrestrained assembly classification for an assembly tested restrained against thermal expansion, the conditions described in Sentences (2) to (6) are required by ULC-S101-1977, "Standard Methods of Fire Endurance Tests of Building Construction and Materials."

(2) The specimen shall have sustained the applied load during the classification period without developing unexposed surface conditions which will ignite cotton waste.

(3) The transmission of heat through the specimen during the classification period shall not have been such as to raise the average temperature on its unexposed surface more than 139°C above its initial temperature.

(4) For specimens employing steel structural members (excluding steel floor or roof units having spans equal to or less than those tested), the temperature of the steel shall not have exceeded 704°C at any location during the classification period, nor shall the average temperature recorded by 4 thermocouples at any section have exceeded 593°C during this period.

(5) For specimens employing conventionally designed concrete structural members, excluding cast-in-place concrete roof or floor slabs having spans equal to or less than those tested, the average temperature of the tension steel at any section shall not have exceeded 427°C for cold-drawn prestressing steel or 593°C for reinforcing steel during the classification period.

(6) For specimens employing 5 or more open-web steel joists, the average temperature recorded by all joist thermocouples shall not have exceeded 593°C during the classification period.

(7) Assemblies tested in an unrestrained condition need only meet the criteria given in Sentences (2) and (3).

1.11.4.(1) In a restrained assembly classification, the conditions described in Sentences (2) to (4) are required by ULC-S101-1977, "Standard Methods of Fire Endurance Tests of Building Construction and Materials."

(2) The specimen shall have sustained the applied load during the classification period without developing unexposed surface conditions which will ignite cotton waste.

(3) Transmission of heat through the specimen during the classification period shall not have been such as to raise the average temperature on its unexposed surface more than 139°C above its initial temperature.

(4) For specimens employing beams spaced more than 1 220 mm o.c., the beams shall achieve a fire-resistance rating on the basis of the temperature criteria specified in Sentences 1.11.3.(4) to (6) for assembly classifications up to and including 1 h. For classifications greater than 1 h, the above temperature criteria shall apply for a period of 1/2 the classification of the assembly or 1 h, whichever is the greater.

1.11.5. The ratings for floors and beams in this Chapter, other than the specific test results in Tables 2.3.H. and 2.3.I., meet the conditions of ULC-S101-1977, "Standard Methods of Fire Endurance Tests of Building Construction and Materials" for unrestrained specimens. In a restrained condition the floor, roof or beams would probably have greater fire resistance, but the extent of this increase can be determined only by reference to behaviour in a standard test.

SECTION 2 FIRE-RESISTANCE RATINGS

SUBSECTION 2.1 MASONRY AND CONCRETE WALLS

2.1.1. The minimum thicknesses of unit masonry and monolithic concrete walls for fire-resistance ratings from $\frac{1}{2}$ h to 4 h are shown in Table 2.1.A. Types of concrete are described in Subsection 1.4. Hollow masonry units are rated on the basis of equivalent thickness as described in Subsection 1.5.

Table 2.1.A.
Forming Part of Article 2.1.1.

MINIMUM EQUIVALENT THICKNESSES ⁽¹⁾ OF UNIT MASONRY AND OF MONOLITHIC CONCRETE WALLS LOADBEARING AND NON-LOADBEARING, mm							
Type of Wall	Fire-Resistance Rating						
	$\frac{1}{2}$ h	$\frac{3}{4}$ h	1 h	$1\frac{1}{2}$ 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							
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 1.5.

⁽²⁾ Hollow concrete masonry units made with Types S or N concrete must have a 28-day compressive strength of at least 7.5 MPa.

2.1.2.(1) Ratings obtained as described in Article 2.1.1. apply to either loadbearing or non-loadbearing walls, except for the walls described in Sentences (2) to (5).

(2) Walls less than the minimum thickness prescribed for loadbearing walls in the Alberta Building Code 1981 are considered non-loadbearing.

(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, is 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.

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 must 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 1.6.A. is included in the wall thickness shown in Table 2.1.A., under the conditions and using the methods described in Subsection 1.6.

2.1.5. Where all the core spaces in a wall of hollow concrete masonry units are filled with loose fill materials, such as expanded slag, burned clay or shale (rotary kiln process), vermiculite or perlite, the fire resistance of the wall is the same as that of a wall of solid units of the same concrete type and of the same overall thickness.

2.1.6. Short reinforced concrete walls or portions of walls that may be exposed to fire on both sides simultaneously and that are required to carry a load during fire exposure shall have minimum dimensions and have minimum cover to steel reinforcement as described in Article 2.8.2.

SUBSECTION 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 139°C or a maximum temperature rise of 181°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. is required to resist the transfer of heat during the fire-resistance period shown.

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						
	1/2 h	3/4 h	1 h	1 1/2 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

(2) The concrete cover over the reinforcement and steel tendons shown in Table 2.2.B. are 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 1.5.

2.2.3. The contribution of plaster finish securely fastened to the underside of concrete is taken into account in floor or roof slabs under the conditions and using the methods described in Subsection 1.6.

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						
	1/2 h	3/4 h	1 h	1 1/2 h	2 h	3 h	4 h
Type S, N, L40S or L concrete	20	20	20	20	25	32	39
Prestressed concrete slabs Types S, N, L40S or L concrete	20	25	25	32	39	50	64
Column 1	2	3	4	5	6	7	8

2.2.4. In prestressed concrete slab construction, the concrete cover over an individual tendon is 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 is 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 must be not less than 1/2 of the value given in Table 2.2.B. nor less than 20 mm.

2.2.5. Minimum dimensions and cover to steel tendons of prestressed concrete beams are shown in Subsection 2.10.

SUBSECTION 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 1/2 h is determined by this Subsection, except as described in Tables 2.3.H. and 2.3.I.

2.3.2. The ratings apply to both loadbearing and non-loadbearing walls and to loadbearing floors and roofs.

2.3.3. The fire-resistance rating of a framed assembly is 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 2.3.9. 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 2.3.9. 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 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 must also take into account the rise in temperature on the unexposed side of the membrane.

Table 2.3.A.
Forming Part of Article 2.3.4.

TIMED ASSIGNED TO WALLBOARD MEMBRANES	
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	30
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⁾
4.5 mm asbestos cement and 9.5 mm gypsum wallboard	40 ⁽²⁾
4.5 mm asbestos cement and 12.7 mm gypsum wallboard	50 ⁽²⁾
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 2 sheets of wallboard.
- ⁽²⁾ Values shown apply to walls only.

Table 2.3.B.
Forming Part of Article 2.3.4.

TIME ASSIGNED TO LATH AND PLASTER ⁽¹⁾ PROTECTION, min					
Type of Lath	Plaster Thickness, mm	Type of Plaster			
		Portland Cement and Sand ⁽²⁾ or Lime and Sand	Gypsum and Sand	Gypsum Wood Fibred	Gypsum and Perlite or Gypsum and Vermiculite
Wood lath	13	5	20	20	—
12.5 mm fibreboard	13	—	20	20	—
9.5 mm gypsum lath	13	—	35	35	55
9.5 mm gypsum lath	16	—	40	40	65
9.5 mm gypsum lath	19	—	50	50	80 ⁽¹⁾
Metal lath	19	20	50	50	80 ⁽¹⁾
Metal lath	23	25	60	65	80 ⁽¹⁾
Metal lath	26	30	80	80	80 ⁽¹⁾
Column 1	2	3	5	6	7

Notes to Table 2.3.B.:

⁽¹⁾ The values shown for these membranes have been limited to 80 min because the fire-resistance ratings of framed assemblies derived from these Tables must not exceed 1½ h.

⁽²⁾ For mixture for portland cement-sand plaster see Sentence 1.6.1.(2).

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.

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 roof joists 400 mm o.c.	10
Open web steel joist floors and roofs with ceiling supports 400 mm o.c.	10
Column 1	2

2.3.6. Interior vertical fire separations must 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 Tables 2.3.A. or 2.3.B.

Table 2.3.D.
Forming Part of Article 2.3.6.

MEMBRANE ON EXTERIOR FACE OF WOOD OR LIGHT-STEEL STUD WALLS	
Sheathing	Exterior Cladding
16 mm T & G lumber 7.5 mm exterior grade plywood 12.7 mm gypsum wallboard	Lumber siding Wood shingles and shakes 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

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 must 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. Mineral wool 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 reinforcement 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 can be added to the fire resistance if these features are incorporated in the assembly.

2.3.10.(1) The values shown in Tables 2.3.A. and 2.3.B. apply only if the supports for the fire-exposed membrane are not more than 400 mm o.c.

(2) Wood studs are assumed to be not less than 38 mm by 89 mm size and wood joists are assumed to be not less than 38 mm thickness. Dimensions for dressed lumber are given in CSA O141-1970, "Softwood Lumber."

(3) The allowable spans for wood joists listed in Part 9 of the Alberta Building Code 1981 are provided for floors supporting specific occupancies.

(4) Plaster thickness is measured from the face of gypsum or metal lath.

2.3.11.(1) Except as provided in Sentences (2) to (5), the fastening of lath and plaster or gypsum wallboard shall conform to CSA A82.30-M1980, "Interior Furring, Lathing and Gypsum Plastering" or CSA A82.31-1977, "Gypsum Board Application."

(2) Where membrane protection in Tables 2.3.A. and 2.3.B. 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 in Tables 2.3.A. and 2.3.B. is applied to wood framing or furring, minimum fastener penetrations 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 in Table 2.3.G. apply to the base layer. Fasteners for the face layer shall penetrate at least 20 mm into wood supports.

(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.

Table 2.3.E.
Forming Part of Article 2.3.7.

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	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	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

Table 2.3.F.
Forming Part of Article 2.3.8.

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 mineral wool batts conforming to CSA A101-M1977, "Specification for Mineral Wool Thermal Building Insulation" and with a mass of not less than 1.22 kg/m ² of wall surface	15
Add to 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 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 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

Table 2.3.G.
Forming Part of Article 2.3.11.

MINIMUM FASTENER PENETRATIONS FOR MEMBRANE PROTECTIONS 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	—	—	—	—
Double layer	20	20	20	29	—	—
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 to fire resistance are determined in Tables 2.3.A. and 2.3.B.

2.3.12. Supplementary ratings based on tests are included in Tables 2.3.H. and 2.3.I. The values shown in these Tables are higher than the fire-resistance ratings obtained by calculation and apply only to constructions which conform in all details to the descriptions given.

Table 2.3.H.
Forming Part of Article 2.3.12

FIRE-RESISTANCE RATING OF RESTRAINED OPEN-WEB STEEL JOIST FLOORS AND ROOFS⁽¹⁾						
Type of Construction	Top Slab or Floor	Ceiling: Perlite or Vermiculite Plaster on 9.5 mm Perforated Gypsum Lath ⁽²⁾				
		Spacing of 1.9 mm Furring Channels ⁽³⁾	Plaster Mix	Plaster Thickness, mm ⁽⁴⁾	Plaster Reinforcement	Fire-Resistance Rating
Steel joist floors ⁽⁵⁾	50 mm portland cement concrete slab reinforced by 150 mm x 150 mm, 4.11 mm diam wire mesh over ribbed metal lath supported by bar joists spaced 600 mm o.c.	400 mm	(6)	13	1.98 mm diam diagonal wire 280 mm o.c. ⁽⁷⁾	2h
			(6)	13	25 mm, 0.86 diam hex. wire mesh ⁽⁸⁾	3h
		300 mm	(9)	16	1.98 mm diam diagonal wire 250 mm o.c. ⁽⁷⁾	3h
			(9)	26	25 mm, 0.86 diam hex. wire mesh ⁽⁸⁾	4h
		300 mm	(9)	16	Extra clips passed through lath along each channel at 135 mm o.c. ⁽¹⁰⁾	3h
Column 1	2	3	4	5	6	7

Notes to Table 2.3.H.:

- (1) The ratings in Table 2.3.H. and the following notes are from "Fire Endurance of Open-Web Steel Joist Floors with Concrete Slabs and Gypsum Ceilings," James V. Ryan and E. W. Bender. Building Materials and Structures Report BMS 141., National Bureau of Standards, Washington, 1954.
- (2) 9.5 mm perforated gypsum lath secured to furring channels by 1.98 mm galvanized wire clips tied to the furring channels at 300 mm or 400 mm o.c., depending on the spacing of the channels, and under the lath so as to provide continuous support for the lath.
- (3) 19 mm steel furring channels fastened to joists by double-strand wire ties.
- (4) Thickness includes finish coat.
- (5) The design tensile stress in the open-web steel joists of the tested assemblies did not exceed 124 MPa.
- (6) 1.56 dm³ of aggregate per kilogram of gypsum plaster.
- (7) Diagonal wire, 1.98 mm diam, galvanized, placed between lath and plaster running at 45° to the furring channels and tied back to the wire clips at the point of junction with the furring channels.
- (8) Galvanized wire mesh, 0.86 mm diam with 25 mm hexagonal openings, fastened under the lath and tied back to the furring channels at 300 mm or 400 mm o.c. depending on the spacing of the channels.
- (9) Scratch coat, 1.25 dm³ of aggregate per kilogram of gypsum plaster. Brown coat, 1.87 dm³ of aggregate per kilogram of gypsum plaster.
- (10) Additional looped wire clips 1.98 mm diam galvanized wire passed through the lath and tied to the furring channels to provide extra support.

Table 2.3.1.
Forming Part of Article 2.3.12.

FIRE-RESISTANCE RATING OF RESTRAINED OPEN-WEB STEEL JOIST ASSEMBLIES FOR ROOFS AND FLOORS⁽¹⁾			
Type of Construction	Top Slab or Floor ⁽²⁾	Ceiling or Soffit Protection on Metal Lath ⁽³⁾	Fire-Resistance Ratings, ^{(1),(4)} h
Steel joist floors	58 mm reinforced concrete or 50 mm reinforced gypsum tile with 6 mm mortar finish	20 mm gypsum-sand plaster 1:2, 1:3	2
	19 mm by 38 mm pine flooring on 19 mm by 38 mm nailing strips set 13 mm into 50 mm concrete on rib lath		
	25 mm portland cement mortar finish on 50 mm concrete on rib lath		
	50 mm reinforced concrete	20 mm gypsum-vermiculite or gypsum-perlite plaster scratch coat 1.25 dm ³ of aggregate per kilogram of gypsum, brown coat 1.87 dm ³ of aggregate per kilogram of gypsum	2
	64 mm reinforced concrete	20 mm gypsum-vermiculite or gypsum-perlite plaster scratch coat 1.25 dm ³ of aggregate per kilogram of gypsum, brown coat 1.87 dm ³ of aggregate per kilogram of gypsum	3
	64 mm reinforced concrete	25 mm gypsum-vermiculite or gypsum-perlite plaster scratch coat 1.25 dm ³ of aggregate per kilogram of gypsum, brown coat 1.87 dm ³ of aggregate per kilogram of gypsum	4
Column 1	2	3	4

Notes to Table 2.3.1.:

- ⁽¹⁾ The design tensile stress in the open-web steel joists did not exceed 124 MPa.
- ⁽²⁾ The ratio of portland cement to combined fine and coarse aggregates for the floor slab (based on mass) must be not less than 1:6.5. The slab thicknesses are measured from the top flange of the joists and, unless otherwise indicated, are for monolithic construction. To obtain the listed fire-resistance ratings, the average thickness of the slabs cast-in-place should be 6 mm greater than at the joists. This greater average thickness usually results from the sag of metal lath forming or the placing of the more rigid forms under the top flange of the joists.
- ⁽³⁾ The plaster for the ceiling must be applied on expanded metal, woven wire or paper-backed wire lath of appropriate mass for the spacing of the supports. The lath must be tied to the supports to give the equivalent strength of single 1.19 mm diam steel-wire ties spaced 125 mm o.c. The thickness of plaster is measured from the back side of flat lath and to the back of the flat portion of ribbed lath.
- ⁽⁴⁾ The ratings in Table 2.3.1. are from "Fire Resistance Classifications of Building Constructions," Building Materials and Structures Report BMS 92, National Bureau of Standards, Washington, 1942.

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 so that there is at least 12 mm clearance between the top of the stud and the top of the runner to allow for expansion in the event of fire.

SUBSECTION 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 $\frac{1}{2}$ h to $1\frac{1}{2}$ h is shown in Table 2.4.A.

Table 2.4.A.
Forming Part of Article 2.4.1.

MINIMUM THICKNESS ⁽¹⁾ OF SOLID WOOD WALLS, ROOFS AND FLOORS, mm				
Type of Construction	Fire-Resistance Rating			
	$\frac{1}{2}$ h	$\frac{3}{4}$ h	1 h	$1\frac{1}{2}$ h
Solid wood ⁽²⁾ floor with building paper and finish flooring on top	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 ⁽²⁾ walls of loadbearing vertical plank	89	114	140	184
Solid wood ⁽²⁾ walls of non-loadbearing horizontal plank	89	89	89	140
Column 1	2	3	4	5

Notes to Table 2.4.A.:

⁽¹⁾ See CSA O141-1970, "Softwood Lumber" for sizes.

⁽²⁾ The assembly consists 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 consists 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.

2.4.2.(1) The fire-resistance ratings of the assemblies described in Table 2.4.A. are 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,
- (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 must conform to Subsection 2.3.

2.4.3. Supplementary ratings based on tests are included in Table 2.4.B. The ratings given 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 RATINGS 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	1/2
Solid panels with 4 mm plywood facings ⁽²⁾ glued to 46 mm solid wood core of glued T & G construction for both sides and ends of core pieces with T & G rails in the core about 760 mm apart	54	1
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 can be taken to apply if the facings are nailed to the frames in addition to being glued.

SUBSECTION 2.5 SOLID PLASTER PARTITIONS

2.5.1. The minimum thickness of solid plaster partitions for fire-resistance ratings from $\frac{1}{2}$ h 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 Ratings						
	$\frac{1}{2}$ h	$\frac{3}{4}$ h	1 h	$1\frac{1}{2}$ 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 is 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 is applied to both sides of the metal lath.
- ⁽²⁾ For mixture for portland cement-sand plaster see Sentence 1.6.1.(2).
- ⁽³⁾ CSA A82.30-M1980, "Interior Furring, Lathing and Gypsum Plastering" does not permit solid plaster partitions to be less than 50 mm thick.

SUBSECTION 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.E. for fire-resistance ratings from $\frac{1}{2}$ h to 4 h.

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 Ratings						
	$\frac{1}{2}$ h	$\frac{3}{4}$ h	1 h	$1\frac{1}{2}$ 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
Types N and 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 is 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 must 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 must conform to CSA A82.5-M1978, "Structural Clay Non-Loadbearing 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 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 Ratings ^{(1),(2)}						
	1/2 h	3/4 h	1 h	1 1/2 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 1/2 h and 3/4 h apply to columns whose M/D ratio is 30 or greater. Fire-resistance ratings greater than 3/4 h 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 3/4 h, the total thickness of protection specified in the Table must be increased by 50 per cent. (To determine M/D, refer to Article 2.6.5.)
- (2) Where the thickness of plaster over gypsum lath is 28 mm or more, wire mesh with 1.57 mm diam wire and openings not exceeding 50 mm by 50 mm must 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 1.6.3.(2).

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 Ratings					
	1/2 h	3/4 h	1 h	1 1/2 h	2 h	3 h
30 to 60	16	16	32	—	—	—
over 60 to 90	16	16	16	32	—	—
over 90 to 120	16	16	16	25	39	—
over 120 to 180	16	16	16	16	25	—
over 180	16	16	16	16	25	39
Column 1	2	3	4	5	6	7

Note to Table 2.6.C.:

- (1) To determine M/D refer to Article 2.6.5.

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 Ratings						
	1/2 h	3/4 h	1 h	1 1/2 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 M/D refer to Article 2.6.5.

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, h
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⁾	3/4
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 1/2
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
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
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 is to be securely fastened to the floor and superstructure, or where sheet-steel cover does not extend floor to floor, fire stopping must be provided at the level where sheet-steel protection ends. In the latter case an alternate type of fire protection shall be applied between the fire stopping and the superstructure.

⁽³⁾ Conforming to CSA A101-M1977, "Mineral Fibre Thermal Building Insulation," Type 1A, minimum density 30 kg/m³; column section and batts wrapped with 25 mm mesh chicken wire.

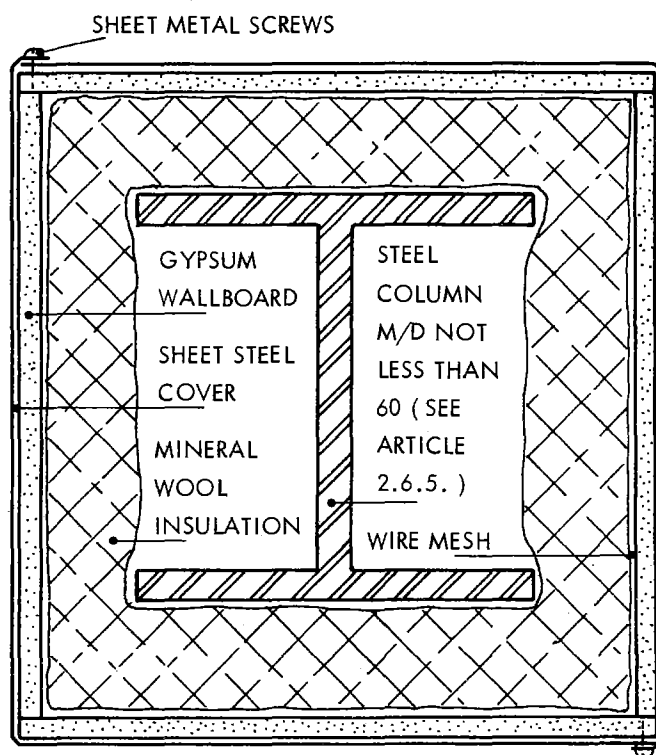


FIGURE 2.6.(a) Column protected by sheet-steel membrane and mineral-wool insulation.

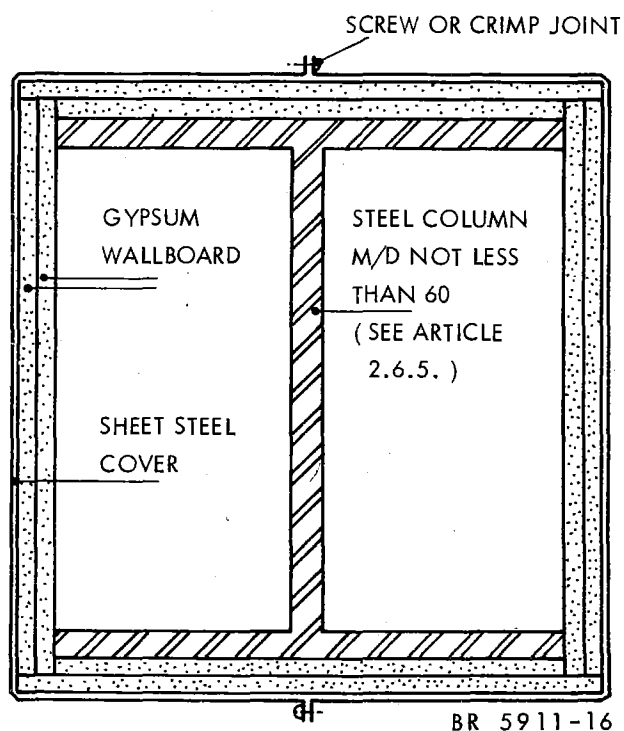


FIGURE 2.6.(b) Column protected by sheet-steel membrane and gypsum wallboard.

2.6.2. For hollow-unit masonry column protection the thickness shown in Tables 2.6.A. to 2.6.D. is equivalent thickness as described in Subsection 1.5.

