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NBC/NFC News contains explanatory articles and comments on the contents of the National Building Code and the National Fire Code together with announcements of Code changes. It appears approximately four times a year. If you wish to be placed on the mailing list to receive the **NBC/NFC News** please fill in the label on the reverse side, detach and return. Note that even though you are receiving the News now, you must complete the label and return it as all previous mailing lists are to be destroyed.

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THE FOLLOWING ORGANIZATIONS COMMEND THE USE OF THIS CODE IN CANADA AS A BUILDING BYLAW

Association of Canadian Fire Marshals and Fire Commissioners

Canadian Association of Fire Chiefs

Canadian Building Officials Association

Canadian Construction Association

Federation of Canadian Municipalities

Canadian Home Manufacturers Association

Canadian Labour Congress

Canadian Telecommunications Carriers Association

Central Mortgage and Housing Corporation

Construction Specifications Canada

Factory Mutual Engineering Association (Factory Mutual System)

Housing and Urban Development Association of Canada

Insurers' Advisory Organization of Canada

The Association of Consulting Engineers of Canada

The Canadian Chamber of Commerce

The Canadian Council of Professional Engineers

The Engineering Institute of Canada

The Royal Architectural Institute of Canada

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RELATIONSHIP BETWEEN NATIONAL BUILDING AND NATIONAL FIRE CODES

When using this Code it is important to appreciate both the special relationship which exists between it and the National Fire Code with respect to fire safety and the need to consider the contents of both Codes in building design, construction and maintenance. The role of each Code with respect to fire safety can be summarized as follows:

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

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

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

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

PREFACE

The National Building Code of Canada is published by the National Research Council through its Associate Committee on the National Building Code. It comprises a model set of regulations for ensuring public safety in buildings and is written in legal form so that it can be adopted or enacted by appropriate legislative authorities in Canada.

Work on the seventh edition of this Code, as in previous editions, has been carried out with the voluntary assistance of the many experts from coast to coast who contribute to the operation of the Associate Committee on the National Building Code, thus ensuring that the Code 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 provide technical and secretarial support, all of which is carried out at the direction of the Associate Committee. The many technical problems revealed by the use and revision 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. These Committees and their memberships are listed in the following pages.

The Code format is unchanged from the 1975 edition except that the metric equivalents which were included in the previous two editions have been omitted from this edition. Instead, a pamphlet has been prepared which gives appropriate metric values of the imperial units of measure in the Code. This metric pamphlet is distributed automatically with each copy of the Code and is intended to provide a basis for building in metric terms pending completion of a fully metric Code in a subsequent edition. Where appropriate, metric pamphlets are also available for the Supplements and other associated Code documents.

An important feature of this Code is its close coordination with its companion document the National Fire Code which is prepared under the direction of the Associate Committee on the National Fire Code. To avoid duplication of requirements in the two Codes, the National Building Code makes reference to appropriate requirements in the National Fire Code and vice versa. Both Associate Committees have agreed that the two Codes should not only be developed, but should also be administered as complimentary documents with both building and fire officials being involved in their enforcement. The statement on Page vii which has been included to encourage this approach takes on a special significance in light of the current interest being shown by provincial governments in these documents as forming the basis for uniform standards for building safety within their respective jurisdictions.

Where a change or addition to the 1975 NBC has been made, the paragraphs affected are indicated by a vertical line in the margin.

The Associate Committee wishes to acknowledge the assistance provided by the many individuals who have contributed to the production of this edition and to express its appreciation to the Standards Writing Organizations whose standards are referenced in this document.

Comments on this edition of the Code will be the basis for the improvement of the next edition. Such comments are welcomed by the Associate Committee and should be submitted as soon as possible to be in time for consideration by the Committees preparing the eighth edition.

The Associate Committee is pleased to grant permission for the reprinting of this document, in whole or in part, provided appropriate acknowledgement is given in the reprinted material.

All communications with regard to the Code and its associated documents should be addressed to: The Secretary, The Associate Committee on the National Building Code, National Research Council of Canada, Ottawa, Ontario K1A 0R6.

Le Code national du bâtiment, ses suppléments et les documents qui s'y rattachent sont disponibles en français. On peut se les procurer en s'adressant au Secrétaire, Comité associé du Code national du bâtiment, Conseil national de recherches du Canada, Ottawa, Ontario K1A 0R6.

A GUIDE TO THE USE OF THE CODE

The National Building Code is essentially a set of minimum regulations respecting the safety of buildings with reference to public health, fire protection and structural sufficiency. It is not intended to be a text book 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 throughout Canada.

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

3.	Part
3.5	Section
3.5.1.	Subsection
3.5.1.6.	Article
3.5.1.6.(1)	Sentence
3.5.1.6.(1)(e)	Clause
3.5.1.6.(1)(e)(i)	Subclause

A summary of the contents of the Code follows:

Part 1: Scope and Definitions

Throughout the Code certain words appear in italic type. These are the words which have been defined in Part 1. This Part also contains a list of abbreviations used in the Code.

Part 2: Administration

Part 2 contains regulations that pertain to the application of the Code. In this Part are defined the powers, duties and responsibilities of those concerned.

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 interpretative 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. An important feature of Part 3 is the Subsection dealing with fire in tall buildings. In addition new requirements have been added with respect to openings through floor assemblies. Part 3 also contains requirements to make "public buildings" more accessible to the handicapped.

Part 4: Design

This Part is made up of eight 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 4.8) deal with design in wood, masonry, concrete, steel and aluminum, and with the materials used to clad a building and protect it from the weather. 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: Materials

This is a short Part but it includes an important Clause which permits the use of materials other than those directly specified in the Code providing equivalency of performance can be shown. The list of material Standards is no longer included; however, a complete listing of all Standards referenced in the Code is provided in a separate document.

Part 6: Building Services

Part 6 and the Canadian Heating, Ventilating and Air-Conditioning Code which it references are concerned with the safe functioning of heating, ventilating, elevator and other service equipment installed in a building. The requirements deal mainly with installation. Corresponding provisions relating to fire safety as determined by the occupancy of the building are to be found in Part 3.

Part 7: Plumbing

Although plumbing is a service that could be classified under Building Services, the prominence and extent of its regulations warrant separate treatment. This Part contains only the basic legal statements with reference to Scope, Application and Administration. All detailed technical requirements are contained in the Canadian Plumbing Code which is published separately. This latter Code contains requirements for the size and quality of fixtures and related pipes and fittings for plumbing systems, and in its Appendix has explanatory sketches and notes to further clarify these requirements.

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

This Part regulates the precautions that must be taken to protect the safety of the public in the vicinity of construction sites. It is similar to Part 7 in that it is quite short, all detailed technical requirements having been transferred to the Canadian Construction Safety Code, which is issued separately and is referenced in the NBC. The Construction Safety Code also contains a Section dealing with the safety of workmen on construction sites, but these requirements are not referenced in the National Building Code.

Part 9: Housing and Small Buildings

This Part provides detailed requirements for the construction of houses and small buildings up to 6,000 square feet per floor and three storeys in height, and applies to all occupancies except assembly, institutional and high hazard industrial. The residential provisions of Part 9 combined with additional requirements for durability and performance make up the Residential Standards, used by Central Mortgage and Housing Corporation to govern construction under the National Housing Act.

SUPPLEMENTS

The following Supplements are published by the Associate Committee but do not form a legal part of the Code when it is adopted for use.

Supplement No. 1: Climatic Information for Building Design in Canada

This Supplement contains information on climatic loads to be expected in all parts of Canada. It is through the use of these climatic factors summarized in this Supplement, with appropriate adjustments for climate variation in different localities, that the Code can be used nationally.

Supplement No. 2: Fire Performance Ratings

Supplement No. 2 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 rating of construction assemblies based on generic descriptions of the materials used in the assemblies.

Supplement No. 3: Commentary on Part 3

The main purpose of this Supplement (still in preparation at time of writing) is to explain the provisions of Part 3 and the reasons for the main groups of requirements, and to provide background information on the application of these requirements in practice. It will also contain material in support of the high-rise requirements in Part 3. The latter has, meanwhile, been issued separately under the title "Measures for Fire Safety in High Buildings."

Supplement No. 4: Commentaries on Part 4

Supplement No. 4 consists of explanatory material and related technical information useful to the designer in the application of the design requirements in Part 4 of the Code. The design provisions for plain and reinforced masonry which were previously contained in this Supplement are no longer included as, together with the design provisions for steel, aluminum, concrete and wood, they are now available as published Standards from the Canadian Standards Association and are referenced in the Code.

Supplement No. 5: Building Standards for the Handicapped

This short but important Supplement is well described by its title. Whenever provision must be made for the use of buildings by handicapped persons, the terms of this Supplement should be applied. Certain requirements in this Supplement are mandatory for "public buildings" under the 1977 edition of the National Building Code.

ASSOCIATED DOCUMENTS

The Associate Committee on the National Building Code also publishes the following associated documents, the majority of which have been mentioned above, which shows the close interrelationship of all these documents with the Code itself:

Canadian Heating, Ventilating and Air-Conditioning Code 1977
Canadian Plumbing Code 1977
Canadian Construction Safety Code 1977
Residential Standards 1977
Canadian Farm Building Code 1977
Span Tables for Wood Joists, Rafters, Trusses and Beams 1977
List of Standards Referenced in the National Building Code 1977
Measures for Fire Safety in High Buildings 1977.

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PART 1

SCOPE AND DEFINITIONS

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PART 1 SCOPE AND DEFINITIONS

SECTION 1.1 SHORT TITLE

SUBSECTION 1.1.1. This Bylaw may be cited as "The Building Bylaw."

SECTION 1.2 SCOPE

SUBSECTION 1.2.1. This Bylaw applies to the design, construction and *occupancy* of new *buildings*, and the *alteration*, reconstruction, demolition, removal, relocation and *occupancy* of existing *buildings*.

SECTION 1.3 DEFINITIONS OF WORDS AND PHRASES

SUBSECTION 1.3.1. Definitions of words and phrases used in this Bylaw that are not included in the list of definitions in this Part shall have the meanings which are commonly assigned to them in the context in which they are used in this Bylaw, taking into account the specialized use of terms with the various trades and professions to which the terminology applies.

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

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 Bylaw.

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 Bylaw.

Appropriate authority having jurisdiction means the departments of the provincial governments and agents thereof that have authority over the subject that is regulated.

Approved means approved by the *authority having jurisdiction* or the *appropriate authority having jurisdiction.*

Architect means a person who is a member or a licensee of a provincial or territorial association which is responsible for the administration and enforcement of the Architects Act within that province or territory.

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
(a) with respect to the proclamation and amendment of this Bylaw, and the creation of a Board of Appeal, the adopting governmental body, or
(b) with respect to the administration of this Bylaw, the person (designated official) appointed by the adopting governmental body and any person authorized by him to administer this Bylaw.

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

Balcony, interior (see *Mezzanine*).

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 *approved* 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 for shutting off an opening through a construction assembly, such as a door or a shutter, 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 ULC-S114-1975, "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 room or suite of rooms operated as a housekeeping unit, used or intended to be used as a domicile 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.

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 *approved* open space.

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 thoroughfare or to an *approved* 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 thoroughfare or to an *approved* 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,* or where a *building* is divided into *fire compartments,* the exterior wall of a *fire compartment* 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 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 square foot, 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*, window assembly or glass block assembly will withstand the passage of flame when exposed to fire under specified conditions of test and performance criteria, or as otherwise prescribed in this Bylaw.

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 Bylaw.

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 Bylaw 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 Bylaw.

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*.

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 (as applying to heating or cooling systems) means that portion of a venting system designed to convey vent gases vertically to the outside air from the *vent connector* of a gas-fired *appliance,* or directly from the *appliance* when a *vent connector* is not used, and includes any offsets.

Grade (as applying to the determination of *building height*) means the average level of finished ground adjoining a *building* at all exterior walls, as determined by the *authority having jurisdiction* (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, by avoidance of concealed spaces under floors and roofs and by use of *approved* fastenings, construction details and adhesives for structural members.

High hazard industrial occupancy (see *Industrial occupancy, high hazard*).

High occupant load means an *occupant load* where the number of persons in a room or *floor area* is such that the area of floor per person is not more than 12 sq ft.

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 71-1974, "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 10 lb or 100,000 Btu/sq ft 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 10 lb or 100,000 Btu/sq ft 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 spaces 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* towards 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,* including movable *partitions.*

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, high occupant (see *High occupant 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 *approved* 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.

Noncombustible (as applying to an elementary building material) means that such material conforms to ULC-S114-1975, "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 any person, firm or corporation controlling the property under consideration.

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

Party wall (see *Wall, party*).

Perched groundwater (see *Groundwater, perched*).

Permit means permission or authorization in writing by the *authority having jurisdiction* to perform work regulated by this Bylaw and, in the case of an occupancy permit, to occupy any *building* or part thereof.

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 a member of or a licensee of a provincial or territorial association which is responsible for the administration and enforcement of the Professional Engineers Act or Engineers Act within that province or territory.

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 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* or *buildings* of Group D *major occupancy* of a single tenancy.

Public corridor means a corridor that provides *access to exit* from individually owned or rented rooms, suites of rooms or *dwelling units.*

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.

Restaurant means any *building* or portion thereof where food is offered for sale for immediate consumption therein, but does not include any *building* or portion thereof where drink or prepackaged food requiring no further preparation before consumption is offered for sale.

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 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 lowest *storey* having its ceiling more than 6 ft above *grade*.

Stove means an *appliance* intended for cooking and space heating.

Street means any highway, road, boulevard, square or other improved thoroughfare 30 ft 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.

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.

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

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

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

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 30 ft.

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.

SECTION 1.4 ABBREVIATIONS

SUBSECTION 1.4.1. ABBREVIATIONS OF NAMES OF ASSOCIATIONS

1.4.1.1. The abbreviations in this Bylaw 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
(345 East 47th Street, New York, New York 10017 U.S.A.)

ASTM ..... American Society for Testing and Materials
(1916 Race Street, Philadelphia, Pa. 19103 U.S.A.)

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

CGSB ..... Canadian Government Specifications Board
(c/o Department of Supply and Services, 88 Metcalfe Street, Ottawa, Ontario 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
(Suite 267, 385 The West Mall, Etobicoke, Ontario M9C 1E7)

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

NFPA ..... National Fire Protection Association
(470 Atlantic Avenue, Boston, Massachusetts 02210 U.S.A.)

NLGA ..... National Lumber Grades Authority
(1055 West Hastings Street, Vancouver, B.C. V6E 2E9)

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 Bylaw shall have the meanings assigned to them in this Subsection.

ASWG ..... American Standard Wire Gage
B&SG ..... Brown and Sharpe Gage
Btu ..... British thermal unit(s)
cfm ..... cubic foot (feet) per minute
CLS ..... Canadian Lumber Standard
cu ft ..... cubic foot (feet)
db ..... decibel(s)
deg. ..... degree(s)
°F ..... degree(s) Fahrenheit
diam. ..... diameter
F° ..... Fahrenheit degree(s)
ft ..... foot (feet)
ft/sec. ..... foot (feet) per second
ga ..... gauge
gal. ..... gallon(s)
gpm ..... gallon(s) per minute
GSG ..... Galvanized Sheet Gage
hr ..... hour(s)
Hz ..... hertz
in. ..... inch(es)
Inc. ..... Incorporated
J ..... joule(s)
lb ..... pound(s)
max. ..... maximum
min. ..... minimum
min. ..... minute(s)
MSG ..... Manufacturers' Standard Gage
N/A ..... not applicable
No. ..... number(s)
nom. ..... nominal
o.c. ..... on centre
oz. ..... ounce(s)
psf ..... pound(s) per square foot
psi ..... pound(s) per square inch
psig ..... pound(s) per square inch gauge
R ..... thermal resistance
sec. ..... second(s)
sq ft ..... square foot (feet)
sq in ..... square inch(es)
sq yd ..... square yard(s)
SWG ..... Standard Wire Gage
temp. ..... temperature
T&G ..... tongue and groove
US gpm ..... United States gallon(s) per minute
USSG ..... United States Standard Gage
W ..... watt(s)
wt ..... weight

PART 2

ADMINISTRATION

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PART 2 ADMINISTRATION

SECTION 2.1 APPLICATION

SUBSECTION 2.1.1. Parts 1, 2, 5, 7 and 8 apply to all *buildings.*

SUBSECTION 2.1.2. Parts 3, 4 and 6 apply to
(a) all *buildings* used for *assembly, institutional* and *high hazard industrial occupancies,* and
(b) all *buildings* exceeding 6,000 sq ft in *building area,* or exceeding 3 *storeys* in *building height* used for *residential, business and personal services, mercantile, medium hazard industrial occupancies* and *low hazard industrial occupancies.*

SUBSECTION 2.1.3. Part 9 applies to *buildings* 3 *storeys* or less in height, having a *building area* not exceeding 6,000 sq ft and which are used for *residential, business and personal services, mercantile, medium hazard industrial occupancies* and *low hazard industrial occupancies.*

SUBSECTION 2.1.4. LIMITED APPLICATION TO EXISTING BUILDINGS

2.1.4.1. When a *building* or any part thereof is altered, this Bylaw applies to the parts of the *building* that are altered.

2.1.4.2. When the whole or any part of a *building* is relocated either within or into the municipality, this Bylaw applies to all parts of the *building.*

2.1.4.3. When the whole or any part of a *building* is demolished, this Bylaw applies to the work involved in the demolition and to work required to any parts remaining after demolition to the extent that deficiencies remaining after demolition are corrected.

2.1.4.4. When a *building* is damaged by fire, earthquake or other cause, this Bylaw and the appropriate regulations in the Fire Prevention Bylaw or, in the absence of a Fire Prevention Bylaw, the National Fire Code of Canada 1977 apply to the work necessary to reconstruct damaged portions of the *building.*

2.1.4.5. When an *unsafe condition* exists in or about a *building,* this Bylaw and the appropriate regulations in the Fire Prevention Bylaw or, in the absence of a Fire Prevention Bylaw, the National Fire Code of Canada 1977 apply to the work necessary to correct the *unsafe condition.*

2.1.4.6. When the *occupancy* of a *building* or any part thereof is changed, this Bylaw applies to all parts of the *building* affected by the change.

SUBSECTION 2.1.5. This Bylaw does not apply to
(a) farm *buildings* other than those used as residences, attached garages and carports,

(The ACNBC Canadian Farm Building Code 1977 provides standards and other useful information for those farm buildings based on elements of the National Building Code.)

(b) public works located on a *street* or on a public transit right of way,
(c) public utility towers and poles, television and radio or other communication aerials and towers, except for loads resulting from those located on or attached to *buildings,*
(d) flood control and hydro electric dams and structures,
(e) mechanical or other equipment and appliances not specifically regulated in this Bylaw, and

(f) an accessory *building* not greater than 100 sq ft in *building area* provided it does not create a hazard.

SECTION 2.2 REFERENCED DOCUMENTS AND CLIMATIC DATA

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

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

SUBSECTION 2.2.3. Unless otherwise specified herein, the documents referenced in this Bylaw shall include all amendments, revisions and Supplements effective to 30 June, 1976.

SUBSECTION 2.2.4. The climatic data required for the design of *buildings* in this municipality are the data provided by Table 2.2.4.A. when the appropriate climatic figures have been entered by the *authority having jurisdiction.*

Table 2.2.4.A.

Forming part of Subsection 2.2.4.

CLIMATIC DATA FOR THE MUNICIPALITY OF _____

		Apply to Code Requirement
Canadian Heating, Ventilating and Air-Conditioning Code 1977		
1. January 2½ per cent Design Temperature	_____	2.3.2.
2. January 1 per cent Design Temperature	_____	2.3.2.
3. July 2½ per cent Design Drybulb Temp.	_____	2.3.2.
4. July 2½ per cent Design Wetbulb Temp.	_____	2.3.2.
5. Annual Total Degree-days	_____	
Canadian Plumbing Code 1977		
6. Maximum Fifteen-minute Rainfall	_____	4.10.4.
National Building Code of Canada 1977		
7. Maximum One-day Rainfall	_____	4.1.7.5.(1)
8. Annual Total Precipitation	_____	
9. Maximum Snow Load on the Ground	_____	4.1.7.1.
10. Wind Effects: Probability 1/10	_____	4.1.8.1.(3)
Probability 1/30	_____	4.1.8.1.(3)
Probability 1/100	_____	4.1.8.1.(3)
11. Seismic Zone	_____	4.1.9.1.(4)
12. Acceleration ratio (A)	_____	4.1.9.1.(4)

Note: The above Table has been provided for recording the values of major climate factors that affect building for each municipality using the Code. These values may be obtained for any municipality from NBC Supplement No. 1, "Climatic Information for Building Design in Canada 1977" or by writing to: Meteorologist, Division of Building Research, National Research Council of Canada, Ottawa, Ontario K1A 0R6.

SECTION 2.3 PROHIBITIONS

SUBSECTION 2.3.1. Any person who fails to comply with any order or notice issued by the *authority having jurisdiction,* or who allows a violation of this Bylaw to continue, contravenes the provisions of this Bylaw.

SUBSECTION 2.3.2. No person shall work or authorize or allow work to proceed on a project for which a *permit* is required unless a valid *permit* exists for the work to be done.

SUBSECTION 2.3.3. No person shall deviate from the *approved* plans and specifications forming a part of the *building permit,* or omit or fail to complete, prior to *occupancy,* work required by the said *approved* plans and specifications, without first having obtained in writing the approval of the *authority having jurisdiction* to do so.

SUBSECTION 2.3.4. No person shall occupy or allow the *occupancy* of any *building,* or part thereof, unless the *owner* has obtained an *occupancy permit* from the *authority having jurisdiction.*

SUBSECTION 2.3.5. No person having authority in the construction, reconstruction, demolition, *alteration,* removal, relocation or *occupancy* of a *building* shall cause, allow or maintain any *unsafe condition.*

SUBSECTION 2.3.6. No person shall excavate or undertake work on, over or under public property, or erect or place any construction or work or store any materials thereon, without approval having first been obtained in writing from the appropriate government authority.

SUBSECTION 2.3.7. No person shall allow the property boundaries of a *building* lot to be so changed as to place a *building* or part thereof in contravention of this Bylaw, unless the *building* or part thereof is so altered, after obtaining the necessary *permit,* so that no contravention will occur as a result of the change of the property boundary or *approved grades.*

SUBSECTION 2.3.8. Any person who knowingly submits false or misleading information contravenes this Bylaw.