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 1.6.

2.6.4. The fire-resistance of a steel column with light protection, such as plaster or sheet steel, varies significantly with its mass and geometric properties for the same thickness of cover. Thus, where a column lighter than that used in a tested assembly is employed, the fire resistance can be expected to be less.

2.6.5.(1) The ratio M/D to which reference is made in Tables 2.6.B., 2.6.C. and 2.6.D. is 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, shown as the dashed line in Figure 2.6.(c).

(2) The heated perimeter "D" of steel columns in Figure 2.6.(c) is equal to $2(B + H)$ in Example (1), $2(B + H)$ in Example (2) and $3.14B$ in Example (3).

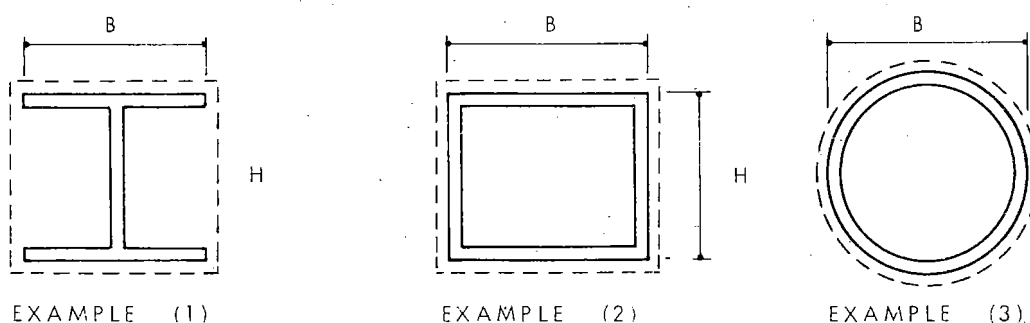


Figure 2.6.(c) Example (1) illustrates a standard or wide-flange beam, Example (2) illustrates a hollow structural section (rectangular or square) and Example (3) illustrates a hollow structural section (round).

SUBSECTION 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 $\frac{1}{2}$ h 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 to concrete or masonry beam protection is described in Subsection 1.6.

2.7.4. The fire resistance of protective cover to steel beams depends on the means used to hold the protection in place. Because of the importance of this factor no ratings have 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 must be equivalent to that described in Subsection 2.3. The rating on this basis may not exceed $1\frac{1}{2}$ h.

Table 2.7.A.
Forming Part of Article 2.7.1.

MINIMUM THICKNESS OF COVER TO INDIVIDUALLY PROTECTED STEEL BEAMS, mm							
Description of Cover	Fire-Resistance Ratings ⁽¹⁾						
	¹ / ₂ h	³ / ₄ h	1 h	1 ¹ / ₂ 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 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 shall be reinforced with wire mesh with 1.57 mm diam wire and 50 mm by 50 mm openings placed midway in the plaster.

SUBSECTION 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.

2.8.2.(1) The minimum dimension, t , in millimetres of a rectangular reinforced concrete column is equal to $100f(R + 1)$ for Types S and N concrete and $75f(R + 1)$ for Types L and L 40S concrete

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-M77, "Code for the 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 must be not less than 1.2 times the value 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 to be Used in Applying Article 2.8.2.			
Overdesign Factor ⁽²⁾	Where kh is not more than 3.7 m	Where kh is greater 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	0.8	1.0	0.8
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), 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-M77, "Code for the Design of Concrete Structures for Buildings."

2.8.3.(1) Where the required fire-resistance rating of a concrete column is 2 h or less, the minimum thickness of concrete cover in millimetres over vertical steel reinforcement equals 25 times the number of hours of fire resistance required.

(2) Where the required fire-resistance rating of a concrete column is greater than 2 h, the minimum thickness in millimetres of concrete cover over vertical steel reinforcement is equal to 25 plus 12.5 times the required number of hours of fire resistance.

(3) Where the required fire-resistance rating of a concrete column exceeds 2 h, wire mesh reinforcement with 1.57 mm diam wire and 100 mm by 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 will govern.

2.8.5. The addition of plaster 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 1.6. The addition of plaster does not, however, justify any decrease in the minimum column sizes shown.

2.8.6. Articles 2.8.2. to 2.8.5. also apply to reinforced concrete walls of limited length (see Article 2.1.6.).

2.8.7. 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 is determined on the basis of cover to vertical reinforcing steel alone. In order to meet this condition, the wall must conform to Subsection 2.1 for the fire-resistance period required.

SUBSECTION 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 $\frac{1}{2}$ h to 4 h where the width of the beam or joist is at least 100 mm.

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 Ratings						
	$\frac{1}{2}$ h	$\frac{3}{4}$ h	1 h	$1\frac{1}{2}$ h	2 h	3 h	4 h
Type S, N or L	20	20	20	25	25	39	50
Column 1	2	3	4	5	6	7	8

2.9.2. 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 assigned where the average width of the part that projects below the slab is less than 165 mm.

2.9.3. For 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 must 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 to a reinforced concrete beam may be taken into account in determining the cover over principal reinforcing by applying the multiplying factors described in Subsection 1.6.

SUBSECTION 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 $\frac{1}{2}$ h to 4 h are shown in Table 2.10.A.

2.10.2. The cover for an individual tendon is 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 is the minimum thickness of concrete between the surface of the duct and the surface of the beam. For beams in which several tendons are used, the cover is assumed to be the average of the minimum cover of the individual tendons. The cover for any individual tendon must be not less than $\frac{1}{2}$ of 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 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 1.6.

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 Ratings						
		1/2 h	3/4 h	1 h	1 1/2 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 must be incorporated in the beams to retain the concrete in position around the tendons. The mesh reinforcement must be located midway in the cover.

SECTION 3 FLAME-SPREAD RATINGS AND SMOKE DEVELOPED CLASSIFICATIONS

SUBSECTION 3.1 INTERIOR FINISH MATERIALS

3.1.1. Tables 3.1.A. and 3.1.B. show flame-spread 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 Alberta Building Code 1981. 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:

$\frac{25}{50}$ —represents a flame-spread rating of 0 to 25 and a smoke developed classification of 0 to 50,

$\frac{150}{300}$ —represents a flame-spread rating of 75 to 150 and a smoke developed classification of 100 to 300,

$\frac{x}{x}$ —applied to walls and ceilings means a flame-spread rating over 150 and a smoke developed classification over 300, and

$\frac{x}{x}$ —applied to floors means a flame-spread rating over 300 and a smoke developed classification over 500.

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 Specifica- tion	Min. Thickness, mm	Un- finished	Paint not More than 1.3 mm Thick		Varnish, Spar or Urethane not More than 1.3 mm Thick	Cellulosic Wallpaper, not More than 1 Layer
				Gloss Finish	Flat Latex Finish		
Masonry	None	None					
Metal sheet	None	None					
Asbestos cement board	CAN2- 34.16-M77	None	$\frac{25}{50}$	$\frac{25}{100}$	$\frac{25}{50}$	(1)	$\frac{25}{50}$
Gypsum plaster	CSA A82.22- M1977	None					
Gypsum wallboard	CSA A82.27- M1977	9.5	$\frac{25}{50}$	$\frac{75}{100}$	$\frac{25}{50}$	(1)	$\frac{25}{50}$
Dressed wood	None	16	$\frac{150}{300}$	$\frac{150}{300}$	$\frac{150}{300}$	$\frac{150}{300}$	$\frac{150}{300}$
Poplar or Spruce plywood, exterior grade	CSA O153- M1980	11	$\frac{150}{100}$	$\frac{150}{100}$	$\frac{150}{100}$	$\frac{150}{300}$	$\frac{150}{300}$
Douglas Fir plywood, exterior grade	CSA O121- M1978	11	$\frac{150}{100}$	$\frac{150}{100}$	$\frac{150}{100}$	$\frac{150}{300}$	$\frac{150}{300}$
		6	$\frac{150}{100}$	$\frac{X}{100}$	$\frac{X}{100}$	(1)	(1)
Fibre- board, low density	CSA A247- M1978	11	$\frac{X}{50}$	$\frac{150}{100}$	$\frac{150}{100}$	(1)	(1)
Hard- board, Type 1 standard	CGSB 11- GP-3M (1976)	9	$\frac{150}{300}$	$\frac{150}{300}$	$\frac{150}{300}$	(1)	(1)
		6	$\frac{150}{X}$	(1)	(1)	(1)	(1)
Column 1	2	3	4	5	6	7	8

Table 3.1.A. (Contd)
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	Applica- ble Specifica- tion	Min. Thickness, mm	Un- finished	Paint not More than 1.3 mm Thick		Varnish, Spar or Urethane not More than 1.3 mm Thick	Cellulosic Wallpaper, not More than 1 Layer
				Gloss Finish	Flat Latex Finish		
Hard- board, factory finish	None	4.5	$\frac{X}{X}$	(1)	(1)	(1)	(1)
Hard- wood plywood, factory finish	CSA O115- 1967	4	$\frac{X}{300}$	(1)	(1)	(1)	(1)
Particle- board	CAN3- O188.1- M78	6.35	$\frac{X}{300}$	(1)	(1)	(1)	(1)
Cork	None	None	$\frac{X}{X}$	(1)	(1)	(1)	(1)
Column 1	2	3	4	5	6	7	8

Note to Table 3.1.A.:

(1) No test information available.

Table 3.1.B.
Forming Part of Article 3.1.1.

FLAME-SPREAD RATINGS AND SMOKE DEVELOPED CLASSIFICATIONS⁽¹⁾ FOR COMBINATIONS OF COMMON FLOOR FINISH MATERIALS AND SURFACE COATINGS		
Material	Applicable Specification	Finished or Unfinished
Hardwood or softwood flooring either unfinished or finished with a spar or urethane varnish coating	None	$\frac{300}{300}$
Vinyl-asbestos flooring not more than 4.8 mm thick applied over plywood or lumber subfloor or direct to concrete	CSA A126.1-1977	$\frac{300}{300}$
Wool carpet (woven), pile weight not less than 1 120 g/m ² , applied with or without felt underlay ⁽²⁾	CGSB 4-GP-129 (1972)	$\frac{300}{300}$
Nylon carpet, pile weight not less than 610 g/m ² , and not more than 880 g/m ² applied with or without felt underlay ⁽²⁾	CGSB 4-GP-129 (1972)	$\frac{300}{500}$
Nylon carpet, pile weight not less than 610 g/m ² , and not more than 1 355 g/m ² glued down to concrete	CGSB 4-GP-129 (1972)	$\frac{300}{500}$
Wool/nylon blend carpet (woven) with not more than 20 per cent nylon and pile weight not less than 1 120 g/m ²	CGSB 4-GP-129 (1972)	$\frac{300}{500}$
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 880 g/m ²	CGSB 4-GP-129 (1972)	$\frac{300}{500}$
Column 1	2	3

Notes to Table 3.1.B.:

⁽¹⁾ Tested on the floor of the tunnel in accordance with provisions of CAN4-S102.2-79, "Standard Method of Test for Surface Burning Characteristics of Flooring, Floor Covering and Miscellaneous Materials."

⁽²⁾ Types 1 or 2 underlay as described in CGSB 4-GP-36M (1978), "Carpet Underlay, Fiber Type."

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.

3.1.5.(1) Information on flame-spread ratings 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 Division of Building Research (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 ratings have 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 specifications applicable to the materials described are noted because the ratings given are dependent on conformance with these specifications.

SECTION 4 NONCOMBUSTIBILITY

SUBSECTION 4.1 TEST METHOD

4.1.1. Noncombustibility is required of certain components of buildings by the provisions of the Alberta Building Code 1981 which specifies noncombustibility by reference to CAN4-S114-1978, "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 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.

SUBSECTION 4.2 MATERIALS CLASSIFIED AS COMBUSTIBLE

4.2.1. Most materials from animal or vegetable sources will be classed as combustible by CAN4-S114-1978, "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 also in many cases be classed as combustible, unless the proportion of combustibles is very small; the batt insulation with combustible binder, cinder concrete, cement and wood chips and wood-fibred 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.

SUBSECTION 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.

APPENDIX A TO CHAPTER 2

Fire Test Reports

Summaries of available fire-test information have been published by the Division of Building Research as follows:

- (1) "Flame Spread Performance of Common Building Materials." M. Galbreath, Technical Paper No. 170, Division of Building Research, National Research Council, Ottawa, April 1964. NRC 7820.
- (2) "Fire Endurance of Protected Steel Columns and Beams." M. Galbreath and W.W. Stanzak, Technical Paper No. 194, Division of Building Research, National Research Council, Ottawa, April 1965. NRC 8379.
- (3) "Elevated-Temperature Tensile and Creep Properties of Some Structural and Prestressing Steels." T.Z. Harmathy and W.W. Stanzak, reprinted from American Society for Testing and Materials, Special Technical Publication 464, 1970, p. 186, (DBR Research Paper No. 424) NRC 11163.
- (4) "Thermal Performance of Concrete Masonry Walls in Fire." T.Z. Harmathy, reprinted from American Society for Testing and Materials, Special Technical Publication 464, 1970, p. 209, (DBR Research Paper No. 423). NRC 11161.
- (5) "Fire Endurance of Selected Non-Loadbearing Concrete Masonry Walls." L.W. Allen, March 1970, DBR Fire Study No. 25. NRC 11275.
- (6) "Comparison of Flame Spread Ratings by Radiant Panel, Tunnel Furnace, and Pittsburgh-Corning Apparatus." A. Rose, June 1969, DBR Fire Study No. 22. NRC 10788.
- (7) "Calculation of the Fire Resistance of Reinforced Concrete Columns." T.T. Lie and D.E. Allen, August 1972, DBR Technical Paper No. 378. NRCC 12797.
- (8) "Column Covers: A Practical Application of Sheet Steel as a Protective Membrane." W.W. Stanzak, February 1972, DBR Fire Study No. 27. NRCC 12483.
- (9) "Sheet Steel as a Protective Membrane for Steel Beams and Columns." W.W. Stanzak, November 1969, DBR Fire Study No. 23 NRCC 10865.
- (10) "Fire Tests on Protected Steel Columns with Different Cross-Sections." W.W. Stanzak and T.T. Lie, February 1973, DBR Fire Study No. 30. NRCC 13072.
- (11) "Prediction of Fire Endurance of Concrete Masonry Walls." G. Williams-Leir and L.W. Allen, DBR Technical Paper No. 399, November 1973. NRCC 13560.
- (12) "Prediction of Fire Endurance of Concrete Slabs." G. Williams-Leir, DBR Technical Paper No. 398, November 1973. NRCC 13559.
- (13) "Flammability of Fibreboard Interior Finish Materials." A. Rose, Building Research Note No. 68, October 1969.
- (14) "Effect of Sand Replacement on the Fire Endurance of Lightweight Aggregate Masonry Units." L.W. Allen, DBR Fire Study No. 26, September 1971. NRCC 12112.
- (15) "Fire Endurance Tests on Unit Masonry Walls with Gypsum Wallboard." L.W. Allen, W.W. Stanzak and M. Galbreath, DBR Fire Study No. 32, February 1974. NRCC 13901.
- (16) "Fire Resistance of Unprotected Steel Columns." W.W. Stanzak and T.T. Lie, DBR Research Paper No. 577. Reprinted from the Journal of the Structural Division ASCE, Vol. 99 No. ST5 Proc. Paper 9719, May 1973. NRCC 13589.
- (17) "Fire Endurance of Concrete-Protected Steel Columns." T.T. Lie and T.Z. Harmathy. Reprinted from A.C.I. Journal, January 1974, Title No. 71-4. DBR Technical Paper No. 597. NRCC 13876.

APPENDIX B TO CHAPTER 2

List of Referenced Standards

Standard Issuing Agency	Standard Number	Title of Standard	Code Reference
ASTM	C330-77	Lightweight Aggregates for Structural Concrete	1.4.3.(2)
CGSB	4-GP-36M November 1978	Carpet Underlay, Fiber Type	Table 3.1.B.
CGSB	4-GP-129 October 1972	Carpets, Commercial (Amended April 1977)	Table 3.1.B.
CGSB	11-GP-3M May 1976	Hardboard	Table 3.1.A.
CGSB	CAN2-34.16-M77	Sheets, Asbestos Cement, Flat, Fully Compressed	Table 3.1.A.
CSA	CAN3-A23.1-M77	Concrete Materials and Methods of Concrete Construction	1.4.3.(1)
CSA	CAN3-A23.3-M77	Code for the Design of Concrete Structures for Buildings	2.8.2.(1) Table 2.8.A.
CSA	A82.5-M78	Structural Clay Non-Load-Bearing Tile	Table 2.6.A.
CSA	A82.22-M77	Gypsum Plasters	Table 3.1.A.
CSA	A82.27-M77	Gypsum Board Products	1.1.1.(5)&(6) Table 3.1.A.
CSA	A82.30-M1980	Interior Furring, Lathing and Gypsum Plastering	1.6.3.(1) 2.3.11.(1) Table 2.5.A.
CSA	A82.31-1977	Gypsum Board Application	2.3.11.(1)
CSA	A101-M77	Mineral Fibre Thermal Building Insulation	Table 2.3.F. Table 2.6.E.
CSA	A126.1-1977	Vinyl Asbestos Floor Tile	Table 3.1.B.
CSA	A247-M78	Insulating Fibreboard	Table 3.1.A.
CSA	O115-1967	Hardwood Plywood	Table 3.1.A.
CSA	O121-M78	Douglas Fir Plywood	Table 3.1.A.
CSA	O141-1970	Softwood Lumber	2.3.10.(1) Table 2.4.A.
CSA	O153-M1980	Poplar Plywood	Table 3.1.A.
CSA	CAN3-O188.1-M78	Interior Mat-Formed Wood Particleboard	Table 3.1.A.
ULC	S101-1977	Standard Methods of Fire Endurance Tests of Building Construction and Materials	1.11.1. 1.11.2. 1.11.3.(1) 1.11.4.(1) 1.11.5.
ULC	CAN4-S102.2-79	Standard Method of Test for Surface Burning Characteristics of Flooring, Floor Covering and Miscellaneous Materials	Table 3.1.B.
ULC	CAN4-S114-78	Standard Method of Test for Determination of Non-Combustibility in Building Materials	1.1.1.(4) 4.1.1. 4.2.1.

GOVERNMENT OF THE PROVINCE OF ALBERTA

THE ALBERTA UNIFORM BUILDING STANDARDS ACT

being chapter 85 of the Statutes of Alberta, 1973 with
amendments up to and including May 18, 1977

OFFICE CONSOLIDATION

NOTE

All persons making use of this consolidation are reminded that it has no legislative sanction; that the amendments have been embodied only for convenience of reference, and that the original Acts should be consulted for all purposes of interpreting and applying the law.

1973

CHAPTER 85

THE ALBERTA UNIFORM BUILDING STANDARDS ACT

(Assented to October 30, 1973)

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, or
 - (ii) the secretary, in the case of a town, new town, 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, 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, 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, subsection (2).

[1973, c. 85, s. 1; 1975 (2), c. 14, s. 9; 1977, c. 46, s. 2]

Staff

2. (1) In accordance with *The Public Service Act* there may be appointed a Director of Building Standards, inspec-

tors and such other employees as required for the purposes of this Act.

(2) Where, pursuant to section 4, a local authority is authorized to enforce this Act, it may appoint inspectors.
[1973, c. 85, s. 2]

3. (1) The Lieutenant Governor in Council may make Regulations
regulations

- (a) prescribing standards respecting any materials, equipment, protection devices or appliances used or installed in the construction of any building;
- (a.1) prescribing any materials, equipment, protection devices or appliances that must be used or installed in a building or a class of building;
- (a.2) governing the use or installation of any materials, equipment, protection devices or appliances in a building or a class of building;
- (a.3) prohibiting the use or installation of any materials, equipment, protection devices or appliances in a building or a class of building;
- (b) classifying buildings according to their use or occupancy;
- (c) governing methods used in the construction or demolition of any building or any class of building;
- (d) governing the construction standards that must be met in respect to any building or class of building;
- (e) governing the use of the property upon which a building is located during the period of time that the construction or demolition of the building is taking place;
- (f) 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 such revisions, variations or modifications as 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

the use, occupancy, relocation, construction or demolition of a building;

- (c) providing 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 authorities, or
 - (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 the provisions of any other Act or any regulation made under any other Act.

[1973, c. 85, s. 3; 1975 (2), c. 86, s. 2
Eff. Oct. 21/76 1977, c. 46, ss. 3, 8 (1,2)]

Municipal by-laws or codes inoperative

3.1 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, or
- (a.1) prescribing any materials, equipment, protection devices or appliances that must be used or installed in a building or a class of building;
- (a.2) governing the use or installation of any materials, equipment, protection devices or appliances in a building or a class of building;
- (a.3) prohibiting the use or installation of any materials, equipment, protection devices or appliances in a building or a class of building;
- (b) classifying buildings according to their use or occupancy, or
- (c) governing methods used in the construction or demolition of any building or any class of building, or
- (d) governing the construction standards that must be met in respect to any building or class of building, or

- (e) governing the use of the property upon which a building is located during the period of time that the construction or demolition of the building is taking place, or
- (f) 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.

[1975(2), c. 86, s. 3 *Eff. Oct. 21/76*; 1977, c. 46, ss. 4, 8(1)]

4. (1) The Minister may, by regulation, authorize any local authority or class of local authority to enforce this Act in its respective municipality. Enforcement

(2) Where a local authority is authorized to enforce the provisions of 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, subsection (3), clauses (a), (b), (c), (d) and (e), and
- (b) upon by-laws being made under clause (a), the regulations of the Minister made under section 3, subsection (3), clauses (a), (b), (c), (d) and (e) do not apply in that municipality.

[1973, c. 85, s. 4]

5. (1) There shall be a council, called the "Alberta Building Standards Council", the members of which shall be appointed by the Lieutenant Governor in Council for a term not exceeding three years and who shall be eligible for reappointment. Alberta
Building
Standards
Council

(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-chairmen. [1973, c. 85, s. 5]

6. 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. Duties of
Council

7. (1) For the purpose of ensuring compliance with the provisions of this Act or the regulations or the conditions of a permit, an inspector may Powers of
Inspector

- (a) enter into or upon 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) Where 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 the local authority, as the case may be, may apply to the district court 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 three days before the day named in the notice for hearing of the application. [1973, c. 85, s. 7; 1977, c. 46, s. 8(2, 3)]

Order of
an inspector

8. Where an inspector finds that the use, occupancy, relocation, construction or demolition of a building is not in accordance with the requirements or provisions of this Act, the regulations, a by-law made under section 4 or a permit, the inspector, for the purpose of ensuring that those requirements or provisions 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.

[1973, c. 85, s. 8; 1977, c. 46, s. 5]

Appeal

9. (1) Where 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 8 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 upon 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) Upon 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 Supreme Court of Alberta from the order of the Council upon a question of law or a question of jurisdiction and upon 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 upon 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 Supreme Court so directs.

[1973, c. 85, s. 9; 1977, c. 46, s. 8(2, 3)]

10. (1) Where the Council is considering appeals under section 9

Hearing
of appeal

(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) three 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, or a division thereof, 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.

[1973, c. 85, s. 10]

11. (1) Where a person does not comply with an order directed to him under section 8 or section 9 within the time specified in the order,

Execution
of orders

(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 upon the land and building and do such acts as are necessary to carry out the order.

(2) Where 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) Where

- (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 cause the amount paid to the Minister or the amount of the expenses incurred by itself in carrying out the order to be placed 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. [1973, c. 85, s. 11]

Offence

12. (1) Any person who

- (a) interferes in any manner with an inspector in the exercise of his duties or powers under this Act or the regulations, or
- (b) does not comply with an order made under section 8 or section 9, or
- (c) refuses to allow or interferes with the execution of an order under section 11, or
- (d) contravenes any provision of this Act, the regulations or a by-law made under section 4 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 4 or a permit,

is guilty of an offence and liable on summary conviction to a fine of not more than \$1,000 and in default to imprisonment for a term not exceeding 90 days, or to both fine and imprisonment.

(2) Where, pursuant to section 4, 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. [1973, c. 85, s. 12; 1977, c. 46, s. 6]

**Order of the
Supreme Court**

12.1 (1) Where a person

- (a) fails to comply with an order directed to him under section 8 or 9, 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 11, an order made under

section 8 or 9 or interferes with or attempts to interfere with the carrying out of that order under section 11,

the Minister or the local authority, as the case may be, may, whether or not that person has been prosecuted under section 12, apply to the Supreme Court by way of originating notice for an order requiring that person

- (c) to comply with the order made under section 8 or 9, or
- (d) restraining that person from interfering in any manner with the carrying out under section 11 of an order made under section 8 or 9.

(2) A copy of the originating notice and each affidavit in support shall be served not less than three days before the day named in the notice for the hearing or such shorter time as the Court may direct. [1977, c. 46, s. 7]

12.2 Where an application is made under section 7, subsection (2), section 9 or section 12.1, the Court may make such direction as to costs as it considers proper.

[1977, c. 46, s. 7]

Costs

13. A certificate

- (a) purporting to be signed by
 - (i) the Director, in the case of an inspector appointed under section 2, subsection (1), or
 - (ii) the clerk, in the case of an inspector appointed under section 2, subsection (2), and
- (b) stating that the person named therein is an inspector under this Act,

shall be admitted in evidence as prima facie proof of the appointment of the person named therein as an inspector without proof of the signature or official character of the person appearing to have signed the certificate.

[1973, c. 85, s. 13]

Proof of
appointment
of inspector

14. (1) Where a building is being constructed or demolished at the time this Act comes into force and a building permit in respect to that building has been issued by a local authority pursuant to a by-law made under *The Municipal Government Act*, that building permit shall be deemed to be a permit issued under this Act.

(2) Where, at the time this Act comes into force, a local authority

- (a) has appointed inspectors under *The Municipal Government Act* for the purpose of enforcing building standards established by by-law under that Act, and

(b) has been authorized to enforce this Act
those inspectors shall be deemed to have been appointed under section 2, subsection (2) of this Act.

[1973, c. 85, s. 14]

Previous
permits and
appoint-
ments
validated

15. *Contained in the original Act of 1971 amended The Municipal Government Act. This section is not included in this consolidation.*

Coming
into
force

16. This Act comes into force on a date or dates to be fixed by Proclamation.

[1973, c. 85, s. 16]

Proclaimed Eff. Jan. 3/74]

INDEX

ALBERTA UNIFORM BUILDING STANDARDS ACT 1973 CHAPTER 85

Sec.

Act

- . coming into force of 16
- . enforcement of 4
- . penalties for contravention 12
- . regulations for carrying out ... 3(3) (h)

Alberta Building Standards Council see Council

Appeal see also Orders

- . hearing of 10
- . stop order, against 9

Buildings

- . classification 3(1) (b)
- . defined 1(a)

Certificate

- . appointment, of 13

Clerk

- . defined 1(b)

Costs

- . orders, of 12.2

Council

- . appeal to and against 9
- . defined 1(d)
- . duties of 6
- . establishment 5
- . rules of procedure by 10(2)

Construction

- . defined 1(c)
- . methods 3(1) (c,e,f,)
- . permit 3(3,4)
- . standards 3(1) (d), (2)

County Act

- . by-laws or codes under,
inoperative 3.1

Definitions

- 1

Demolition

- . defined 1(e)
- . methods 3(1) (c,e,f,)
- . permit 3(3,4)

Director

- . appointment 2(1)
- . defined 1(f)

District court

- . application for restraining
order to 7(2,3)

ALBERTA UNIFORM BUILDING STANDARDS ACT—Con. Sec.

Enforcement

- . Act, of 4

Expenses

- . carrying out order 11(2)

Fees

- . permit 3(3) (e)

Inspectors

- . appointment 2
- . . previous, validity 14
- . . proof 13
- . compliance with directions of 8
- . defined 1(g)
- . penalties for interference with 12
- . powers of 7
- . requirements of 3(3) (g)

Local authority

- . appointment of inspectors 2(2)
- . defined 1(h)
- . enforcement by 4
- . fines accrue to 12(2)

Minister

- . advice by Council to 6
- . defined 1(i)
- . regulations by 3(3)

Municipal by-laws or codes

- . inoperative 3.1

Municipal Government Act

- . by-laws or codes under, inoperative 3.1
- . permit issued under 14

Municipality

- . defined 1(j)
- . enforcement by local authority in 4
- . exemption to 3(3) (f)

National Building Code of Canada

- . application of 3(2)

Notice

- . appeal 9(2)
- . court action 12.1(2)
- . stop use of building 8

Offences

- . penalties for 12

INDEX

**ALBERTA UNIFORM BUILDING
STANDARDS ACT—Con. Sec.****Orders**

- . costs of 12.2
- . execution of 11
- . . penalty for interference 12
- . failure to comply with 12.1
- . inspector, of 8

Penalties

- . offences, for 12

Permit

- . construction or demolition 3(3,4)
- . defined 1(k)
- . penalties for contravention 12
- . previous 14

Protection

- . devices 3(1)(a.1-a.3), 3.1(a.1-a.3)

Public Service Act

- . appointments under 2(1)

**ALBERTA UNIFORM BUILDING
STANDARDS ACT—Con. Sec.****Regulations**

- . defined 1(1)
- . making of 3
- . penalties for contravention 12

Staff

- . appointments 2

Standards

- regulations re 3(1)(a,d), (2)

Supreme Court

- . order of 12.1, 12.2
- . service of notice, for 7(3), 12.1(2)

Tax roll

- . putting expenses on 11(3)

Time

- . appeal notice 9(2)
- . service of notice, for 7(3), 12.1(2)

Validity

- . previous permits 14

THE ALBERTA UNIFORM BUILDING STANDARDS ACT

Alberta Building Regulation 1981

(Alberta Regulation 128/81)



LABOUR

General Safety Services Division

Building Standards Branch

707, 10808 - 99 Avenue

Edmonton, Alberta, Canada

T5K 0G2

THE ALBERTA UNIFORM BUILDING STANDARDS ACT

Alberta Building Regulation, 1981

1 Subject to the amendments set forth in the Schedule to this regulation, Parts 1, 2, 3, 4, 5, 6, 7, 8 and 9 of the National Building Code of Canada 1980 (loose leaf edition of document NRCC No. 17303, including Errata of May 1980, issued by the Associate Committee on the National Building Code, National Research Council of Canada, Ottawa and distributed by School Book Branch, Alberta Education, Edmonton, Alberta) is hereby declared to be in force under *The Alberta Uniform Building Standards Act*.

2 The ALBERTA BUILDING REGULATION 1978 (Alta. Reg. 149/78), the ALBERTA HEATING, VENTILATING AND AIR-CONDITIONING REGULATION 1978 (Alta. Reg. 151/78), and the ALBERTA REGULATION GOVERNING GENERAL SAFETY DURING CONSTRUCTION, DEMOLITION AND RELOCATION OF BUILDINGS 1978 (Alta. Reg. 153/78), are repealed.

3 Notwithstanding section 2, the Alberta Building Regulation 1978 (Alta. Reg. 149/78), the Alberta Heating, Ventilating and Air-Conditioning Regulation 1978 (Alta. Reg. 151/78) and the Alberta Regulation Governing General Safety During Construction, Demolition and Relocation of Buildings 1978 (Alta. Reg. 153/78) remain in force for work for which an application for a permit was accepted by the local authority on or before May 31, 1981 until the work, for which the permit application was submitted, has been completed.

4 This regulation comes into force on May 31, 1981.

SCHEDULE

1 Part 1 of the National Building Code of Canada 1980 is amended

(a) in the heading preceeding Section 1.1 by striking out "SCOPE AND DEFINITIONS" and substituting "ADMINISTRATION";

(b) by repealing Section 1.1 and substituting the following:

SECTION 1.1 REFERENCING

SUBSECTION 1.1.1. SHORT TITLE

1.1.1.1. This Code may be cited as the Alberta Building Code 1981.

SUBSECTION 1.1.2. NUMBERING SYSTEM

1.1.2.1. 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.

1.1.2.2. 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.

1.1.2.3. 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.

1.1.2.4. 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.

(c) by repealing Subsection 1.2.1. and substituting the following:

SUBSECTION 1.2.1. APPLICATION

1.2.1.1.(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 not directly involved in *alterations*;
 - (iii) 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;
 - (o) safety during construction of a *project*, including protection of the public and neighbouring properties.
- (2) In Sentence (1) the term "any *building*" includes *new buildings* and *existing buildings*.

1.2.1.2. The rehabilitation or change in *occupancy* of an *existing building*, that has been designated by an *acceptable* authority as having a significant historic value, shall be permitted if it can be shown that the level of safety is *acceptable* for its intended use.

SUBSECTION 1.2.2. EXCLUSIONS

1.2.2.1.(1) This Code does not apply to

- (a) a *building* for the housing of livestock or the storage or maintenance of equipment or materials or produce associated with the operation of the farm on which it is located;
- (b) utility towers and poles, television and radio or other communication antennas or towers, except that loads resulting from those located on or attached to *buildings* shall be included in the *building* design;
- (c) flood control and hydro-electric dams, except for *buildings* provided for *occupancy*;
- (d) highway and railway bridges;
- (e) mechanical and other equipment and *appliances* not required for *building* services and not specifically regulated by this Code;
- (f) an accessory *building* not greater than 10 square metres in *building* area if it is *acceptable* as not creating a hazard.

(d) by repealing Subsection 1.3.1. and substituting the following:

SUBSECTION 1.3.1. For definitions of words that are not included in Subsection 1.3.2. reference should be made to Webster's Third New International Dictionary.

(e) in Subsection 1.3.2.

(i) by adding "or, where specified, to the *fire authority*" after "*Acceptable* means acceptable to the *authority having jurisdiction*";

(ii) by striking out:

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

and substituting:

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.

(iii) by adding the following after the definition of "appliance":

Architect means a person who is legally permitted to practise as an architect in Alberta.

(iv) by striking out:

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

and substituting:

Authority having jurisdiction means an inspector appointed pursuant to Section 2 of *The Alberta Uniform Building Standards Act*.

(v) by adding the following after the definition of "bachelor dwelling unit":

Barrier free building (as applying to requirements for the design of buildings for physically handicapped persons) means a building to which the public is admitted, but does not include apartment buildings less than 4 storeys in building height, houses, boarding houses, or relocatable industrial accommodation or buildings of Group F major occupancy.

(vi) in the definition of "dwelling unit," by striking out "as a domicile";

(vii) by adding the following after the definition of "Exhaust duct":

Existing building means

(a) a building that was completed on or before May 31, 1981, or

(b) a building for which an application for a permit was accepted by the authority having jurisdiction on or before May 31, 1981.

(viii) by striking out:

Exit means that part of a means of egress that leads from the floor area it serves, including any doorway leading directly from a floor area, to a public thoroughfare or to an acceptable open space.

and substituting:

Exit means that part of a means of egress that leads from the floor area it serves, including a doorway leading directly from a floor area, to an acceptable public thoroughfare or to an acceptable open space, both of which are essentially unobstructed from the ground to the sky throughout their length and breadth.

(ix) in the definition of "exposing building face" by adding "and any exterior wall that encloses an attic or roof space" after "ceiling of its top storey";

(x) by adding the following after the definition of "Fill":

Fire authority means the Fire Commissioner or a local assistant to the Fire Commissioner authorized by him to act on his behalf with respect to this Code.

(xi) by adding the following after the definition of "Flue pipe":

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, polyvinylchloride foam and ureaformaldehyde foam.

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

(xii) in the definition of "Industrial occupancy, medium hazard" by striking out "floor area" and substituting "floor area";

(xiii) in the definition of "Industrial occupancy, low hazard" by striking out "floor area" and substituting "floor area";

(xiv) by adding the following after the definition of "Mezzanine":

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

New building means a building that was not completed on or before May 31, 1981 and for which an application for a permit, was not accepted by the authority having jurisdiction on or before May 31, 1981.

(xv) by striking out:

Owner means any person, firm or corporation controlling the property under consideration.

and substituting:

Owner means

(a) a person who is registered under provincial legislation as the owner of a freehold estate in possession of land,

(b) a person who has purchased or otherwise acquired land, whether he has purchased or otherwise acquired the land directly from the owner or from another purchaser, and has not become the registered owner thereof,

(c) a person holding 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, or

(d) a person controlling the property under consideration.

(xvi) by adding the following after "Perched groundwater (see Groundwater, perched)":

Permit means permission, or authorization in writing, to undertake any activity regulated by this Code and, in the case of an occupancy permit, to use or occupy a building for the sheltering or support of persons, animals or property.

(xvii) by adding the following after the definition of "Private sewage disposal system":

Professional engineer means a person who is legally permitted to practise as a professional engineer in Alberta and is qualified to engage in the appropriate combination of those branches of professional engineering that are applicable to building design and construction.

(xviii) in the definition of "project" by striking out "alteration" and substituting "alteration";

(xix) by striking out:

Public building (as applying to requirements for the design of buildings for physically handicapped persons) means a building to which the public is admitted, but does not include apartment buildings, houses, boarding houses or buildings of Group F major occupancy.

(xx) in the definition of "public way" by striking out "street" and substituting "street";

(xxi) In the definition of "Suite" by striking out "business and personal services occupancies" and substituting "business and personal services, and medium and low hazard industrial occupancies";

(xxii) by adding the following after the definition of "Theatre":

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.

(xxiii) In the definition of "unsafe condition" by striking out "could cause undue hazard to" and substituting "is not acceptable and could endanger the";

(xxiv) by adding the following after the definition of "Wall, party":

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.

(f) by adding the following after Subsection 1.3.2.:

SUBSECTION 1.3.3.

1.3.3.1. Except for the definition of *permit*, definitions in section 1 of *The Alberta Uniform Building Standards Act* also apply in this Code.

(g) In Article 1.4.1.1. by adding the following after the abbreviation of "NLGA":

SHACNA.....Sheet Metal and Air Conditioning Contractors
National Association Inc.
(1611 N. 10th Street, Suite 200
Arlington, Virginia, U.S.A. 22209)

(h) by adding the following after Section 1.4:

SECTION 1.5 ADMINISTRATION

SUBSECTION 1.5.1. GENERAL

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

(2) In addition to *permits* that may be required by Sentence (1) for *building* components and services, other permits may be required in connection with the proposed *work*.

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

(a) identify and describe in detail the *project* or *occupancy* to be covered by the *permit* for which application is made,

(b) 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*, *architect*, *professional engineer*, or other *designer*, and *constructor*.

(2) If requested by the *authority having jurisdiction*, the *owner* shall submit an up-to-date plan of survey, 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.

1.5.1.3.(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 an *architect* or *professional engineer*, or both,

(b) that the construction or *alteration* be generally reviewed during construction by an *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 1.5.1.6.(2) or 1.5.1.7.(1) shall submit evidence to the *authority having jurisdiction*, before any work begins, that he has retained

(a) an *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*.

1.5.1.4.(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 Alberta Uniform Building Standards Act* or this Code.

(2) Notwithstanding anything in any other Act, in a regulation under any 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 Articles 1.5.1.5., 1.5.1.6., or 1.5.1.7. unless the plans, drawings or specifications comply with those Articles.

1.5.1.5.(1) In this Article and in Article 1.5.1.6., 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 4(2) of *The Alberta Uniform Building Standards Act*, and if the application is for a *building* described in Sentence (3).

(3) The *buildings* referred to in Sentence (2) are:

(a) a *building*, 3 storeys or less in *building 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 unit*, or
- (ii) is a multiple family dwelling, containing 4 *dwelling units* or less;

(c) a *building*, 3 storeys or less in *building 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 *building 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 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* complying with Part 10.

1.5.1.6.(1) No local authority shall issue a *permit* with respect to an application for a *building* described in Sentence (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 an *architect*, or
- (ii) imprinted with a stamp or seal affixed by or on behalf of one or more *professional engineers*,

and

(b) the application complies with this Code and the by-laws of the local authority made pursuant to section 4(2) of *The Alberta Uniform Building Standards Act*.

(2) The *buildings* referred to in Sentence (1) are

(a) a *building* 3 storeys or less in *building height* for *residential occupancy* that is a multiple family dwelling containing 20 *dwelling units* or less, unless another number is prescribed in regulations under *The Alberta Uniform Building Standards Act*;

(b) a *building* for *Industrial occupancy*, if the *occupant load* is designated to be at a ratio of 28 square metres per person or more, unless another number is prescribed in regulations under *The Alberta Uniform Building Standards Act*;

(c) a *building* that is classified for more than one type of *occupancy*, if

(i) the major use of the *building* is *Industrial occupancy* and the *occupant load* is designated to be at a ratio of 28 square metres per person or more, unless another ratio is prescribed in regulations under *The Alberta Uniform Building Standards Act*, and

(ii) any type of *occupancy*, other than the major use, does not extend over an area exceeding 400 square metres, unless another area is prescribed in regulations under *The Alberta Uniform Building Standards Act*.

1.5.1.7.(1) No local authority shall issue a *permit* for a *building* that is not referred to in Articles 1.5.1.5. or 1.5.1.6. 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 an *architect*,

(b) in the case of engineering drawings, plans or specifications, imprinted with a stamp or seal affixed by or on behalf of a *professional engineer*, and

(c) in the case of combined architectural and engineering drawings, imprinted with a stamp or seal affixed by

(i) an *architect*, and

(ii) one or more *professional engineers*

or are submitted by an *architect* or *professional engineer* who is authorized by the council of his association to submit those drawings, plans or specifications without the seal of the other professional.

1.5.1.8. 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 Alberta Uniform Building Standards Act*.

1.5.1.9.(1) If *permits* are required, the *authority having jurisdiction* shall

(a) accept an application for a *permit*, and

(b) issue a *permit* when, to the best of his knowledge, the applicable requirements of this Code have been met.

1.5.1.10.(1) The *authority having jurisdiction* may issue a *permit* for an entire *building* conditional upon the submission, before starting work thereon, of additional information not available at the time of issuance, if such data are of secondary

importance, and are of a nature that the withholding of the *permit* until its availability would unreasonably delay the *building*.

(2) When in order to expedite work, an initial *permit* for part of a *building* is desired before the issuance of a *permit* for the entire *building*, application shall be made for the entire *building*, and complete plans, specifications and documents covering the part of the *building* for which the initial *permit* is desired shall be submitted to the *authority having jurisdiction*.

(3) The *authority having jurisdiction* may issue a *permit*, at the risk of the *owner*, with conditions, if necessary, to ensure compliance with this Code, to excavate or to construct a part of a *building* before the plans of the entire *building* have been submitted.

(4) If a *permit* is issued for part of a *building*, the *owner*, if he proceeds, proceeds without assurance that further *permits* will be issued.

(5) The *authority having jurisdiction* may issue a *permit*, if in his opinion it is warranted, with respect to a *building* or *occupancy* in which existing related construction is not in complete compliance with this Code, in which case the *permit* may be issued subject to conditions.

1.5.1.11.(1) A *permit* for a temporary *building* may be issued by the *authority having jurisdiction*, notwithstanding anything contained elsewhere in this Code, authorizing, for a limited time only, the erection and existence of a *building* for an *occupancy* which because of its nature will exist for a short time under circumstances which warrant only selective compliance with this Code.

(2) A *permit* for a temporary *building* shall state the date after which and the conditions under which the *permit* is no longer valid.

(3) A *permit* for a temporary *building* may be extended if permission in writing is given by the *authority having jurisdiction*.

(4) A *permit* for a temporary *building* shall be posted on the *building*.

1.5.1.12.(1) The *authority having jurisdiction* may refuse to issue a *permit*

(a) if information submitted is inadequate to determine compliance with the provisions of this Code,

(b) if incorrect information is submitted, or

(c) that would authorize any *building*, *project*, *work* or *occupancy* that would not be permitted by

(i) this Code, or

(ii) other legislation.

1.5.1.13.(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.(1) *Permit* fees and application procedures shall be as established by regulation or bylaw.

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

1.5.1.15. 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 to allow the use of a manufactured product that has not been changed in size during the transition to the International System of Units.

SUBSECTION 1.5.2. NOTIFICATION

1.5.2.1.(1) Before work is started, 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 *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*.

1.5.2.2.(1) The owner shall give notice in writing to the *authority having jurisdiction*

(a) immediately 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.

1.5.2.3. 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*.

1.5.2.4. 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*.

1.5.2.5.(1) The owner shall give notice to the *authority having jurisdiction*

(a) of 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.

1.5.2.6. 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*.

1.5.2.7. 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 this Code, a bylaw, or the *permit*, including compliance with any special conditions required by the *authority having jurisdiction*.

SUBSECTION 1.5.3. SAFETY DURING CONSTRUCTION

1.5.3.1.(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.

1.5.3.2. 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.

1.5.3.3.(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.

SUBSECTION 1.5.4. TESTS AND EQUIVALENTS

1.5.4.1. 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 test or inspection reports with the *authority having jurisdiction*.

1.5.4.2.(1) 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.

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

(3) 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 the equivalent, if he is of the opinion that sufficient evidence has been presented to demonstrate that the proposed equivalent will provide the level of performance required by this Code.

(4) A copy of the evidence referred to in Sentence (3) shall be forwarded to the Director.

(5) 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.

(6) After the Director has reviewed the evidence submitted under Sentence (5) he may issue a ruling, that may contain conditions, that in his opinion the performance intended by the Code is or is not met and his ruling shall apply in all municipalities.

(7) 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.

(8) The Director may issue lists of materials that, in his opinion, satisfy the requirements of this Code and, after listing, may be used to fulfill the requirements of this Code.

(9) Every *mobile home* and off-site manufactured house that is constructed after May 31, 1981, shall be certified by the Canadian Standards Association, or by an organization approved for this purpose by the Director, to confirm that the unit complies with the performance required by this Code.

(10) Every relocatable industrial camp *building*, that is constructed after May 31, 1981, 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.

(11) The Director may issue lists of third party inspection and certification agencies that, in his opinion, are qualified to certify products or manufacturers for performance to the requirements of this Code.

(12) 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.

SUBSECTION 1.5.5. CERTIFICATION

1.5.5.1. If requested by the *authority having jurisdiction*, an owner shall provide written certification by a qualified person to certify compliance with this Code and with any *permits* issued.

SUBSECTION 1.5.6. OCCUPANCY

1.5.6.1.(1) An owner shall obtain an *occupancy permit*, if required by the *authority having jurisdiction*, or permission in writing to occupy from the *authority having jurisdiction*, before any

(a) *occupancy of a building after*

(i) construction,

(ii) partial demolition, or

(iii) *alteration of that building*, and

(b) change in the *occupancy of a building*.

1.5.6.2. 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* for the accepted use before completion of construction or demolition.

1.5.6.3.(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 *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.

SUBSECTION 1.5.7. UNSAFE CONDITIONS

1.5.7.1. If any *building* is in an *unsafe condition*, the owner shall forthwith take all necessary action to correct the condition.

1.5.7.2. The *authority having jurisdiction* may, by notice in writing, order the owner of any *building* to correct any *unsafe condition*.

1.5.7.3. 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.

1.5.7.4. The *authority having jurisdiction* shall accept any construction or condition that lawfully existed before May 31, 1981 if the construction or condition does not constitute an *unsafe condition*.