SECTION 2.4 DUTIES AND RESPONSIBILITIES OF THE OWNER

SUBSECTION 2.4.1. Every *owner* shall allow the *authority having jurisdiction* to enter any *building* or premises at any reasonable time for the purpose of administering and enforcing this Bylaw.

SUBSECTION 2.4.2. Every *owner* shall obtain all *permits* or approvals required in connection with proposed work, prior to commencing the work to which they relate.

SUBSECTION 2.4.3. Every *owner* shall ensure that the plans and specifications on which the issue of the *building permit* was based are available continuously at the site of the work for inspection during working hours by the *authority having jurisdiction,* and that the *permit,* or true copy thereof, is posted conspicuously on the site during the entire execution of the work.

SUBSECTION 2.4.4. Every *owner* shall give notice to the *authority having juisdiction* of the dates on which he intends to begin work prior to commencing work on the *building* site.

SUBSECTION 2.4.5. Every *owner* shall give notice in writing to the *authority having jurisdiction,* prior to commencing the work, listing

(a) the name, address and telephone number of
  (i) the *constructor* or other person in charge of the work,
  (ii) the engineer or architect reviewing the work, and
  (iii) any inspection or testing agency engaged to monitor the work, and
(b) any change in or termination of employment of such persons during the course of the construction immediately that such change or termination occurs.

SUBSECTION 2.4.6. Every *owner* shall give notice to the *authority having jurisdiction*
(a) of intent to do work that has been ordered inspected during construction,
(b) of intent to cover work that has been ordered to be inspected prior to covering, and
(c) when work has been completed so that a final inspection can be made.

SUBSECTION 2.4.7. Every *owner* shall give notice in writing to the *authority having jurisdiction*
(a) immediately that any change in ownership or change in the address of the *owner* occurs prior to the issuance of an *occupancy permit*, and
(b) prior to occupying any portion of the *building* if it is to be occupied in stages.

SUBSECTION 2.4.8. Every *owner* shall give such other notice to the *authority having jurisdiction* as may be required by the provisions of this Bylaw.

SUBSECTION 2.4.9. Every *owner* shall make or have made at his own expense tests or inspections as necessary to prove compliance with this Bylaw, and shall promptly file a copy of all such test or inspection reports with the *authority having jurisdiction.*

SUBSECTION 2.4.10. Every *owner* shall provide an up-to-date survey of the *building* site when and as required by the *authority having jurisdiction.*

SUBSECTION 2.4.11. When required by the *authority having jurisdiction*, every *owner* shall uncover and replace at his own expense any work that has been covered contrary to an order issued by the *authority having jurisdiction.*

SUBSECTION 2.4.12. Every *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 for which a *permit* was required by this Bylaw.

SUBSECTION 2.4.13. No *owner* shall deviate from the requirements of this Bylaw or of the conditions of the *permit* or omit work required by this Bylaw or the conditions of the *permit* without first obtaining from the *authority having jurisdiction* permission in writing to do so.

SUBSECTION 2.4.14. Every *owner* shall obtain an *occupancy permit* from the *authority having jurisdiction* prior to any
(a) *occupancy* of a *building* or part thereof after construction, partial demolition or *alteration* of that *building*, or
(b) change in the *occupancy* of any *building* or part thereof.

SUBSECTION 2.4.15. Every *owner* shall ensure that no *unsafe condition* exists or will exist because of the work being undertaken or not completed, should *occupancy* occur prior to the completion of any work being undertaken that requires a *permit.*

SUBSECTION 2.4.16. When required by the *authority having jurisdiction*, every *owner* shall provide a letter to certify compliance with the requirements of this Bylaw and of any *permits* required.

SUBSECTION 2.4.17. The granting of a *permit*, the approval of the drawings and specifications or inspections made by the *authority having jurisdiction*, shall not in any way relieve the *owner* of a *building* from full responsibility for carrying out the work or having the work carried out in accordance with the requirements of this Bylaw, including ensuring that the *occupancy* of the *building*, or any part thereof, is in accordance with the terms of the *occupancy permit*, and including compliance with any special conditions made under the provisions of Subsection 2.7.6.

SUBSECTION 2.4.18. When a *building* or part thereof is in an *unsafe condition*, the *owner* shall forthwith take all necessary action to put the *building* in a safe condition.

SECTION 2.5 DUTIES AND RESPONSIBILITIES OF THE CONSTRUCTOR

SUBSECTION 2.5.1. Every *constructor* shall ensure that all construction safety requirements of this Bylaw are complied with.

SUBSECTION 2.5.2. Every *constructor* is responsible for ensuring that no excavation or other work is undertaken on public property, and that no *building* is erected or materials stored in whole or in part thereon without approval first having been obtained in writing from the appropriate government authority.

SUBSECTION 2.5.3. Every *constructor* is responsible jointly and severally with the *owner* for any work actually undertaken.

SECTION 2.6 DUTIES AND RESPONSIBILITIES OF THE AUTHORITY HAVING JURISDICTION

SUBSECTION 2.6.1. The *authority having jurisdiction* is responsible for the administration and enforcement of this Bylaw.

SUBSECTION 2.6.2. The *authority having jurisdiction* shall 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 this Bylaw for such time as other regulations require.

SUBSECTION 2.6.3. The *authority having jurisdiction* shall accept any construction or condition that lawfully existed prior to the effective date of this Bylaw provided that such construction or condition does not constitute an *unsafe condition*.

SUBSECTION 2.6.4. The *authority having jurisdiction* shall issue in writing such notices or orders as may be necessary to inform the *owner* where a contravention of this Bylaw has been observed.

SUBSECTION 2.6.5. The *authority having jurisdiction* shall issue to the *owner* an order or notice in writing to correct any *unsafe condition* observed in any *building*.

SUBSECTION 2.6.6. The *authority having jurisdiction* shall provide when requested to do so all reasons for refusal to grant a *permit*.

SUBSECTION 2.6.7. The *authority having jurisdiction* shall answer such relevant questions as may be reasonable with respect to the provisions of this Bylaw when requested to do so, but except for standard design aids shall refrain from assisting in the laying out of any work and from acting in the capacity of an engineering or architectural consultant.

SUBSECTION 2.6.8. The *authority having jurisdiction* shall issue a *permit* to the *owner* when, to the best of his knowledge, the applicable conditions as set forth in this or any other Bylaw have been met.

SECTION 2.7 POWERS OF THE AUTHORITY HAVING JURISDICTION

SUBSECTION 2.7.1. The *authority having jurisdiction* may enter any *building* or premises at any reasonable time for the purpose of administering or enforcing this Bylaw.

SUBSECTION 2.7.2. The *authority having jurisdiction* is empowered to order

(a) a person who contravenes this Bylaw to comply with the Bylaw within the time period specified,
(b) work to stop on the *building* or any part thereof if such work is proceeding in contravention of this Bylaw, or if there is deemed to be an *unsafe condition*,
(c) the removal of any unauthorized encroachment on public property,
(d) the removal of any *building* or part thereof constructed in contravention of this Bylaw,
(e) the cessation of any *occupancy* in contravention of this Bylaw, and
(f) the cessation of any *occupancy* if any *unsafe condition* exists because of work being undertaken or not completed.

SUBSECTION 2.7.3. The *authority having jurisdiction* may direct that tests of materials, equipment, devices, construction methods, structural assemblies or *foundation* conditions be made, or sufficient evidence or proof be submitted at the expense of the *owner*, where such evidence or proof is necessary to determine whether the material, equipment, device, construction or *foundation* condition meets the requirements of this Bylaw.

SUBSECTION 2.7.4. The *authority having jurisdiction* may require any *owner* to submit an up-to-date plan of survey prepared by a registered land surveyor which shall contain sufficient information regarding the site and the location of any *building*

(a) to establish before construction begins that all requirements of this Bylaw 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.

SUBSECTION 2.7.5. When site conditions, size or complexity of the work warrant, the *authority having jurisdiction* may require that all plans and specifications or any part thereof be certified, and the construction or *alteration* of any *building* or part thereof be generally reviewed during construction, by an architect or engineer registered or licensed to practice in the jurisdiction in which the work is being undertaken.

SUBSECTION 2.7.6. The *authority having jurisdiction* may issue a *permit* when 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 Bylaw, in which case the *permit* may be issued subject to certain conditions.

SUBSECTION 2.7.7. The *authority having jurisdiction* may issue a *permit* at the risk of the *owner*, with conditions if necessary to ensure compliance with this and any other applicable Bylaw, to excavate or to construct a portion of a *building* before the entire plans of the whole project have been submitted or *approved*.

SUBSECTION 2.7.8. The *authority having jurisdiction* may issue a *permit* for the entire project conditional upon the submission, prior to commencing work thereon, of additional information not available at the time of issuance, if such data are of secondary importance, and are of such nature that the withholding of the *permit* until its availability would unreasonably delay the work.

SUBSECTION 2.7.9. The *authority having jurisdiction* may refuse to issue any *permit*

(a) whenever information submitted is inadequate to determine compliance with the provisions of this Bylaw,
(b) whenever incorrect information is submitted,
(c) that would authorize any *building* work or *occupancy* that would not be permitted by this Bylaw, or
(d) that would be prohibited by any other Bylaw, act or regulation.

SUBSECTION 2.7.10. 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.

SUBSECTION 2.7.11. The *authority having jurisdiction* may place a value on the cost of the work for the purpose of determining *permit* fees to be applicable.

SUBSECTION 2.7.12. 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* or a part thereof for the *approved* use, prior to commencement or completion of the construction or demolition work.

SUBSECTION 2.7.13. When any *building*, construction or excavation or part thereof is in an *unsafe condition* as a result of being open or unguarded, or because of danger from fire or risk of accident because of its ruinous or dilipidated state, faulty construction, abandonment or otherwise, and when due notice to correct such condition has not been complied with, the *authority having jurisdiction* may

(a) demolish, remove or make safe such *building*, construction, excavation or part thereof at the expense of the *owner* and may recover such expense in like manner as municipal taxes, and
(b) take such other measures as he may consider necessary to protect the public.

SUBSECTION 2.7.14. When immediate measures must be taken to avoid an imminent danger of fire or risk of accident, the *authority having jurisdiction* may take such action as is appropriate, without notice, and at the expense of the *owner*.

SUBSECTION 2.7.15. Before issuing an *occupancy permit*, the *authority having jurisdiction* may require the *owner* to provide letters to certify that the requirements of this Bylaw and the necessary *permits* have been met.

SECTION 2.8 TESTS AND CONSTRUCTION REVIEW

SUBSECTION 2.8.1. TESTS

2.8.1.1. All required tests of materials shall be conducted according to the appropriate methods found in the standards listed in this Bylaw, or in the absence of these, as specified by the *authority having jurisdiction* or other authority acceptable to him.

2.8.1.2. All tests shall be conducted and reports thereon prepared at the expense of the *owner*.

2.8.1.3. Laboratory tests shall be conducted by a laboratory acceptable to the *authority having jurisdiction.*

SUBSECTION 2.8.2. CONSTRUCTION REVIEW

2.8.2.1. Whenever general review, during construction, by an architect or engineer is required by this Bylaw, such review shall be to standards satisfactory to the *authority having jurisdiction.*

2.8.2.2. Upon completion of the work for which review was required, a report shall be submitted to the *authority having jurisdiction* by the architect or engineer stating what was reviewed and, where applicable, what was not reviewed, and stating the extent to which the construction conforms to this Bylaw.

SECTION 2.9 PERMITS AND PERMIT FEES

SUBSECTION 2.9.1. PERMITS

2.9.1.1. A *permit* is required whenever work regulated by this Bylaw is to be undertaken.

2.9.1.2. *Permits,* in addition to the *permits* required in Article 2.9.1.1. with respect to *building* components and services, may be required by the *authority having jurisdiction.*

2.9.1.3.(1) An *occupancy permit* is required
(a) to allow the *occupancy* of a *building* or part thereof, or
(b) when the *occupancy* of a *building* or part thereof is changed.

SUBSECTION 2.9.2. APPLICATION FOR PERMIT

2.9.2.1. To obtain a *permit* the *owner* shall file an application in writing on a prescribed form.

2.9.2.2.(1) Except as otherwise allowed by the *authority having jurisdiction,* every application shall
(a) identify and describe in detail the work and *occupancy* to be covered by the *permit* for which application is made,
(b) describe the land on which the work is to be done, by a description that will readily identify and locate the *building* lot,
(c) include plans and specifications, unless otherwise *approved* by the *authority having jurisdiction,* and show the *occupancy* of all parts of the *building,*
(d) state the valuation of the proposed work, and be accompanied by the required fee, and
(e) state the names, addresses and telephone numbers of the *owner,* architect, engineer or other designer and *constructor.*

2.9.2.3. An application for a *permit* may be deemed to have been abandoned 6 months after the date of filing, unless such application has been proceeded with.

SUBSECTION 2.9.3. PLANS AND SPECIFICATIONS

2.9.3.1. Sufficient information shall be submitted with each application for a *permit* to enable the *authority having jurisdiction* to determine whether or not the proposed work will conform to this Bylaw and whether or not it may affect adjacent property.

2.9.3.2. When required by the *authority having jurisdiction*, plans and specifications shall be provided.

2.9.3.3. Plans drawn to scale upon paper, cloth or other substantial material shall be clear and durable, 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 Bylaw and other relevant Bylaws and regulations.

2.9.3.4.(1) Site plans shall be referenced to an up-to-date survey and, when required to prove compliance with this Bylaw, a copy of the survey shall be submitted to the *authority having jurisdiction.*

(2) 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.

2.9.3.5. In lieu of separate specifications, the *authority having jurisdiction* may allow the essential information to be shown on the plans, but in no case shall such terms as "in accordance with this Bylaw," "legal," or similar terms be used as substitutes for specific information.

SUBSECTION 2.9.4. APPROVAL IN PART

2.9.4.1. When in order to expedite work, approval of a portion of the *building* is desired prior to the issuance of a *permit* for the whole project, application shall be made for the complete project, and complete plans and specifications covering the portion of the work for which immediate approval is desired shall be filed with the *authority having jurisdiction.*

2.9.4.2. Should a *permit* be issued for part of a *building*, the holder of such *permit* may proceed without assurance that the *permit* for the entire *building* will be granted.

SUBSECTION 2.9.5. After issuance of the *permit*, application may be made for revision of the *permit*, and such applications shall be made in the same manner as for the original *permit.*

SUBSECTION 2.9.6. A *permit* shall expire and the right of an *owner* under the *permit* shall terminate if
(a) the work authorized by the *permit* is not commenced within 6 months from the date of issuance of the *permit* and actively carried out thereafter, or
(b) work is suspended for a period of 6 months.

SUBSECTION 2.9.7. *Permit* fees and all procedures and conditions applicable thereto shall be as established by the *authority having jurisdiction.*

SUBSECTION 2.9.8. PERMIT FOR A TEMPORARY BUILDING

2.9.8.1. Notwithstanding anything contained elsewhere in this Bylaw, a *permit* for a temporary *building* may be issued by the *authority having jurisdiction,* authorizing for a limited time only the erection and existence of a *building* or part thereof for an *occupancy* which because of its nature will exist for a short time under circumstances which warrant only selective compliance with the Bylaw.

2.9.8.2. A *permit* for a temporary *building* shall state the date after which and the conditions under which the *permit* is no longer valid.

2.9.8.3. A *permit* for a temporary *building* may be extended provided permission in writing is granted by the *authority having jurisdiction.*

2.9.8.4. A *permit* for a temporary *building* shall be posted on the *building.*

SECTION 2.10 EQUIVALENTS

SUBSECTION 2.10.1. The provisions of this Bylaw are not intended to limit the appropriate use of materials, *appliances,* equipment or methods of design or construction not specifically authorized herein.

SUBSECTION 2.10.2 Any person desirous of providing an equivalent to satisfy one or more of the requirements of this Bylaw shall submit to the *authority having jurisdiction* sufficient evidence to satisfy the authority that the proposed equivalent will provide the level of performance required by this Bylaw.

SECTION 2.11 BOARD OF APPEAL

SUBSECTION 2.11.1. Unless provincial legislation provides for a Board of Appeal, the *authority having jurisdiction* may create such a board, and if created it shall have the following establishment and terms of reference.

SUBSECTION 2.11.2. The Board of Appeal shall consist of at least 7 members, including a Chairman and Vice-Chairman, who are qualified by experience and training to consider matters pertaining to *building* design and construction.

2.11.2.1. The members of the Board of Appeal shall be appointed for such periods as may be deemed appropriate.

2.11.2.2. In the absence of the Chairman and Vice-Chairman at any meeting, the members shall elect a Chairman from among those present to preside.

2.11.2.3. A Secretary without voting privileges shall be appointed and be responsible for maintaining records, correspondence and keeping minutes of the Board meetings.

2.11.2.4. Three members of the Board constitute a quorum.

SUBSECTION 2.11.3. The Board shall hear appeals from decisions of the designated official pertaining to the requirements of this Bylaw, and shall confirm, alter or reject such decision in accordance with the intent of this Bylaw.

SUBSECTION 2.11.4. An appeal against a decision of the designated official may be submitted to the Board of Appeal by a person who

(a) has applied under the provisions of this Bylaw for a *permit* which has not been granted,
(b) has had a *permit* revoked, or
(c) feels himself adversely affected by a decision of the designated official.

SUBSECTION 2.11.5. The appellant shall file with the Secretary of the Board of Appeal a statement in writing in such detail as will enable the Board properly to consider the appeal, addressed to the Board of Appeal and setting out

(a) the nature and subject matter of the appeal,
(b) the address of the *building* affected by the appeal, and
(c) the sections of this Bylaw applicable to the appeal.

SUBSECTION 2.11.6. The Board shall meet as often as it deems necessary to conduct the work of the Board in an expeditious manner.

2.11.6.1. The Board shall consider any appeal filed with the Secretary within 15 calendar days after a decision of the designated official and need not consider any appeal filed thereafter.

2.11.6.2. The Board shall meet to hear an appeal within 15 calendar days after the appeal has been filed.

2.11.6.3. The Board shall communicate its decision to the person making the appeal within 2 working days after the decision has been reached.

SUBSECTION 2.11.7. The appellant and the designated official, or their respective representatives may attend the meeting of the Board and may make representations concerning the matter under appeal.

2.11.7.1. The Board in making its decisions may inform itself in any manner it deems appropriate and which it considers necessary to arrive at a decision.

2.11.7.2. The Board shall inform the appellant and the designated official of any additional information considered, and shall provide an opportunity for either party to respond.

SUBSECTION 2.11.8. The decisions of a majority of the members of the Board present at a hearing shall be the decision of the Board, whose decision shall not be subject to further appeal.

SUBSECTION 2.11.9. The Secretary shall notify the appellant and the designated official of a decision of the Board in writing, and such decisions shall form part of the public record.

SUBSECTION 2.11.10. A person who appeals in accordance with the provisions of this Section shall not be relieved of complying with the Bylaw pending a decision on the appeal, nor shall the *authority having jurisdiction* be precluded from enforcing the provisions of the Bylaw during such period.

SECTION 2.12 EFFECTIVE DATE

SUBSECTION 2.12.1. This Bylaw shall come into effect when proclaimed by the *authority having jurisdiction.*

SUBSECTION 2.12.2. Any person who carries out work under the terms of this Bylaw after its adoption but before its effective date, may do so, but all such work shall comply entirely with this Bylaw.

SUBSECTION 2.12.3. This Bylaw, or any amendment to it, shall not affect the rights of an *owner* under a *permit* issued prior to the effective date of this Bylaw or such amendment provided the *owner* has commenced work within 6 months of the date of issuance of the *permit* and has actively carried out work thereafter.

PART 3

USE AND OCCUPANCY

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PART 3 USE AND OCCUPANCY

SECTION 3.1 GENERAL

SUBSECTION 3.1.1. SCOPE

Application

3.1.1.1.(1) This Part applies 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 6,000 sq ft 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.*

(2) For *buildings* not listed in Sentence (1), requirements relating to use and *occupancy* will be found in Part 9 of this Bylaw.

Definitions

3.1.1.2. Words that appear in italics are defined in Part 1 of this Bylaw.

Plans and Specifications

3.1.1.3.(1) In addition to the requirements contained in Subsection 2.9.3. of Part 2 of this Bylaw, information shall be submitted to show schematically or in writing 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), and
(e) the location of *exits.*

Tents and Air-Supported Structures

Occupancy certificate

3.1.1.4.(1) Except where permitted by the *authority having jurisdiction,* a tent or *air-supported structure* shall not be erected unless a certificate of *occupancy* has been obtained.

(2) The *authority having jurisdiction* shall issue a certificate of *occupancy* when he is satisfied that a tent or *air-supported structure* complies with Article 3.1.4.7.

(3) The certificate of *occupancy* for a tent or *air-supported structure* is renewable every 12 months provided the tent or *air-supported structure* complies with all laws and regulations in effect at the time of request for renewal.

Reference Documents

3.1.1.5. When a specification or reference document listed herein contains requirements that conflict with specific requirements in this Part, the requirements in this Part shall govern.

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

Classification of buildings or parts thereof

3.1.2.1.(1) Every *building* or part thereof shall be classified by the *authority having jurisdiction* 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.:

(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) The purpose of classification is to determine which requirements apply. This Bylaw requires classification in accordance with every *major occupancy* for which the *building* is used or intended to be used. This gives the *authority having jurisdiction* the right to enforce regulations for every such *occupancy*. Where necessary in this Part, an application clause has been inserted to explain how to choose between the alternate regulations which multiple *occupancy* classification may present.

(3) 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.

Buildings containing occupancies of same classification

(4) 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.

Other uses of arena-type buildings

(5) 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 15,000 sq ft, the *building* shall be *sprinklered*.