SUBSECTION 1.5.8. FAILURES

1.5.8.1.(1) If a failure occurs, with the potential to cause injury or loss of life, the owner or the owner's agent shall submit a report, if requested by the Director or the *authority having jurisdiction*, to the *authority having jurisdiction*, and a copy 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, and
- (d) the nature of the failure.

SUBSECTION 1.5.9. ASBESTOS

1.5.9.1.(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 sytem.

(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*.

SUBSECTION 1.5.10. PROHIBITIONS

1.5.10.1.(1) No person

- (a) shall fail to complete, before occupancy, construction or demolition required by the examined plans, specifications and documents, 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*.

SUBSECTION 1.5.11. PREVIOUS PERMITS

1.5.11.1. This Code, or any amendment to it, shall not affect the rights of an *owner* under a *permit* issued before the effective date of this Code, if the *owner* has started work within 6 months of the date the *permit* was issued and has actively carried out work after starting.

2 Part 2 of the National Building Code of Canada 1980 is amended

(a) In Subsection 2.1.1. by striking out "and 8" and substituting ", 8 and 11";

(b) In Subsection 2.1.2. by adding "Except as permitted by Subsection 2.1.5.," before "Parts 3";

(c) In Subsection 2.1.3. by adding "Except as permitted by Subsection 2.1.5.," before "Part 9";

(d) by adding the following after Subsection 2.1.4.:

SUBSECTION 2.1.5.

2.1.5.1.(1) Part 10 applies to *buildings* 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 one *storey buildings*

(a) without sleeping accommodation, that do not exceed 1200 square metres in *building area*, and

(b) with sleeping accommodation, that do not exceed 600 square metres in *building area*.

(e) In Subsection 2.2.3. by striking out "30 June, 1979" and substituting "31 October, 1980";

(f) by repealing Article 2.3.1.1. and substituting the following:

2.3.1.1. The climatic data for the design of *buildings* in Alberta are given in Part 11.

(g) In Clause 2.4.2.2.(1)(c) by striking out "datufm" and substituting "datum";

(h) in Clause 2.4.3.1.(1)(c) by striking out "rating" and substituting "rating";

3 Part 3 of the National Building Code of Canada 1980 is amended

(a) In Article 3.1.2.1.

(i) In Sentence (1) by striking out "(4) to (6)" and substituting "(4) to (7)";

(ii) in Sentence (6) by adding "and mentally capable of making decisions to evacuate during an emergency" after "occupants are ambulatory";

(iii) by adding the following after Sentence (6):

(7) Facilities for pre-school programmes, involving not more than 3 h attendance per day, in which no child is less than 3.5 years old, may be classified as Group A, Division 2 occupancy.

(a.1) In Table 3.1.2.A. by

(i) striking out "Day-care centres" in the examples for Group

(5)

A, Division 2 and by adding "Day-care centres" in the examples for Group B, Division 2;

(5)

(ii) by adding " See Sentence 3.1.2.1.(7)" in the Notes to Table 3.1.2.A.;

(a.2) In Article 3.1.3.1. by repealing Sentence (5) and substituting the following:

(5) If a major occupancy is supported above another major occupancy the fire-resistance rating of the structural assemblies supporting the assembly separating the two major occupancies shall be not less than the fire-resistance rating required by Article 3.1.3.3. for the fire separation between the major occupancies.

(b) In Article 3.1.3.3. by adding the following after Sentence (8):

(9) Group D major occupancies shall be separated from Group E and Group F, Division 2 and 3 major occupancies by a fire separation having a fire-resistance rating not less than 1 h.

(10) Group E major occupancies shall be separated from Group F, Division 2 and 3 major occupancies by a fire separation having a fire-resistance rating not less than 1 h.

(11) Group F, Division 2 major occupancies shall be separated from Group F, Division 3 major occupancies by a fire separation having a fire-resistance rating not less than 1 h.

(b.1) in Article 3.1.4.1.

(i) in Sentence (2) by striking out "Foamed plastics" and substituting "Foamed plastics";

(ii) by repealing Clauses 3.1.4.1.(2)(a) and (b) and substituting the following:

one of the finishes described in Clause 3.1.4.5.(2)(e).

(iii) by adding the following after Sentence (2):

(3) Subject to Sentences (4) and (5), foamed plastic within an exterior metal panel wall assembly, or above a metal roof deck, in a building classified as Group F, Division 3 occupancy,

is exempt from the requirement for protection from the *building* interior if

- (a) the *building* is not more than 1 storey in *building height*,
 - (b) the *building area* is not greater than the area permitted in this Code for unsprinklered *combustible construction*, and
 - (c) the exterior metal panel wall assembly or the metal roof deck is exposed to a space that is
 - (i) used for cold storage at temperatures below 5 degrees C,
 - (ii) unoccupied, except for occasional maintenance, and used as a compressor station or a pumphouse,
 - (iii) *sprinklered* and used as a *storage garage*, or
 - (iv) *sprinklered* and used as a warehouse and contains no production, sales or display facilities.
- (4) All surfaces of *foamed plastic* within an exterior metal panel wall assembly shall be protected by sheet metal not less than 0.48 mm thick with a melting point not less than 750 degrees C.
- (5) *Foamed plastic* above a metal roof deck shall be protected from the *building* interior by sheet metal not less than 0.48 mm thick with a melting point not less than 750 degrees C.
- (6) *Foamed plastic interior trim* may be used without *thermal barrier* protection in *buildings* permitted to be of *combustible construction* if it covers not more than 5% of the wall or ceiling area to which it is attached and the *flame-spread rating* is not more than 150.

(b.2) in Article 3.1.4.4. by repealing Sentences 3.1.4.4.(2) to (7) and substituting the following:

- (2) The dimensions given in this Article for solid sawn lumber used in *heavy timber construction* shall conform to CSA O141-1970, "Softwood Lumber".
- (3) Except as provided in Sentences (4) to (6), the minimum dimensions of wood elements in *heavy timber construction* shall conform to Table 3.1.4.A.

Table 3.1.4.A.

Forming Part of Sentence 3.1.4.4.(3)

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

(4) Roof arches supported on the top 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 that is 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 not less than 19 mm thick tongued and grooved flooring laid cross-wise or diagonally, or not less than 12.5 mm thick tongued and grooved phenolic-bonded plywood or 12.5 mm thick tongued and grooved phenolic-bonded waferboard, and

(b) laid not closer than 15 mm to walls to provide for expansion, and the gap covered at the top or bottom.

(6) Roofs shall be

(a) not less than 28 mm thick, tongued and grooved phenolic-bonded plywood, or

(b) glued-laminated or solid sawn plank that is

(i) not less than 38 mm thick, splined or tongued and grooved, or

(ii) 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 points of support.

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

(c) In Sentence 3.1.4.5.(2)

(i) by striking out "thermal barrier" wherever it occurs and substituting "thermal barrier";

(ii) by striking out "foamed plastic" wherever it occurs and substituting "foamed plastic";

(iii) by striking out "foamed plastics" wherever it occurs and substituting "foamed plastics";

(iv) by striking out "or" in Subclause (e)(iv);

(v) by adding ", or" at the end of Subclause (e)(v), and by adding the following after Subclause (e)(v):

(vi) any thermal barrier that meets or surpasses classification A when tested in accordance with ULC-S124-1976, "Standard Method of Test for the Evaluation of Protective Coverings for Foamed Plastic";

(vi) by striking out Clause (g) and substituting the following:

(g) insulation,

(i) including foamed plastics, installed above concrete roof decks, outside concrete foundation walls below ground level and beneath concrete slabs-on-ground, and

(ii) excluding foamed plastics, installed above metal roof decks, except as permitted by Sentence 3.1.4.4.(3);

(vii) in Subclause (h)(iv) by striking out "ULC-S102.2-1978" and substituting "CAN4-S102.2-79";

(viii) by striking out "and" at the end of Clause (h);

(ix) by adding "and" at the end of Clause (i), and by adding the following after Clause (i):

(j) wood nailer facings to parapets, not more than 600 mm in height, if the facings and any roof membranes covering the facings are protected by sheet steel, aluminum, or copper flashing.

(c.1) in Sentence 3.1.4.5.(3) by striking out "foamed plastics" in Clauses (g) and (h) and substituting "foamed plastics";

(c.2) in Subsection 3.1.4. by repealing Article 3.1.4.6.;

(d) In Sentence 3.1.5.4.(1) by striking out "3.1.3.1.(5)";

(d.1) In Article 3.1.6.2. by adding the following after Sentence (2):

(3) Foamed plastic shall not be used in any fire separation.

(d.2) in Sentence 3.1.6.8.(2) by striking out "and" at the end of Subclause (d)(i), adding "and" at the end of Subclause (d)(ii), and adding the following after Subclause (d)(ii):

(iii) the total area of wired glass in all openings in a fire separation between 2 fire compartments is not more than 11 square metres if either fire compartment is not sprinklered, or not more than 22 square metres if both fire compartments are sprinklered.

(e) in Article 3.1.7.2. by repealing Sentence (2) and substituting the following:

(2) Except as permitted by Sentences (3), (4) and (5), no combustible drain, waste or vent piping shall be used in a plumbing system within a building if any part of the plumbing system is located within or passes through a fire separation required to have a fire-resistance rating.

(3) If drain, waste or vent piping passes through a vertical fire separation, the piping within a fire compartment on one side of the fire separation may be combustible.

(4) If 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, if no combustible piping passes through the wall of or is located within the fire separation or the vertical service space.

(5) 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 if

(a) the combustible piping is within the basement and is restricted to a single fire compartment, and

(b) the basement is not more than 1 storey in height.

(e.1) in Article 3.1.8.1. by adding the following after Sentence (13):

(14) In a building of noncombustible construction a firewall may be offset at any intermediate floor construction if

(a) the fire separation for the complete firewall assembly is continuous, and

(b) the offset floor construction and all supporting elements have a fire-resistance rating not less than that required for the firewall and the materials conform to Sentence (5).

(e.2) in Sentence 3.1.9.1.(2) by striking out "foamed plastic" and substituting "foamed plastic";

(f) in Article 3.1.10.1.

(i) in Sentence (1) by striking out "ULC-S102-1978" and substituting "CAN4-S102-79";

(ii) in Sentence (2) by striking out "ULC-S102.2-1978" and substituting "CAN4-S102.2-79";

(f.1) in Article 3.1.11.1.

(i) in Clause (2)(a) by striking out "Fire Tests" and substituting "Fire Test";

(ii) in Clause (2)(b) by striking out "ULC-S102.2-1978" and substituting "CAN4-S102.2-79";

(f.2) in Article 3.1.13.1. by striking out "Test Method" and substituting "Standard Test Methods";

(g) in Sentence 3.2.2.8.(1) by striking out "fire-reistance" and substituting "fire-resistance";

(g.1) in Sentence 3.2.2.19.(2) by repealing Clause (f) and substituting the following:

(f) roof assemblies shall have a 1 h fire-resistance rating, except that heavy timber construction, noncombustible construction without a fire-resistance rating, or combinations thereof may be used if every part of the roof assembly is not less than 6 m above the main floor or balcony and carries no loads other than normal roof loads, including access walks, ventilating and sound or similar equipment, except that the restriction concerning minimum distance shall not apply to

- (i) an inclined and stepped floor ascending from the main floor and which is used for seating purposes only,
- (ii) a balcony used for seating purposes only,
- (iii) a walkway used only as a means of egress, and

(g.2) In Sentence 3.2.2.20.(2) by repealing Clause (f) and substituting the following:

(f) roof assemblies shall have a 1 h fire-resistance rating, except that this requirement is waived if every part of the roof assembly is not less than 6 m above the main floor or balcony and carries no loads other than normal roof loads, including access walks and ventilating and sound or similar equipment, except that the restriction concerning minimum distance shall not apply to

- (i) an inclined and stepped floor ascending from the main floor and which is used for seating purposes only,
- (ii) a balcony used for seating purposes only, or
- (iii) a walkway used only as a means of egress, and

(h) in Clause 3.2.2.26.(1)(a) by adding ", except as permitted by Sentence 3.2.2.27.(4)" after "building height";

(h.1) in Article 3.2.2.27. by adding the following after Sentence (3):

(4) Notwithstanding Sentence (1) a building may be constructed to conform to Sentence 3.2.2.26.(2) if,

- (a) the building contains not more than 4 storeys,
- (b) the area limits of clauses 3.2.2.26.(1)(b) and (c) are not exceeded,
- (c) the exterior walls of the lowest storey are of noncombustible construction, and
- (d) the building is not placed above a storage garage considered as a separate building under Article 3.2.1.3.

(h.2) In Clause 3.2.2.28.(2)(e) by striking out "mezzanines" and substituting "mezzanines";

(i) In Sentence 3.2.3.2.(1) by adding "and any exterior wall that encloses an attic or roof space" after "uppermost ceiling";

(i.1) in Sentence 3.2.3.6.(1) by striking out "Sentence 6.2.2.2.(6)" in Clause (a) and substituting "Sentence 6.2.2.2.(3)";

(i.2) In Table 3.2.4.A. by striking out

Group B, Division 1 and 2

10 detained or having sleeping
accommodation

and substituting the following:

Group B, Division 1	0 person detained (Type 1, 2 or 3 system)
	10 persons detained (Type 4 or 5 system)
Group B, Division 2 (except children's custodial homes, convalescent homes, day-care centres, homes for the aged and orphanages)	10 persons having sleeping accommodation
Group B, Division 2 (children's custodial homes, convalescent homes, day-care centres, homes for the aged and orphanages)	10 persons

(j) in Article 3.2.4.1.

(i) by repealing Sentence (2) and substituting the following:

(2) A fire alarm system is not required in a *building*, not more than 3 storeys in *building height*, containing only *dwelling units* if

(a) not more than 4 *dwelling units* share a *public corridor* or an *exit*, or

(b) each *dwelling unit* has direct access to the outdoors by a door

(i) at ground level, or

(ii) leading to a balcony with *exit stairs* to ground level.

(ii) by repealing Sentence (5) and substituting the following:

(5) A Type 4 or 5 system shall be installed in Group B *occupancies* other than

(a) children's custodial homes, convalescent homes, day-care centres, homes for the aged and orphanages in *buildings* not more than 3 storeys in *building height*, and

(b) Group B, Division 1 *occupancies* with not more than 10 persons detained.

(j.1) in Article 3.2.4.4.

(i) in Sentences (2) and (3) by striking out "Except as provided in Sentence (8)" and substituting "Except as provided in Sentence (7)";

(ii) in Sentence (6) by striking out "ULC-S524-1978, "Standard for the Installation of Fire Alarm Systems and Emergency Voice Communication Systems," " and substituting "ULC-S524-M1980, "Standard for the Installation of Fire Alarm Systems",";

(iii) in Clause (6)(c) by striking out "3.3.3.5." and substituting "3.3.3.6.";

(iv) by adding the following after Sentence (8):

(9) 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.

(10) In a Group B, Division 2 *occupancy* each sleeping room *smoke detector* required by Clause 3.2.4.4.(4)(a) shall be individually annunciated on a panel at a continuously attended station within the zone containing the *smoke detector*.

(11) *Heat detectors* or *smoke detectors* need not be installed in a room used for storage if the room is less than 1 square metre in area unless

(a) the room is a janitor's closet, or

(b) the room is used for the storage of hazardous substances.

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

(j.2) in Sentence 3.2.4.6.(1) by striking out "ULC-S524-1978, "Standard for the Installation of Fire Systems and Emergency Voice Communication Systems." " and substituting "ULC-S524-M1980, "Standard for the Installation of Fire Alarm Systems." ";

(k) in Article 3.2.4.8. by repealing Sentence (1) and substituting the following:

(1) *Smoke alarms* conforming to ULC-S531-1978, "Standard for Smoke Alarms" shall be installed in each *dwelling unit* and, except for *institutional occupancies* in which there is a fire alarm system, in each sleeping room not within a *dwelling unit*.

(k.1) in Subsection 3.2.5.

(i) in Article 3.2.5.2. by adding the following after Sentence (6):

(7) Compliance with this Article is not required for an *existing building* or a *new building* in which construction was started before May 31, 1981.

(ii) by repealing Article 3.2.5.3. and substituting the following:

3.2.5.3.(1) A supply of water, acceptable to the fire authority, shall be provided for every *building* for firefighting.

(2) Compliance with Sentence (1) is not required for an *existing building* or for a *new building* in which construction was started before May 31, 1981.

(k.2) in Article 3.2.5.4. by adding the following after Sentence (12):

(13) Every 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.

(l) in Article 3.2.5.6. by striking out "the appropriate provincial or municipal regulations or, in the absence of such regulations, the National Fire Code of Canada 1980." and substituting "The Fire Prevention Act and regulations made pursuant to that Act.";

(l.1) In Sentence 3.2.6.2.(4) by striking out "a fire fighter's elevator, as required by Article 3.2.6.4." and substituting "an elevator for use by fire fighters, as required by Sentence 3.2.6.4.(1)";

(l.2) In Sentence 3.2.6.2.(5) by adding "(See Appendix A)" at the end;

(m) in Article 3.2.6.3. by repealing Sentences (1) to (4) and substituting the following:

3.2.6.3.(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 operation when subjected to the standard

fire exposure described in ULC-S101-1977, "Standard Methods of Fire Endurance Tests of Building Construction and Materials" for a period of not less than 1 h.

(m.1) in Article 3.2.6.4. by repealing Sentences (1) to (7) and substituting the following:

3.2.6.4.(1) At least 1 elevator shall be provided and shall have a useable platform area not less than 2.2 square metres, and shall be capable of carrying a load of 900 kg from a street floor landing to the top floor that it serves in not more than 1 min.

(2) Except when Measure K of Chapter 3, "Measures for Fire Safety in High Buildings" of the Supplement to the NBC 1980 is used, each elevator 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-S104-77, "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) Except as provided in Sentence (4), the elevator described in Sentence (1) shall be capable of providing transportation from the street floor to every floor that is above grade in the building, normally served by the elevator system.

(4) If it is necessary to change elevators to reach any floor referred to in Sentence (3), the system shall be designed so that not more than 1 change of elevators is required when travelling from a street floor to any floor in the building.

(5) The elevator described in Sentence (1) shall be identified on the floor containing the central alarm and control facility described in Article 3.2.6.8., and at any interchange level described in Sentence (4).

(6) If Measure K of Chapter 3, "Measures for Fire Safety in High Buildings" of the Supplement to the NBC 1980 is used, at least one elevator conforming to Sentences (1), (3), (4) and (5) shall be provided in each smoke control region.

(m.2) in Sentence 3.2.6.9.(3) by striking out "ULC-S524-1978, "Standard for the Installation of Fire Alarm Systems and Emergency Voice Communication Systems." " and substituting "ULC-S524-M1980, "Standard for the Installation of Fire Alarm Systems".";

(n) in Clause 3.2.6.11.(4)(a) by striking out "in a building that is more than 36 m in height measured between grade and the floor level of the top storey and every fire fighter's elevator";

(n.1) in Subsection 3.2.7.

(i) by striking out "public building" in Articles 3.2.7.1. and 3.2.7.2. and substituting "barrier free building";

(ii) by striking out "public buildings" in Articles 3.2.7.2. and 3.2.7.3. and substituting "barrier free buildings";

(iii) by adding the following after Article 3.2.7.3.:

3.2.7.4.(1) If residential projects are funded in part or in whole by the Government of Alberta, a project of 25 dwelling units or over shall contain dwelling units designed for the

handicapped, in conformance with the ACNBC publication "Building Standards for the Handicapped 1980".

(2) The number of *dwelling units* for the handicapped to be provided in projects referred to in Sentence (1) shall be:

- (a) 1 in a project of 25 to 50 *dwelling units*;
- (b) 2 in a project of 51 to 100 *dwelling units*;
- (c) 3 in a project of 101 to 200 *dwelling units*;
- (d) 4 in a project exceeding 200 *dwelling units*;

3.2.7.5.(1) The Director may grant relaxation of one or more of the requirements of Articles 3.2.7.1. to 3.2.7.4. if an *owner* can demonstrate to the satisfaction of the Director that

- (a) the specific requirements are unnecessary, or
- (b) extraordinary circumstances prevent conformance.

(n.2) In Subsection 3.2.8.

(I) in sentence 3.2.8.4.(1) by striking out "Except as provided in sentence (2).";

(II) by repealing Sentence 3.2.8.4.(2);

(o) In Clause 3.2.9.3.(1)(d) by striking out "door of the vestibule measured along the path of *exit* travel" and substituting "nearest door of the vestibule measured along the path of travel to *exit*";

(o.1) In Sentence 3.3.1.1.(2) by striking out "the appropriate provincial or municipal regulations or, in the absence of such regulations, in conformance with the National Fire Code of Canada 1980" and substituting "The Fire Prevention Act and regulations made pursuant to that Act";

(o.2) In Article 3.3.1.2. by adding the following after Sentence (2):

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

(4) Compliance with sentence (3) is not required for an *existing building* or a *new building* in which construction was started before May 31, 1981.

(p) In Article 3.3.1.4. by adding the following after Sentence (4):

(5) Notwithstanding Clause 3.3.1.4.(1)(c), operating suites in Group B, Division 2 *major occupancies* do not need 2 egress doors if

- (a) the area of the suite is less than 150 square metres,
- (b) the distance from any point in the suite to the egress door is less than 15 m, and
- (c) the egress door opens onto a corridor leading directly to an *exit*.

(p.1) in Subsection 3.3.1. by adding the following after Article 3.3.1.14.:

3.3.1.15. 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* 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.

3.3.1.16. If an *occupancy* involves metal welding or flame cutting operations the room in which the metal welding or flame cutting is undertaken shall have a concrete floor and the room shall be separated from the remainder of the *building* by a *fire separation* having a *fire-resistance rating* not less than 2 h except that

the fire separation is not required if the operation takes place entirely within a Group F major occupancy.

3.3.1.17. Except for a corridor that is entirely within a suite a dead end corridor shall be not more than 3 m in length.

(p.2) in Subsection 3.3.2.

(i) in Article 3.3.2.2. by adding the following after Sentence (3):

(4) Storage rooms, more than 1 square metre in area, in assembly occupancies 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.

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

(6) Each suite shall be separated from adjoining suites by construction 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.

(ii) in Sentence 3.3.2.7.(2) by striking out "corridor or adjacent" and substituting "corridor and adjacent";

(iii) by repealing Article 3.3.2.8.;

(iv) by adding the following after Article 3.3.2.15.:

3.3.2.16.(1) Sentence (2) applies to kitchens and storerooms that are operated in conjunction with restaurants as defined in the Provincial Board of Health Regulations Respecting Restaurants (Alta. Reg. 399/70), as amended or replaced from time to time.

(2) Walls and ceilings in every kitchen and storeroom shall be plastered or shall be finished with a durable material suitable for cleansing by washing and shall satisfy the regulation referred to in Sentence (1).

(v) in Sentence 3.3.2.10.(3) by striking out "600 m" and substituting "600 mm";

(q) in Article 3.3.3.2. by adding the following after Sentence (2):

(3) Storage rooms, more than 1 square metre in area, in institutional occupancies 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.

(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.

(q.1) in Sentence 3.3.3.3.(1) by adding ", and" at the end of Subclause (b), by striking out ", and" at the end of Subclause (c) and by repealing Subclause (d);

(q.2) in Sentence 3.3.3.3.(3)

(i) by striking out "The requirement" and substituting "In an active treatment hospital the requirement";

(ii) by striking out "(See Appendix A)";

(r) in Clause 3.3.3.3.(5)(b) by striking out "2 134" and substituting "2 100";

(r.1) in Subsection 3.3.3. by adding the following after Article 3.3.3.7.:

3.3.3.8. Sleeping rooms in *institutional occupancies* shall be provided with windows whose unobstructed glass area conforms with Table 9.7.2.A.