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	*Assembly occupancies* intended for the production and viewing of the performing arts, including:	Motion picture *theatres* Opera houses Television studios admitting a viewing audience *Theatres*, including experimental *theatres*
A	2	*Assembly occupancies* 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 Day-care centres Exhibition halls (other than classified in Group E) Gymnasia Indoor swimming pools 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 spectator seating
A	4	*Assembly occupancies* in which provision is made for the congregation or gathering of persons for the purpose of participating in or viewing open air activities, including:	Amusement park structures (not elsewhere classified) Bleachers Grandstands Reviewing stands Stadia
B	1	*Occupancies* in which persons are detained for penal or correctional purposes, or for involuntary detention, or whose liberties are restricted, including:	Jails Penitentiaries Police stations[2] Prisons Psychiatric hospitals[2] Reformatories[2]
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	*Occupancies* in which persons because of age, mental, or physical limitations require special care or treatment, including:	Children's custodial homes[5] Convalescent homes[5] Homes for the aged Hospitals Infirmaries Orphanages Psychiatric hospitals[3] Reformatories[3] Sanitoria[3]
C		*Occupancies* used for sleeping accommodation excluding those covered in Group B, *institutional occupancies,* including:	Apartments Boarding houses Clubs, residential Colleges, residential Convents Dormitories Hotels Houses Lodging houses Monasteries Motels Schools, residential
D		*Occupancies* for conducting business and the rendering of professional and personal services, including:	Banks Barber and hairdressing shops Beauty parlours Dental offices Dry cleaning, self-service not employing flammable or explosive solvents or cleaners Fire stations Laundry, self-service Medical offices Offices Police stations[3] Radio stations Small tool and appliance rental and service Telephone exchanges
E		*Occupancies* for the displaying, or selling of retail goods, wares or merchandise, including:	Department stores Exhibition halls Markets Shops Stores Supermarkets
F	1	*Occupancies* involving sufficient quantities of highly *combustible* and flammable or explosive materials which because of their inherent characteristics constitute a special fire hazard, including:	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 *combustible* content is more than 10 lb or 100,000 Btu per square foot 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 *combustible* content is not more than 10 lb or 100,000 Btu per square foot 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.(5).

(2) With detention quarters.

(3) Without detention quarters.

(4) See Sentence 3.2.2.1.(2).

(5) Where the occupants are ambulatory and live as a single housekeeping unit in a *dwelling unit* with sleeping accommodation for not more than 10 persons, the *occupancy* may be considered to be Group C.

SUBSECTION 3.1.3. MULTIPLE OCCUPANCY REQUIREMENTS

Fire Safety Requirements for Buildings of Mixed Occupancy

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*.

Supplementary major occupancies

(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*.

(5) *Fire separations* required for the separation of *major occupancies* described in Sentence (4) need not conform to Article 3.1.5.4. and Sentence 3.1.6.2.(1), except that in no case shall the *fire-resistance rating* of the structure supporting the upper *major occupancy* be less than ¾ hr.

(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*.

Prohibited combinations of occupancies

3.1.3.2.(1) Not more than 1 *dwelling unit* shall be contained within a *building* classified as Group F, Division 2 *major occupancy*.

(2) No *major occupancy* of Group F, Division 1 shall be contained within a *building* with any *occupancy* classified as Group A, B or C.

Separation of major occupancies

3.1.3.3.(1) Except as provided in Sentence (2), 2 or more *major occupancies* of different Groups or Divisions shall be separated from each other by a *fire separation* having a *fire-resistance rating* conforming to Table 3.1.3.A.

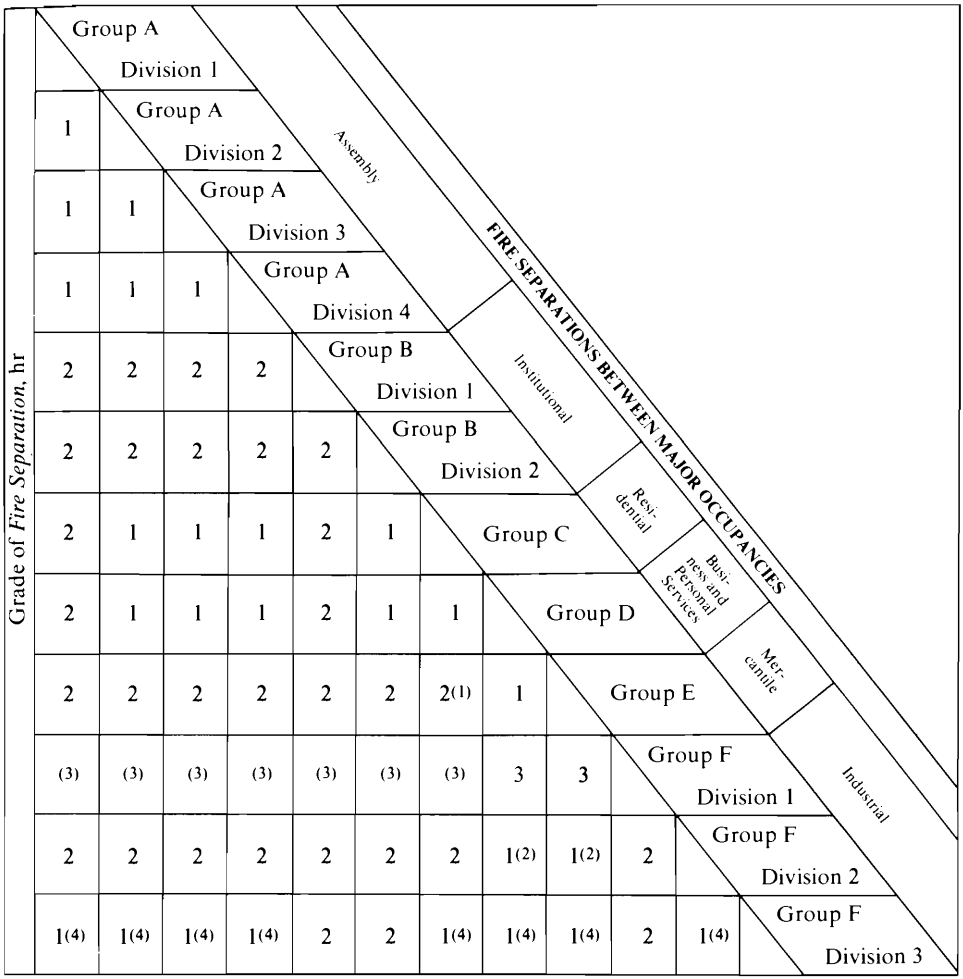
Separation of dwellings from mercantile occupancies

(2) Where not more than 2 *dwelling units* are contained within a *building* with a Group E *occupancy* not over 3 *storeys* in *building height*, the grade of *fire separation* between the 2 *major occupancies* need not exceed 1 hr.

(3) Fire protection measures conforming to good fire protection engineering practice for the regulation of arrangements of multiple *occupancies* that are not covered by other requirements in this Subsection may be required by the *authority having jurisdiction*.

Table 3.1.3.A.

Forming Part of Article 3.1.3.3.



Notes to Table 3.1.3.A.:

(1) See Sentence 3.1.3.3.(2) for exception.

(2) A *fire separation* of at least 2 hr is required for *repair garages* (see Sentence 3.3.7.7.(11)).

(3) These *major occupancy* combinations are not permitted (see Sentence 3.1.3.2.(2)).

(4) A *fire separation* of at least 1½ hr is required for *storage garages*.

SUBSECTION 3.1.4. CONSTRUCTION TYPES

Approved materials

3.1.4.1. Materials and assemblies of materials and systems other than those indicated in this Subsection shall not be used unless *approved* in accordance with the provisions of Section 5.1 of Part 5 of this Bylaw.

Combustible Construction

Composition

3.1.4.2. Where a *building* is permitted to be of *combustible construction*, it may be constructed of *combustible* materials described in Part 9 of this Bylaw, with or without *noncombustible* components.

Heavy timber alternative to ¾-hr combustible fire rating

3.1.4.3. Where *combustible construction* is permitted and is required to have a ¾-hr *fire-resistance rating*, *heavy timber construction* may be used provided the construction conforms to Article 3.1.4.4.

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.

Dimensions

(2) The actual dimensions of the nominal sized lumber used in *heavy timber construction* in this Article shall conform to Article 5.1.1.3. of this Bylaw.

Columns

(3) Wood columns shall be continuous or superimposed throughout all *storeys* and shall be

(a) solid sawn or glued-laminated at least
  (i) 8 in. by 8 in. nominal dimension when supporting floor loads, and
  (ii) 6 in. by 8 in. nominal dimension when supporting roof and ceiling loads only, or
(b) round timber columns of uniform taper at least
  (i) 8 in. diam. at the top of the column when supporting floor loads, and
  (ii) 7 in. diam. at the top of the column when supporting roof and ceiling only.

Floor supports

(4) Floors shall be supported by

(a) beams and girders of wood that are
  (i) solid sawn or glued-laminated, and
  (ii) at least 6 in. nominal width and 10 in. nominal depth,
(b) framed or glued-laminated wood arches that spring from the floor line and are at least 8 in. by 8 in. nominal dimension, or
(c) framed timber trusses having members that are at least 8 in. by 8 in. nominal dimension.

Roof supports

(5) Roof framing when not supporting floor loads shall be

(a) framed or glued-laminated wood arches springing from the floor line and having members at least 6 in. nominal width, and at least 8 in. nominal depth below the eave elevation and 6 in. nominal depth above the eave elevation (where there are no eaves, the depth of the entire arch shall be at least 6 in. nominal), or
(b) framed or glued-laminated wood arches springing from the top of walls or abutments, framed timber trusses, wood beams and girders having members
  (i) at least 4 in. nominal width and 6 in. nominal depth,
  (ii) at least 3 in. nominal thickness when made of 2 or more spaced members, provided intervening spaces are blocked solidly throughout or tightly closed by a continuous wood cover plate of at least 2 in. nominal thickness secured to the underside of the members, or
  (iii) at least 3 in. nominal thickness when protected by *approved* automatic sprinklers under the roof deck, and
(c) spliced where necessary with splice plates at least 3 in. nominal thickness.

(6) Floors shall be of glued-laminated or solid sawn plank that is at least 3 in. nominal thickness, splined or tongued and grooved, or at least 2 in. nominal width and 4 in. nominal depth set on edge and well spiked together, Floors

(a) laid so that no continuous line of end joints will occur except at points of support, and covered with 1 in. nominal dimension tongued and grooved flooring laid cross-wise or diagonally, or ½-in. tongued and grooved phenolic-bonded plywood, and

(b) laid not closer than ½ in. to walls to provide for expansion, and the gap covered at top or bottom.

(7) Roofs shall be of at least 1⅛ in. thick, tongued and grooved phenolic-bonded plywood, or glued-laminated or solid sawn plank that is Roofs

(a) at least 2 in. nominal thickness, splined or tongued and grooved, or

(b) at least 2 in. nominal width and 3 in. nominal depth set on edge and laid so that no continuous line of end joints will occur except at points of support.

(8) Superimposed wood columns shall be connected by Construction detail

(a) reinforced concrete or metal caps with brackets,

(b) steel or iron caps with pintles and base plates,

(c) timber splice plates fastened to the columns by metal connectors housed within the contact faces, or

(d) other *approved* methods.

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

(10) Wood girders and beams shall be closely fitted around columns, and adjoining ends shall be connected by ties or *approved* 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 *approved* 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

(a) the space is compartmented by *fire stopping* conforming to Sentence 3.1.9.1.(5), except that no compartment shall exceed 50 ft in any horizontal dimension, and

(b) 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.

Noncombustible Construction

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 Article 3.1.7.7. for *combustible* elements penetrating a *fire separation.*)

(2) *Combustible* elements of roofs, floors and walls shall be limited to Combustible elements permitted in roofs, floors and walls

(a) the following minor components:

(i) paint,

(ii) tightly-adhering paper covering not exceeding 0.036-in. 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 2 in. by 2 in. nominal dimension attached directly to a continuous *noncombustible* backing, or wood nailing strips set into a continuous *noncombustible* backing in an *approved* manner for the attachment of interior finishes, and

(v) similar minor components as *approved*,

(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, and

(d) thermal and sound 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, except that

(i) where the insulation is placed between 2 layers of *noncombustible* material having a melting point above 1,200°F without an intervening air space, the *flame-spread rating* of the insulation shall not exceed 100 on any exposed surface or any surface that would be exposed by cutting through the material in any direction, and

(ii) no limitation on the *flame-spread rating* is required for thermal insulation installed above a roof deck,

(e) *combustible* skylight assemblies provided such assemblies

(i) do not exceed 100 sq ft in area with a maximum dimension of 10 ft,

(ii) are spaced at least 8 ft apart and 8 ft 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 ULC-S102.2-1975, "Standard Method of Test for Surface Burning Characteristics of Flooring and Floor Covering Materials," and

(f) wood cantstrips and roof curbs provided such roof curbs are not more than 12 in. in height above the top surface of the roof assembly.

Combustible finishes and millwork

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

(a) millwork such as interior trim, ordinary 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 3 ft 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 0.036 in. in thickness,

(g) interior wall finishes that
  (i) are not more than 1 in. 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 that
  (i) are not more than 1 in. in thickness except for exposed fire-retardant treated wood battens, and
  (ii) have a *flame-spread rating* of not more than 25 on any exposed surface or on any surface that would be exposed by cutting through the material in any direction, and
(i) combustible vertical glazing provided such glazing has a *flame-spread rating* of not more than 50 and the glazing is not installed at a height of more than 2 *storeys* above *grade.*

(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 the ACNBC Canadian Heating, Ventilating and Air-Conditioning Code 1977.

(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 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 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 the ACNBC Canadian Heating, Ventilating and Air-Conditioning Code 1977.

(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 that has an overall diameter greater than 1 in. 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-hr *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.

3.1.4.6. Prestressed concrete beams shall be constructed with secondary reinforcement to retain the concrete in position around the tendons in the event of a fire where the thickness of concrete cover over the steel tendons exceeds 2½ in.

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 10 ft to other structures on the same property except as provided in Sentences (3) and (4). Such structures 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 10 ft from other structures on the same property where the *authority having jurisdiction* deems such closer spacing safe from hazard to the public.

(4) Tents not exceeding 1,200 sq ft in ground area, located on fair grounds or similar open spaces, need not be separated from one another provided *approved* 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 the appropriate requirements for resistance to fire in NFPA 701-1975, "Fire Tests for Flame Resistant Textiles and Films."

(6) The ground enclosed by a tent or *air-supported structure* and for at least 10 ft 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 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.

(9) 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 hr, or a supplementary blower powered by an automatic internal-combustion engine.

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

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

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

SUBSECTION 3.1.5. FIRE-RESISTANCE RATING

Determination of fire-resistance ratings

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*, it shall be determined by the *authority having jurisdiction* on the basis of the results of tests conducted in conformance with ULC-S101-1975, "Standard Methods of Fire Endurance Tests of Building Construction and Materials."

(2) The *authority having jurisdiction* may accept the results of tests based on a test standard other than as described in Sentence (1) provided he is satisfied that such alternate test standard provides a *fire-resistance rating* comparable to that obtained in Sentence (1)."

(3) A material, assembly of materials or a structural member may be assigned a *fire-resistance rating* on the basis of NBC Supplement No. 2, "Fire Performance Ratings 1977."

Exception for exterior walls

(4) The limitation on the rise of temperature on the unexposed surface of an assembly as required by the Standard tests in Sentence (1) shall not apply to an exterior wall that has a *limiting distance* of 4 ft or more provided correction is made for radiation from the unexposed surface in accordance with Article 3.2.3.9.

(5) 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 *approved* means shall be provided to prevent the lifting of such panels or tiles in the event of a fire.

Application to various assemblies

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

(2) *Firewalls* and interior vertical *fire separations* shall be rated for exposure to fire on each side.

(3) Exterior walls shall be rated for exposure to fire from inside the *building* unless otherwise specified.

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. No structural member or assembly required to have a *fire-resistance rating* shall be supported on construction that has a lesser *fire-resistance rating*, except as permitted in Subsection 3.2.2. for mixed types of construction, Article 3.1.6.2. and elsewhere in this Part.

Exceptions to fire protection requirements

3.1.5.5.(1) Notwithstanding the requirements in Section 3.2, fire protection is not required for

(a) steel lintels over openings not more than 6 ft wide in *loadbearing* walls and not more than 10 ft 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 6 ft 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 and iron 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 and iron members of stairways, including escalators, which are not a part of the structural frame of a *building*,

(f) steel and iron 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 10 ft from a property line or centre line of a public thoroughfare, and

(ii) at least 3 ft 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.

Openings in membranes

3.1.5.6.(1) Every 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 boxes are *noncombustible* and are tightly fitted to the membrane.

(2) Except as permitted in Sentence (3), every membrane ceiling forming a part of an assembly assigned a *fire-resistance rating* on the basis of NBC Supplement No. 2, "Fire Performance Ratings 1977" 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 144 sq in. 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 7 ft apart, and

(d) where an opening exceeds 20 sq in. in area, it is protected by a *fire stop flap* conforming to Article 2.4.10. of the ACNBC Canadian Heating, Ventilating and Air-Conditioning Code 1977.

(3) Where the inside or outside of a duct within a ceiling space is protected within the assembly by a covering that has a *fire-resistance rating* at least equivalent to ½ the *fire-resistance rating* required for the assembly, the restrictions on openings in Sentence (2) do not apply to such duct.

(The *fire-resistance rating* of the covering may be as set forth in NBC Supplement No. 2, "Fire Performance Ratings 1977" for membranes only.)

(4) Openings described in Sentences (1), (2) and (3) shall not be applied to a fire-resistive assembly tested in accordance with Article 3.1.5.1.

(5) Where a ceiling assembly is used as a *plenum*, the requirements of Sentence 2.4.2.(4) of the ACNBC Canadian Heating, Ventilating and Air-Conditioning Code 1977 shall apply.

SUBSECTION 3.1.6. FIRE SEPARATIONS

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 *approved* means in conformance with Subsections 3.1.7. and 3.2.9.

3.1.6.2.(1) Except as otherwise permitted elsewhere in this Part, every *fire separation* required to have a *fire-resistance rating* shall be supported from the ground by construction having a *fire-resistance rating* at least equal to that required for the supported *fire separation*. Support of fire separations

(2) Where a *fire separation* is required to be of *noncombustible construction* having a *fire-resistance rating*, it shall be supported by *noncombustible construction* conforming to Sentence (1).

(3) *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*. Combustible elements and construction

(4) 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.

3.1.6.3.(1) Except as provided in Sentences (2) and 3.3.1.1.(3), 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 walls shall terminate so that a smoke-tight joint is provided at the point where the wall abuts on or intersects the floor, roof slab or deck. Continuity of fire separations

(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*.

(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 one of the elements that contribute to the performance of the assembly and does not in itself provide the protection implied by the rating. For the *fire-resistance rating* of membrane materials used in this form of construction, reference should be made to the results of fire tests which have been conducted to evaluate specifically the performance of this element.)

(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, roof slab or deck, except as provided in Subsection 3.5.3. where the shaft pierces through a roof assembly.

SUBSECTION 3.1.7. PROTECTION OF OPENINGS IN FIRE SEPARATIONS

3.1.7.1.(1) Except as provided in Sentence (2), where an opening in a *fire separation* is required to be protected with a *closure* having a *fire-protection rating*, such *fire-protection rating* shall be determined by the *authority having jurisdiction* on the basis of the results of tests conducted in conformance with the appropriate provisions of the following: Determination of fire-protection ratings

ULC-S106-1976, "Standard Method for Fire Tests of Window and Glass Block Assemblies,"

ULC-S104-1976, "Standard Method for Fire Tests of Door Assemblies,"

ULC-S112-1976, "Fire Dampers,"

(See Sentence 3.1.8.1.(14) for additional requirements for *closures* in *firewalls*.)

(2) The *authority having jurisdiction* may accept the results of tests based on test standards other than as described in Sentence (1) provided he is satisfied that such alternate test standards will provide a *fire-protection rating* comparable to that obtained in Sentence (1).

Installation

(3) Except as otherwise specified in this Part, every *closure* required in *fire separations* shall be installed in conformance with the installation and operation requirements of NFPA 80-1975, "Fire Doors and Windows."

Rating of closures

(4) Except as provided in Sentences 3.1.7.2.(4) and (7), the *fire-protection rating* of *closures* shall conform to Table 3.1.7.A. for the required grade of *fire separation*.

Table 3.1.7.A.

Forming Part of Sentence 3.1.7.1.(4)

Grade of *Fire Separation*, hr	Required *Fire-Protection Rating* of *Closures*, hr
¾	¾
1	¾
1½	1
2	1½
3	2
4	3
Column 1	2

Fire dampers

(5) Except as provided in Sentences (9) and (10), a duct piercing a *fire separation* required to have a *fire-resistance rating* shall be equipped with a *fire damper* to act as a *closure* at the *fire separation*.

(6) A *fire damper* required in Sentence (5) or other *fire damper* used as a *closure* in a *fire separation* shall have a *fire-protection rating* conforming to Sentence (4), and shall be installed in conformance with Article 2.4.9. of the ACNBC Canadian Heating, Ventilating and Air-Conditioning Code 1977.

(7) A *fire damper* referred to in Sentence (6), used in a *fire separation* required to have a *fire-resistance rating* of not more than 2 hr, but which is not a *firewall*, shall be constructed and rated in conformance with ULC-S112-1976, "Fire Dampers."

(8) A *fire damper* referred to in Sentence (6), used in a *fire separation* required to have a *fire-resistance rating* of more than 2 hr, or used in a *firewall*, shall be rated in conformance with one of the test methods in Sentence (1) for door assemblies.

(9) *Fire dampers* need not be provided in *noncombustible* branch ducts that have a melting point above 1,400°F 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 4 ft above the floor provided such ducts
   (i) do not pierce a floor at more than 1 place, and
   (ii) have a cross sectional area of not more than 20 sq in, or
(b) are connected to *exhaust duct* risers in which the air flow is upward and such ducts are carried up inside the riser at least 22 in.

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

3.1.7.2.(1) Except for *exits* and except as permitted elsewhere in this Part, the size of an opening in an interior *fire separation* required to be protected with a *closure* shall not exceed 120 sq ft, with no dimension greater than 12 ft when the *fire compartments* on both sides of the *fire separation* are not *sprinklered,* and shall not exceed 240 sq ft with no dimension greater than 20 ft when the *fire compartments* on both sides of the *fire separation* are *sprinklered.* Maximum openings

(2) The aggregate width of all openings in a vertical *fire separation* shall not exceed 25 per cent of the length of the wall of a *fire compartment.*

(3) Two *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) A door assembly having a 20-minute *fire-protection rating* may be used as a *closure* in a *fire separation* not required to exceed 1-hr *fire-resistance rating* in

(a) a required *fire separation* located between a *public corridor* and an individually rented room or suite of rooms,
(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 ¾-hr *fire-resistance rating* in *buildings* not exceeding 3 *storeys* in *building height.*

(5) The requirements for *noncombustible* sills in NFPA 80-1975, "Fire Doors and Windows" shall not apply to doors described in Sentence (4).

(6) Doors described in Sentence (4) shall have a clearance of not more than ¼ in. at the bottom and not more than ⅛ in. at the sides and top.

(7) The *fire-protection rating* of *closures* in *exit* shafts need not be greater than 1½ hr.

(8) A *closure* in a *fire separation* required to be of *noncombustible construction* may have *combustible* elements.

(9) Except as provided in Sentence (10), Article 3.3.2.7. and Article 3.3.5.4., every door in an interior *fire separation* shall have an *approved* self-closing device and a latch which shall be installed so as to return and hold the door in the closed position after each use.

(10) Where the safety of the occupants is not endangered thereby, and with the approval of the *authority having jurisdiction, approved* 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.

(11) Hold-open devices permitted in Sentence (10) shall be actuated by *approved smoke detectors* or the *building* fire alarm system, except that where the door is not required to function as part of a smoke control system, the hold-open device may be actuated by a sprinker system or an *approved* heat actuated device designed for this purpose.

3.1.7.3.(1) Except as provided in Article 3.4.5.1. for separation of *exits,* an opening or openings in ¾-hr and 1-hr interior *fire separations* may be protected with wired glass or glass blocks when installed in accordance with Sentences (2) and (3). Wired glass and glass blocks as closures

(2) Where wired glass is permitted in Sentence (1), such glass shall conform to Sentence 3.1.7.1.(1) or shall

(a) not exceed the size limitations specified in Sentences 3.1.7.2.(1) and (2),

(b) provide a ¾-hr *fire-protection rating* or consist of glass that is

(i) ¼ in. thick, and

(ii) reinforced by a steel wire mesh in the form of diamonds, squares or hexagons having dimensions of approximately 1 in. across the flats, using wire of at least 25 ASW gauge, or approximately ½ in. across the flats, using wire of at least 26 ASW gauge, the wire to be centrally embedded during manufacture and welded or intertwined at each intersection,

(c) be set in fixed steel frames, and

(d) be limited in area such that

(i) individual panes are not more than 1,296 sq in. with neither height nor width exceeding 54 in., and

(ii) the maximum area unsupported by structural mullions does not exceed 80 sq ft.

(3) Where glass blocks are permitted in Sentence (1), they shall not exceed the area limitations specified in Sentences 3.1.7.2.(1) and (2), and they shall be installed in accordance with Section 4.4 of this Bylaw and reinforced with steel reinforcement in each horizontal joint.

Protection of openings between storeys

3.1.7.4.(1) Openings such as those for *exit* shafts, elevators and *building* service facilities, through floors required to be *fire separations*, shall be protected in accordance with Sections 3.4 and 3.5 as applicable.

(2) An escalator or inclined moving walk that pierces a required *fire separation* and serves as a required *exit* shall be enclosed in the same manner as *exit* stairs.

Integrity of fire separation

3.1.7.5. Every assembly required to be a *fire separation* shall be continuous for the entire assembly except for openings protected with *closures* in accordance with the requirements of Article 3.1.7.1., or except for openings incorporated in an assembly at the time of testing, or as permitted in this Subsection and Subsection 3.1.5.

Openings for pipes and ducts

3.1.7.6.(1) Openings for pipes are permitted in *fire separations* provided such pipes

(a) are enclosed in shafts conforming to Section 3.5, or

(b) are tightly fitted or *fire stopped* to prevent the passage of smoke and flame.

(2) Openings for ducts are permitted through *fire separations* provided such ducts

(a) are enclosed in shafts conforming to Section 3.5, or

(b) conform to Articles 3.1.7.1. or 3.1.7.7. and are tightly fitted or *fire stopped* to prevent the passage of smoke and flame.

Service equipment penetrating fire separations

3.1.7.7.(1) Every pipe, duct, electrical outlet box, electrical conduit or other similar service equipment partially or wholly penetrating a required *fire separation* shall be of *noncombustible* material, except

(a) when such service equipment has been incorporated in the assembly at the time of testing in conformance with Sentence 3.1.5.1.(1),

(b) wiring not exceeding 1 in. in overall diameter, and

(c) wiring located in *noncombustible* conduit.

(2) *Combustible* drain, waste and vent piping shall not be used in a *plumbing system* within a *building* where part of the system is located within or passes through a *fire separation*, except that where drain, waste and vent piping penetrates through a vertical *fire separation*, the piping on one side of the separation may be *combustible* provided the *combustible* piping is not located in a vertical shaft or in a *fire separation*.

3.1.7.8. Where a door is installed so that it may damage the integrity of a *fire separation* if its swing is unrestricted, *approved* door stops shall be installed to prevent such damage. Door stops required

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 ½ 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 hr, 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 hr. 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 hr.

(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.

(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) 6 in. in height for a *firewall* required to have a *fire-resistance rating* of 2 hr, and
(b) 36 in. in height for a *firewall* required to have a *fire-resistance rating* of 4 hr.

(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-hr *fire-resistance rating* if a *firewall* is required to have a 2-hr *fire-resistance rating*, or
  (ii) 2-hr *fire-resistance rating* if a *firewall* is required to have a 4-hr *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 10 ft.

(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*. Support

Penetration of firewalls

(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) Openings in *firewalls* shall conform to the size limits described in Sentences 3.1.7.2.(1) and (2).

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

(14) All openings in *firewalls* shall be protected with *closures* in conformance with Subsection 3.1.7. and the temperature rise on the unexposed face of such *closures* shall not exceed 650F° after 30 min. for a *firewall* required to have a 2-hr *fire-resistance rating* and 450F° after 30 min. for *firewalls* required to have a 4-hr *fire-resistance rating* when tested in conformance with ULC-S104-1976, "Standard Method for Fire Tests of Door Assemblies."

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 draft openings 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 10 ft,
(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, and
(f) the top or bottom of every expansion joint between floors and walls in *heavy timber construction.*

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 100 sq ft in area.

Ceiling

(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 20 sq ft in area between the ceiling finish and the backing.

Concealed spaces

(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

(a) 6,000 sq ft in area or 200 ft in any dimension where materials having a *flame-spread rating* of 25 or less are exposed in the space, and
(b) 3,000 sq ft in area or 60 ft in any dimension where materials having a *flame-spread rating* greater than 25 are exposed in the space, except as otherwise required in Article 3.1.4.4. for *heavy timber construction.*

(6) The concealed spaces in exterior cornices including the mansard type, balconies and canopies of *combustible construction* shall be *fire stopped* from the point where such concealed spaces extend across the end of required *fire separations.*

Firestopping materials

(7) Every *fire stop* shall

(a) be constructed of
  (i) asbestos-cement board, gypsum board or other *noncombustible* material having a melting point above 1,400°F such as sheet steel,
  (ii) solid lumber not less than 2 in. nominal thickness, or
  (iii) ½-in. thick plywood with joints backed with like material, or 2 thicknesses of lumber not less than 1 in. nominal 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 2-in.-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.

(10) *Fire stops* shall not be concealed until inspected and *approved.* Inspection

SUBSECTION 3.1.10. FLAME-SPREAD RATING AND SMOKE DEVELOPED CLASSIFICATION

3.1.10.1.(1) Except as provided in Sentences (2) to (5), the *flame-spread rating* and smoke developed classification of a material, assembly of materials or structural member shall be determined by the *authority having jurisdiction* on the basis of at least 3 tests conducted in conformance with the appropriate provisions of ULC-S102-1975, "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 for floor application shall be determined by the *authority having jurisdiction* on the basis of results of tests conducted in accordance with the provisions of ULC-S102.2-1975, "Standard Method of Test for Surface Burning Characteristics of Flooring and Floor Covering Materials."

(3) The *authority having jurisdiction* may accept the results of tests based on test standards other than as described in Sentence (1) provided he is satisfied that such alternate test standards will provide a *flame-spread rating* or smoke developed classification comparable to that obtained in Sentence (1).

(4) A material, assembly of materials or a structural member may be assigned a *flame-spread rating* and smoke developed classification on the basis of NBC Supplement No. 2, "Fire Performance Ratings 1977."

(5) Where the *flame-spread rating* determined in accordance with the provision of Sentence (1) is between 55 and 78 the *flame-spread rating* shall be the greater of
(a) the value determined in accordance with the provisions of Sentence (1), or
(b) the greatest value that can be determined by the formula $25\frac{d}{t}$ applied to observations of the progress of the flame front during the tests, where d = any distance of flame travel from the point of origin, in feet, that is greater than 10, and t = the time in minutes for the flame to travel distance d.

SUBSECTION 3.1.11. INTERIOR FINISH

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 General
(a) interior cladding of plaster, wood or tile,
(b) surfacing of fabric, paint, plastic, veneer or wallpaper,
(c) doors, windows and trim,

(d) transparent or translucent 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.

(2) Transparent or translucent lighting elements, such as light diffusers and lenses, need not meet the *flame-spread rating* for interior finish provided
(a) all *combustible* portions of the lighting elements when mounted in the test apparatus described in ULC-S102-1975, "Standard Method of Test for Surface Burning Characteristics of Building Materials," as modified in clauses (b) and (c), will fall to the bottom of the test apparatus before the test specimen ignites,
(b) the test specimen is at least 12 ft in length, located at least 18 in. away from the centre line of the burners with an air gap of at least 2 in. between the test specimen and the top of the test apparatus so that the gap is closed off at each end of the specimen with an asbestos-cement board *fire stop*, and with the gap between the top of the test specimen and the burners lined with asbestos-cement board,
(c) the test specimens are supported in the test apparatus in the same manner as is used in practice,
(d) the lighting elements 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 ULC-S102.2-1975, "Standard Method of Test for Surface Burning Characteristics of Flooring and Floor Covering Materials," and
(e) the lighting elements 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 the element does not exceed 10 sq ft in area and is separated from any adjacent element by at least 4 ft of ceiling finish material having the required *flame-spread rating*.

(3) Open grid and translucent ceilings located below sprinkler systems shall be installed in conformance with NFPA 13-1975, "Installation of Sprinkler Systems," paragraphs 4-4.15, 4-4.16.

Foamed plastics

3.1.11.2.(1) Where a *building* or part of a *building* is required to be of *noncombustible construction*, foamed plastics shall not be used for interior wall or ceiling finish as described in Sentence 3.1.11.1.(1), but shall be protected on the interior surface by not less than ½-in.-thick gypsum board, lath and plaster or other material that when subjected to the standard fire exposure described in ULC-S101-1975, "Standard Methods of Fire Endurance Tests of Building Construction and Materials," will not exceed a temperature rise of 250F° on the unexposed face after a period of 10 min.

(2) Protective finishes described in Sentence (1) shall be mechanically fastened to the supporting structure unless it can be demonstrated on the basis of fire tests acceptable to the *authority having jurisdiction* that such fasteners are not necessary.

(3) Where a *building* or part of a *building* is permitted to be of *combustible construction*, foamed plastics shall not be used as an interior finish as described in Sentence 3.1.11.1.(1), but shall be protected on the interior surface by one of the interior finishes described in Section 9.30 of Part 9 of this Bylaw.

SUBSECTION 3.1.12. FIRE-RETARDANT TREATED WOOD

Acceptable material

3.1.12.1.(1) Where *fire-retardant treated wood* is specified in this Part, such wood shall
(a) be impregnated with fire-retardant chemicals in accordance with CSA O80-1974, "Wood Preservation" or other *approved* method, and

(b) be tested to determine its *flame-spread rating* in conformance with Sentence 3.1.10.1.(1), except as provided in Sentence (2), and bear *approved* identification showing this provision has been complied with.

(2) Where a *fire-retardant treated wood* roof system is specified in Subsection 3.2.2., the assembly shall consist of Roof system

(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 5 ft from the point of flame impingement, resulting in an equivalent *flame-spread rating* of 25, and bear *approved* identification that this provision has been complied with,

(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 ¾ in. in actual thickness, and

(d) a membrane of metallic material of not less than 0.002-in. thickness applied directly above the wood deck material.

SUBSECTION 3.1.13. ROOF COVERING

3.1.13.1.(1) Except as provided in Sentence (2), where a roof covering is required to be a Class A, B or C roof covering, such classification shall conform to ULC-S107-1969, "Test Methods for Fire Resistance of Roof Covering Materials" for Class A, B or C roof covering, and shall be determined by the *authority having jurisdiction* on the basis of results of tests conducted in conformance with ULC-S107-1969, "Test Methods for Fire Resistance of Roof Covering Materials." Classification

(2) The *authority having jurisdiction* may accept the results of tests based on test standards other than as described in Sentence (1) provided he is satisfied that such alternate test standards will provide a roof covering classification comparable to that obtained in Sentence (1).

SUBSECTION 3.1.14. OCCUPANT LOAD

3.1.14.1.(1) The *occupant load* of every *floor area*, or part thereof, shall be

(a) the number of persons for which the *floor area*, or part thereof is designed, but

(b) unless otherwise *approved*, not less than the number of persons that can be accommodated on the *floor area* or part thereof as determined from Table 3.1.14.A.

(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.

Table 3.1.14.A.

Forming Part of Article 3.1.14.1.

Item No.	Type of Use of *Floor Area* or Part Thereof	Area per Person, sq ft
	Assembly uses	
1	space with fixed seats	(1)
2	space with nonfixed seats	8
3	stages for theatrical performances	8
4	space with nonfixed seats and tables	10
5	standing space	4
6	stadia and grandstands	6
7	bowling alleys, pool and billiard rooms	100
8	classrooms	20
9	school shops and vocational rooms	100
10	reading or writing rooms or lounges	20
11	dining, beverage and cafeteria space	12
12	laboratories in schools	50
	Institutional uses	
1	surgical and obstetrical suites	125
2	wards containing more than 2 beds	50
3	detention quarters	125
	Residential uses	(2)
1	houses	See Part 9
2	dormitories	50
	Business and Personal Services uses	
1	personal service shops	50
2	offices	100
	Mercantile uses	
1	retail sales floors at ground, basement or cellar	30
2	other floors	60
	Industrial uses	
1	manufacturing or process rooms	50
2	*storage garages*	500
3	storage spaces (warehouse)	300
4	aircraft hangars	500
	Other uses	
1	cleaning and repair of goods	50
2	kitchens	100
3	storage	500
Col. 1	2	3

Notes to Table 3.1.14.A.:

(1) The *occupant load* shall be based on the number of seats provided.

(2) The *occupant load* for *dwelling units* shall be based on 2 persons per bedroom or area provided for sleeping.

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.

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 42 in. above such floors.

(4) Except as provided in Sentence (5), a *mezzanine* shall not 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.

3.2.1.3. Where a basement contains only a *storage garage* located below the *first storey* and is connected to 2 or more spatially separated portions of the same *building* extending above the *storage garage*, each such portion above the *storage garage* may be considered as a separate *building* for the purpose of Subsection 3.2.2. providing the *storage garage* is separated from the remainder of the *building* by a *noncombustible fire separation* having a *fire-resistance rating* of at least 2 hr.

SUBSECTION 3.2.2. BUILDING SIZE AND CONSTRUCTION RELATIVE TO OCCUPANCY

Application

3.2.2.1.(1) *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*.)

Special structures

(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 and to the satisfaction of the *authority having jurisdiction*.

When lesser restrictions apply

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.

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*.

Crawl spaces

(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

(a) it exceeds 6 ft 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*.

Streets

3.2.2.4.(1) Every *building* shall face at least 1 *street*, except that for the purposes of Sentences (2) to (4), a yard may be considered as a *street* provided the yard is

(a) at least 30 ft wide,
(b) designed to be accessible for fire fighting equipment at all times, and
(c) connected to a *street* in conformance with Sentence 3.2.5.1.(6).

(2) For the purposes of this Section, a *building* is considered to face a *street* when the *street* is within 50 ft of the *building* face.

(3) A *building* is considered to face 2 *streets* when at least 50 per cent of the *building* perimeter is located within 50 ft 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 50 ft 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 unless *approved* as such.

Roofs considered as walls

3.2.2.5. For the purpose of this Subsection, any part of a roof that is pitched at an angle of 60 deg. 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*.

Exterior balconies

3.2.2.6.(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

3.2.2.7.(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

3.2.2.8.(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-hr *fire separation* where the basements or cellars are occupied as Group A, D or Group F, Division 3 *occupancies,* and

(ii) 3-hr *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.

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 15 ft 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 ¾-hr *fire separation* (see Article 3.2.2.3.),

(c) other floor assemblies shall be a ¾-hr *fire separation* except for floors above crawl spaces,

(d) *mezzanines* shall have, if of *combustible construction, a ¾-hr fire-resistance rating,*

(e) roof assemblies shall have, if of *combustible construction,* a ¾-hr *fire-resistance rating,* and

(f) all *loadbearing* walls, columns and arches supporting an assembly required to have a *fire-resistance rating* shall have a ¾-hr *fire-resistance rating,* or shall be of *noncombustible construction* or be a combination thereof, except that such members and assemblies supporting a *fire separation* as required in Clause (b) or (c) shall have a *fire-resistance rating* at least equivalent to that required for the supported assembly.

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 6,000 sq ft 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 ¾-hr *fire separation* (see Article 3.2.2.3.),
(c) other floor assemblies shall be a ¾-hr *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* or be a combination thereof, except that such members and assemblies supporting a *fire separation* as required in Clause (b) or (c) shall have a *fire-resistance rating* at least equivalent to that required for the supported assembly.

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-hr *fire separation* into areas not exceeding 5,000 sq ft, or they shall be *sprinklered,*
(b) floor assemblies immediately above basements or cellars shall be a 2-hr *fire separation,*
(c) floor assemblies immediately above crawl spaces shall have a 1-hr *fire-resistance rating,* except that this requirement is waived if the crawl space is subdivided by a 1-hr *fire separation* into areas not exceeding 5,000 sq ft, or they are *sprinklered* (see Article 3.2.2.3.),
(d) other floor assemblies shall be a 2-hr *fire separation,*
(e) *mezzanines* shall have a 1-hr *fire-resistance rating,*
(f) except as provided in Article 3.2.5.5., roof assemblies shall have a 1-hr *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) 4,000 sq ft if facing 1 *street,*
(ii) 5,000 sq ft if facing 2 *streets,* or
(iii) 6,000 sq ft if facing 3 *streets,* and
(b) 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 ¾-hr *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-hr *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) 4,000 sq ft if facing 1 *street*,
  (ii) 5,000 sq ft if facing 2 *streets*, or
  (iii) 6,000 sq ft 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 ¾-hr *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)

Unsprinklered Maximum Area, sq ft			
No. of *Storeys*	Facing 1 *Street*	Facing 2 *Streets*	Facing 3 *Streets*
1	16,000	20,000	24,000
2	8,000	10,000	12,000
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-hr *fire separation* into areas not exceeding 5,000 sq ft, or they shall be *sprinklered*,
(b) floor assemblies immediately above basements or cellars shall be a ¾-hr *fire separation*,
(c) floor assemblies immediately above crawl spaces shall have, if of *combustible construction*, a ¾-hr *fire-resistance rating*, except that this requirement is waived if the crawl spaces are subdivided by a ¾-hr *fire separation* into areas not exceeding 5,000 sq ft, 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 ¾-hr *fire-resistance rating*,
(e) *mezzanines* shall have, if of *combustible construction*, a ¾-hr *fire-resistance rating*,

(f) roof assemblies shall have, if of *combustible construction*, a ¾-hr *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.(2) and

(i) if unsprinklered, the *building area* is not greater than
8,000 sq ft if facing 1 *street*,
10,000 sq ft if facing 2 *streets*, or
12,000 sq ft 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 described in Clauses (b) to (f) shall have a ¾-hr *fire-resistance rating*, or shall be of *noncombustible construction*, or be a combination thereof, except that such members and assemblies supporting a *fire separation* as required in Clause (b) or (d) shall have a *fire-resistance rating* at least equivalent to that required for the supported assembly.

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-hr *fire separation* into areas not exceeding 5,000 sq ft, or they shall be *sprinklered*,

(b) floor assemblies immediately above basements or cellars shall be a 2-hr *fire separation*,

(c) floor assemblies immediately above crawl spaces shall have a 1-hr *fire-resistance rating*, except that this requirement is waived if the crawl spaces are subdivided by a 1-hr *fire separation* into areas not exceeding 5,000 sq ft, or they are *sprinklered* (see Article 3.2.2.3.),

(d) other floor assemblies shall be a 1-hr *fire separation*,

(e) *mezzanines* shall have a 1-hr *fire-resistance rating*,

(f) except as provided in Sentence (3), and in Article 3.2.5.5., roof assemblies shall have a 1-hr *fire-resistance* rating, and

(g) except as provided in Sentence (3), all *loadbearing* walls, all columns and arches shall have a *fire-resistance rating* at least equivalent to the supported assembly, but not less than 1 hr.

(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 32,000 sq ft if unsprinklered, or 64,000 sq ft 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-hr *fire separation* into areas not exceeding 5,000 sq ft, or they shall be *sprinklered*,

(b) floor assemblies immediately above basements or cellars shall be a 2-hr *fire separation,*

(c) floor assemblies immediately above crawl spaces shall have a 1-hr *fire-resistance rating,* except that this requirement is waived if the crawl spaces are subdivided by a 1-hr *fire separation* into areas not exceeding 5,000 sq ft, or they are *sprinklered* (see Article 3.2.2.3.),

(d) other floor assemblies shall be a 2-hr *fire separation,*

(e) *mezzanines* shall have a 1-hr *fire-resistance rating,*

(f) except as provided in Article 3.2.5.5., roof assemblies shall have a 1-hr *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 hr.

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) 10,000 sq ft if facing 1 *street,*

(ii) 12,500 sq ft if facing 2 *streets,* or

(iii) 15,000 sq ft 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-hr *fire separation* into areas not exceeding 5,000 sq ft, or they shall be *sprinklered,*

(b) floor assemblies immediately above basements or cellars shall be a ¾-hr *fire separation,*

(c) floor assemblies immediately above crawl spaces shall have, if of *combustible construction,* a ¾-hr *fire-resistance rating,* except that this requirement is waived if the crawl spaces are subdivided by a ¾-hr *fire separation* into areas not exceeding 5,000 sq ft, 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 ¾-hr *fire-resistance rating,* or shall be of *noncombustible construction,* or be a combination thereof, except that such members and assemblies supporting a *fire separation* as required in Clause (b) shall have a *fire-resistance rating* at least equivalent to that required for the supported assembly.