(r.2) by repealing Article 3.3.4.4.;

(s) in Article 3.3.5.4. by striking out "Except as provided in Clause 3.3.5.5.(1)(e).";

(s.1) by repealing Article 3.3.5.5.;

(s.2) in Subsection 3.3.6. by repealing Article 3.3.6.6. and substituting the following:

3.3.6.6. Each *suite* shall be separated from adjoining *suites* by construction 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.

(t) in Subsection 3.3.7. by renumbering Article 3.3.7.2. as Sentence 3.3.7.2.(1), and adding the following after Sentence 3.3.7.2.(1):

(2) Each *suite* shall be separated from adjoining *suites* by construction 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.

(t.1) in Article 3.3.7.3. by striking out "appropriate provincial and municipal regulations or, in the absence of such regulations, in conformance with the National Fire Code of Canada 1980" and substituting "The Fire Prevention Act and regulations made pursuant to that Act";

(t.2) in Article 3.3.7.8. by repealing Sentences (1) and (2) and substituting the following:

3.3.7.8.(1) Facilities for the dispensing of gasoline, or associated products that have a flash point below 38 degrees C as determined by the closed cup method, shall not be installed above any space intended for occupancy.

(2) Facilities for the dispensing of gasoline, or associated products that have a flash point below 38 degrees C as determined by the closed cup method, shall not be installed in any *building*, except that this requirement does not apply to a canopy which is open on at least 75% of its perimeter, or, when *acceptable* to a *building* of Group F occupancy that complies with regulations made pursuant to The Fire Prevention Act.

(u) in Subsection 3.3.7. by repealing Article 3.3.7.10.;

(u.1) in Subsection 3.4.1. by adding the following after Article 3.4.1.4.:

3.4.1.5. *Combustible* glazing shall not be used in wall or ceiling assemblies of an *exit*.

(u.2) in Sentence 3.4.2.1.(1) by striking out "Sentences (2) to (4)" and substituting "Sentences (2), (3), (4) and (7)";

(v) in Article 3.4.2.1. by adding the following after Sentence (6):

(7) *Service rooms* not more than 150 square metres in area, within roof-top enclosures, do not require more than 1 *exit* if there is an alternate egress door leading to a separate *means of egress*.

(v.1) in Sentence 3.4.3.5.(1) by striking out "2 150" and substituting "2 100";

(v.2) in Article 3.4.6.1.

(i) by striking out "or" at the end of Clause (1)(c), adding "or" at the end of Clause (1)(d), and adding the following after Clause (1)(d):

(e) a room, or floor area in Group A occupancies having an occupant load of more than 60 persons, except as provided in Clause 3.3.2.4.(2)(a);

(ii) by repealing Sentence (5);

(w) In Sentence 3.4.8.

(i) by repealing Sentence 3.4.8.9.(1) and substituting the following:

3.4.8.9.(1) Stair treads shall have a minimum run of 230 mm exclusive of nosing and stair risers shall have a maximum rise of 200 mm and a minimum rise of 125 mm.

(ii) in Sentence 3.4.8.14.(2) by striking out "existing buildings" and substituting "existing buildings";

(w.1) In Sentence 3.5.2.8.(1) by striking out "appropriate provincial or municipal regulations, or in the absence of such regulations, by the provisions of CSA C22.1-1978, "Canadian Electrical Code, Part I," " and substituting "The Electrical Protection Act and regulations made pursuant to that Act,";

(w.2) in Article 3.5.3.1.

(i) by repealing Sentence (1) and substituting the following:

3.5.3.1.(1) Except as provided by Sentence 3.5.3.2.(2), every vertical service space shall be separated from the remainder of the building by a fire separation having a fire-resistance rating conforming to Table 3.5.3.A. for the grade of fire separation required for the floor assemblies of the storeys that it penetrates.

Table 3.5.3.A.

Forming Part of Sentence 3.5.3.1.(1)

Grade of Fire Separation Floor Assembly h	Minimum Fire- Resistance Rating of Vertical Service Spaces h	Minimum Fire- Resistance Rating of Elevator Shafts h
not more than 1	0.75	0.75
1.5	1	1
2	1	1.5
3	1.5	2
4	2	3
Column 1	2	3

(ii) in Sentence (7) by striking out "Foamed plastic" and substituting "Foamed plastic";

(x) in Sentence 3.5.3.2.(6) by striking out "refuse chute" and substituting "refuse chute,";

(x.1) in Article 3.5.4.3.

(i) by repealing Sentence (1) and substituting the following:

(1) Buildings shall be provided with permanent access to the roof if they are more than 4 m in height from grade to roof

elevation and have heating, ventilating or air-conditioning equipment installed on the roof.

(ii) by adding the following after Sentence (4):

(5) *Buildings more than 3 storeys in building height, having a roof slope less than 1:4, shall be provided with direct access by an interior stairway to all main roof areas.*

(y) *in Article 3.5.5.1. in Sentences (1) and (2) by striking out "appropriate provincial requirements or, in the absence of such requirements, in conformance with CSA B44-1975, "Safety Code for Elevators, Dumbwaiters, Escalators, and Moving Walks." and substituting "The Elevator and Fixed Conveyances Act and regulations made pursuant to that Act.";*

(y.1) *in Article 3.6.4.2.*

(i) *in Sentence (6) by striking out "Group D occupancies and for restaurants,";*

(ii) *in Column 2 of Table 3.6.4.A. by striking out "6 plus 1 for each" and substituting "7 plus 1 for each";*

(iii) *in Column 3 of Table 3.6.4.A. by striking out "8 plus 1 for each" and substituting "9 plus 1 for each";*

(iv) *in Sentence (7) by striking out "and day care centres";*

(v) *in Sentence (9) by striking out "institutional occupancies" and substituting "Group B, Division 1 occupancies";*

(vi) *in Column 2 of Table 3.6.4.B. by striking out "2 plus 1 for each" and substituting "3 plus 1 for each";*

(vii) *in Sentence (12) by adding "Group B, Division 2 occupancies, Group D occupancies, establishments primarily serving alcoholic beverages, including lounges, taverns and clubs, and" before "industrial occupancies";*

(viii) *in Column 2 of Table 3.6.4.C. by striking out "5 plus 1 for each" and substituting "6 plus 1 for each";*

(ix) *by adding the following after Sentence (15):*

(16) *Unless otherwise accepted the minimum number of water closets shall be determined according to Article 3.6.4.2. for the occupant load of the occupancy calculated from Table 3.1.14.A., except that for Group D occupancies the occupant load shall be calculated by assuming a net area of 14 square metres for each person.*

(17) *The number of water closets required for dining rooms, restaurants and banquet rooms shall be at least 1 fixture for each 35 males and 1 fixture for each 25 females, except that in washrooms provided for males at least one urinal shall be provided if the male portion of the occupant load is more than 20 persons and this urinal shall be in addition to the one water closet required when the male portion of the occupant load is not more than 35 persons.*

(18) *Facilities provided for employees may be counted as part of those required for the occupancy if those facilities are made accessible to the public.*

(19) *Except for facilities provided for handicapped persons, every cubicle containing a water closet shall have a minimum depth of 1 400 mm and a minimum width of 800 mm.*

(20) *Every urinal shall be installed so that water from the urinal cannot run onto the floor beneath the fixture or onto the walls.*

(21) 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.

(22) No water closet or urinal shall be installed in a room used for sleeping unless *accepted*.

(23) No water closet or urinal shall be installed in a basement unless *acceptable* light and ventilation are provided.

(24) Every room containing sanitary facilities serving one sex only shall be enclosed by a full height door that shall be clearly marked to show the sex served.

(25) Rooms providing separate water closets or urinals for more than 1 male or female shall be designed so that the water closets or urinals are not visible if the doors to the rooms open onto a place where persons of the other sex work or pass.

(z) In Article 3.6.4.4. by striking out "public building" and substituting "barrier free building";

(z.1) in Subsection 3.6.5. by adding the following after Article 3.6.5.1.:

3.6.5.2.(1) Upon completion of the installation of, or the alteration of, a non-flammable medical gas piping system in a new or existing building

(a) the non-flammable medical gas piping system shall be inspected and tested in conformance with CSA Standard Z305.1-1975, "Non-flammable 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 non-flammable medical gas piping system.

3.6.5.3.(1) A non-flammable medical gas piping system shall not be used until the report required by Clause 3.6.5.2.(1)(b) has

(a) been certified by the person making the report that the non-flammable medical gas piping that is the subject of the report conforms to CSA Standard Z305.1-1975, "Non-flammable Medical Gas Piping Systems", and

(b) in the case of a hospital, been filed with and accepted by the Director of Design and Construction, Hospital Services, Department of Hospitals and Medical Care.

3.6.5.4. If an alteration is made to an existing non-flammable 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 Z305.1-1975, "Non-flammable Medical Gas Piping Systems", are affixed to both the existing system and the alteration.

3.6.5.5. Types of air compressors other than water sealed rotary types may be *accepted* if *alterations* are being made to existing non-flammable medical gas piping systems.

4 Part 4 of the National building Code of Canada 1980 is amended

(a) in Table 4.1.10.A. by striking out "See CSA B44-1975, Clause 2.6.2." and substituting "See regulations made pursuant to *The Elevator and Fixed Conveyances Act*";

(b) in Article 4.2.3.8.

(i) by striking out "ASTM A252-77a" and substituting "ASTM A252-80";

(ii) by striking out "ASTM A283-78" and substituting "ASTM A283-79";

(iii) by striking out "ASTM A570-78" and substituting "ASTM A570-79";

(c) in Article 4.3.2.1. by striking out "CSA O86-1976, "Code for the Engineering Design of Wood." " and substituting "CAN3-O86-M1980, "Code for Engineering Design in Wood"."

5 Part 6 of the National Building Code of Canada 1980 is amended

(a) in Sentence 6.1.2.2.(2) by striking out "CSA B51-1975, "Code for the Construction and Inspection of Boilers and Pressure Vessels" " and substituting "The Boilers and Pressure Vessels Act and regulations made pursuant to that Act";

(b) in Subsection 6.2.1.

(i) by repealing Sentence 6.2.1.2.(1) and substituting the following:

6.2.1.2.(1) Heating and air-conditioning equipment shall be installed to 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,

(c) The Electrical Protection Act and regulations made pursuant to that Act,

(d) The Fire Prevention Act and regulations made pursuant to that Act, and

(e) CSA B52-M1977, "Mechanical Refrigeration Code.";

(ii) in Article 6.2.1.3. by striking out "determined in conformance with Subsection 2.3.1." and substituting "the values given in Part 11";

(iii) by repealing Article 6.2.1.6. and substituting the following:

6.2.1.6. Electrical wiring and electrical equipment shall be installed to conform to The Electrical Protection Act and regulations made pursuant to that Act.

(iv) by adding the following after Article 6.2.1.6.:

6.2.1.7. 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.

(c) in Subsection 6.2.2. by repealing Article 6.2.2.2. and substituting the following:

6.2.2.2.(1) Except as permitted by Sentence (3), an enclosed storage garage shall have a mechanical ventilation system designed to limit the maximum concentration of carbon monoxide at any time to not more than 100 parts per million parts of air.

(2) Mechanical ventilation systems required by Sentence (1) shall include automatic ventilating fan control by means of acceptable carbon monoxide monitoring devices.

(3) The requirements of Sentences (1) and (2) are waived for those storeys in a storage garage in which

(a) at least 25% of the total area of the perimeter walls on the storey is open to the outdoors and distributed to provide cross ventilation,

(b) no portion of the storey is more than 1 m below the adjacent ground level, and

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

(d) *In Subsection 6.2.3.*

(i) *in Sentence 6.2.3.1.(2) by adding "in residential occupancies" after "air-conditioning systems";*

(ii) *in Clause 6.2.3.2.(4)(a) by striking out "CSA C22.1-1978, "Safety Standards for Electrical Installations." " and substituting "The Electrical Protection Act and regulations made pursuant to that Act";*

(iii) *In Sentence 6.2.3.3.(1) by adding "or to manuals issued by SMACNA" after "(Systems)";*

(iv) *by renumbering Article 6.2.3.7. as Sentence 6.2.3.7.(1) and adding the following after Sentence 6.2.3.7.(1):*

(2) A clean-out or pump out shall be included in underground duct systems at every low point of the duct system.

(v) *in Sentence 6.2.3.9.(2) by striking out "smoked-actuated" and substituting "smoke-actuated";*

(vi) *in Sentence 6.2.3.10.(1) by striking out "asbestos paper" and substituting "acceptable ceramic fibre paper";*

(vii) *in Sentence 6.2.3.14.(1) by striking out "ULC S111-1977" and substituting "CAN4-S111-79";*

(viii) *by adding the following after Article 6.2.3.15.:*

6.2.3.16.(1) Ducts in or under slabs-on-ground shall be of metal and of gauges recommended by ASHRAE or SMACNA and they shall be surrounded by concrete with a minimum thickness of 50 mm.

(2) If perimeter warm air ducts are installed in or under slabs within 900 mm of ground level, not less than 25 mm thickness of rigid water-resistant type insulation with 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.

6.2.3.17.(1) This Article applies to projection rooms in which equipment is used to handle film more than 16 mm in width.

(2) Unless acceptable engineering calculations, demonstrating the adequacy of the ventilation system, are submitted to the authority having jurisdiction, a projection room shall be provided with 2 or more fresh air inlet ducts, located at opposite ends of the room, with screened openings terminating within 300 mm of the floor.

(3) The supply air to a projection room shall be independent of any other building air supply system.

(4) 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 degrees C to 24 degrees C.

(5) In addition to the air supply requirements for the lamp exhaust systems, the air supply system for a projection room shall be capable of supplying not less than 0.12 cubic m/s for the first projector plus an additional 0.06 cubic m/s for each additional projector, film handling device, floodlight, spot-light, or similar piece of equipment.

(6) A projection room shall be provided with one or more exhaust air outlets which may be manifolded into a single duct outside the room, and the outlets shall be located to ensure circulation of air throughout the room.

(7) Projection room exhaust air systems shall be independent of any other air system in the building.

(8) Projection room exhaust air ducts shall terminate at the exterior of the *building* in a location where exhaust air cannot readily enter any supply air system.

(9) A projection room exhaust system shall be mechanically operated and fan motors shall be located outside the duct system.

(10) Each projection machine shall be provided with an exhaust duct that shall be of rigid material, except for an *acceptable* continuous flexible connector, that will draw air from each lamp and exhaust it directly to the outside of the *building*, and the lamp exhaust system shall not be interconnected with any other system.

(11) In the case of xenon projection equipment, the lamp exhaust system shall exhaust not less than 0.14 cubic m/s for each lamp, but not less than the exhaust volume required or recommended by the equipment manufacturer, and the external temperature of the lamp housing shall be not more than 54 degrees C when operating.

(e) in Sentence 6.2.4.1.(2) by adding, ", except for solid fuel fired appliances, other than stoves, ranges and space heaters" after "shall apply";

(f) In Subsection 6.2.5.

(i) in Article 6.2.5.1.(1) by striking out "the appropriate provincial legislation or, in the absence of such legislation, with CSA B51-1975, "Code for the Construction and Inspection of Boilers and Pressure Vessels" " and substituting "*The Boilers and Pressure Vessels Act* and regulations made pursuant to that Act";

(ii) in Sentence 6.2.5.2.(6) by striking out "6 mm asbestos or asbestos millboard" and substituting "a layer of *acceptable* resilient *noncombustible* insulation";

(iii) by repealing Table 6.2.5.B. and substituting the following:

Table 6.2.5.B.

Forming Part of Article 6.2.5.3.

MINIMUM CLEARANCES TO COMBUSTIBLE MATERIAL WITH SPECIFIED FORMS OF PROTECTION FOR FURNACES AND BOILERS USING SOLID FUEL, mm				
Minimum Protection for Combustible Material	Where in Table 6.2.5.A the minimum clearance is:			
	450 mm		150 mm	
	Above and Sides of Bonnet or Plenum	Jacket Sides and Rear	Above and Sides of Bonnet or Plenum	Jacket Sides and Rear
6 mm acceptable resilient ceramic fibre thermal in- sulation spaced out 25 mm by noncombustible material	380	230	75	50
0.33 mm sheet metal on 6 mm acceptable resilient ceramic fibre thermal insulation	300	230	75	50
0.33 mm sheet metal spaced out 25 mm by noncombustible material	230	150	50	50
0.33 mm sheet metal on 3 mm acceptable resilient ceramic fibre thermal insulation spaced out 25 mm by non- combustible material	230	150	50	50
6 mm acceptable resilient ceramic fibre thermal insu- lation on 25 mm mineral wool batts reinforced with wire mesh or equivalent	150	150	50	50
0.68 mm sheet metal on 25 mm mineral wool batts rein- forced with wire mesh or equivalent	100	75	50	50
6 mm asbestos-cement board	450	450	100	100
Column 1	2	3	4	5

(iv) in Sentence 6.2.5.4.(1) by striking out "the appropriate provincial regulations" and substituting "The Boilers and Pressure Vessels Act and regulations made pursuant to that Act";

(g) in Subsection 6.2.6.

(i) by repealing Table 6.2.6.B. and substituting the following:

Table 6.2.6.B.

Forming Part of Article 6.2.6.2.

MINIMUM CLEARANCES TO COMBUSTIBLE MATERIAL WITH SPECIFIED FORMS OF PROTECTION FOR STOVES, RANGES, SPACE HEATERS AND SERVICE WATER HEATERS USING SOLID FUEL, mm					
Minimum Protection for Combustible Material	Where the Minimum Clearance in Table 6.2.6.A. is:				
	300 mm	450 mm	600 mm	750 mm or 900 mm	
	Sides and Rear	Sides	Sides	Top	Sides and Rear
6 mm <i>acceptable</i> resilient ceramic fibre thermal insula- tion spaced out 25 mm by <i>non- combustible</i> material	150	230	300	750	450
0.33 mm sheet metal on 6 mm <i>acceptable</i> resilient ceramic fibre thermal insulation	150	230	300	600	450
0.33 mm sheet metal spaced out 25 mm by <i>noncombustible</i> material	100	150	200	450	300
6 mm <i>acceptable</i> resilient ceramic fibre thermal insula- tion on 25 mm mineral wool batts reinforced with wire mesh or equivalent	100	150	200	450	300
0.68 mm sheet metal on 25 mm mineral wool batts reinforced with wire mesh or equivalent	50	100	200	450	300
Column 1	2	3	4	5	6

(ii) by repealing Article 6.2.6.3. and substituting the following:

6.2.6.3. Service water heaters shall conform to *The Plumbing and Drainage Act* and regulations made pursuant to that Act.

(h) in Subsection 6.2.8. by repealing Sentence 6.2.8.1.(1) and substituting the following:

6.2.8.1.(1) Indirect service water heaters for installation within the heat exchanger of a boiler shall be installed in accordance with

(a) *The Boilers and Pressure Vessels Act* and regulations made pursuant to that Act, and

(b) *The Plumbing and Drainage Act* and regulations made pursuant to that Act.

(i) in Sentence 6.2.10.5.(7)

(i) by striking out "Foamed plastic" and substituting "Foamed plastic";

(ii) by striking out "located in vertical service spaces or in rooms or spaces other than service spaces";

(j) in Sentence 6.2.11.1.(1) by striking out "to the requirements of the appropriate provincial legislation or, in the absence of such legislation,";

(k) in Subsection 6.3.1. by repealing Article 6.3.1.5. and substituting the following:

6.3.1.5. A protection system for lightning, if used, shall conform to *The Lightning Rod Act* and regulations made pursuant to that Act.

(l) in Clause 6.3.2.1.(2)(a) by striking out "ASTM C315-1978b" and substituting "C315-78c";

(m) in Clause 6.3.2.1.(2)(c) by striking out "ASTM C279-54(1972)" and substituting "ASTM C279-79";

(n) in Clause 6.3.5.1.(5)(b) by striking out "ASTM A525-79" and substituting "ASTM A525-80";

(o) in Subsection 6.3.8. by repealing Table 6.3.8.B. and substituting the following:

Table 6.3.8.B.

Forming Part of Sentence 6.3.8.1.(8)

Minimum Protection for <i>Combustible</i> Material	Minimum Clearance with Protection, mm
6 mm <i>acceptable</i> resilient ceramic fibre thermal insulation spaced out 25 mm by <i>noncombustible</i> material	300
0.33 mm sheet metal on 6 mm <i>acceptable</i> resilient ceramic fibre thermal insulation	300
0.33 mm sheet metal spaced out 25 mm by <i>noncombustible</i> material	230
0.33 mm sheet metal on 3 mm <i>acceptable</i> resilient ceramic fibre thermal insulation spaced out 25 mm by <i>noncombustible</i> material	230
40 mm mineral wool covering on <i>flue pipe</i> or breeching	230
0.68 mm sheet metal on 25 mm mineral wool batts reinforced with wire mesh or equivalent	75
Column 1	2

6 Part 7 of the *National Building Code of Canada 1980* is amended by repealing Article 7.1.2.1. and substituting the following:

7.1.2.1. Every *plumbing system* shall conform to *The Plumbing and Drainage Act* and regulations made pursuant to that Act.

7 Part 8 of the National Building Code of Canada 1980 is amended

(a) in Article 8.1.1.3.

(i) by adding ", alteration or demolition" after "construction";

(ii) by striking out "M79" and substituting "M1980";

(b) in Sentence 8.2.1.2.(1) by striking out "and" at the end of Clause (f), adding "and" at the end of Clause (g) and adding the following after Clause (g):

(h) have, at each opening for pedestrian access, a gate at least 1200 mm high that can be locked or bolted in a closed position to prevent the entry of pedestrians.

(c) in Subsection 8.2.2.

(i) in Article 8.2.2.1. by striking out "the appropriate provincial or municipal regulations or, in the absence of such regulations, the National Fire Code of Canada 1980" and substituting "The Fire Prevention Act and regulations made pursuant to that Act";

(ii) in Sentence 8.2.2.4.(1) by striking out "At least 1 water-type" and substituting "In buildings that are heated, at least one acceptable";

(iii) by repealing Article 8.2.2.5. and substituting the following:

8.2.2.5.(1) At least one portable extinguisher of the dry chemical type with a minimum rating of 2-A, 20-B,C shall be provided

(a) in buildings that are not heated, in

(i) every workshop,

(ii) every storage building for combustible materials, and

(iii) on each storey having a floor area of 500 square metres or less in an enclosed building being constructed or altered, and an additional portable extinguisher shall be provided for each additional 500 square metres of floor area or any fraction thereof, except that this does not apply to buildings of residential occupancy of not more than 2 storeys in building height or a single storey building of any occupancy without basement or cellar,

(b) where flammable liquids are handled or stored,

(c) where temporary oil-fired or gas-fired equipment is used, or

(d) a tar or asphalt kettle is used.

(d) in Subsection 8.2.4. by adding the following after Article 8.2.4.5.:

8.2.4.6. If other measures are not being taken to control the passage of pedestrians past a project site while hoisting or other hazardous operations are underway, every gate required by Clause 8.2.1.2.(1)(h) shall be closed and fastened, and pedestrians diverted away from any area into which material or equipment could fall.

8 Part 9 of the National Building Code of Canada 1980 is amended

(a) by repealing Table 9.3.2.A. and substituting the following:

Table 9.3.2.A.
Forming Part of Article 9.3.2.2.