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) 24,000 sq ft if facing 1 *street,*

(ii) 30,000 sq ft if facing 2 *streets,* or

(iii) 36,000 sq ft 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-hr *fire separation* into areas not exceeding 5,000 sq ft, or they shall be *sprinklered,*

(b) floor assemblies immediately above basements or cellars shall be a 1-hr *fire separation,*

(c) floor assemblies immediately above crawl spaces shall have, if of *combustible construction,* a ¾-hr *fire-resistance rating,* except that this requirement is waived if the crawl spaces are subdivided by a ¾-hr *fire separation* into areas not exceeding 5,000 sq ft, or they are *sprinklered* (see Article 3.2.2.3.),

(d) *mezzanines* shall have, if of *combustible construction,* a ¾-hr *fire-resistance rating,*

(e) roof assemblies shall have, if of *combustible construction,* a ¾-hr *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.(2), and

(i) if unsprinklered, the *building area* is not greater than

12,000 sq ft if facing 1 *street,*

15,000 sq ft if facing 2 *streets,* or

18,000 sq ft 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 described in Clauses (b) to (e) shall have a ¾-hr *fire-resistance rating,* or shall be of *noncombustible construction,* or be a combination thereof, except that such members and assemblies supporting a *fire separation* as required in Clause (b) shall have a *fire-resistance rating* at least equivalent to that required for the supported assembly.

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) 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.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, sq ft		
	Facing 1 *Street*	Facing 2 *Streets*	Facing 3 *Streets*
1	40,000	50,000	60,000
2	20,000	25,000	30,000
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-hr *fire separation* into areas not exceeding 5,000 sq ft, or they shall be *sprinklered,*

(b) floor assemblies immediately above basements or cellars shall be a 2-hr *fire separation,*

(c) floor assemblies immediately above crawl spaces shall have a 1-hr *fire-resistance rating,* except that this requirement is waived if the crawl spaces are subdivided by a 1-hr *fire separation* into areas not exceeding 5,000 sq ft, or they are *sprinklered* (see Article 3.2.2.3.),

(d) other floor assemblies shall be a 1-hr *fire separation*,
(e) *mezzanines* shall have a 1-hr *fire-resistance rating*,
(f) except as provided in Article 3.2.5.5., roof assemblies shall have a ¾-hr *fire-resistance rating* or be of *heavy timber construction* and,
(g) all *loadbearing* walls and columns and arches shall have a *fire-resistance rating* at least equivalent to that required for the supported assembly, but not less than 1 hr, 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-hr *fire separation* into areas not exceeding 5,000 sq ft, or they shall be *sprinklered*,
(b) floor assemblies immediately above basements or cellars shall be a 2-hr *fire separation*,
(c) floor assemblies immediately above crawl spaces shall have a 1-hr *fire-resistance rating*, except that this requirement is waived if the crawl spaces are subdivided by a 1-hr *fire separation* into areas not exceeding 5,000 sq ft, or they are *sprinklered* (see Article 3.2.2.3.),
(d) other floor assemblies shall be a 2-hr *fire separation*,
(e) *mezzanines* shall have a 1-hr *fire-resistance rating*,
(f) except as provided in Article 3.2.5.5., roof assemblies shall have a 1-hr *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 hr.

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 20 ft.

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-hr *fire separation* into areas not exceeding 5,000 sq ft, or they shall be *sprinklered*,
(b) floor assemblies immediately above basements or cellars shall be a 2-hr *fire separation*,
(c) floor assemblies immediately above crawl spaces shall have a 2-hr *fire-resistance rating*, except that this requirement is waived if the crawl spaces are subdivided by a 2-hr *fire separation* into areas not exceeding 5,000 sq ft, or they are *sprinklered* (see Article 3.2.2.3.),
(d) other floor assemblies shall be a 2-hr *fire separation*,

(e) *mezzanines* shall have a 1-hr *fire-resistance rating,*
(f) except as provided in Article 3.2.5.5., roof assemblies shall have a 1-hr *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 2,500 sq ft, and
(c) if *sprinklered,* is not greater than 5,000 sq ft.

(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 ¾-hr *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, sq ft	*Sprinklered* Maximum Area, sq ft
1	10,000	24,000
2	5,000	16,000
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-hr *fire separation* (see Article 3.2.2.3.),
(b) other floor assemblies, except floors over crawl spaces, shall be a ¾-hr *fire separation,*
(c) *mezzanines* shall have, if of *combustible construction,* a ¾-hr *fire-resistance rating,*
(d) roof assemblies shall have, if of *combustible construction,* a ¾-hr *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 ¾ hr.

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-hr *fire separation*,
(c) other floor assemblies shall be a 2-hr *fire separation* except for floors above crawl spaces,
(d) *mezzanines* shall have a 1-hr *fire-resistance rating*,
(e) except as provided in Article 3.2.5.5., roof assemblies shall have a 1-hr *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*,
(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, sq ft		
	Facing 1 *Street*	Facing 2 *Streets*	Facing 3 *Streets*
1	12,000	15,000	18,000
2	9,000	11,250	13,500
3	6,000	7,500	9,000
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 ¾-hr *fire separation* into areas not exceeding 5,000 sq ft, or they shall be *sprinklered*,
(b) floor assemblies immediately above basements or cellars shall be a ¾-hr *fire separation*,
(c) other floor assemblies, except floors over crawl spaces, shall be a ¾-hr *fire separation* (see Article 3.2.2.3.),
(d) *mezzanines* shall have, if of *combustible construction*, a ¾-hr *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 ¾-hr *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).

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	60,000	unlimited	unlimited
3	40,000	50,000	60,000
4	30,000	37,500	45,000
5	24,000	30,000	36,000
6	20,000	25,000	30,000
Column 1	2	3	4

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

(a) basements and cellars shall be subdivided by a 2-hr *fire separation* into areas not exceeding 5,000 sq ft, or they shall be *sprinklered,*

(b) floor assemblies immediately above basements or cellars shall be a 2-hr *fire separation,*

(c) floor assemblies immediately above crawl spaces shall have a 1-hr *fire-resistance rating,* except that this requirement is waived if the crawl spaces are subdivided by a 1-hr *fire separation* into areas not exceeding 5,000 sq ft, or they are *sprinklered* (see Article 3.2.2.3.),

(d) other floor assemblies shall be a 1-hr *fire separation,*

(e) *mezzanines* shall have a 1-hr *fire-resistance rating,*

(f) except as provided in Article 3.2.5.5., roof assemblies shall have a 1-hr *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, 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-hr *fire-resistance rating* and need not be constructed as a *fire separation.*

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-hr *fire separation* into areas not exceeding 5,000 sq ft, or they shall be *sprinklered*,
(b) floor assemblies immediately above basements or cellars shall be a 2-hr *fire separation*,
(c) floor assemblies immediately above crawl spaces shall have a 1-hr *fire-resistance rating*, except that this requirement is waived if the crawl spaces are subdivided by a 1-hr *fire separation* into areas not exceeding 5,000 sq ft, or they are *sprinklered* (see Article 3.2.2.3.),
(d) other floor assemblies shall be a 2-hr *fire separation*,
(e) mezzanines shall have a 1-hr *fire-resistance rating*,
(f) except as provided in Article 3.2.5.5., roof assemblies shall have a 1-hr *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, 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-hr *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, sq ft		
	Facing 1 *Street*	Facing 2 *Streets*	Facing 3 *Streets*
1	10,000	12,500	15,000
2	8,000	10,000	12,000
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-hr *fire separations* into areas not exceeding 5,000 sq ft, or they shall be *sprinklered*,
(b) floor assemblies immediately above basements or cellars shall be a ¾-hr *fire separation* (see Article 3.2.2.3.),

(c) other floor assemblies shall be *fire separations* and, if of *combustible construction*, shall have a ¾-hr *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-hr *fire-resistance rating*, or shall be of *noncombustible construction*, or be a combination thereof, except that such members and assemblies supporting a *fire separation* as required in Clause (b) shall have a *fire-resistance rating* at least equivalent to that required for the supported assembly.

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).

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	48,000	60,000	72,000
2	24,000	30,000	36,000
3	16,000	20,000	24,000
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-hr *fire separation* into areas not exceeding 5,000 sq ft, or they shall be *sprinklered*,

(b) floor assemblies immediately above basements or cellars shall be a 1-hr *fire separation*,

(c) floor assemblies immediately above crawl spaces shall have, if of *combustible construction*, a ¾-hr *fire-resistance rating*, except that this requirement is waived if the crawl spaces are subdivided by a ¾-hr *fire separation* into areas not exceeding 5,000 sq ft, 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 ¾-hr *fire-resistance rating*,

(e) *mezzanines shall have, if of combustible construction,* a ¾-hr *fire-resistance rating*,

(f) roof assemblies shall have, if of *combustible construction*, a ¾-hr *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.(2), and

(i) if unsprinklered, the *building area* is not greater than
24,000 sq ft if facing 1 *street*,
30,000 sq ft if facing 2 *streets*, or
36,000 sq ft 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 described in Clauses (b) to (f) shall have a ¾-hr *fire-resistance rating*, or shall be of *noncombustible construction*, or be a combination thereof, except that such members and assemblies supporting a *fire separation* as required in Clause (b) or (d), shall have a *fire-resistance rating* at least equivalent to that required for the supported assembly.

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).

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	72,000	unlimited	unlimited
3	48,000	60,000	72,000
4	36,000	45,000	54,000
5	28,800	36,000	43,200
6	24,000	30,000	36,000
Column 1	2	3	4

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

(a) basements and cellars shall be subdivided by a 2-hr *fire separation* into areas not exceeding 5,000 sq ft, or they shall be *sprinklered*,
(b) floor assemblies immediately above basements or cellars shall be a 2-hr *fire separation*,
(c) floor assemblies immediately above crawl spaces shall have a 1-hr *fire-resistance rating*, except that this requirement is waived if the crawl spaces are subdivided by a 1-hr *fire separation* into areas not exceeding 5,000 sq ft, or they are *sprinklered* (see Article 3.2.2.3.),
(d) other floor assemblies shall be a 1-hr *fire separation*,
(e) *mezzanines* shall have a 1-hr *fire-resistance rating*,
(f) roof assemblies shall have a 1-hr *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-hr *fire separation* into areas not exceeding 5,000 sq ft, or they shall be *sprinklered*,

(b) floor assemblies immediately above basements or cellars shall be a 2-hr *fire separation*,
(c) floor assemblies immediately above crawl spaces shall have a 1-hr *fire-resistance rating*, except that this requirement is waived if the crawl spaces are subdivided by a 1-hr *fire separation* into areas not exceeding 5,000 sq ft, or they are *sprinklered* (see Article 3.2.2.3.),
(d) other floor assemblies shall be a 2-hr *fire separation*,
(e) *mezzanines* shall have a 1-hr *fire-resistance rating*,
(f) roof assemblies shall have a 1-hr *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).

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	10,000	12,500	15,000
2	6,000	7,500	9,000
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-hr *fire separations* into areas not exceeding 5,000 sq ft, or they shall be *sprinklered*,
(b) floor assemblies immediately above basements or cellars shall be a ¾-hr *fire separation* (see Article 3.2.2.3.),
(c) other floor assemblies, except floors over crawl spaces, shall be a ¾-hr *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.

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.

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	15,000	15,000	15,000
2	12,000	15,000	15,000
3	8,000	10,000	12,000

No. of *Storeys*	*Sprinklered* Maximum Area, sq ft		
	Facing 1 *Street*	Facing 2 *Streets*	Facing 3 *Streets*
1	48,000	60,000	72,000
2	24,000	30,000	36,000
3	16,000	20,000	24,000
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-hr *fire separation* into areas not exceeding 5,000 sq ft, or they shall be *sprinklered,*

(b) floor assemblies immediately above basements or cellars shall be a 1-hr *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 ¾-hr *fire-resistance rating,* except that this requirement is waived if the crawl spaces are subdivided by a ¾-hr *fire separation* into areas not exceeding 5,000 sq ft, or they are *sprinklered* (see Article 3.2.2.3.),

(d) other floor assemblies shall be a ¾-hr *fire separation,*

(e) *mezzanines* shall have, if of *combustible construction,* a ¾-hr *fire-resistance rating,*

(f) roof assemblies shall have a ¾-hr *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.(2),

(i) if unsprinklered, the *building area* is not greater than 15,000 sq ft, and

(ii) if *sprinklered,* the *building area* is not greater than

24,000 sq ft if facing 1 *street,*

30,000 sq ft if facing 2 *streets,* or

36,000 sq ft if facing 3 *streets,* and

(g) all *loadbearing* walls, columns and arches supporting an assembly described in Clauses (b) to (f) shall have a ¾-hr *fire-resistance rating,* or shall be of *noncombustible construction,* or be a combination thereof, except that such members and assemblies supporting a *fire separation* as required in Clause (b) or (d) shall have a *fire-resistance rating* at least equivalent to that required for the supported assembly.

Group E, up to 6 Storeys, Sprinklered

3.2.2.35.(1) A *building* classified as Group E shall conform to Sentence (2) provided the *building* is *sprinklered* and 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.

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	75,000	unlimited	unlimited
3	50,000	62,500	75,000
4	37,500	46,875	56,250
5	30,000	37,500	45,000
6	25,000	31,250	37,500
Column 1	2	3	4

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

(a) basements and cellars shall be subdivided by a 2-hr *fire separation* into areas not exceeding 5,000 sq ft, or they shall be *sprinklered*,

(b) floor assemblies immediately above basements or cellars shall be a 2-hr *fire separation*,

(c) floor assemblies immediately above crawl spaces shall have a 1-hr *fire-resistance rating*, except that this requirement is waived if the crawl spaces are subdivided by a 1-hr *fire separation* into areas not exceeding 5,000 sq ft, or they are *sprinklered* (see Article 3.2.2.3.),

(d) other floor assemblies shall be a 2-hr *fire separation*,

(e) *mezzanines* shall have a 1-hr *fire-resistance rating*,

(f) except as provided in Article 3.2.5.5., roof assemblies shall have a 1-hr *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-hr *fire separation*,

(b) sprinklers may be omitted in crawl spaces provided

(i) floor assemblies immediately above crawl spaces have a 2-hr *fire-resistance rating*, or

(ii) the crawl spaces are subdivided by a 2-hr *fire separation* into areas not exceeding 5,000 sq ft, (see Article 3.2.2.3.),

(c) other floor assemblies shall be a 3-hr *fire separation*, except for floors above crawl spaces,

(d) *mezzanines* shall have a 1½-hr *fire-resistance rating*,

(e) roof assemblies shall have a 1½-hr *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, sq ft		
	Facing 1 *Street*	Facing 2 *Streets*	Facing 3 *Streets*
1	8,000	10,000	12,000
2	4,000	5,000	6,000
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 ¾-hr *fire separation* into areas not exceeding 5,000 sq ft, or they shall be *sprinklered*,

(b) floor assemblies immediately above basements or cellars shall have a ¾-hr *fire separation*,

(c) floor assemblies immediately above crawl spaces shall have, if of *combustible construction*, a ¾-hr *fire-resistance rating*, except that this requirement is waived if the crawl spaces are subdivided by a ¾-hr *fire separation* into areas not exceeding 5,000 sq ft, 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 ¾-hr *fire-resistance rating*, and

(e) all *loadbearing* walls, columns and arches supporting an assembly required to have a *fire-resistance rating* shall have a ¾-hr *fire-resistance rating*, or shall be of *noncombustible construction*, or be a combination thereof, except that such members and assemblies supporting a *fire separation* as required in Clause (b) or (d) shall have a *fire-resistance rating* at least equivalent to that required for the supported assembly.

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, sq ft		
	Facing 1 *Street*	Facing 2 *Streets*	Facing 3 *Streets*
1	24,000	30,000	36,000
2	12,000	15,000	18,000
3	8,000	10,000	12,000
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-hr *fire separation* of *noncombustible construction,*

(b) sprinklers may be omitted in crawl spaces provided

(i) floor assemblies immediately above crawl spaces have a ¾-hr *fire-resistance rating,* or

(ii) the crawl spaces are subdivided by a ¾-hr *fire separation* into areas not exceeding 5,000 sq ft (see Article 3.2.2.3.),

(c) other floor assemblies shall be a ¾-hr *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* or be a combination thereof, 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, sq ft		
	Facing 1 *Street*	Facing 2 *Streets*	Facing 3 *Streets*
1	24,000	30,000	36,000
2	12,000	15,000	18,000
3	8,000	10,000	12,000
4	6,000	7,500	9,000
Column 1	2	3	4

(2) The *building* shall be of *noncombustible construction,* and
(a) basements and cellars shall be subdivided by a 2-hr *fire separation* into areas not exceeding 5,000 sq ft, or they shall be *sprinklered,*
(b) floor assemblies immediately above basements or cellars shall be a 2-hr *fire separation,*
(c) floor assemblies immediately above crawl spaces shall have a 2-hr *fire-resistance rating,* except that this requirement is waived if the crawl spaces are subdivided by a 2-hr *fire separation* into areas not exceeding 5,000 sq ft, or they are *sprinklered* (see Article 3.2.2.3.),
(d) other floor assemblies shall be a 2-hr *fire separation,*
(e) *mezzanines* shall have a 1-hr *fire-resistance rating,*
(f) except as provided in Article 3.2.5.5., roof assemblies shall have a 1-hr *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 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.

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	60,000	75,000	90,000
2	30,000	37,500	45,000
3	20,000	25,000	30,000
4	15,000	18,750	22,500
Column 1	2	3	4

(2) The *building* shall be of *noncombustible construction,* and
(a) floor assemblies immediately above basements or cellars shall be a 3-hr *fire separation,*
(b) sprinklers may be omitted in crawl spaces provided
  (i) floor assemblies immediately above crawl spaces have a 2-hr *fire-resistance rating,* or
  (ii) the crawl spaces are subdivided by a 2-hr *fire separation* into areas not exceeding 5,000 sq ft (see Article 3.2.2.3.),
(c) other floor assemblies shall be a 3-hr *fire separation,* except for floors above crawl spaces,
(d) *mezzanines* shall have a 1½-hr *fire-resistance rating,*
(e) roof assemblies shall have a 1½-hr *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

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, sq ft		
	Facing 1 *Street*	Facing 2 *Streets*	Facing 3 *Streets*
1	10,000	12,500	15,000
2	6,000	7,500	9,000

No. of *Storeys*	*Sprinklered* Maximum Area, sq ft		
	Facing 1 *Street*	Facing 2 *Streets*	Facing 3 *Streets*
1	30,000	37,500	45,000
2	12,000	15,000	18,000
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-hr *fire separations* into areas not exceeding 5,000 sq ft, or they shall be *sprinklered*,

(b) floor assemblies immediately above basements or cellars shall be a ¾-hr *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-hr *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-hr *fire-resistance rating*, or shall be of *noncombustible construction*, or be a combination thereof, except that such members and assemblies supporting a *fire separation* as required in Clause (b) 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 3.2.2.43.)

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, sq ft		
	Facing 1 *Street*	Facing 2 *Streets*	Facing 3 *Streets*
1	32,000	40,000	48,000
2	16,000	20,000	24,000
3	10,700	13,400	16,000
4	8,000	10,000	12,000
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-hr *fire separation* into areas not exceeding 5,000 sq ft, or they shall be *sprinklered,*

(b) floor assemblies immediately above basements or cellars shall be a 1-hr *fire separation* of *noncombustible construction,*

(c) floor assemblies immediately above crawl spaces, shall have a ¾-hr *fire-resistance rating,* except that this requirement is waived if the crawl spaces are subdivided by a ¾-hr *fire separation* into areas not exceeding 5,000 sq ft, or they are *sprinklered* (see Article 3.2.2.3.),

(d) other floor assemblies shall be a ¾-hr *fire separation,*

(e) *mezzanines* shall have, if of *combustible construction,* a ¾-hr *fire-resistance rating,*

(f) roof assemblies shall have, if of *combustible construction,* a ¾-hr *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.(2), and

(i) if unsprinklered, the *building area* is not greater than
16,000 sq ft if facing 1 *street,*
20,000 sq ft if facing 2 *streets,* or
24,000 sq ft 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 described in Clauses (b) to (f) shall have a ¾-hr *fire-resistance rating,* or shall be of *noncombustible construction,* or be a combination thereof, except that such members and assemblies supporting a *fire separation* as required 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, sq ft		
	Facing 1 *Street*	Facing 2 *Streets*	Facing 3 *Streets*
1	60,000	75,000	90,000
2	30,000	37,500	45,000
3	20,000	25,000	30,000
4	15,000	18,750	22,500
Column 1	2	3	4

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

(a) basements and cellars shall be subdivided by a 2-hr *fire separation* into areas not exceeding 5,000 sq ft, or they shall be *sprinklered*,

(b) floor assemblies immediately above basements or cellars shall be a 2-hr *fire separation*,

(c) floor assemblies immediately above crawl spaces shall have a 1-hr *fire-resistance rating*, except that this requirement is waived if the crawl spaces are subdivided by a 1-hr *fire separation* into areas not exceeding 5,000 sq ft, or they are *sprinklered* (see Article 3.2.2.3.),

(d) other floor assemblies shall be a 1-hr *fire separation*,

(e) *mezzanines* shall have a 1-hr *fire-resistance rating*,

(f) except as provided in Article 3.2.5.5., roof assemblies shall have a 1-hr *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).

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	90,000	112,500	135,000
2	45,000	56,250	67,500
3	30,000	37,500	45,000
4	22,500	28,125	33,750
5	18,000	22,500	27,000
6	15,000	18,750	22,500
Column 1	2	3	4

(2) The *building* shall be of *noncombustible construction,* and
(a) basements and cellars shall be subdivided by a 2-hr *fire separation* into areas not exceeding 5,000 sq ft, or they shall be *sprinklered,*
(b) floor assemblies immediately above basements or cellars shall be a 2-hr *fire separation,*
(c) floor assemblies immediately above crawl spaces shall have a 2-hr *fire-resistance rating,* except that this requirement is waived if the crawl spaces are subdivided by a 2-hr *fire separation* into areas not exceeding 5,000 sq ft, or they are *sprinklered* (see Article 3.2.2.3.),
(d) other floor assemblies shall be a 2-hr *fire separation,*
(e) *mezzanines* shall have a 1-hr *fire-resistance rating,*
(f) except as provided in Article 3.2.5.5., roof assemblies shall have a 1-hr *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
Any Height, Any Area, Sprinklered

3.2.2.45.(1) A *building* classsified 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-hr *fire separation,*
(b) sprinklers may be omitted in crawl spaces provided
  (i) floor assemblies immediately above crawl spaces have a 2-hr *fire-resistance rating,* or
  (ii) the crawl spaces are subdivided by a 2-hr *fire separation* into areas not exceeding 5,000 sq ft (see Article 3.2.2.3.),
(c) other floor assemblies shall be a 3-hr *fire separation,* except for floors above crawl spaces,
(d) *mezzanines* shall have a 1½-hr *fire-resistance rating,*
(e) roof assemblies shall have a 1½-hr *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.

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	16,000	20,000	24,000
2	8,000	10,000	12,000

Table 3.2.2.T. (Cont'd)

No. of *Storeys*	*Sprinklered* Maximum Area, sq ft		
	Facing 1 *Street*	Facing 2 *Streets*	Facing 3 *Streets*
1	48,000	60,000	72,000
2	16,000	20,000	24,000
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 ¾-hr *fire separation* into areas not exceeding 5,000 sq ft, or they shall be *sprinklered,*

(b) floor assemblies immediately above basements or cellars shall be a ¾-hr *fire separation,*

(c) floor assemblies immediately above crawl spaces shall have, if of *combustible construction,* a ¾-hr *fire-resistance rating,* except that this requirement is waived if the crawl spaces are subdivided by a ¾-hr *fire separation* into areas not exceeding 5,000 sq ft, 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 ¾-hr *fire-resistance rating,* and

(e) all *loadbearing* walls, columns and arches supporting an assembly required to have a *fire-resistance rating* shall have a ¾-hr *fire-resistance rating,* or shall be of *noncombustible construction,* or be a combination thereof, except that such members and assemblies supporting a *fire separation* as required in Clause (b) shall have a *fire-resistance rating* at least equivalent to that required for the supported assembly.

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).

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	48,000	60,000	72,000
2	24,000	30,000	36,000
3	16,000	20,000	24,000
4	12,000	15,000	18,000
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-hr *fire separation* into areas not exceeding 5,000 sq ft, or they shall be *sprinklered,*
(b) floor assemblies immediately above basements or cellars shall be a 1-hr *fire separation,*
(c) floor assemblies immediately above crawl spaces shall have, if of *combustible construction,* a ¾-hr *fire-resistance rating,* except that this requirement is waived if the crawl spaces are subdivided by a ¾-hr *fire separation* into areas not exceeding 5,000 sq ft, 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 ¾-hr *fire-resistance rating,*
(e) *mezzanines* shall have, if of *combustible construction,* a ¾-hr *fire-resistance rating,*
(f) roof assemblies shall have, if of *combustible construction,* a ¾-hr *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.(2), and
  (i) if unsprinklered, the *building area* is not greater than
    24,000 sq ft if facing 1 *street,*
    30,000 sq ft if facing 2 *streets,* or
    36,000 sq ft 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 described in Clauses (b) to (f) shall have a ¾-hr *fire-resistance rating,* or shall be of *noncombustible construction,* or be a combination thereof, except that such members and assemblies supporting a *fire separation* as required in Clause (b) or (d) shall have a *fire-resistance rating* at least equivalent to that required for the supported assembly.

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).

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	56,000	70,000	84,000
Column 1	2	3	4

(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 ¾-hr *fire separation* into areas not exceeding 5,000 sq ft, or they shall be *sprinklered,*
(b) floor assemblies immediately above basements or cellars shall be a ¾-hr *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* or be a combination thereof, except that such members and assemblies supporting a *fire separation* as required in Clause (b) shall have a *fire-resistance rating* at least equivalent to that required for the supported assembly.

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 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-hr *fire separation* into areas not exceeding 5,000 sq ft, or they shall be *sprinklered,*
(b) floor assemblies immediately above basements or cellars shall be a 1-hr *fire separation,*
(c) floor assemblies immediately above crawl spaces shall have a 1-hr *fire-resistance rating,* except that this requirement is waived if the crawl spaces are subdivided by a 1-hr *fire separation* into areas not exceeding 5,000 sq ft, 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 70 ft 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 70 ft in height above *grade,*
(c) not more than 100,000 sq ft in *building area,*
(d) ventilated in conformance with Sentence 3.6.3.3.(6), and
(e) designed so that every portion of each *floor area* is within 200 ft 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).

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	72,000	90,000	108,000
3	48,000	60,000	72,000
4	36,000	45,000	54,000
5	28,800	36,000	43,200
6	24,000	30,000	36,000
Column 1	2	3	4

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

(a) basements and cellars shall be subdivided by a 2-hr *fire separation* into areas not exceeding 5,000 sq ft, or they shall be *sprinklered*,

(b) floor assemblies immediately above basements or cellars shall be a 2-hr *fire separation*,

(c) floor assemblies immediately above crawl spaces shall have a 1-hr *fire-resistance rating*, except that this requirement is waived if the crawl spaces are subdivided by a 1-hr *fire separation* into areas not exceeding 5,000 sq ft, or they are *sprinklered* (see Article 3.2.2.3.),

(d) other floor assemblies shall be a 1-hr *fire separation*,

(e) *mezzanines* shall have a 1-hr *fire-resistance rating*,

(f) except as provided in Article 3.2.5.5., roof assemblies shall have a 1-hr *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 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-hr *fire separation* into areas not exceeding 5,000 sq ft, or they shall be *sprinklered*,

(b) floor assemblies immediately above basements or cellars shall be a 2-hr *fire separation*,

(c) floor assemblies immediately above crawl spaces shall have a 1-hr *fire-resistance rating*, except that this requirement is waived if the crawl spaces are subdivided by a 1-hr *fire separation* into areas not exceeding 5,000 sq ft, or they are *sprinklered* (see Article 3.2.2.3.),

(d) all other floor assemblies shall be at least a 2-hr *fire separation*, except that such floor assemblies may be reduced to a 1-hr *fire separation* in a *storage garage* conforming to Sentence 3.6.3.3.(6),

(e) *mezzanines* shall have a 1-hr *fire-resistance rating*,

(f) except as provided in Article 3.2.5.5., roof assemblies shall have a 1-hr *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

3.2.3.1.(1) Except as provided in Articles 3.2.3.2., 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.

(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 flaming combustion 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 firefighting and the protective wetting of the exposed building facade will often be necessary as supplementary measures to inhibit fire spread.)

(2) The area of the *unprotected openings* in an *exposing 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 3.2.3.3.(1)).

Limiting distance

(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. 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.

(4) In respect to the *building* under consideration where firefighting 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. Methods other than those described in Article 3.2.3.1. for determining the maximum allowable area of *unprotected openings* in an *exposing building face* may be used provided the *authority having jurisdiction* is satisfied that the standards of safety are not reduced.

Area of exposing building face

3.2.3.3.(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, 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*

(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 ¾ hr and need not be more than 1 hr, and

(b) in Group E or Group F, Division 1 or 2 *occupancy* have a *fire-resistance rating* of at least 2 hr.

Walls with limiting distance less than 4 ft

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 4 ft shall be protected by *approved closures* as required for the grade of *fire separation* of the wall; wired glass and glass blocks shall not be used for such *closures.*

TABLE 3.2.3.A

Forming Part of Subsection 3.2.3.

| EXPOSING BUILDING FACE | RATIO (L/H or H/L) (1) | AREA OF UNPROTECTED OPENING FOR GROUP A, B, C, D AND GROUP F DIVISION 3 OCCUPANCIES, PER CENT | | |

TABLE 3.2.3.B.

Forming Part of Subsection 3.2.3.

| EXPOSING BUILDING FACE | | AREA OF UNPROTECTED OPENING FOR GROUP E AND GROUP F DIVISION 1 AND 2 OCCUPANCIES, PER CENT. | | |

Construction of exposing building faces

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

(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 hr,

(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 hr 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 ¾-hr *fire-resistance rating.*

(2) Except as permitted in Articles 3.2.3.6. and 3.2.3.7., 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 hr,

(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 hr, 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-hr *fire-resistance rating.*

(3) Structural members, such as beams, columns and arches placed wholly or partly outside an exterior face of a *building* and which are 10 ft or more from the property line or centre line of a public thoroughfare need not be protected from exterior fires.

(4) Such structural members that are less than 10 ft 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-hr *fire-resistance rating,* whichever is the greater.

(5) 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 10 ft or more from the property line or centre line of a public thoroughfare need not be covered with *noncombustible* cladding.

First storey facing street

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

(a) in a *storage garage* conforming to Sentence 3.6.3.3.(6) having a *limiting distance* of at least 10 ft, or

(b) in the *first storey* of a *building* that faces a *street* and having a *limiting distance* of at least 30 ft.

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 10 ft.

Increased openings permitted

3.2.3.8.(1) The area of *unprotected openings* in any *exposing building face* may be double the area permitted in Sentence 3.2.3.1.(1) where

(a) the *building* is *sprinklered,* or

(b) such openings are glazed with wired glass in fixed steel frames conforming to the requirements of Article 3.1.7.3.

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.(4), 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:

$$F_{EO} = \frac{(T_u + 460)^4}{(T_e + 460)^4}$$

where T_u = average temperature in degrees Fahrenheit of the unexposed wall surface at the time the required *fire-resistance rating* is reached under test conditions,

T_e = 1,638°F for a ¾-hr *fire-resistance rating*,
1,700°F for a 1-hr *fire-resistance rating*, and
1,850°F for a 2-hr *fire-resistance rating*.

Exterior walls meeting at a firewall

3.2.3.10. Where 2 exterior walls meet at a *firewall* at an external angle of 135 deg. or less, one or both of the intersecting exterior walls shall be constructed as a *firewall* without openings and conforming to Subsection 3.1.8. so that

$$L_O = 2L - \left(\frac{\theta}{90} \times L\right), \text{ but in no case less than 3 ft}$$

where L_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*,

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

θ = the external angle between the two exterior walls.

Walls exposed to adjoining roof

3.2.3.11.(1) Except as provided in Sentence 3.2.3.15.(3), where a wall is exposed to a fire hazard from an adjoining roof of a separate *fire compartment* of the same *building*, and the construction of the adjoining roof assembly has a *fire-resistance rating* less than 1 hr, every opening in the exposed wall within 3 *storeys* vertically and 15 ft horizontally of such roof shall be protected with wired glass in steel frames in accordance with Article 3.1.7.3.

(2) Except for *sprinklered buildings*, where an *exposing building face* is required by Sentences 3.2.3.5.(1) and (2) to have a *fire-resistance rating*, the portion of the roof-ceiling assembly adjacent to the *exposing building face* within 15 ft of a property line or centre line of a *street*, lane or public thoroughfare shall be constructed as a *fire separation* having a *fire-resistance rating* equal to that required for the *exposing building face*.

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 10,000 sq ft in *building area* provided the roof covering is underlaid with an *approved noncombustible* material.

Separation of Buildings Connected by Covered Malls

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 30 ft, then each portion of the *building* so separated may be considered as a separate *building* provided that

(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-hr *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 3.4.2.5.),

(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 hr, except that any part of the mall that is more than 20 ft 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 hr, 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-speed 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 hr 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-hr *fire separation.* 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

(a) such other purpose is *approved,* and the entire *walkway* and the spaces used for other purposes are *sprinklered,* or

(b) the zone between smoke barrier doors as prescribed in Sentence (4) and such spaces contained therein are *sprinklered.*

Separation

(2) *Buildings* connected by an underground *walkway* shall be separated from the *walkway* by a 1-hr *fire separation.*

(3) An underground *walkway* shall be of *noncombustible construction* suitable for underground location.

Travel distance

(4) Smoke barrier doors shall be installed in underground *walkways* at intervals not exceeding 300 ft, 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).

Interior finish

(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

Where required

3.2.4.1.(1) An *approved* 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.

(2) Manually operated, non-electric alarm systems employing *approved* 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.*

(3) In addition to any manual system that may be required, an *approved* 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.

(4) When mixed *occupancies* are present in the same *building,* the most demanding requirements for fire alarm and detector systems for the *occupancies* contained therein shall apply.

(5) Where a fire alarm system is required in any portion of a *building,* it shall be installed throughout that *building.*

(6) Where a fire alarm system is required by Sentence (1), an *approved smoke detector* shall be installed in every recirculating air handling system where such system

(a) serves a Group A, Division 1 *major occupancy* or a 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 Group F, Division 1 or 2 *major occupancy* where the system supplies more than 1 *occupancy* on the same floor or serves more than 1 *storey*,
(c) serves a Group B *major occupancy* where the system supplies more than 1 smoke control zone 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*.

Annunciator required

(7) Where a fire alarm system is required by Sentence (1), an *approved* 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.

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	Type of Fire Alarm Required
Group A, Division 1	300 persons	Types 4 or 5
Group A, Division 2 (except licensed beverage establishments, *restaurants*, schools and colleges)	300 persons	Types 1, 2, 3, 4 or 5
Group A, Division 2 (licensed beverage establishments and *restaurants* only)	150 persons	Types 1, 2, 3, 4 or 5
Group A, Division 2 (nonresidential schools, nonresidential colleges only)	40 persons	Types 1, 2 or 3
Group A, Division 3	500 persons	Types 1, 2 or 3
Group A, Division 4	500 persons below the seating area	Types 1, 2 or 3
Group B, Division 1	1 person	Types 1, 2 or 3
	10 persons detained (sleeping accommodation)	Types 4 or 5
Group B, Division 2 (except children's custodial homes, convalescent homes, homes for the aged and orphanages)	10 persons (sleeping accommodation)	Types 4 or 5
Group B, Division 2 (children's custodial homes, convalescent homes, homes for the aged and orphanages)	10 persons	Types 1, 2 or 3 for *buildings* up to 3 *storeys* in *building height;* Types 4 or 5 over 3 *storeys*
Group C (apartments only)	10 persons[1] (sleeping accommodation)	Types 1, 2 or 3
Column 1	2	3

Table 3.2.4.A. (Cont'd)

Major Occupancy Classification	*Occupant Load* Above Which a Fire Alarm System is Required	Type of Fire Alarm Required
Group C (convents, dormatories, boarding houses, residential clubs, lodging houses and monasteries only)	10 persons (sleeping accommodation)	Types 1, 2 or 3 for *buildings* up to 3 *storeys* in *building height;* Types 4 or 5 over 3 *storeys*
Group C (hotels and motels only)	10 persons[2] (sleeping accommodation)	Types 1, 2 or 3 for *buildings* up to 3 *storeys* in *building height;* Types 4 or 5 over 3 *storeys*
Group C (residential colleges and residential schools only)	10 persons (sleeping accommodation)	Types 1, 2 or 3
Group D	500 persons total or 150 persons above or below the *first storey*	Types 1, 2 or 3
Group E	300 persons total or 150 persons above or below the *first storey* or in *buildings* exceeding 2 *storeys* in *building height*	Types 1, 4 or 5
Group F, Division 1 and 2	100 persons total or where more than 25 persons are employed above or below the *first storey*[3]	Types 1, 2, 3, 4 or 5
Group F, Division 3	500 persons total or where more than 75 persons are employed above or below the *first storey*[3]	Types 1, 2, 3, 4 or 5
Column 1	2	3

Notes to Table 3.2.4.A.:

(1) An alarm system is not required in *buildings* containing only *dwelling units,* if not more than 4 *dwelling units* share a *public corridor* or *exit,* or if the *building* is 3 *storeys* or less in *building height* and each *dwelling unit* has direct access to the outdoors by a door at ground level or a door providing direct access by a balcony to ground level.

(2) An alarm system is not required in *buildings* 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 to ground level.

(3) No fire alarm system is required in a *building* not more than 1 *storey* in *building height* where the *floor area* is open.

3.2.4.2.(1) The Type 1 fire alarm system required in Table 3.2.4.A., 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) The Type 2 fire alarm system required in Table 3.2.4.A., 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) The Type 3 fire alarm system required in Table 3.2.4.A., 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) The Type 4 fire alarm system required in Table 3.2.4.A., 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.

(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.)

(5) The Type 5 fire alarm system required in Table 3.2.4.A., 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 a Type 4 fire alarm system, 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 a Type 3 system.

(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.

(A 2 stage fire alarm system is intended only for those *buildings* in which there are at least 2 persons on duty at all times with authority to sound a general fire alarm.)

(9) Except as otherwise provided in this Bylaw, every general fire alarm shall be designed so that when activated it will sound for at least 5 min.

(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.)

Direct connection to fire department

3.2.4.3.(1) In a Group A, Division 1, or a Group B *occupancy,* or in a *building* regulated by the provisions of Subsection 3.2.6., a direct connection shall be provided to the fire department headquarters 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 communication with the fire department where

(a) a fire alarm system is required to be installed, and
(b) where a sprinkler system functions as a fire detection system or part of a fire detection system.

(2) Except where otherwise required by the provisions of Subsection 3.2.6., a local fire alarm system shall

(a) release hold-open devices that are permitted on certain doors in Sentence 3.1.7.2.(10),
(b) close *theatre* fire curtains required by Article 3.3.2.15., and
(c) actuate motorized devices to open smoke dampers.

Automatic fire detection

3.2.4.4.(1) Except as provided in Sentence (3), where a fire alarm system is required to be installed, *approved heat detectors* or *smoke detectors* shall be installed

(a) 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, stair shafts, janitors' closets and any room where hazardous products are intended to be used or stored,
(b) in every corridor and room in *buildings* classified as Group A, Division 1, or Group B *major occupancy,* and
(c) in every *public corridor, dwelling unit*, suite and room not located within a *dwelling unit* or suite in *buildings* classified as Group C *occupancy*, except that where a hotel or motel exceeds 3 *storeys* in *building height, public corridors* shall be equipped with *approved smoke detectors.*

Exception for sprinklers

(2) Except in those locations where smoke detectors are required, where *approved* 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.

(3) When a sprinkler system functions as a fire detection system or part of a fire detection system, as provided in Sentence (2) or Sentence 3.2.4.1.(3), it shall be supervised electrically to indicate separately at the fire alarm annunciator each of the following faults:

(a) movement of a valve handle that would interfere with the operation of the sprinkler system,
(b) loss of required water or air pressure in the sprinkler system,

(c) loss of electrical power supply to any automatic fire pumps, auxiliary booster or special service pumps required for the operation of the sprinkler system, and
(d) significant change of water levels and, where there is a danger of freezing, water temperatures within any on-site water containers or pressure tanks required to supply and supplement the sprinkler water supply.

3.2.4.5.(1) An *approved* electrically supervised emergency power supply shall be provided for every local electrical fire alarm system when there are required to be
(a) annunciators,
(b) more than 12 manual fire alarm stations, or
(c) more than 12 automatic alarm-initiating devices.

3.2.4.6. Local fire alarm systems and protective signalling systems shall be installed in conformance with Part 6 of this Bylaw.

SUBSECTION 3.2.5. PROVISIONS FOR FIRE FIGHTING

Access above grade

3.2.5.1.(1) Except for the *first storey* or ground floor, in every *building* direct access for fire fighting shall be provided from the outdoors to every *storey* below the sixth *storey* or 90 ft above *grade* by at least 1 unobstructed window or access panel for each 50 lineal ft of wall in at least 1 wall facing on a *street* or a yard conforming to Sentence 3.2.2.4.(1).

(2) An opening for access required in Sentence (1) shall be not less than 42 in. high by 22 in. wide, with a sill height of not more than 36 in. 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.

(4) The requirements of Sentences (1) to (3) need not apply to any *storey* that is *sprinklered.*

(5) Access for fire department equipment shall be provided to each *building* by means of a *street,* private roadway or yard.

(6) Where access to a *building* as required in Sentence (5) is provided by means of a private roadway or yard, the design and location of such access shall be subject to the approval of the *authority having jurisdiction,* taking into account such features as
(a) connection with public thoroughfares,
(b) weight of firefighting equipment,
(c) width of roadway,
(d) radius of curves,
(e) overhead clearance,
(f) location of fire hydrants,
(g) location of fire department connections, and
(h) vehicle parking.

Access below grade

3.2.5.2.(1) Direct access from at least 1 *street* shall be provided from the outdoors to each basement and cellar having a horizontal dimension exceeding 75 ft; such access may be provided by doors, windows or other means that provide an opening at least 42 in. high and 22 in. wide, the sill of which shall be not higher than 36 in. above the inside floor, or by an interior stairway immediately accessible from the outdoors.

(2) The requirements of Sentence (1) need not apply to any basement or cellar that is *sprinklered.*

3.2.5.3. A water supply for fire fighting shall be designed, installed and maintained in accordance with the requirements of the *authority having jurisdiction.* Water supply

(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 for 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. The selection of water supplies for each installation should be determined in co-operation with the *authority having jurisdiction.* 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.)

3.2.5.4.(1) Except as provided in Sentence 3.3.7.7.(8), a standpipe and hose system shall be installed in conformance with Part 6 of this Bylaw in every *building* that is Standpipes

(a) more than 3 *storeys* in *building height* or more than 45 ft 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 45 ft in height measured between *grade* and the ceiling of the top *storey*. (See also Article 3.2.3.13.)

(2) Where a standpipe and hose system is required, 2½-in. diam. hose connections shall be provided, except that in *buildings* 6 *storeys* or less in *building height* or 75 ft or less above *grade* and having a *building area* of 40,000 sq ft or less, the hose connections are permitted to be 1½-in. diam.

Table 3.2.5.A.

Forming Part of Sentence 3.2.5.4.(1)

BUILDING AREA LIMITS FOR STANDPIPES IN UNSPRINKLERED BUILDINGS UP TO 3 STOREYS IN BUILDING HEIGHT

Occupancy Classification	*Building Area*, sq ft		
	1 *storey*	2 *storeys*	3 *storeys*
A	25,000	20,000	15,000
B (except hospitals)	20,000	15,000	10,000
Hospitals	5,000	5,000	5,000
C	20,000	15,000	10,000
D	40,000	30,000	20,000
E[1]	—	—	—
F, Division 1	10,000	10,000	10,000
F, Division 2	20,000	15,000	10,000
F, Division 3	30,000	20,000	10,000
Column 1	2	3	4

Note to Table 3.2.5.A.:

(1) Group E *occupancies* over 15,000 sq ft in *building area* or over 3 *storeys* must be *sprinklered* as required in Subsection 3.2.2.

(3) When a covered mall is greater than 15 ft 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 portion.

Sprinkler systems

3.2.5.5.(1) Where a *building* or part of a *building* is required to be *sprinklered,* the sprinkler system shall conform to Part 6 of this Bylaw.

(2) 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 provided

(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 hr,
(c) the roof assembly is equipped with an automatic sprinkler system designed to protect the roof assembly and the space below,
(d) the sprinkler system in Clause (c) is electrically supervised in conformance with Sentence 3.2.4.4.(3), and
(e) the operation of the sprinkler system in Clause (c) will cause an alarm signal to be transmitted to the fire department headquarters in conformance with Sentence 3.2.4.3.(1).