MINIMUM LUMBER GRADES FOR SPECIFIC END USES								
USE	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				
				Stud	Light Framing	Structural Light Framing	Structural Joists and Planks	Posts and Timbers
	Para 113	Para 114	Para 118	Para 121	Para 122	Para 123	Para 124	Para 131
Stud wall framing (loadbearing members)	-	-	-	Stud	Standard	No. 2	No. 2	-
Stud wall framing (non-loadbearing members)		-	-	Stud	Utility	No. 3	No. 3	-
Plank frame construction (loadbearing members)	3 Common	-	3 Common	-	-	-	No. 2	-
Plank frame construction (non-loadbearing members)	5 Common	-	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
Roof sheathing	3 Common	Standard	3 Common	-	-	-	-	-
Sub-flooring	3 Common	Standard	3 Common	-	-	-	-	-
Wall sheathing required as a nailing base	4 Common	Utility	4 Common	-	-	-	-	-
Wall sheathing not required as a nailing base	5 Common	Economy	5 Common	-	-	-	-	-
Column 1	2	3	4	5	6	7	8	9

(a.1) in Article 9.3.3.2. by striking out "A525-79" and substituting "A525-80";

(a.2) In Table 9.4.2.A.

(i) by striking out "Balconies, residential, not used as passageways" and substituting "Balconies and decks, residential, not used as passageways", and

(ii) by striking out "except in residential occupancies" and substituting "except in residential occupancies";

(b) in Subsection 9.4.3.

(i) by repealing Articles 9.4.3.1. and 9.4.3.2. and substituting the following:

9.4.3.1. Except for the requirements of Articles 9.4.3.2. to 9.4.3.5., design snow load shall be not less than 60% of the ground snow load given in Part 11, but in no case less than 1 kPa on the horizontal roof projection.

9.4.3.2. If the entire width of a roof does not exceed 4.3 m, the design snow load shall be not less than 50% of the ground snow load given in Part 11, but in no case less than 1 kPa on the horizontal roof projection.

(ii) in Article 9.4.3.4. by striking out "not withstanding" and substituting "notwithstanding";

(iii) by adding the following after Article 9.4.3.4.:

9.4.3.5. If roofs are at different levels or there are projections above the roof level, allowance shall be made for the effects of drifting snow in accordance with Part 4.

(b.1) in Table 9.5.2.A. by striking out "passage to laundry and required storage areas" and substituting "passage to laundry and storage areas";

(b.2) In Subsection 9.6.2. by adding the following after Article 9.6.2.2.:

9.6.2.3. Notwithstanding the installation of overhead doors for vehicular access, at least one egress door not less than 1980 mm high and 760 mm wide, swinging on a vertical axis, shall be installed in a storage garage.

(c) in Subsection 9.6.3. by adding the following after Article 9.6.3.2.:

9.6.3.3. The door height from a dwelling unit to an exterior balcony required by Table 9.6.3.A. 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.

(c.1) in Subsection 9.7.2. by adding the following after Article 9.7.2.3.:

9.7.2.4. Openable windows shall not be located in that part of a wall separating a dwelling unit from an attached garage or carport.

(c.2) in Subsection 9.8.3.

(i) by repealing Articles 9.8.3.1. and 9.8.3.2. and substituting the following:

9.8.3.1. Except as permitted in Subsection 9.8.5., interior stairs within dwelling units and exterior stairs serving not more than one dwelling unit shall have a maximum rise of 200 mm, a minimum run of 210 mm and a minimum tread width of 235 mm.

(II) In Article 9.8.3.3. by striking out "The product of the run and rise (expressed in millimetres) for such stairs shall be not less than 45 000 nor more than 48 500.";

(d) In Article 9.8.4.3. by striking out "between the doorway and the stairs" and substituting "between the doorway and the stair, if the door does not swing over the stair";

(d.1) In Subsection 9.8.5. by adding the following after Article 9.8.5.3.:

9.8.5.4. Spiral stairs, not required as part of a means of egress, may be used within dwelling units if

- (a) individual treads turn through an angle not less than 30 degrees,
- (b) the minimum tread width is 150 mm,
- (c) the maximum rise is 230 mm, and
- (d) the average run is not less than 200 mm.

(d.2) In Article 9.8.8.

(I) In Article 9.8.8.1. by adding ", raised deck" after "balcony";

(II) In Article 9.8.8.7. by adding ", raised deck" after "balcony";

(III) In Article 9.8.8.8. by adding "or raised decks" after "balconies";

(e) In Article 9.8.9.1. by striking out "grade" and substituting "ground level";

(e.1) In Articles 9.9.2.7. and 9.9.2.8. by striking out "public building" and substituting "barrier free building";

(e.2) in Article 9.9.3.9. by striking out "Article 9.8.3.7." and substituting "Articles 9.8.3.7. and 9.8.4.6.";

(f) in Article 9.9.6.9. by striking out "a storage garage serving not more than 1 dwelling unit, and except for other";

(f.1) In Subsection 9.9.7. by repealing Articles 9.9.7.2. and 9.9.7.3. and Table 9.9.7.A. and substituting the following:

9.9.7.2. Except for a corridor that is entirely within a suite, a dead end corridor shall be not more than 3 m in length.

(f.2) In Subsection 9.9.8.

(I) In Article 9.9.8.8. by striking out "more than one exit" and substituting "more than one means of egress";

(II) by adding the following after Article 9.9.8.8.:

9.9.8.9. Mobile homes shall have at least 2 exterior doors located remotely from each other.

(g) In Subsection 9.10.2.

(I) by repealing Article 9.10.2.7. and substituting the following:

9.10.2.7.(1) Facilities for the dispensing of gasoline, or associated products that have a flash point below 38 degrees C as determined by the closed cup method, shall not be installed above any space intended for occupancy.

(2) Facilities for the dispensing of gasoline, or associated products that have a flash point below 38 degrees C as determined by the closed cup method, shall not be installed in any building, except that this requirement does not apply to a canopy which is

open on at least 75% of its perimeter, or if acceptable, to a building of industrial occupancy that complies with regulations made pursuant to The Fire Prevention Act.

(ii) in Article 9.10.2.10. by striking out "air-supported structures" and substituting "air-supported structures";

(iii) by adding the following after Article 9.10.2.14.:

9.10.2.15. If an occupancy involves metal welding or flame cutting operations the room in which the metal welding or flame cutting is undertaken shall have a concrete floor and the room shall be separated from the remainder of the building by a fire separation having a fire-resistance rating of not less than 2 h except that the fire separation is not required if the operation takes place entirely within an industrial occupancy.

(g.1) in Subsection 9.10.9.

(i) in Article 9.10.9.24. by striking out "Article 9.10.14.18." and substituting "Article 9.10.14.17.";

(ii) by repealing Article 9.10.9.26. and substituting the following:

9.10.9.26.(1) Except as permitted by Sentences (2), (3) and (4), no combustible drain, waste or vent piping shall be used in a plumbing system within a building if any part of the plumbing system is located within or passes through a fire separation required to have a fire-resistance rating.

(2) If drain, waste or vent piping passes through a vertical fire separation, the piping within a fire compartment on one side of the fire separation may be combustible.

(3) If 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, if no combustible piping passes through the wall of or is located within the fire separation or the vertical service space.

(4) 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 if

(a) the combustible piping is within the basement and is restricted to a single fire compartment, and

(b) the basement is not more than 1 storey in height.

(iii) by adding the following after Article 9.10.9.26.:

9.10.9.27. Except as exempted by Article 9.10.9.28., trunk rooms and storage rooms in residential occupancies shall be separated from the remainder of the building by a fire separation having a fire-resistance rating not less than 45 min.

9.10.9.28. Article 9.10.9.27. does not apply to trunk rooms and storage rooms that are

(a) part of an individual dwelling unit,

(b) part of a sleeping room occupied separately and not within a suite,

(c) part of an individually occupied suite, or

(d) less than 1 square metre in area.

9.10.9.29. 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 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.

9.10.9.30. Foamed plastic shall not be used in any fire separation.

(g.2) In Subsection 9.10.12.

(i) by repealing Article 9.10.12.3. and substituting the following:

9.10.12.3.(1) If a vertical shaft penetrates a floor assembly required to be a fire separation, the shaft shall be separated from the floor area by a fire separation.

(2) Except as required by Article 9.10.12.5., shaft walls required by Sentence (1) to be a fire separation shall conform to Table 9.10.12.A.

(ii) by adding the following after Article 9.10.12.3.:

Table 9.10.12.A.

Forming Part of Article 9.10.12.3.

MINIMUM FIRE-RESISTANCE RATINGS FOR SHAFT WALLS		
Minimum Required Fire-Resistance Rating for Floor Assembly Through Which the Shaft Passes, h	Type of Shaft	
	Exit and Elevator Shafts h	Other Shafts h
not more than 1	0.75	0.75
1.5	1	1
2	1.5	1
Column 1	2	3

(h) In Subsection 9.10.14.

(i) by repealing Articles 9.10.14.2. and 9.10.14.3. and substituting the following:

9.10.14.2.(1) A door assembly having a 20 min fire-protection rating may be used as a closure in

(a) a fire separation, whose fire-resistance rating is not required to be more than 1 h, located between

(i) a public corridor and a suite, or

(ii) a corridor and a sleeping room that is not within a suite, and

(b) other fire separations, whose fire-resistance rating is not required to be more than 45 min, in buildings not more than 3 storeys in building height.

(2) The requirements for noncombustible sills and combustible floor coverings in NFPA 80-1979, "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.

9.10.14.3. Door assemblies required to provide a 20 min *fire-protection rating* may include an unrated wood frame that is not less than 38 mm in thickness.

(ii) by repealing Article 9.10.14.5. and substituting the following:

9.10.14.5.(1) An opening or openings in a *fire separation* having a *fire-resistance rating* of not more than 1 h may be protected by fixed wired glass assemblies that have not been tested in conformance with Article 9.10.4.1. if the wired glass

- (a) is not less than 6 mm thick,
- (b) conforms to CAN2-12.11-M76, "Glass, Wired, Safety",
- (c) is set in steel frames, having a minimum metal thickness of 1.35 mm, and including a glazing stop not less than 20 mm on each side of the glass, and
- (d) is limited in area so that
 - (i) individual panes are not more than 0.84 square metres, with neither height nor width more than 1.4 m,
 - (ii) the maximum area unsupported by structural mullions is not more than 7.5 square metres, and
 - (iii) the total area of wired glass in all openings in a *fire separation* between 2 *fire compartments* is not more than 11 square metres.

(iii) in Article 9.10.14.14. by striking out "1.59 mm thick asbestos" and substituting "acceptable ceramic fibre paper not less than 1.6 mm thick";

(iv) by repealing Article 9.10.14.18.

(h.1) In Subsection 9.10.15.

(i) by renumbering Article 9.10.15.1. as Sentence 9.10.15.1.(1) and adding the following after Sentence 9.10.15.1.(1):

(2) 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 and any exterior wall that encloses an *attic or roof space*, except that if a *building* is divided by *fire separations* into *fire compartments*, the area of *exposing building face* may be calculated for each *fire compartment* if the *fire separations* have not less than a 2 h *fire-resistance rating* in the case of *mercantile and medium hazard industrial occupancies* and not less than a 45 min *fire-resistance rating* in the case of *residential, business and personal services*, and *low hazard industrial occupancies*.

(ii) by repealing Article 9.10.15.2. and substituting the following:

9.10.15.2. In respect to a *building* under consideration, if fire fighting facilities and protective wetting facilities are not available within 10 min of the alarm being received, the *limiting distance* required by Article 9.10.15.1. shall be doubled.

(iii) by adding the following after Article 9.10.15.13:

9.10.15.14. 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 Article 9.10.15.8. if the *building* contains not more than 2 *dwelling units* and not more than 3 *storeys* including any basements.

(h.2) in Article 9.10.16.1. by striking out "foamed plastic" and substituting "foamed plastic";

(l) In Subsection 9.10.18. by adding the following after Article 9.10.18.8.:

9.10.18.9. 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.

(l.1) by repealing Subsection 9.10.21.;

(l.2) In Article 9.13.2.1. by striking out "CSA A123.7-1973, "Asphalt" " and substituting "CSA A123.4-M1979, "Bitumen" ";

(j) In Article 9.14.3.1.

(i) by striking out "ASTM C412-78" and substituting "ASTM C412-79E";

(ii) by striking out "ASTM C444-77" and substituting "ASTM C444-79E";

(j.1) In Subsection 9.14.5. by repealing Article 9.14.5.1. and substituting the following:

9.14.5.1. *Foundation* drains shall drain to a *building* drain, storm drain, drainage ditch, dry well, or to the ground surface.

(j.2) in Article 9.18.3.5. by striking out "when the crawl space is used as a warm-air plenum, or";

(k) by repealing Subsection 9.18.7.;

(k.1) In Subsection 9.20.5.

(i) in Article 9.20.5.1. by adding ", except as permitted in Article 9.20.5.5." after "steel";

(ii) by adding the following after Article 9.20.5.4.:

9.20.5.5. Masonry veneer, not more than 90 mm in thickness, may rest on wood frame construction if all supporting material is pressure treated with preservatives in accordance with CSA O80.15-1974 "Preservative Treatment of Wood for Building Foundation Systems, Basement and Crawl Spaces by Pressure Processes", and designed to carry the superimposed load of the masonry veneer in addition to all other loads.

(k.2) in Subsection 9.21.1.

(i) in Article 9.21.1.4. by striking out "CAN1-B149.1-78, "Installation Code for Natural Gas Burning Appliances and Equipment" or CAN1-B149.2-78, "Installation Code for Propane Burning Appliances and Equipment." " and substituting "The Gas Protection Act and regulations made pursuant to that Act.";

(ii) in Article 9.21.1.5. by striking out "CSA B139-1976, "Installation Code for Oil Burning Equipment." " and substituting "The Fire Prevention Act and regulations made pursuant to that Act.";

(l) in Subsection 9.21.2. by repealing Article 9.21.2.1. and substituting the following:

9.21.2.1. A *chimney flue* serving a fireplace, incinerator or "slow burning" solid fuel fired *appliance* shall not serve any other *appliance*.

(l.1) in Article 9.21.4.4. by striking out "Appendix" and substituting "Appendix A";

(l.2) in Subsection 9.21.5. by repealing Article 9.21.5.2. and substituting the following:

9.21.5.2.(1) Flue pipes connecting a gas-burning appliance to a chimney flue shall conform to *The Gas Protection Act* and regulations made pursuant to that Act.

(2) Flue pipes connecting an oil-burning appliance to a chimney flue shall conform to *The Fire Prevention Act* and regulations made pursuant to that Act.

(m) in Article 9.21.6.5. by striking out "not less tha" and substituting "not less than";

(m.1) in Subsection 9.22.1. by adding the following after Article 9.22.1.3.:

9.22.1.4. Combustion air for a fireplace shall be provided by an air intake other than a door or window.

(n) in Article 9.22.8.1. by striking out "S610-1978" and substituting "S610-1979";

(n.1) in Article 9.23.13.18. by striking out "1977" and substituting "M1980";

(o) In Articles 9.23.14.2., 9.23.15.1., 9.24.3.1., and Table 9.23.16.A. by striking out "O153-1976" and substituting "O153-M1980";

(o.1) in Subsection 9.26.2. by adding the following after Article 9.26.2.3.:

9.26.2.4. Thermal insulation conforming with Table 9.26.2.A. shall be included in *buildings of residential occupancy* and in *garages serving buildings of residential occupancy*, if the *building* or garage is to be heated.

Table 9.26.2.A.

Forming part of Article 9.26.2.4.

THERMAL INSULATION REQUIREMENTS		
LOCATION OF ASSEMBLY IN WHICH INSULATION IS PLACED		MINIMUM THERMAL RESISTANCE $m^2 \cdot ^\circ C/W$
Wall assembly (Except Basements)	<i>Building</i> exterior	2.1
	Between <i>building</i> and attached garage	2.1
	Exterior of heated garage	2.1
Basement and crawl space	Perimeter walls - top to 600 mm below <i>grade</i>	1.4
Floor assembly	Perimeter	2.1
	Exposed cantilevers	4.7
Roof - ceiling assembly	<i>Building</i> - general	6.0
	Heated garage	6.0
Column 1	2	3

(p) In Article 9.26.4.4. by striking out "existing buildings" and substituting "existing buildings";

(p.1) In Subsection 9.26.5.

(i) In Article 9.26.5.1. by adding "and Article 9.26.5.15." after "Article 9.26.5.2.";

(ii) by adding the following after Article 9.26.5.14.:

9.26.5.15. A vapour barrier may be placed within a wall assembly if the location of the vapour barrier is always above the dew point.

(q) in Article 9.27.2.1. by striking out "CSA A123.2-1966, "Asphalt Roofing Surfaced with Mineral Granules,"" and everything following it and substituting the following:

CSA A123.1-M1979, "Asphalt Shingles Surfaced with Mineral Granules",

CSA A123.2-M1979, "Asphalt Coated Roofing Sheets",

CSA A123.3-M1979, "Asphalt or Tar Saturated Roofing Felt",

CSA A123.4-M1979, "Bitumen for Use in Construction of Built-Up Roof Coverings and Dampproofing and Waterproofing Systems",

CSA A123.17-1963, "Asphalt-Saturated Felted Glass-Fibre Mat for Use in Construction of Built-Up Roofs", or

CSA O118.1-M1980, "Western Red Cedar Shingles, Handsplit Western Red Cedar Shakes and Machine-Grooved Shakes".;

(q.1) in Subsection 9.27.15.

(i) by repealing Article 9.27.15.2. and substituting the following:

9.27.15.2. If eave troughs are required, eave troughs and downspouts shall conform to Articles 9.27.15.3. to 9.27.15.5.

(ii) by adding the following after Article 9.27.15.2.:

9.27.15.3.(1) Except as provided in Sentence (2), the hydraulic load in litres from a roof or paved surface is the maximum 15 min rainfall given in Part 11 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) Flow control drains 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) they are located not more than 15 m from the edge of the roof and not more than 30 m from adjacent drains, and
- (e) there is at least one drain for each 900 square metres of roof area.

9.27.15.4. The hydraulic load that drains to an eave trough shall conform to Table 9.27.15.A.

Table 9.27.15.A.

Forming Part of Article 9.27.15.4.

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	100
100	4 000	840	1 200	1 700	2 400
125	6 300	1 500	2 100	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

9.27.15.5. The hydraulic load that drains to a downspout shall conform to Table 9.27.15.B.

Table 9.27.15.B.

Forming Part of Article 9.27.15.5.

Circular Downspout Diameter, mm	Maximum Hydraulic Load, L	Non-Circular Downspout 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

(r) In Article 9.28.7.1. by striking out "CSA O118-1960, "Western Red Cedar Shingles, Machine Grooved Shakes, and Handsplit Red Cedar Shakes." " and substituting "CSA-O118.1-M1980, "Western Red Cedar Shingles, Handsplit Western Red Cedar Shakes and Machine-Grooved Shakes." ";

(r.1) In Article 9.28.8.1. by striking out "21M(1978)" and substituting "21M(1979)";

(s) In Article 9.28.9.1. by striking out "O153-1976" and substituting "O153-M1980";

(s.1) In Article 9.30.1.

(I) In Article 9.30.1.1. by striking out "A82.30-1965" and substituting "A82.30-M1980";

(II) by repealing Articles 9.30.1.2. and 9.30.1.3. and substituting the following:

9.30.1.2. Foamed plastic materials shall be protected in accordance with Part 3.

(t) In Article 9.31.2.3. by striking out "O153-1976" and substituting "O153-M1980";

(t.1) In Subsection 9.32.4. by adding the following after Article 9.32.4.5.:

9.32.4.6. If the plumbing system of a building is connected to a municipal sewer system, roughed-in plumbing for automatic washer drains shall be provided in every single family dwelling unit.

9.32.4.7. No water closet or urinal shall be installed in any room used for sleeping unless accepted.

9.32.4.8. No water closet or urinal shall be placed in a basement unless light is provided in accordance with Table 9.7.2.A. and ventilation is provided in accordance with Section 9.33.

(u) In Article 9.32.5.1. by striking out "building sewer" and substituting "plumbing system";

(u.1) in Subsection 9.33.1. by adding the following after Article 9.33.1.4.:

9.33.1.5. If roughed-in plumbing is installed for the future installation of a water closet or urinal, provision shall be made for the required ventilation.

(v) in Subsection 9.33.2. by adding the following after Article 9.33.2.5.:

9.33.2.6. On-site constructed fireplaces or factory-built fireplaces shall be considered fuel-fired appliances.

9.33.2.7. A supply of fresh air shall be provided for residential occupancies and, if the building is heated by a forced air system, may be introduced at the return air duct upstream from the furnace fan.

9.33.2.8.(1) An outdoor air intake opening 0.008 square metres or less in area into a return air system shall not be dampered.

(2) An outdoor air intake opening more than 0.008 square metres in area but less than 0.033 square metres in area into a return air system shall be equipped with an manually operated 50% damper.

(3) An outdoor air intake opening more than 0.033 square metres in area into a return air system shall be equipped with an automatic damper.

(v.1) in Subsection 9.33.4. by adding the following after Article 9.33.4.12.:

9.33.4.13.(1) In residential occupancies 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 positioned upstream from all outlets to positively exhaust all moisture and lint.

(2) Screens are not permitted on clothes dryer vents.

(3) Suitable access doors shall be installed in clothes dryer vents for cleaning purposes.

(4) A clothes dryer vent shall not be connected to any other exhaust system, gas vent or chimney.

(w) in Subsection 9.34.2.

(i) by repealing Article 9.34.2.3. and substituting the following:

9.34.2.3.(1) Oil-burning, gas-burning and electrical 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,

(c) The Electrical Protection Act and regulations made pursuant to that Act,

(d) The Fire Prevention Act and regulations made pursuant to that Act, and

(e) CSA B52-M1977, "Mechanical Refrigeration Code".

(ii) in Article 9.34.2.6. by striking out "2 1/2 per cent design temperature determined in conformance with Article 2.3.1.1." and substituting "1% design temperature given in Part 11";

(iii) by adding the following after Article 9.34.2.7.:

9.34.2.8. Crawl spaces beneath mobile homes need not be heated if the floor assembly of the mobile home has been designed and insulated for the design interior temperature required by Article 9.34.2.6. and if building services and foundations are protected against frost damage.

9.34.2.9. Coverings, linings and associated adhesives, and insulation of air ducts, plenums and other parts of air duct systems shall conform to Article 6.2.3.6.

9.34.2.10. 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 efficiency of the exhaust system is not adversely affected.

9.34.2.11. 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.

(w.1) In Subsection 9.34.3.

(i) by repealing Article 9.34.3.1. and substituting the following:

9.34.3.1.(1) Ducts in or under slabs-on-ground shall be of metal and gauges recommended by ASHRAE or SMACNA and they shall be surrounded by concrete with a minimum thickness of 50 mm.

(2) If perimeter warm air ducts are installed in or under slabs 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.

(ii) In Article 9.34.3.2. by striking out " , aluminum or tin plate" and substituting "or aluminum";

(iii) In Table 9.34.3.A. by striking out the 5th column;

(iv) In Article 9.34.3.4. by striking out "not less than 6 mm cellular asbestos insulation or other";

(v) by repealing Article 9.34.3.6. and substituting the following:

9.34.3.6.(1) The clearance of furnace plenums from combustible material shall conform to the appropriate requirements of

(a) The Fire Prevention Act and regulations made pursuant to that Act,

(b) The Gas Protection Act and regulations made pursuant to that Act, and

(c) Part 6.

(vi) in Article 9.34.3.7. by striking out "Appendix" and substituting "Appendix A";

(vii) In Article 9.34.3.8. by striking out "Appendix" and substituting "Appendix A";

(viii) In Article 9.34.3.9. by striking out "Appendix" and substituting "Appendix A";

(x) in Subsection 9.34.4. by repealing Article 9.34.4.3. and substituting the following:

9.34.4.3.(1) Air supply ducts shall be complete from the furnace to the room supply outlet.