Portable extinguishers

3.2.5.6. Portable extinguishers shall be provided and installed in accordance with the appropriate regulation in the Fire Prevention Bylaw or, in the absence of such Bylaw, the National Fire Code of Canada 1977.

SUBSECTION 3.2.6. ADDITIONAL REQUIREMENTS FOR HIGH BUILDINGS

Introductory Note

(Experience with high buildings has shown that the time required for complete evacuation can exceed that which is condidered necessary for the safe egress of all occupants. Studies of the 'chimney effect' and observations of smoke movement in actual fires have shown that present measures for containing a fire on any one storey will not usually prevent the movement of smoke through elevator, stair and other vertical shafts to the upper floors of a high building. Occupants of high buildings, and particularly those on upper storeys, may therefore be faced with severe smoke conditions from fires occurring in storeys below them, before their own evacuation is possible. The measures described in 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 firefighters 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 ACNBC publication, "Measures for Fire Safety in High Buildings." Adoption of one 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.)

3.2.6.1.(1) This Subsection applies to

(a) every *building* of Group A, D, E or F *major occupancy* classification that is more than
  (i) 120 ft in height, measured between *grade* and the floor level of the top *storey,* or
  (ii) 60 ft 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 22-in. 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 60 ft 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 60 ft above *grade.*

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

(2) Except as provided in Sentences (5) to (8), every *building* shall be designed so that during a period of 2 hr 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 in Table 2.2.4.A. of Part 2 of this Bylaw.

(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.*

(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 a firefighters' elevator, as required by Article 3.2.6.4.

(The requirements of Sentences (2), (3) and (4) may be met by use of measures B, D, F, H or I described in ACNBC publication "Measures for Fire Safety in High Buildings.")

(5) The requirements of Sentence (2) are waived in a *building* of Group C *major occupancy* classification that is not more than 250 ft in height measured between *grade* and the floor level of the top *storey,* and in any *building* of Group A, D, E or F *major occupancy* classification 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 at least on every fifth *storey,*
(c) provide not less than 5 sq ft of floor space per ambulatory occupant and 16 sq ft 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 22-in. 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 22-in. 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 hr 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 in Table 2.2.4.A. of Part 2 of this Bylaw.

(In a *building* that falls within the scope of Sentence (5), the requirements in Sentence (5) may be met by use of Measures K or L, described in ACNBC publication "Measures for Fire Safety in High Buildings.")

(6) In a *building* of Group A, C, D, E or F *major occupancy* classification, the requirements of Sentences (2) and (4) and Clause 3(a) are waived when the *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 *approved independent central station*,

(ii) transmit automatically other *supervisory signals* to an *approved proprietary control centre* or to an *approved 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*.

(In a *building* that falls within the scope of Sentence (6), the requirements in Sentence (6) may be met by use of Measure A, described in ACNBC publication "Measures for Fire Safety in High 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 250 ft 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 ⅓ of the total area in square feet of treads and landings in the *exit* stairs serving these *storeys*.

(In a *building* that falls within the scope of Sentence (7), the requirements of Sentence (7) may be met by use of Measures C, E, G or J, described in ACNBC publication "Measures for Fire Safety in High Buildings.")

(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 120 ft in height, measured between *grade* and the floor level of the top *storey*,

(b) where each individually rented room, suite of rooms or *dwelling unit* 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 5 ft, and

(ii) provides not less than 5 sq ft of balcony space for each occupant of the room, suite of rooms or *dwelling unit*,

(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*.

(In a *building* that falls within the scope of Sentence (8), the requirements of Sentence (8) may be met by use of Measure M, described in ACNBC publication "Measures for Fire Safety in High Buildings.")

(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.

(The requirement of Sentence (9) may be met by the use of Measure N, described in ACNBC publication "Measures for Fire Safety in High Buildings.")

Elevators

3.2.6.3.(1) Except at the *street* floor level on which the central alarm and control facility required in Article 3.2.6.8. is located, elevator door re-opening devices that may be affected by smoke or hot gases, such as photo-electric devices, shall be rendered inoperative after the doors have been held open for 10 sec.

(2) A key-operated switch shall be provided that
(a) is in a conspicuous location on the outside of the elevator shaft at or near the central alarm and control facility referred to in Article 3.2.6.8.,
(b) will cause the immediate return of all elevator cars in the *building* to the *street* floor or transfer lobby by cancelling all other calls after the car has stopped at the next floor at which it can make a normal stop, and
(c) will render inoperative the emergency stop switch in each elevator car upon operation of the key-operated switch.

(3) In each elevator car a key-operated switch shall be provided to
(a) enable the elevator to operate independently of other elevators,
(b) allow operation of the elevator without interference from floor call buttons,
(c) render door protective devices inoperative, and
(d) control the opening of power-operated doors only by continuous pressure on the "open" buttons or switches, so that, if the "open" button or switch is released while the door is opening, the doors will automatically reclose.

(4) Keys to operate the switches required by Sentences (2) and (3) shall be provided in a suitably identified box conspicuously located on the outside of an elevator shaft near the central alarm and control facility required by Article 3.2.6.8., and an additional key, or keys, shall be kept at the central alarm and control facility.

Elevator for Use by Firefighters

3.2.6.4.(1) At least 1 elevator shall be provided for use by firefighters in conformance with Sentences (2) to (6).

(2) The elevator required in Sentence (1) shall have a useable platform area not less than 24 sq ft, and shall be capable of carrying a load of 2,000 lb from a *street* floor landing to the top floor that it serves in 1 min.

(3) *Approved* measures shall be taken to ensure that the elevator required in Sentence (1) is operable under conditions of exposure to a fire from the outside of the shaft for a period of 1 hr.

(The requirements in Sentences (3) and 3.2.6.2.(4) are considered to be met by use of Measures B, C, D, E or L, described in ACNBC publication "Measures for Fire Safety in High Buildings," to limit entry of smoke into the elevator required in Sentence (1), provided the elevator door opens onto a *public corridor* or a vestibule protected against entry of smoke and fire as described in these measures.)

(The requirements in Sentences (3) and 3.2.6.2.(4) are considered to be met by use of Measure K, described in ACNBC publication "Measures for Fire Safety in High Buildings," by providing an elevator complying with the requirements of Sentence (2) and Sentences (4) to (7) on each side of a vertically divided *building*.)

(4) Except as provided in Sentence (5), an elevator required in Sentence (1) shall be capable of providing transportation from the *street* floor to every floor normally served by the elevator system that is above *grade* in the *building*.

(5) Where it is necessary to change elevators to reach any floor referred to in Sentence (4), the system shall be designed so that not more than 1 change of elevators is required when travelling from a *street* floor to any floor in the *building*.

(6) Elevators required 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 (5), except that where Measures A or K are used, such elevators shall not be identified.

(7) Electrical conductors for the operation of the elevator referred to in Sentence (1) shall be

(a) installed in *service spaces* conforming to Section 3.5 that do not contain other *combustible* material,
(b) installed in the elevator shaft when permitted by the *authority having jurisdiction* provided the conductors are *approved*, or
(c) protected against exposure to fire from the service entrance of the emergency power supply, or the normal service entrance of the normal power supply to the equipment served, to ensure operation for a period of 1 hr when subjected to the temperature conditions described in the appropriate *fire resistance* test in Article 3.1.5.1.

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 Chapter 3 in the ACNBC publication "Measures for Fire Safety in High Buildings."

(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.

Provision of 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 10,000 sq ft, except when the *floor area* is divided into *fire compartments* not exceeding 10,000 sq ft in area and separated from the remainder of the *floor area* by *fire separations* having at least a 1-hr *fire-resistance rating*.

(Sprinklering of below *grade storeys* is covered in Article 3.2.2.8.)

Interior Finish

3.2.6.7.(1) Except as permitted in Sentence (2), 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 Sentences 3.1.11.2.(1) and (2).)

Table 3.2.6.A.

Forming Part of Sentence 3.2.6.7.(1)

Location	Maximum *Flame-Spread Rating*			Maximum Smoke Developed Classification		
	Wall Surface	Ceiling Surface	Floor Surface	Wall Surface	Ceiling Surface	Floor Surface
Exit stairways, vestibules to *exit* stairs and *exit* lobbies	25[3]	25[3]	25	50[3]	50[3]	50
Corridors providing *access to exit* except within suites	[1]	[1]	300	100[3]	50[3]	500
Elevator cars and vestibules	25	25	300	100	100	300
Service spaces and *service rooms*	25	25	25	50	50	50
Other rooms or spaces	[1]	[1]	[2]	300	50	[2], [4]
Column 1	2	3	4	5	6	7

Notes to Table 3.2.6.A.

[1] See Section 3.3 and Subsections 3.1.4. and 3.1.11. for *flame-spread rating* requirements in these locations.

[2] See Sentence (3).

[3] Trim millwork and doors may have a *flame-spread rating* not exceeding 150 (see Sentences 3.4.4.1.(1) and (2)) and 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] For smoke developed classifications for lighting elements such as light diffusers and lenses, refer to Article 3.1.11.1.

(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) Soft floor coverings in rooms and spaces other than in *service rooms*, *service spaces*, floors and stairs in *exits*, elevator cars, vestibules adjacent to elevator cars and corridors providing *access to exits* not within suites, shall pass the test method for flame resistance in CGSB 4-GP-129 (1972), "Carpets, Commercial."

Central Alarm and Control Facility

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 an *approved* location that is readily accessible to firefighters entering the *building*, and

(b) takes into account the effect of background noise likely to occur under fire emergency conditions, so that the facility can properly perform its required function under such conditions.

(2) The central alarm and control facility 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,

(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 *approved independent central station,* or through an *approved 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 3.1.7.2.(11), unless this is effected automatically by proprietary system control equipment,

(f) means to manually actuate the fire alarm devices in the *building,* and to silence them after they have 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 120 ft, 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, an *approved* voice communication system or systems shall be provided in *buildings,* and shall consist of

(a) a 2-way communication system at *approved* 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 Part 6 of this Bylaw.

Fire Protection of Electrical Conductors

3.2.6.10. Electrical conductors for emergency equipment shall be installed in *service spaces* that do not contain other *combustible* material, or shall be protected against exposure to fire, as provided in Subsections 3.5.3. and 3.5.4., to ensure continued operation for a period of 1 hr, from the source of power supply to the branch circuits supplying the equipment required by Articles 3.2.6.2. to 3.2.6.6., 3.2.6.8. and 3.2.6.9.

Emergency Electrical Power Supply

3.2.6.11.(1) An *approved* local emergency power supply capable of operating under a full load for at least 2 hr 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 *approved* emergency power supply capable of operating under a full load for at least 2 hr 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 in a *building* that is more than 120 ft in height between *grade* and the floor of the top *storey*, 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 Part 6 of this Bylaw.

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 the satisfaction of the *authority having jurisdiction* to ensure satisfactory operation in accordance with the procedures described in Appendix C of the ACNBC publication "Measures for Fire Safety in High Buildings."

SUBSECTION 3.2.7. PROVISIONS FOR PHYSICALLY HANDICAPPED PERSONS

3.2.7.1. Every *public building* shall have at least 1 principal entrance designed in conformance with NBC Supplement No. 5, "Building Standards for the Handicapped 1977," 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. Every *public 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.

3.2.7.3. Washroom facilities in *public buildings* shall conform to Article 3.6.4.4.

(Where *buildings* are designed to accommodate handicapped persons, the requirements in NBC Supplement No. 5, "Building Standards for the Handicapped 1977" may be used as a guide for facilities in addition to the facilities required by this Bylaw.)

SUBSECTION 3.2.8. LIGHTING

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 5 ft candles at floor level and at all points such as angles and intersections at changes of level where there are stairs or ramps.

(2) Rooms and spaces used by the public shall be illuminated as described in Article 9.35.2.9. in Part 9 of this Bylaw.

3.2.8.2.(1) Emergency lighting shall be provided to average levels of at least 1 ft candle 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.

(2) An *approved* 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 hr for all *buildings* within the scope of Subsection 3.2.6.,
(b) 1 hr for *buildings* of Group B *major occupancy* classification that are not within the scope of Subsection 3.2.6., and
(c) ½ hr 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."

SUBSECTION 3.2.9. OPENINGS THROUGH FLOOR ASSEMBLIES

Application

3.2.9.1.(1) Except as provided in Sentences (3) to (7) and Sentence 3.3.4.2.(2), *buildings* which contain *interconnected floor spaces* shall conform to the requirements of this Subsection.

(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*.

(4) 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.

(5) Where unprotected openings are necessary in *fire separations* because of the nature of a manufacturing process, such as unbroken flow of material from *storey* to *storey*, the *authority having jurisdiction* may permit the omission of *closures* for such openings provided special precautions to offset the hazard of the unprotected openings are taken in conformance with good fire protection engineering practice.

(6) 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 100 sq ft,
(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 Section 6-12 of NFPA 101-1973, "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 13-1975, "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*.

(7) An *interconnected floor space* need not conform to the requirements of Articles 3.2.9.3. 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 *V2* 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.*

Vestibules required

3.2.9.3.(1) Except where protected floor spaces are provided in conformance with Article 3.2.9.4., *exits* serving *interconnected floor spaces* shall be protected at each floor level by vestibules which are
(a) at least 6 ft by 6 ft 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 Sentence 3.2.6.2.(2), and
(d) located so that the travel distance from any point in *interconnected floor spaces* to the door of the vestibule measured along the path of *exit* travel is not more than 100 ft.

(2) *Exits* serving *interconnected floor spaces* shall conform to Sentence 3.4.3.2.(7).

(3) Where elevator shafts open into an *interconnected floor space* and open into *storeys* above or below such space, elevator doors opening into 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 spaces* 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 required

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 18 in. 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 6 ft apart,
(b) located 6 in. to 12 in. from the baffle or draft stop on the side away from the opening,
(c) designed to provide a discharge of 2.5 gpm per lineal foot measured horizontally around the opening, with no sprinkler discharging less than 12 gpm, 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 headquarters in conformance with Sentence 3.2.4.3.(1), and
(b) sprinkler systems shall be electrically supervised as required in Sentence 3.2.4.4.(3).

Fire alarm and detection system required

3.2.9.6.(1) *Buildings* containing *interconnected floor spaces* shall be provided with
(a) an *approved* fire alarm system and electrically supervised annunciator conforming to Subsection 3.2.4.,
(b) an *approved* 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) a direct connection to the fire department headquarters in conformance with Sentence 3.2.4.3.(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.)

Hose station

3.2.9.7. In *buildings* containing *interconnected floor spaces*, a hose station conforming to Part 6 of this Bylaw shall be provided in each vestibule required in Sentence 3.2.9.3.(1).

Mechanical exhaust system

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 key operated or other *approved* switch located on the *street* entrance floor at an *approved* location.

Interior finish

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*.

Combustible contents

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 15 ft above the floor, is limited to not more than 1 lb of *combustible* material for each 1,000 cu ft of volume of the *interconnected floor space*.

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

$$\left(1 - \frac{H_s}{120}\right) \times \left(150 - \frac{H_b}{4}\right)$$

where H_s is the height of the *building* in feet located above the *interconnected floor space* or 60 ft whichever is the lesser, and H_b is the height of the *building* in feet or 360 ft whichever is the lesser, except that the height of the *interconnected floor space* need not be reduced to less than 30 ft.

(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 hr if the interconnected space contains a Group A, B, Division 1, or Group C, D or F, Division 3 *major occupancy* and 4 hr 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 spaces* by a wall having at least a 1-hr *fire-resistance rating*, constructed without openings for a distance of 10 ft measured vertically between openings and extending at least 10 ft horizontally on each side of such openings.

SECTION 3.3 SAFETY REQUIREMENTS WITHIN FLOOR AREAS

Interpretation

(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 these occupants occur in the early stages of a fire. These risks are not the same for different *occupancies* and must be regulated differently. Section 3.3 regulates these special life risks within *floor areas* and these 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.*)

SUBSECTION 3.3.1. REQUIREMENTS APPLYING TO ALL FLOOR AREAS

General

3.3.1.1.(1) 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 accordance with the appropriate regulation in the Fire Prevention Bylaw or, in the absence of such Bylaw, the National Fire Code of Canada 1975.

(2) Every room or vault where hazardous substances are stored shall be separated from all other *occupancies* by a 3-hr *fire separation.* Such *fire separations* need not be supported as required in Sentence 3.1.6.2.(1). Vaults

(3) In kitchens containing commercial cooking equipment used in processes producing grease-laden vapours, the equipment shall be designed and installed in conformance with Sentence 2.3.5.(3) of the ACNBC Canadian Heating, Ventilating and Air-Conditioning Code 1976. Kitchens

Access to Exits

3.3.1.2.(1) An *access to exit* shall be provided from every roof which is intended for *occupancy,* and from every podium, terrace, platform or contained open space.

(2) *Access to exits* within *floor areas* shall conform to Subsections 3.3.2. to 3.3.7. in addition to the requirements of this Subsection.

3.3.1.3.(1) Except as permitted in Sentence 3.3.4.3.(1)., each individually rented room or suite of rooms in a *floor area* occupied by more than 1 tenancy and each *dwelling unit* shall have an exterior doorway at or near ground level, or a doorway leading to an exterior passageway open to the outdoors, or to an interior 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 permitted in this Section.

(2) Except as otherwise required in this Part, *public corridors* shall be separated from the remainder of the *building* by a *fire separation* having a *fire-resistance rating* at least equal to 1 hr, except that

(a) the *fire-resistance rating* need not exceed ¾ hr when the *fire-resistance rating* of the floor assembly is not required to exceed ¾ hr,

(b) no *fire-resistance rating* is required when the *floor area* is *sprinklered* and the corridor does not serve an *institutional occupancy* or a *residential occupancy,* and

(c) no *fire separation* is required where the corridor exceeds 15 ft in unobstructed width, the *floor area* is *sprinklered* and the corridor does not serve an *institutional occupancy* or a *residential occupancy.*

(3) The sprinkler system in Clauses (2)(b) and (c) shall be electrically supervised in conformance with Sentence 3.2.4.4.(3) and upon operation, cause an alarm signal to be transmitted to the fire department headquarters in conformance with Sentence 3.2.4.3.(1) when the corridor serves a Group E or Group F, Division 1 or 2 *occupancy.*

Doorways required

3.3.1.4.(1) Any room or suite of rooms occupied by a single tenancy shall have 2 egress doorways placed in such a manner that one doorway could provide egress from the room or suite of rooms as required in Article 3.3.1.3. if the other doorway becomes inaccessible to the occupants due to a fire which might originate in the room or suite of rooms

(a) where the *occupancy* is classified as Group F, Division 1,

(b) which is intended for an *occupant load* of more than 60 persons, or

(c) except for *dwelling units,* where the area of a room or suite of rooms or the distance measured from any point within a room or suite of rooms to the nearest door opening onto a *public corridor,* a corridor used by the public or a corridor serving classrooms or patients' bedrooms or opening directly to an *exit* exceeds the values shown in Table 3.3.1.A.

Table 3.3.1.A.

Forming Part of Sentence 3.3.1.4.(1)

Occupancy of Room, Suite or *Floor Area*	Maximum Area of Room, Suite or *Floor Area*, sq ft	Maximum Distance to Egress Door, ft
Group A	1,500	50
Group B	750	35
Group C	1,000(1)	50(1)
Group D	2,000	75
Group E	1,500	50
Group F, Division 2	1,500	35
Group F, Division 3	2,000	50
Column 1	2	3

Note to Table 3.3.1.A.:
(1) See Sentence 3.3.4.2.(6) for *dwelling units*.

(2) Where a roof is used or intended for an *occupant load* of more than 60 persons, at least 2 separate *means of egress* shall be provided from the roof to stairs, designed in conformance with the requirements for *exit* stairs, located so that the distance between such stairs conforms to the requirements in Article 3.4.2.2. for *exits*.

(3) Where a podium, terrace, platform or contained open space is provided, egress requirements shall conform to the appropriate requirements for rooms and suites of rooms in Sentence (1).

3.3.1.5. The total minimum number of doorways from any room containing a *high occupant load* shall be the same as the number of *exits* required for a *floor area* having the same *occupant load* as determined by Article 3.4.2.4., and such doorways shall be provided with *exit* signs as prescribed in Article 3.4.6.1.

3.3.1.6.(1) The minimum width of every *public corridor* shall be 44 in. Corridors

(2) Except as provided in Sentence 3.3.3.7.(1), the minimum unobstructed width of every corridor used by the public and every corridor serving classrooms or patients' bedrooms shall be 44 in.

(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) The minimum headroom clearance of every *public corridor* and every doorway in such *public corridor* shall conform to Article 3.4.3.5.

(5) 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 room or suite of rooms shall swing on a vertical axis, and where such room or suite of rooms is used or intended for an *occupant load* of more than 60 persons or for a Group F, Division 1 *occupancy*, shall swing in the direction of *exit* travel. Doors

(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 *occupancy*, a sliding door may be used as an *access to exit* from a room or suite of rooms where persons are under legal restraint provided locks are connected to releasing devices operated from a constantly supervised control station.

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 room or suite of rooms occupied as a single tenancy shall

(a) be at least 32 in. in width where there is only 1 door leaf,
(b) have no single leaf in any multiple leaf door less than 24 in. or more than 48 in. in width,
(c) not open onto a step, and
(d) be readily openable without the use of keys in the direction of travel to an *exit*, except that this requirement does not apply to doors of rooms where persons are under legal restraint.

3.3.1.9.(1) Except as provided in Sentence (2) and Sentence 3.3.2.11(6), ramps, stairways, escalators 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 6 in., a minimum average run of 8 in. 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 (22 in.),
(b) except as provided in Clause (c), stairways, ramps, and escalators shall be assumed to accommodate not more than 60 persons per unit of *exit* width (22 in.), 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 (22 in.).

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 42 in. 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 42 in. above the floor, and

(c) at each raised floor, *mezzanine,* balcony, gallery and other locations where the difference in floor elevations is greater than 24 in.

(2) The height of *guards* on stairs used by the public but not forming part of a required *exit* shall be not less than 36 in. measured vertically to the top of the *guard* from a line drawn through the outside edges of the stair nosings and 42 in. 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 4 in. in *residential occupancies* and 8 in. in other occupancies, unless it can be shown to the satisfaction of the *authority having jurisdiction* that the location and size of openings that exceed these limits do not present a hazardous condition.