(2) A crawl space shall not be used as a supply air plenum.

(x.1) in Article 9.34.7.3. by striking out "12 mm" and substituting "15 mm";

(y) in Article 9.34.3.4. by striking out "6 mm asbestos cement or asbestos millboard" and substituting "a layer of acceptable resilient noncombustible insulation";

(y.1) in Subsection 9.35.1. by repealing Article 9.35.1.1. and substituting the following:

9.35.1.1. Electrical installations shall conform to *The Electrical Protection Act* and regulations made pursuant to that Act.

(z) in Subsection 9.35.3. by repealing Articles 9.35.3.1. to 9.35.3.7. and substituting the following:

9.35.3.1. Receptacles shall be installed in accordance with *The Electrical Protection Act* and regulations made pursuant to that Act.

9.35.3.2. *Public corridors* and public stairs shall have at least 1 duplex receptacle for each 10 m length or fraction thereof.

(z.1) by adding the following after Section 9.36:

SECTION 9.37 LOG CONSTRUCTION

SUBSECTION 9.37.1. GENERAL

9.37.1.1. Logs which are sound and free of fractures may be used for *foundations*, 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.

9.37.1.2. 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.

9.37.1.3. All exterior joints between logs shall be made watertight.

9.37.1.4. Logs shall be seasoned to a moisture content not exceeding 19% before installation.

SUBSECTION 9.37.2. WALLS

9.37.2.1. 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.

9.37.2.2. 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.

9.37.2.3. Each log in a wall built of vertical logs shall be scribed to fit as closely as possible to the adjacent logs.

9.37.2.4. 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.

SECTION 9.38 MEDICAL GAS PIPING SYSTEMS

SUBSECTION 9.38.1. GENERAL

9.38.1.1. Non-flammable medical gas piping systems in *buildings* regulated by Part 9 shall meet the requirements of Subsection 3.6.5.

9 The following is added after Part 9:

PART 10

RELOCATABLE INDUSTRIAL ACCOMMODATION

SECTION 10.1 APPLICATION

SUBSECTION 10.1.1. GENERAL

10.1.1.1. This Part applies to *buildings* 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*.

10.1.1.2. *Buildings* to which this Part applies shall not stay at one site for more than 5 years, except as permitted by the *authority having jurisdiction*.

10.1.1.3. This Part applies to one *storey buildings*

(a) without sleeping accommodation, that do not exceed 1200 square metres in *building area*, and

(b) with sleeping accommodation, that do not exceed 600 square metres in *building area*.

10.1.1.4. A *building* containing sleeping accommodation may include spaces for other uses not exceeding 100 square metres each in area if each space is separated from the remainder of the *building* by a wall conforming to Sentence 10.4.1.5.(1).

10.1.1.5. Requirements for *buildings* with 2 *storeys* may be established by the Director.

10.1.1.6. A *building* may consist of one or more transportable modules specifically designed to be readily relocatable and usable without permanent *foundations*.

10.1.1.7. Except as specifically varied in this Part, Parts 1 to 9 and 11 apply to *buildings* regulated by this Part.

10.1.1.8. Except for Section 10.6, this Code does not apply to *buildings* regulated by this Part which were constructed before May 31, 1981.

10.1.1.9.(1) This Part does not apply to relocatable industrial housing units that are permanently mounted on running gear, or sled runners, or skids, and are fully self-contained if

(a) the *building area* does not exceed 75 square metres, and

(b) the *building* conforms to the appropriate standards in the CSA Z 240 Series.

SECTION 10.2 STRUCTURAL REQUIREMENTS

SUBSECTION 10.2.1. GENERAL

10.2.1.1. 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.

10.2.1.2. Structural design of *loadbearing* assemblies shall be done by a *professional engineer* who is normally engaged in the practice of structural design.

SUBSECTION 10.2.2. DESIGN LOADS

10.2.2.1.(1) Roof *live load* shall be ground snow load with no modification by any coefficient of reduction, but not less than 2 kPa.

(2) Roof design shall allow for the effects of drifting snow.

10.2.2.2. Design *live load* due to wind shall be based on a wind pressure not less than 0.7 kPa.

SUBSECTION 10.2.3. STABILITY

10.2.3.1. 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 upon the *building*, provision for the attachment of tie down devices shall be made in the construction of the modules.

10.2.3.2.(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 printed on a permanent label and affixed to the module in a visible location.

SECTION 10.3 HEIGHTS AND AREAS

SUBSECTION 10.3.1.

10.3.1.1. Except as permitted by Article 10.3.1.2., the clear ceiling height shall be at least 2.1 m.

10.3.1.2. In modules specifically produced to be transported by aircraft the clear ceiling height shall be at least 2 m over at least 90% of the *floor area* and shall be at least 1.9 m over the remaining *floor area*.

10.3.1.3.(1) The area, calculated wall finish to wall finish, in sleeping rooms shall be not less than

- (a) 7.4 square metres for each occupant in singly occupied rooms, and
- (b) 4.7 square metres for each occupant in other than singly occupied rooms.

SECTION 10.4 FIRE SAFETY

SUBSECTION 10.4.1. FIRE SEPARATIONS

10.4.1.1.(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 10.4.1.4. to 10.4.1.9.

- (a) when rated in accordance with Chapter 2, "Fire Performance Ratings", of The Supplement to the NBC 1980, or
- (b) when tested in accordance with Section 15 of ULC-S101-1977, "Standard Methods of Fire Endurance Tests of Building Construction and Materials".

10.4.1.2. The values of membrane protection in Articles 10.4.1.4. to 10.4.1.9. apply only if the wall is framed with wood studs not less than 38 X 64 mm spaced not greater than 400 mm o.c.

10.4.1.3. If framing systems with stud dimensions less than specified in Article 10.4.1.2. are used the required membrane value in Articles 10.4.1.4. to 10.4.1.8. shall be increased by 10 min.

10.4.1.4. Each face of a wall separating a sleeping room from another room shall have not less than a 5 min membrane protection.

10.4.1.5.(1) Except as permitted by Sentence (2), 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 10.1.1.4., shall have not less than a 10 min membrane protection.

(2) If a 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/cubic metre,

(b) compressed to 75% of its nominal thickness, and

(c) completely filling the cavity

the rating of the membrane protection required by Sentence (1) need not exceed 5 min.

(3) Each face of a wall separating a corridor from any other part of a *building*, except a sleeping room, shall have not less than a 5 min membrane protection.

10.4.1.6. Wall faces in *service rooms* shall have not less than a 30 min membrane protection.

10.4.1.7.(1) Except as permitted by Sentence (2), exterior walls shall have not less than a 5 min membrane protection on the inner face and shall have *noncombustible* exterior cladding.

(2) The membrane requirements of Sentence (1) do not apply in single modules if the *occupant load* is less than 10, the area is less than 80 square metres and the module is placed at least 10 m from any other *building*.

10.4.1.8. Ceilings of *service rooms* shall have not less than a 30 min membrane protection.

SUBSECTION 10.4.2. SERVICE SPACES

10.4.2.1. If a fuel fired *appliance* is placed in a module containing sleeping accommodation, the fuel fired *appliance* shall be placed in a *service room*.

10.4.2.2. 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*.

SUBSECTION 10.4.3. FLAME SPREAD RATING

10.4.3.1.(1) *Flame-spread rating* in a corridor shall not exceed 25 on

(a) 90% of the ceiling surface area, and

(b) 90% of the wall surface area.

10.4.3.2.(1) *Flame-spread rating* for floor coverings shall not exceed 300.

(2) *Flame-spread rating* for floor coverings shall be determined on the basis of the results of at least 3 tests conducted in accordance with the provisions of CAN4-S102.2-79, "Standard Method of Test for Surface Burning Characteristics of Flooring, Floor Covering and Miscellaneous Materials".

10.4.3.3. *Flame-spread rating* of any *building* material shall not exceed 150 for 90% of the surface area of cupboards and built-in furniture.

SUBSECTION 10.4.4. MEANS OF EGRESS

10.4.4.1. For each sleeping room a window capable of serving as an emergency *means of egress* shall be provided, shall have an unobstructed openable area not less than 0.5 square metres with no dimension less than 560 mm, and shall have a sill height not more than 1 m above the inside floor.

10.4.4.2. Windows using non-breakable glazing or which are not openable shall not be used in sleeping areas unless the windows are designed and permanently marked as being of a knock out type.

SUBSECTION 10.4.5. DOORS

10.4.5.1.(1) Doors, listed and labelled, having not less than a 20 min *fire-protection rating* or conforming to CAN4-S113-79, "Standard Specification for Wood Core Doors Meeting the Performance Required by CAN4-S104-77 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, or
 - (ii) a *service room*.

10.4.5.2.(1) Doors equipped with automatic closers shall be used between any part of a *building* and

- (a) a *service room*, or
- (b) a washroom facility.

10.4.5.3. Smoke doors shall be equipped with automatic closers actuated by *smoke detectors*, and shall be designed and installed to retard the passage of smoke.

SUBSECTION 10.4.6. EXITS

10.4.6.1. Every *floor area* shall be served by not less than 2 *exits* and *exits* shall be located so that the travel distance from any part of the *building* to at least one *exit* is not more than 25 m.

10.4.6.2. Every corridor more than 50 m in length shall be subdivided by smoke doors.

SUBSECTION 10.4.7. STANDPIPE AND HOSE SYSTEMS

10.4.7.1.(1) Every *building* containing sleeping accommodation for more than 30 persons shall be provided with a standpipe and hose system

- (a) having a fire fighting water supply storage volume not less than 4.5 cubic metres,
- (b) capable of supplying 0.005 cubic metres/s at a gauge pressure not less than 300 kPa, and
- (c) installed in conformance with NFPA 14-1978, "Standard for the Installation of Standpipe and Hose Systems".

(2) The water supply for fire fighting shall be independent of the domestic water supply.

(3) The standpipe and hose system required by Sentence (1) shall be capable of connection to an external water supply and suitable for adaptation to a local delivery system.

(4) If a central water system, capable of supplying all fire fighting requirements, is provided, the individual tanks required by Sentence (1) need not be provided.

SUBSECTION 10.4.8. ELECTRICAL

10.4.8.1. Not less than 2 duplex receptacles shall be installed in each sleeping room.

SUBSECTION 10.4.9. FOAMED PLASTICS

10.4.9.1.(1) *Foamed plastic* shall not be exposed in any part of a *building*.

(2) Sentence (1) applies to crawl spaces and roof spaces in addition to other parts of the *building*.

10.4.9.2. If *foamed plastic* is used, the *foamed plastic* shall have a flame spread classification not more than 25.

10.4.9.3. If *foamed plastic* is used, the surface must be covered by 12.7 mm gypsum board or by a *thermal barrier* complying with ULC-S124-1976, "Standard Method of Test for the Evaluation of Protective Coverings for Foamed Plastic", Classification A.

SECTION 10.5 HEALTH REQUIREMENTS

SUBSECTION 10.5.1. HEATING AND VENTILATION

10.5.1.1. Heating equipment shall be capable of maintaining a temperature of 20 degrees C within the *building* when the outside temperature is -45 degrees C and the wind velocity is 25 km/h.

10.5.1.2. Floors shall be insulated.

10.5.1.3. Ventilation requirements shall be in accordance with ASHRAE Standard 62-73, "Standards for Natural and Mechanical Ventilation".

10.5.1.4.(1) In *buildings* 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. All ducts for heating systems and ventilation systems shall be constructed of galvanized steel or aluminum.

10.5.1.6. If vapour barriers are cut 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.

10.5.1.7. Installation and fastening of insulation shall ensure that it cannot be displaced during transportation.

SUBSECTION 10.5.2. PLUMBING FACILITIES

10.5.2.1. The fixtures in each washroom shall be based on the number of persons using that washroom, shall conform to Articles 10.5.2.2. and 10.5.2.3. and, if persons of each sex are to be accommodated, separate washrooms shall be provided for each sex.

10.5.2.2.(1) In *buildings* 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, and
- (d) urinals shall be provided in washrooms for males on the basis of 1 unit for every 25 persons or part thereof.

10.5.2.3. In *buildings* not covered by Sentence 10.5.2.2.(1) water closets and lavatories shall conform to Part 3 unless variations have been *accepted*.

10.5.2.4. Piping in corridor walls and in walls separating sleeping rooms shall be *noncombustible*.

10.5.2.5. If heat tape is used, it shall not be placed in direct contact with *combustible piping* and shall be installed in accordance with the tape manufacturer's instructions but not closer than 50 mm to any *combustible* material.

SECTION 10.6 GENERAL SAFETY

SUBSECTION 10.6.1. SCOPE

10.6.1.1.(1) Section 10.6 applies to

- (a) all *buildings* constructed on or after May 31, 1981, and
- (b) all *buildings*, constructed before May 31, 1981, at the time of relocation.

SUBSECTION 10.6.2. SPATIAL SEPARATION

10.6.2.1. The spatial separation between *buildings* shall be not less than 10 m.

10.6.2.2. A *building* shall be located not closer than 15 m to any bushes, trees or similar vegetation.

SUBSECTION 10.6.3. FIRE ALARM AND DETECTION

10.6.3.1.(1) A fire alarm system shall be installed in accordance with ULC-S524-M1980, "Standard for The Installation of Fire Alarm Systems", in all *buildings*

- (a) providing sleeping accommodation for 10 or more persons,
- (b) providing dining facilities for 100 or more persons,
- (c) providing recreational facilities for 150 or more persons, or
- (d) if required by other Parts of this Code, except as varied by Clauses (a), (b) and (c).

10.6.3.2. Manual pull stations conforming to ULC-S528-1978, "Standard for Manually Actuated Signalling Boxes for Fire Alarm Systems", shall be located adjacent to *exits* within every *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 actuated fire detectors conforming to ULC-S530-1978, "Standard for Heat Actuated Fire Detectors for Fire Alarm Systems", shall be placed in each *service room*, storage room and clothes drying area in a *building* requiring a fire alarm system.

10.6.3.4.(1) A *smoke alarm*

- (a) conforming to ULC-S531-1978, "Standard for Smoke Alarms", and
- (b) equipped to show that it is in operating condition

shall be installed on the ceiling of every room providing sleeping accommodation and may be tied into the *building* fire alarm system.

(2) *Smoke alarms* shall be installed by permanent connection to an electrical circuit and shall have no disconnect switches between the overcurrent device and any *smoke alarm*.

10.6.3.5.(1) If a fire alarm system is required by Sentence 10.6.3.1.(1), *smoke detectors* conforming to ULC-S529-1978, "Standard for Smoke Detectors for Fire Alarm Systems" shall be installed in every

- (a) circulating air handling system and shall activate devices to shut down fans in the system in the event of a fire, and

- (b) corridor serving rooms containing sleeping accommodation.

10.6.3.6. Portable fire extinguishers shall be provided conforming to NFPA No. 10-1978, "Standard for Portable Fire Extinguishers".

SUBSECTION 10.6.4. KITCHEN VENTILATION

10.6.4.1. Every kitchen containing commercial cooking equipment used in processes producing smoke or grease laden vapours, shall be equipped with a mechanical exhaust and fire suppression system conforming to NFPA 96-1978, "Standard for the Installation of Equipment for the Removal of Smoke and Grease-Laden Vapors from Commercial Cooking Equipment".

10.6.4.2. *Acceptable* dismantable exhaust extensions may be used.

SUBSECTION 10.6.5. LIGHTING

10.6.5.1. Emergency lighting installations shall be installed in all corridors and in areas serving as *access to exit* from areas having an *occupant load* of more than 20 persons.

10.6.5.2. Emergency lighting installations shall conform to *The Electrical Protection Act* and regulations made pursuant to that Act.

10.6.5.3. Illuminated *exit* signs shall be installed at each *exit* location serving an *occupant load* of more than 20 persons.

SUBSECTION 10.6.6. DOORS

10.6.6.1. Every *exit* door from a *building* containing sleeping, dining or recreational facilities shall be equipped with fasteners, listed and labelled, or *accepted* by the Director, 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

SUBSECTION 10.7.1. LABELLING

10.7.1.1.(1) Each *building* module conforming to this Part shall be clearly and permanently identified, at the time of construction, 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.

10.7.1.2. The identification plate shall be affixed to the module in a visible location.

PART 11

CLIMATIC DATA FOR BUILDING DESIGN IN ALBERTA

SECTION 11.1 GENERAL

SUBSECTION 11.1.1. SCOPE

11.1.1.1.(1) The values in Charts 11.1.2.A. to 11.1.2.1. shall not be considered as providing a complete picture of the variability of local climatic conditions.

(2) In mountainous areas the values in Charts 11.1.2.A. to 11.1.2.1. represent typical values for populated communities and do not apply to

mountain slopes and other remote areas where substantially different conditions may exist.

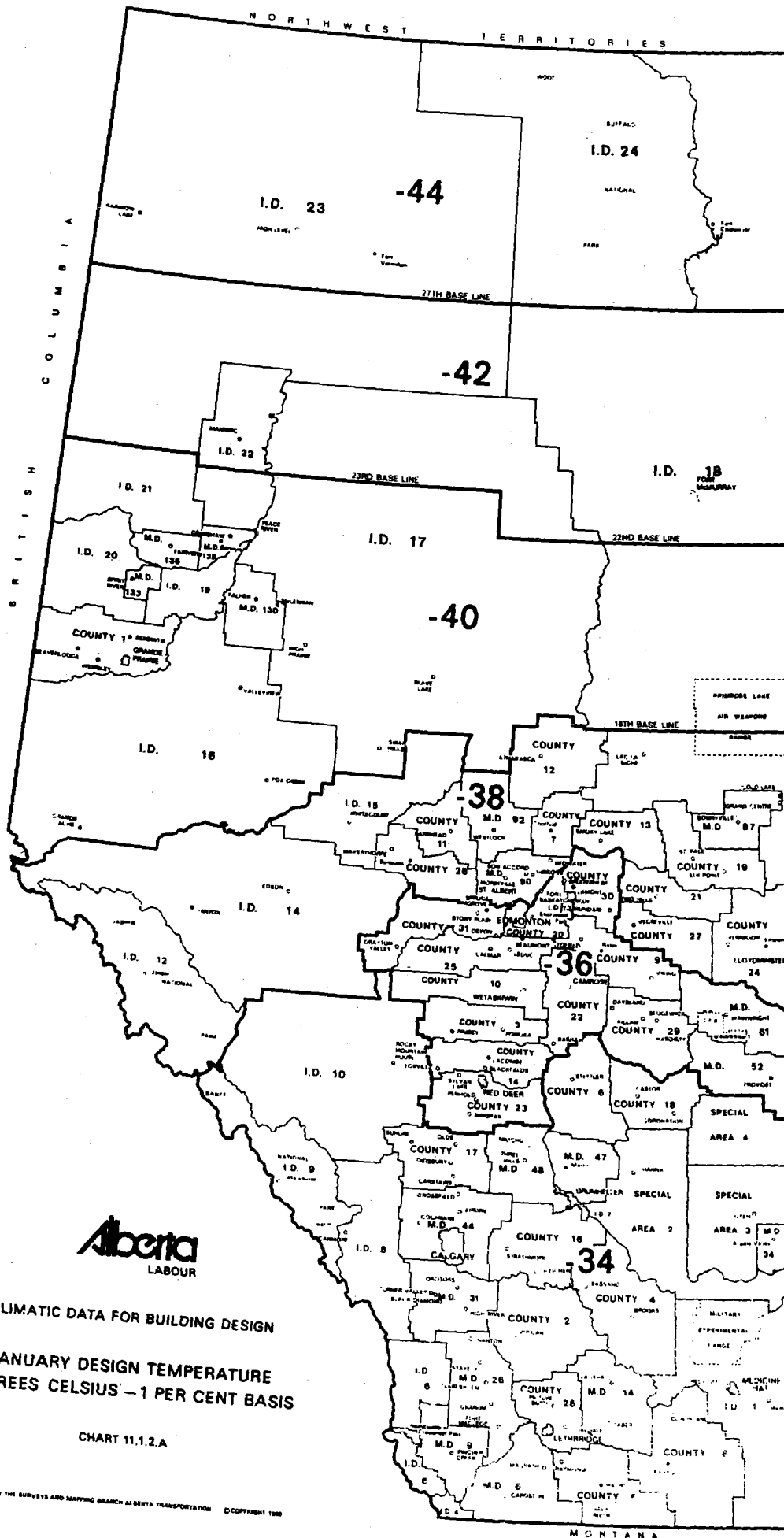
(3) In areas with abrupt changes in topography the designer should consult the *authority having jurisdiction* and other experienced persons for assistance in determining realistic values.

SUBSECTION 11.1.2. DESIGN DATA

11.1.2.1. Except as permitted by Article 11.1.3.1., climatic data for *building design* in Alberta shall be based on Charts 11.1.2.A. to 11.1.2.I.

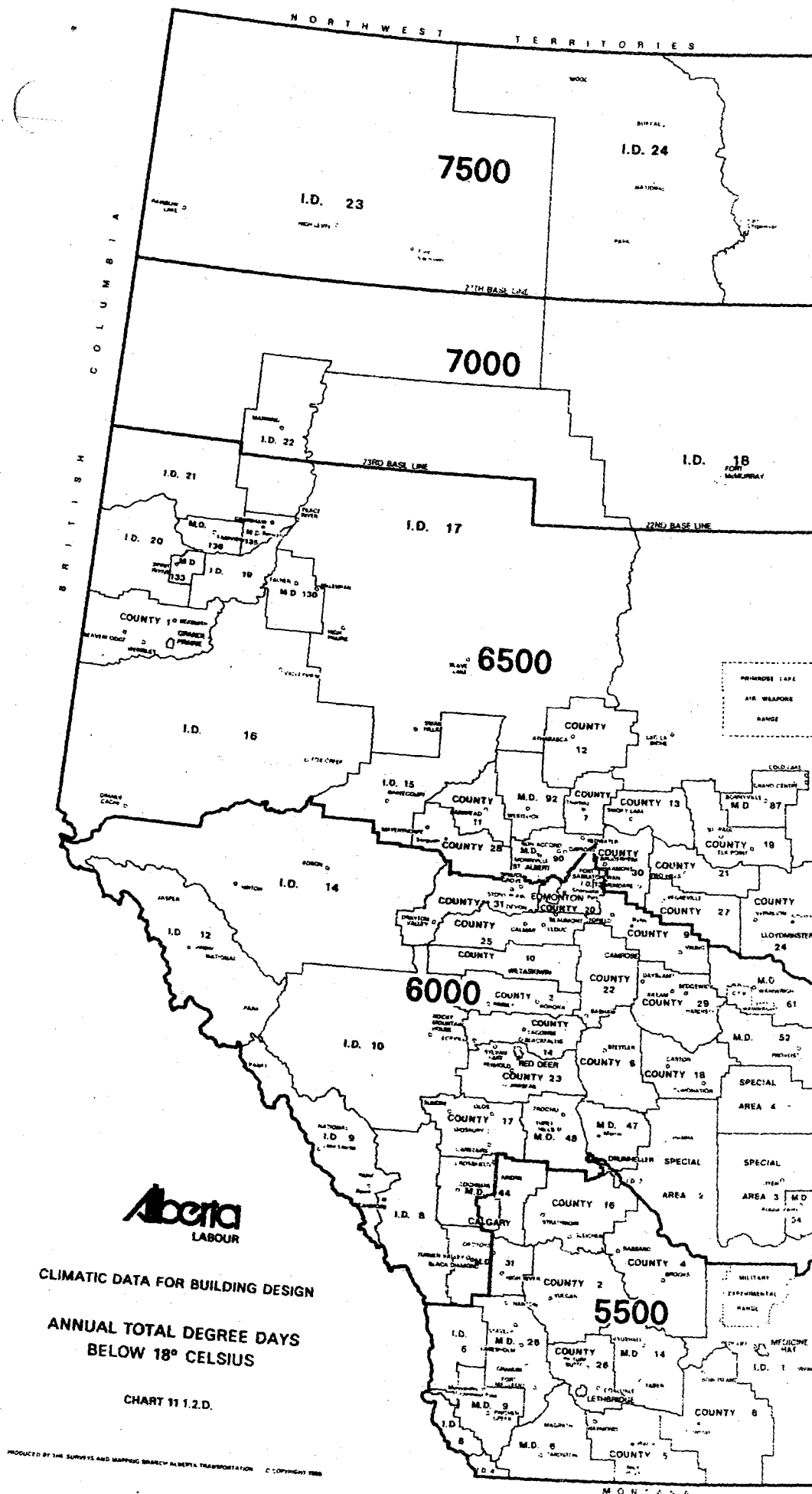
SUBSECTION 11.1.3. SPECIFIC MUNICIPALITIES

11.1.3.1. Within the municipal boundaries of the municipalities listed in Table 11.1.3.A. the values of climatic data listed in the Table may be used instead of the values shown on Charts 11.1.2.A. to 11.1.2.I.

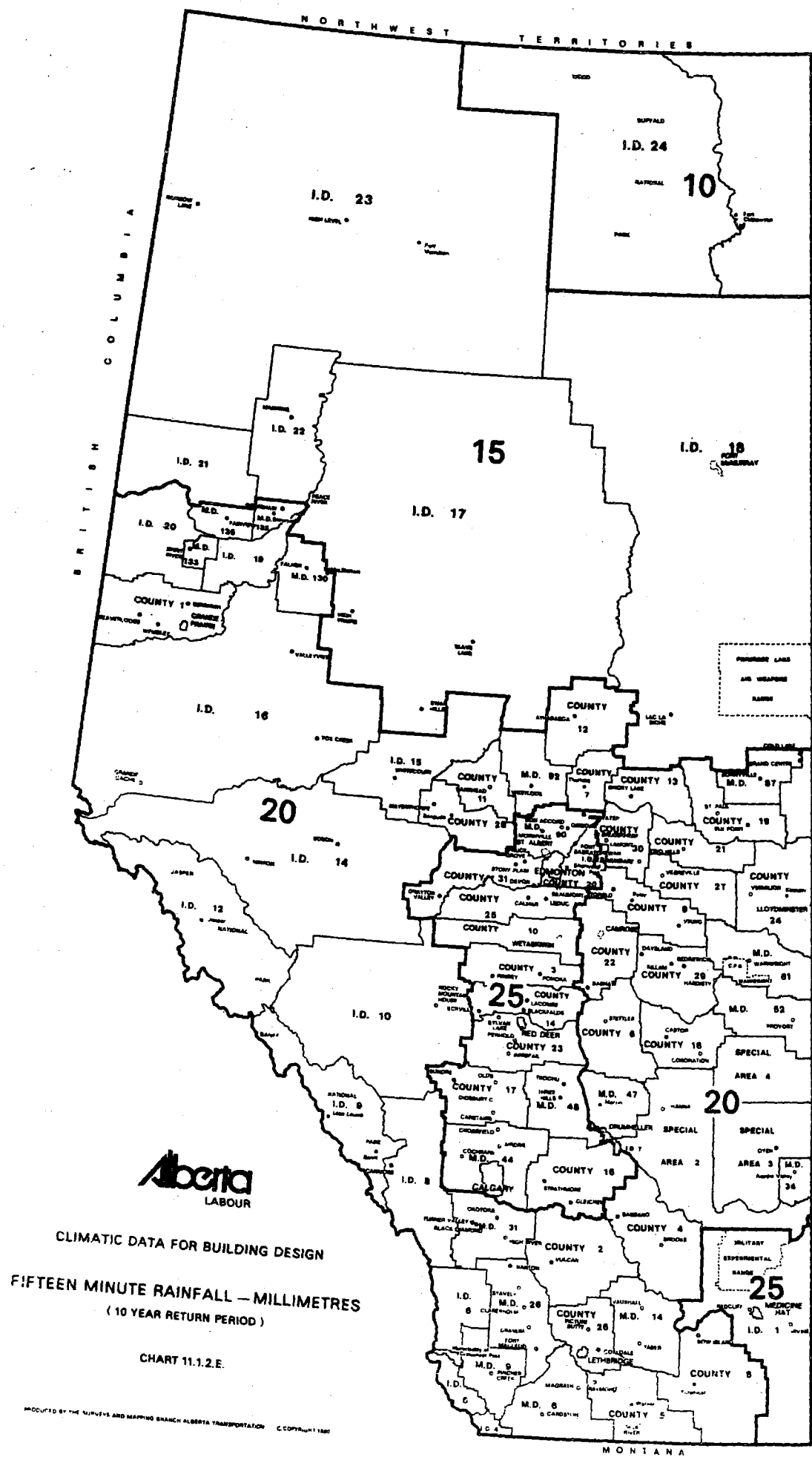




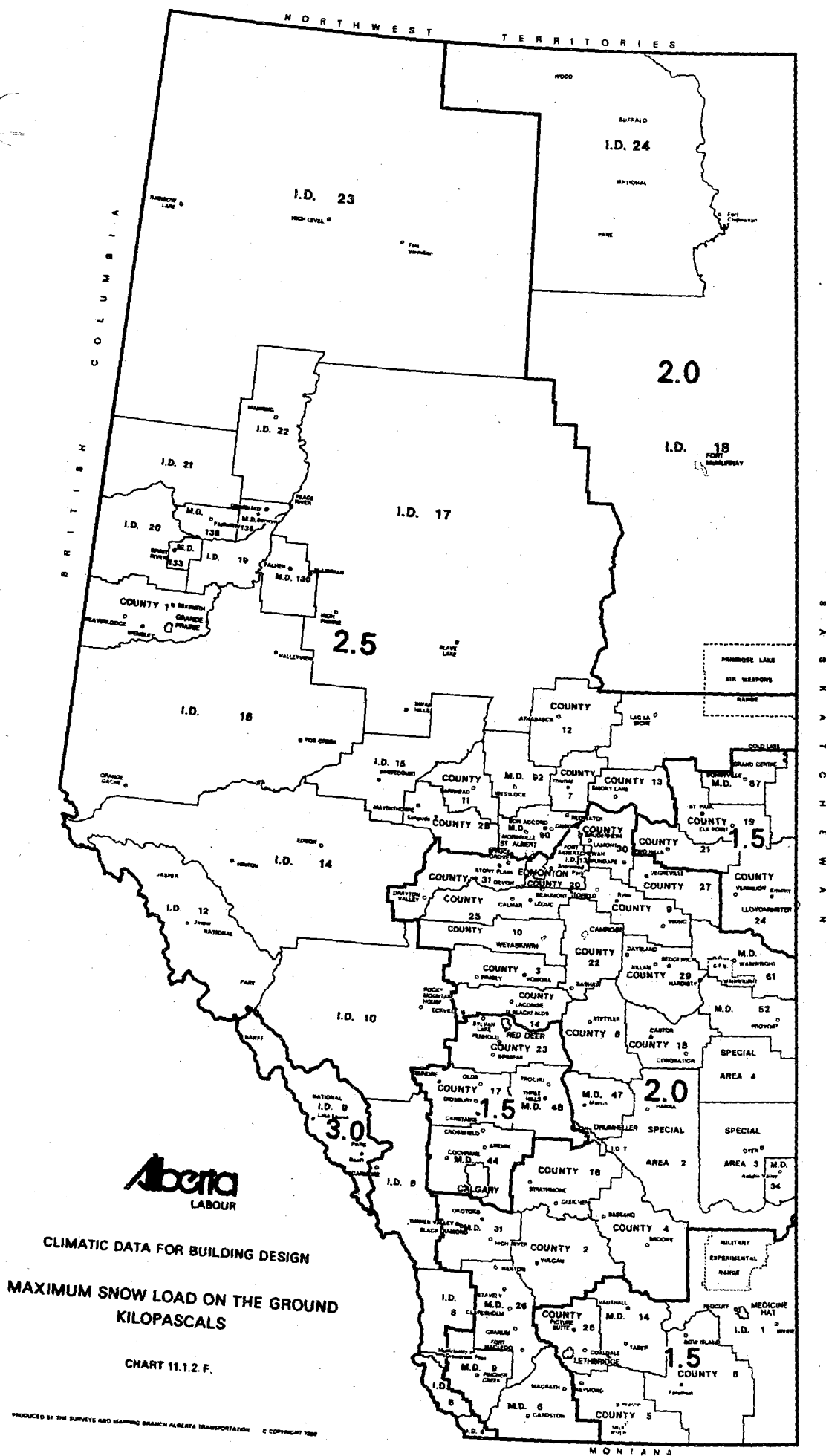
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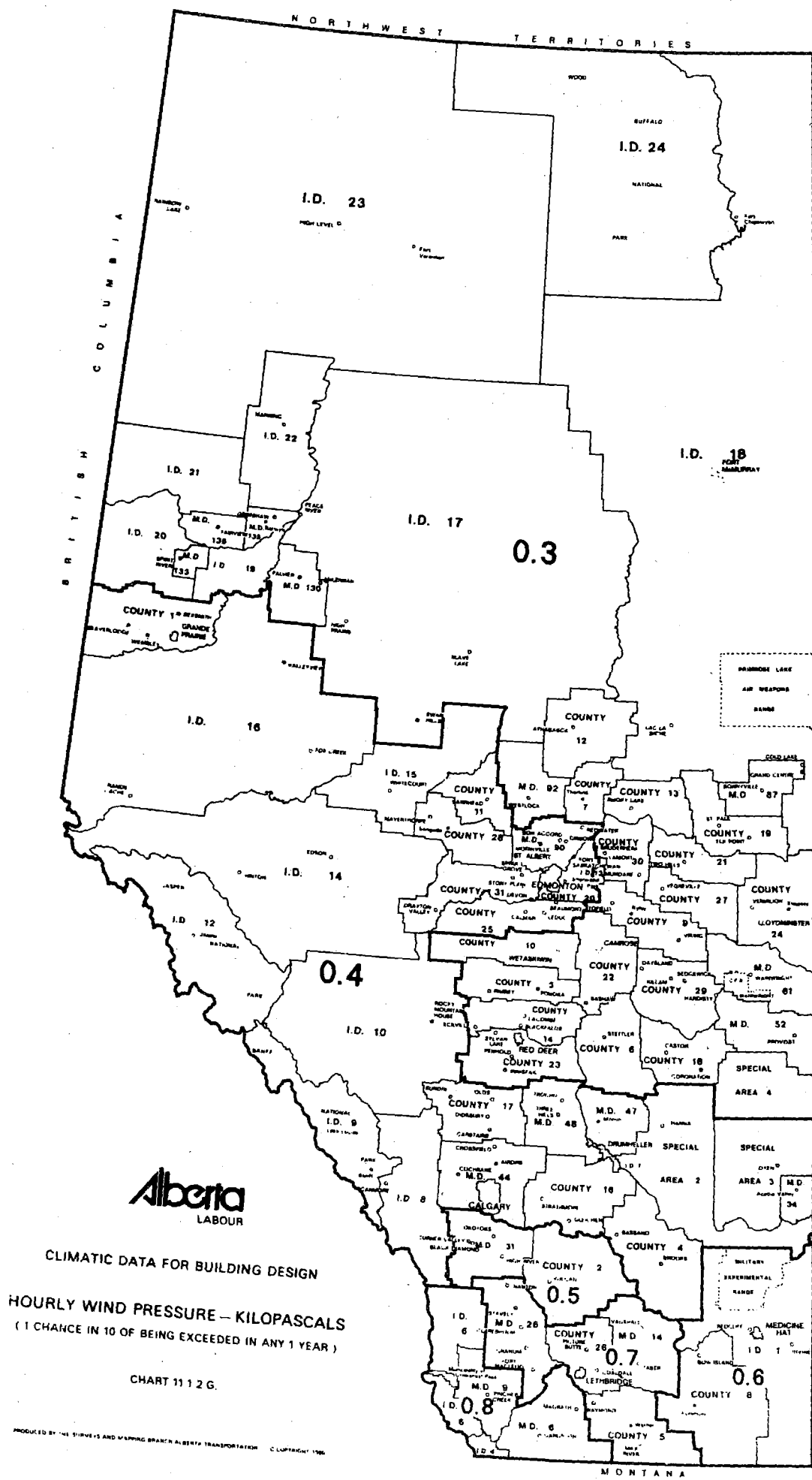
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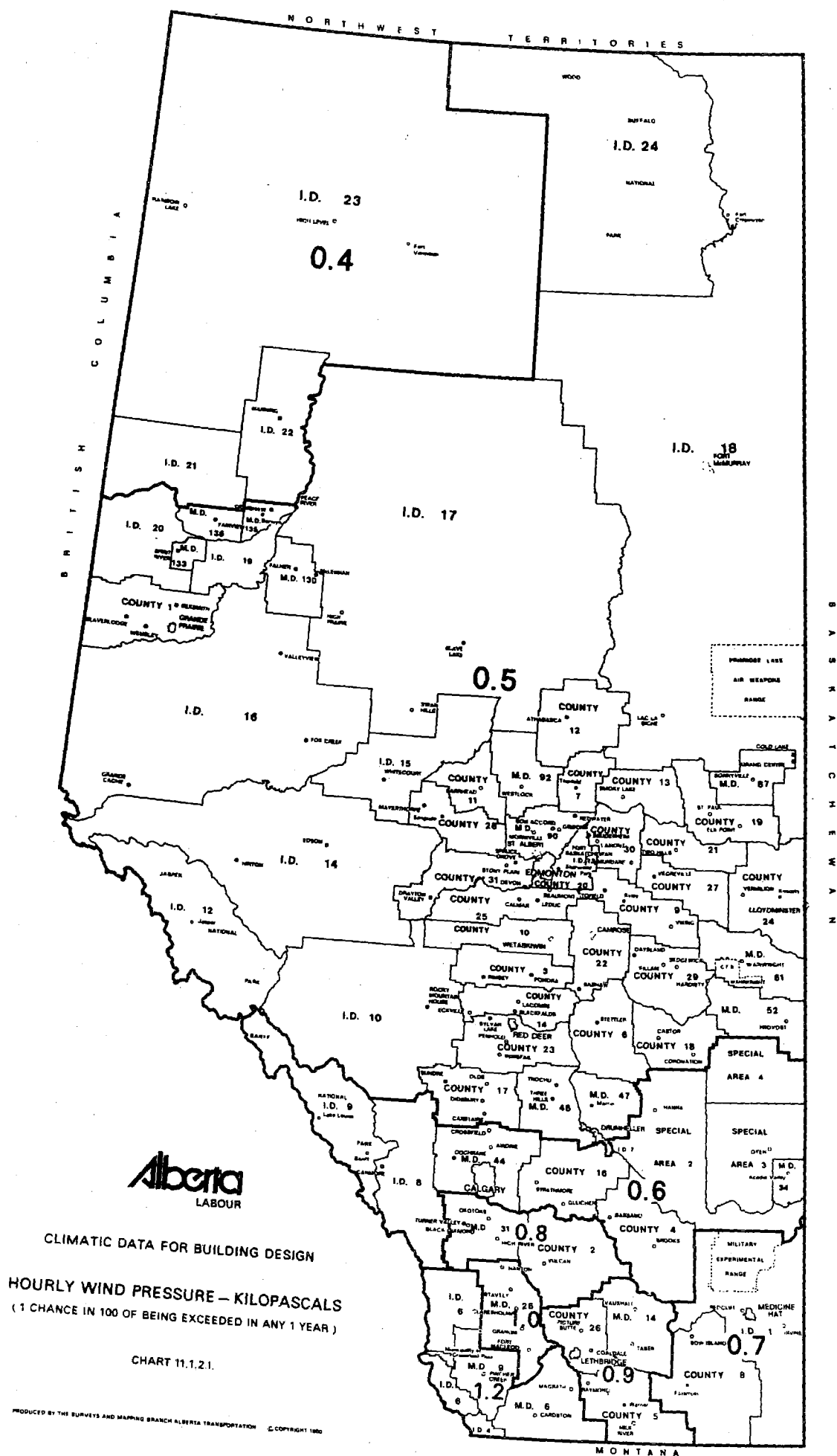


Table 11.1.3.A.
Forming Part of Article 11.1.3.1

CLIMATIC DATA FOR SELECTED MUNICIPALITIES IN ALBERTA														
Municipality	Design Temperature				Degree Days Below 18°C	15 Min. Rain., mm	One Day Rain., mm	Ann. Tot Pcpn., mm	Gnd. Snow Load kPa	Hourly Wind Pressures			Seismic Data	
	January		July 2.5%							1/10, kPa	1/30, kPa	1/100 kPa	Zone	Acceleration Ratio, A
	2.5%, °C	1%, °C	Dry, °C	Wet °C										
Athabasca	-35	-38	28	19	6 310	18	88	442	2.2	0.30	0.37	0.45	0	0
Banff	-30	-32	27	17	5 719	18	53	477	2.8	0.39	0.45	0.52	0	0
Barrhead	-34	-37	26	19	6 000	20	102	460	2.2	0.32	0.39	0.49	0	0
Beaverlodge	-35	-38	28	18	5 909	25	101	455	2.1	0.27	0.33	0.40	0	0
Brooks	-32	-34	32	19	5 266	18	89	353	1.6	0.39	0.48	0.57	0	0
Calgary	-31	-33	29	17	5 344	23	95	437	0.9	0.40	0.46	0.54	0	0
Campsie	-34	-37	26	19	6 080	20	111	445	2.3	0.32	0.39	0.49	0	0
Camrose	-33	-35	29	19	5 960	20	92	394	1.7	0.21	0.29	0.39	0	0
Cardston	-30	-33	29	18	4 870	20	102	495	1.8	0.74	0.93	1.15	0	0
Clareholm	-31	-34	29	18	4 782	15	97	460	1.0	0.66	0.80	0.96	0	0
Cold Lake	-36	-38	28	20	6 183	15	94	433	1.5	0.31	0.37	0.44	0	0
Coleman	-31	-34	28	18	5 418	15	62	337	2.6	0.54	0.69	0.87	0	0
Coronation	-31	-33	30	19	5 905	20	99	373	1.9	0.23	0.32	0.43	0	0
Cowley	-31	-34	29	18	5 189	15	74	504	1.7	0.73	0.91	1.13	0	0
Drumheller	-31	-33	29	18	5 330	20	73	358	1.6	0.32	0.39	0.49	0	0
Edmonton	-32	-34	28	19	5 590	23	114	446	1.5	0.32	0.40	0.51	0	0
Edson	-34	-37	28	18	5 962	18	79	554	2.4	0.36	0.43	0.50	0	0
Embrass Portage	-41	-44	27	19	6 999	10	82	399	1.6	0.31	0.37	0.45	0	0
Fairview	-38	-40	27	18	6 132	15	64	422	2.1	0.26	0.32	0.39	0	0
Fort McMurray	-39	-41	28	19	6 779	13	61	435	1.8	0.27	0.32	0.38	0	0
Fort Saskatchewan	-32	-35	28	19	5 881	20	78	430	1.5	0.31	0.39	0.49	0	0
Fort Vermilion	-41	-43	28	18	7 077	13	60	360	2.0	0.22	0.26	0.32	0	0
Grande Prairie	-36	-39	27	18	6 144	23	78	442	2.1	0.37	0.44	0.52	0	0
Habay	-41	-43	28	18	7 050	13	63	360	2.5	0.20	0.24	0.28	0	0
Hardisty	-33	-35	30	19	5 950	20	56	384	1.8	0.24	0.32	0.42	0	0

Table 11.1.3.A. Cont'd
Forming Part of Article 11.1.3.1

CLIMATIC DATA FOR SELECTED MUNICIPALITIES IN ALBERTA														
Municipality	Design Temperature				Degree Days Below 18°C	15 Min. Rain., mm	One Day Rain., mm	Ann. Tot Pcpn., mm	Gnd. Snow Load kPa	Hourly Wind Pressures			Seismic Data	
	January		July 2.5%							1/10, kPa	1/30, kPa	1/100 kPa	Zone	Acceleration Ratio, A
	2.5%, °C	1%, °C	Dry, °C	Wet °C										
High River	-31	-33	28	17	5 414	18	111	489	1.9	0.51	0.60	0.72	0	0
Jasper	-32	-35	28	18	5 530	10	108	402	2.4	0.37	0.43	0.50	0	0
Keg River	-40	-42	28	18	6 854	13	60	403	2.6	0.19	0.24	0.29	0	0
Lac La Biche	-35	-38	28	19	6 308	15	82	460	2.1	0.31	0.37	0.44	0	0
Lacombe	-33	-35	29	18	5 761	23	71	456	1.8	0.24	0.31	0.40	0	0
Lethbridge	-30	-33	31	18	4 717	20	95	436	1.5	0.64	0.76	0.91	0	0
Lloydminster	-35	-38	29	20	6 038	18	104	402	1.6	0.30	0.37	0.46	0	0
Manning	-39	-41	27	18	6 600	13	51	360	2.5	0.21	0.26	0.32	0	0
Medicine Hat	-31	-34	33	19	4 872	23	122	348	1.4	0.39	0.49	0.60	0	0
Peace River	-37	-40	27	18	6 424	15	48	351	2.4	0.24	0.29	0.36	0	0
Penhold	-32	-35	29	18	5 845	23	124	449	1.5	0.31	0.37	0.44	0	0
Pincher Creek	-32	-34	29	18	5 054	18	128	531	1.8	0.70	0.88	1.08	0	0
Ranfurly	-34	-37	29	19	6 015	18	89	434	1.6	0.23	0.29	0.36	0	0
Red Deer	-32	-35	29	18	5 846	23	154	442	1.5	0.31	0.37	0.44	0	0
Rocky Mountain House	-31	-33	28	18	5 639	20	77	543	1.8	0.26	0.32	0.39	0	0
Slave Lake	-36	-39	27	19	6 284	15	76	473	2.4	0.28	0.34	0.41	0	0
Stettler	-32	-34	30	19	5 585	20	165	420	1.8	0.24	0.32	0.42	0	0
Stony Plain	-32	-35	28	19	5 789	23	102	510	1.8	0.32	0.40	0.51	0	0
Suffield	-32	-34	33	19	5 102	20	69	323	1.1	0.43	0.52	0.64	0	0
Taber	-31	-33	31	19	4 821	20	95	373	1.4	0.57	0.69	0.82	0	0
Turner Valley	-31	-33	28	17	5 784	20	82	584	1.9	0.51	0.60	0.71	0	0
Valleyview	-37	-40	27	18	6 110	18	51	460	2.3	0.35	0.43	0.51	0	0
Vegreville	-34	-36	29	19	6 402	18	69	410	1.6	0.25	0.32	0.40	0	0
Vermilion	-35	-38	29	20	6 251	18	75	399	1.5	0.23	0.28	0.34	0	0
Wagner	-36	-39	27	19	6 280	15	72	465	2.2	0.28	0.34	0.41	0	0
Wainwright	-33	-36	29	19	6 000	20	63	380	1.6	0.24	0.32	0.41	0	0
Westaskwin	-33	-35	29	19	5 686	23	78	472	1.7	0.24	0.32	0.42	0	0
Whitecourt	-35	-38	27	18	6 196	20	89	522	2.2	0.32	0.39	0.48	0	0
Wimbome	-31	-34	29	18	5 620	23	89	430	1.5	0.30	0.37	0.45	0	0