Transparent doorways and panels

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 of this Bylaw.

(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 of this Bylaw.

Exhaust ventilation required

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 accordance with the ACNBC Canadian Heating, Ventilating and Air-Conditioning Code 1977. (See also Article 4.2.4.15.)

(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 *approved* explosion relief devices and vents, or other protective measures shall be taken which conform to good engineering practice.

(For the purpose of this Article the National Fire Code of Canada 1977 and NFPA Standards shall be considered as good engineering practice.)

(3) All explosion relief devices shall be of an *approved* type.

3.3.1.15.(1) Except as provided in Sentence (2), Subsection 3.2.9. and as otherwise required in this Part, 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.

(2) A *mezzanine* need not terminate at a vertical *fire* separation 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 5,000 sq ft in area and does not contain a Group B *occupancy*.

3.3.1.16. Except as provided in Article 3.2.3.10., where the exterior walls of a *building* meet at an external angle of less than 135 deg., the horizontal distance from an opening in one wall to another opening in the other wall shall be not less than 4 ft where the openings are in different *fire compartments*.

SUBSECTION 3.3.2. ASSEMBLY OCCUPANCY

Scope

3.3.2.1. This Subsection applies to *floor areas* or parts thereof used or intended for use as *assembly occupancies*.

Fire separations required

3.3.2.2.(1) Except as otherwise provided in this Subsection, different *occupancies* of the same *occupancy* classification, any one of which has an *occupant load* exceeding 200 persons, shall be separated from each other by a *fire separation* having a *fire-resistance rating* of at least 1 hr, except that a *fire separation* having a *fire-resistance rating* of ¾ hr may be used where the floor assembly is not required to have a *fire-resistance rating* greater than ¾ hr.

(2) Where usable space exists under tiers of seats in arena-type *buildings*, a ¾-hr *fire-separation* shall be provided between such space and the seats or the space shall be *sprinklered*.

(3) An *assembly occupancy* shall be separated from a garage by a *fire separation* conforming to Article 3.3.7.7.

Flame-spread rating

3.3.2.3.(1) Except as provided in Sentences (2), (3) and (4), interior finish materials used on the wall or ceiling of a room or space intended for assembly purposes shall have a *flame-spread rating* of not more than 150.

(2) Group A, Division 1 *occupancies* shall have a *flame-spread rating* 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) Except where the *floor area* is *sprinklered*, Group A, Division 2 *occupancies* having a *high occupant load* shall have a *flame-spread rating* of not more than 75 over at least 90 per cent of the area of

(a) ceilings, and
(b) walls where the *occupant load* exceeds 200 persons.

(4) The requirements of Sentences (2) and (3) shall not apply to doors or the exposed surfaces of *heavy timber construction*.

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 16 in. 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 *access to exit* is provided for every 3 rows of seats, in which case such doors or doorways need not be provided with *exit* signs, and

(b) the number of seats in a row does not exceed 100.

(3) Seating arrangements that do not conform to the requirements of Sentence (2) may be *approved* provided the standard of safety is not reduced and the time required for egress is not increased.

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 *exits* shall be provided in places of assembly which contain fixed seats in conformance with Sentences (2) to (9). Aisles

(2) The minimum clear width of aisles shall be not less than 44 in., except that the width may be reduced to not less than

(a) 30 in. when serving 60 seats or fewer, and

(b) 36 in. 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 1½ in. for each 5 ft 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 20 ft in length.

(6) The length of travel to an *exit* door by any aisle shall not be longer than 150 ft.

(7) Side aisles shall be at least 44 in. wide when seating is provided in conformance with Clauses 3.3.2.4.(2)(a) to (c).

(8) The floor of every aisle shall have a gradient of not more than 1 to 8.

(9) Steps shall not be placed in any aisle unless the gradient would exceed 1 to 8. Such steps shall conform to the following requirements:

(a) the passageway between rows of seats shall be level at right angles to the line of travel,

(b) the riser height shall be at least 4½ in.,

(c) the riser height shall not exceed 8 in. where not more than 1 riser is used between adjacent seating platforms and shall not exceed 7¾ in. where more than 1 riser is used,

(d) where variations in riser height occur

(i) the heights of adjacent risers shall not vary more than ¼ in., and

(ii) treads or any part of a platform shall extend at least 17 in.,

(e) the width of stair treads between platforms shall conform to Article 3.4.8.9.,

(f) aisle platforms where they extend at least 17 in. in the direction of *exit* travel may slope ¼ in. in 12 in.,

(g) an unobstructed platform at least 32 in. square shall be 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, contrasting marking stripes or other *approved* methods.

3.3.2.6.(1) Corridors used by the public in *assembly occupancies* or serving classrooms as *access to exits* shall

(a) be separated from the remainder of the *building* by a *fire separation* having a *fire-resistance rating* of not less than 1 hr, except that

(i) the *fire-resistance rating* need not be greater than ¾ hr where the floor assembly is permitted to have a ¾ hr *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*.

(2) *Access to exit* used by the public or which serve classrooms in assembly *occupancies* may be by a dead-end corridor provided the areas served by the dead-end corridor have a second and separate *means of egress*.

3.3.2.7.(1) Every door in a principal *access to exit* from a room, suite of rooms or *floor area* of Group A *occupancy* containing an *occupant load* of more than 100 persons shall be equipped with an *approved* hardware that will release and allow the door to swing wide open when a force of 20 lb is applied to the device in the direction of travel to the *exit*.

(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*.

3.3.2.8. *Access to exit* from a room or suite of rooms of *assembly occupancy* shall not be through a dead-end corridor unless there is a second and separate *means of egress* from the room or suite of rooms.

Fixed bench-type seats without arms

3.3.2.9.(1) Where fixed bench-type seats without arms are provided, the seat width per person shall be assumed to be 18 in.

(2) The centre-to-centre spacing between rows of bench-type seats shall be at least 30 in. where back rests are provided, and at least 22 in. where back rests are not provided.

(3) There shall be a space of at least 12 in. 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 seat shall conform to Article 3.3.2.5.

(6) Steps shall not be placed in any aisle unless the gradient would exceed 1 to 8. Such steps need not have handrails when the adjacent seating is on the same level.

(7) Seating arrangements that do not conform to the requirements in this Article may be *approved* provided the standard of safety is not reduced and the time required for egress is not increased.

Height of guards

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

(a) at the fascia of every box, balcony or gallery where the seats extend to the edge, the height of *guards* is at least 30 in. in front of the seats and at least 36 in. 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 26 in., except that such *guards* need not be provided where the backs of the seats along the front side of the aisle are at least 24 in. above the floor of the aisle, and
(c) where the seating is arranged in successive tiers and the height of rise between platforms exceeds 18 in., the height of *guards* is at least 26 in. along the entire row of seats at the edge of the platform.

(2) The backs and ends of bleacher seats more than 4 ft above the ground or floor that are not adjacent to a wall shall be protected with a *guard*
(a) at least 42 in. in height above an adjacent aisle surface or foot rest, and
(b) at least 36 in. in height above the centre of an adjacent seat board.

(3) If the front of a bleacher is more than 2 ft above the ground or floor, it shall be protected with a *guard* at least 33 in. 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 12 in. 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 150 ft 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 75 ft 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 48 in. in width, except that an aisle serving fewer than 60 persons may be 30 in. in width, and
(c) shall not have steps unless the gradient of the aisle would exceed 1 to 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 9 in. in height, and
(c) have treads with a run of at least 10 in.

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 10 in., and

(b) have treads with a run of at least 11 in.

(2) When the vertical distance between seating platforms in bleachers exceeds 11 in., 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 18 in., 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 ¾ of the centre-to-centre spacing between rows of seats, and

(b) the spacing between footboard members shall not exceed 1 in.

Libraries

3.3.2.13.(1) Where a book storage room in a library exceeds 2,500 sq ft in area, or where the book stacks exceed 30 ft in height or penetrate more than 1 *storey*

(a) the book storage room shall be separated from the remainder of the *building* by a 2-hr *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 7 ft or 75 per cent of the floor to ceiling height of the space above or below the *mezzanine* floor assembly.

Bowling alleys

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-hr *fire separation.*

(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-hr *fire separation* where the combined area of these subsidiary *occupancies* exceeds 1,500 sq ft.

Stages for theatrical performances

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.*

(2) *Stages* for theatrical performances and ancillary spaces, such as workshops, dressing rooms and storage areas, shall be *sprinklered.*

(3) A 1-hr *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 1-hr *fire separation,* except for a proscenium opening which shall be protected with an *approved*

(a) unframed asbestos fire curtain when the opening does not exceed 60 ft in width, or

(b) semi-rigid asbestos fire curtain when the opening is more than 60 ft in width.

(5) Every asbestos curtain as required by Sentence (4) shall be

(a) operated automatically by heat actuated devices and operated manually by remote control devices, one on the *stage* control panel and one on each side of the *stage,* and

(b) designed to close automatically upon the actuation of the sprinkler system.

(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 ⅛ 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.

(7) Where any requirement of Sentences (1) to (6) is incompatible with the function of a *stage*, other fire safety measures may be substituted provided the *authority having jurisdiction* is satisfied that the standard of safety is not reduced.

Motion picture projection rooms

3.3.2.16.(1) This Article does not apply to portable motion picture projectors.

(2) Except as provided in Sentence (1), every motion picture projector, together with all associated electrical devices, shall be operated within a projection room separated from the remainder of the *building* by a *fire separation* having a *fire-resistance rating* of at least 1 hr.

(3) A clear space of at least 30 in. shall be provided behind projection equipment in every projection room.

(4) Every projection room shall have at least 2 doorways with dimensions at least 30 in. in width and 6 ft 8 in. in height. Such doorways shall be separated by at least ⅓ of the perimeter of the room and shall lead to an *access to exit*.

(5) Doors installed in projection rooms shall be equipped with self-closing devices and shall open outward.

(6) Every projection room shall be equipped with exhaust ventilation of sufficient capacity to provide 6 air changes per hr, and shall be designed in conformance with good practice.

(7) Every shelf, fixture and major item of fixed equipment in a projection room shall be constructed of *noncombustible* materials.

SUBSECTION 3.3.3. INSTITUTIONAL OCCUPANCY

Scope

3.3.3.1. This Subsection applies to *floor areas* or parts thereof used or intended for use as *institutional occupancies*.

3.3.3.2.(1) Except for sleeping rooms and patients' bedrooms within a suite, sleeping rooms and patients' bedrooms shall be separated from adjacent rooms or suites by a *fire separation* having a *fire-resistance rating* of at least 1 hr, except that the *fire-resistance rating* need not be greater than ¾ hr where the floor assembly is not required to exceed a ¾-hr *fire-resistance rating*.

(2) Except for corridors within a suite, corridors used by the public or serving patients' bedrooms or sleeping rooms shall

(a) be separated from the adjacent rooms or suites by a *fire separation* having a *fire-resistance rating* as required in Sentence (1),

(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 of Sentence 3.3.1.11.(1) for *public corridors*.

(3) A door located between a corridor and an adjacent bedroom or suite may be equipped with a hold-open device designed to release the door upon a signal from a *smoke detector*.

(4) *Access to exit* from a room or suite may be by a dead-end corridor provided the room or suite has a second and separate *means of egress.*

3.3.3.3. The *fire separation* required between an *institutional occupancy* and a *repair garage* shall have no openings.

Flame-spread rating

3.3.3.4. Except for doors, at least 90 per cent of the aggregate area of the interior finish of walls or ceilings shall have a *flame-spread rating* of not more than 75, and in no case shall the interior finish of walls or ceilings have a *flame-spread rating* greater than 150.

Separated zones in floor areas

3.3.3.5.(1) Every *floor area* used or intended to be used for patients in bed or *infirm persons* shall be divided into 2 or more zones separated by a *fire separation* in such a manner that the occupants in every zone have access to 2 *exits* either directly or through adjacent zones.

(2) *Fire separations* between zones shall have a *fire-resistance rating* of at least 1 hr, except that a ¾-hr *fire separation* is permitted where the *fire-resistance rating* of the floor assembly is not required to exceed ¾ hr.

(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 3.4.8.12.

(5) The travel distance from any point within each zone to an adjacent zone shall not exceed 100 ft.

Special requirements

3.3.3.6. 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.

Corridors

3.3.3.7.(1) Every corridor in which it is necessary to move patients in beds shall be at least 96 in. wide.

(2) Paired doors in corridors shall

(a) swing in opposite directions, the right-hand door swinging in the direction of travel, and

(b) be at least 44 in. wide and 7 ft high, to permit movement of beds.

SUBSECTION 3.3.4. RESIDENTIAL OCCUPANCY

Scope

3.3.4.1. This Subsection applies to *floor areas* or parts thereof used or intended for use as *residential occupancies.*

3.3.4.2.(1) Except as provided in Sentence (2), sleeping rooms occupied separately and not as suites, and suites or *dwelling units* in hotels and other residential *buildings*, shall be separated from adjacent rooms, suites and *public corridors* by a *fire separation* having a *fire-resistance rating* of at least 1 hr, except that a ¾-hr *fire-resistance rating* is permitted if the floor assembly is not required to exceed ¾-hr *fire-resistance rating.*

(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 20 ft, and provided that each *dwelling unit* is separated from the remainder of the *building* by

(a) a 1-hr *fire separation* when contained within a *building* 3 *storeys* or less in *building height*, or

(b) a 2-hr *fire separation* when contained within a *building* exceeding 3 *storeys* in *building height.*

(3) Except for hotels and motels, a door opening onto a *public corridor* which provides *access to exit* from individually rented rooms, suites of rooms or *dwelling units* shall be designed not to lock automatically.

(4) Trunk rooms and storage rooms for the use of tenants of *residential occupancies* not forming part of an individual *dwelling unit* or sleeping room occupied separately and not as a suite shall be *sprinklered* and separated from the remainder of the *building* by a 1-hr *fire separation*, except that a ¾-hr *fire separation* is permitted where the *fire-resistance rating* of the floor assembly is not required to exceed ¾ hr.

(5) Except as provided in Sentence (6), every *dwelling unit* containing more than 1 *storey* shall have an *exit* or public *access to exit*, from the uppermost *storey* and the lowest *storey* of the *dwelling unit*.

(6) A single *exit* is permitted from a *dwelling unit* where the uppermost floor level is not more than 15 ft above the floor level adjacent to the *exit* provided such *exit* is an exterior door leading directly from a *storey* of the *dwelling unit* at or near ground level.

3.3.4.3.(1) In *buildings* of *residential occupancy* and 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*.

(2) 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*.

3.3.4.4. 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. Flame-spread rating

3.3.4.5. Except for corridors served by a single *exit* as described in Sentence 3.3.4.3.(2)., a dead-end *public corridor* is permitted only if it does not exceed 20 ft in length, measured from the end of the corridor to the nearest *exit*. Such dead-end corridors shall contain no door openings except entrance doors to individually rented rooms, suites of rooms or *dwelling units*, located so that it is not necessary to pass more than 2 doors in travelling to the nearest *exit*.

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*. Partitions 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 0.036 in. thickness.

(3) Storage lockers in storage rooms shared by more than 1 tenant may be constructed of wood in *building* required to be of *noncombustible construction*.

3.3.4.7. Walls and floors separating *dwelling units* shall be designed and constructed to restrict sound transmission in conformance with Part 9 of this Bylaw. Sound control

3.3.4.8. *Guards* around balconies in *buildings* of *residential occupancy* shall be designed so that no member, attachment or opening located between 4 in. and 36 in. 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 5,000 sq ft where such spaces are separated from the remainder of the *floor area* by at least a 1-hr *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 0.036 in. 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 2 in. thickness.

Flame-spread rating

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.

3.3.5.4. Except as provided in Clause 3.3.5.5.(1)(e), 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.*

3.3.5.5.(1) Dead-end *public corridors* are permitted in Group D *occupancies* provided the areas served by the corridor have a second and separate *means of egress* or provided

(a) the *occupant load* served by the dead-end corridor does not exceed 30 persons,

(b) door openings other than entrance doors to individually rented rooms or suites are not located in the dead-end portion that serves as *access to exit,*

(c) the travel distance from the most remote point of the dead-end portion to the nearest *exit* does not exceed 30 ft in length,

(d) the doors in the dead-end portions are located so that it is not necessary to pass more than 2 doors in travelling to the nearest *exit,* and

(e) the doors in the dead-end portion are equipped with self-closing devices, and designed not to lock automatically.

SUBSECTION 3.3.6. MERCANTILE OCCUPANCY

Scope

3.3.6.1. This Subsection applies to *floor areas* or parts thereof used or intended for use as *mercantile occupancies.*

Partitions

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*

(a) where the *floor area* is *sprinklered,* or

(b) where a *floor area* comprising a single tenancy does not exceed 5,000 sq ft and is enclosed by a 1-hr *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 0.036 in. 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 2 in. nominal thickness.

Exterior wall openings

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 3 ft in height or by a canopy at least 3 ft 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 hr, except as required in Subsection 3.2.3.

Flame-spread rating

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.

Posts or turnstiles

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 30 in. unless an alternate *means of egress* is provided adjacent to and is plainly visible from the restricted egress.

3.3.6.6. Dead-end *public corridors* are permitted in *mercantile occupancies* provided the areas served by such corridors have a second and separate means of egress.

SUBSECTION 3.3.7. INDUSTRIAL OCCUPANCY

Scope

3.3.7.1. This Subsection applies to *floor areas* or parts thereof used or intended for use as *industrial occupancies.*

Fire separations

3.3.7.2. Except in Group F, Division 1 *major occupancies,* every process room where hazardous substances are used or intended to be used shall be separated from the remainder of the *building* by a 2-hr *fire separation.* The *authority having jurisdiction* may waive the requirement for such separation where *approved* fire extinguishing equipment as described in Article 3.3.7.3. is installed.

Fire extinguishing equipment for Group F Division 1

3.3.7.3. In a Group F, Division 1 *major occupancy,* every *floor area* shall be equipped with suitable fire extinguishing equipment in accordance with the nature of the risk present and the National Fire Code of Canada 1977. Suitable fire extinguishing equipment includes a standard installation of automatic sprinklers, a carbon dioxide system, a dry chemical system or other such protection as is required by the *authority having jurisdiction.*

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 *exits* to basements, cellars and rooms containing *building* services in *buildings* 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 *building.* Such basements, cellars and rooms shall be separated from other parts of the *building* with a vapour-tight separation.

Exterior wall openings

3.3.7.5. Where any *storey* of a *building* classified as a Group F, Division 1 or 2 *major occupancy* is required to be separated from the *storey* above or below by a *fire separation*, every opening in an exterior wall located vertically above another opening shall be separated by apron or spandrel walls at least 3 ft in height or by a canopy at least 3 ft 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 hr, 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 *industrial occupancy* shall have a *flame-spread rating* of not more than 150.

Garages

3.3.7.7.(1) Where access is provided from a *storage garage* to a stair tower or elevator lobby serving *occupancies* above the level of a *storage garage*, such access shall be through a vestibule conforming to Sentence (15).

(2) Stairways extending to the roof of a *storage garage* shall be protected from ice and snow.

(3) Mechanical *storage garages* of not more than 4 *storeys* in *building height*, where no persons other than parking attendants are permitted above the *street* floor level, need not have a *fire separation* between the *exits* and the remainder of the *building*.

(4) Every garage shall be provided with natural or mechanical ventilation in conformance with Subsection 3.6.3. 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 6 ft 6 in.

(6) A continuous curb at least 6 in. in height and a *guard* at least 42 in. 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, asphalt or other *approved* material.

(8) A standpipe need not be installed in *storage garages* conforming to Article 3.2.2.50. provided such *buildings* are not more than 50 ft 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 3 ft below *grade*, or 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*.

Repair garages

(11) A *repair garage* shall be separated from other *occupancies* by at least a 2-hr *fire separation*.

Storage garages

(12) A *storage garage* shall be separated from other *occupancies* by at least a 1½-hr *fire separation*.

Vestibule required

(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).

(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 — Vestibule requirements

(a) be at least 6 ft in length,

(b) be naturally ventilated to outside air in an *approved* manner, or mechanically ventilated at the rate required in Sentence 3.6.3.3.(2), 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 shall not be installed above any space intended for *occupancy*. — Dispensing of gasoline

(2) Facilities for the dispensing of gasoline shall not be installed in any *building*, except that this requirement does not apply to a canopy which is open on at least 75 per cent of its perimeter, or, when *approved*, to a *building* of Group F *occupancy*.

3.3.7.9. Rooms or spaces involving the use of explosive substances shall be ventilated in conformance with Article 3.3.1.14.

3.3.7.10.(1) *Access to exit* from a room or suite of rooms containing an *industrial occupancy* with an *occupant load* of more than 30 persons or a *high hazard industrial occupancy* shall not be through a dead-end corridor unless there is a second and separate *means of egress*.

(2) Where *access to exit* from a room or suite of rooms is permitted in Sentence (1) to be by a dead-end corridor, the travel distance from the most remote point of the dead end to the nearest *exit* shall not exceed 30 ft in length.

SECTION 3.4 REQUIREMENTS FOR EXITS

SUBSECTION 3.4.1. GENERAL REQUIREMENTS

3.4.1.1.(1) *Exit* facilities complying with this Section shall be provided to a public thoroughfare or to an *approved* open space with access to a public thoroughfare from every *floor area* which is intended for *occupancy*. — Scope

(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*.

(3) *Access to exits* shall conform to Section 3.3.

3.4.1.2.(1) Unless otherwise indicated, the requirements of this Section shall apply to new construction.

(2) Where *alterations* are made or changes of *occupancy* occur in an existing *building*

(a) *exits* shall conform to this Part, except that the *authority having jurisdiction* may permit other arrangements when in his opinion safety to life is not unduly endangered, and

(b) the *authority having jurisdiction* may require any deficiency in *exits* to be corrected, and may permit fire escapes as described in Article 3.4.8.16. for this purpose provided such fire escapes serve *floor areas*

(i) not more than 2 *storeys* above ground level in Group B *occupancies*, and

(ii) not more than 5 *storeys* above ground level for *occupancies* other than Group B.

Types of exits

3.4.1.3. Subject to the requirements of this Section, an *exit* from any *floor area* shall be one of the following used singly or in combination:

escalator that is capable of moving only in the direction of *exit* travel,
exterior doorway,
exterior passageway,
exterior ramp,
exterior stairway,
fire escape (as described in Article 3.4.8.16.),
horizontal exit,
interior passageway,
interior ramp,
interior stairway, or
moving *walkway* that is capable of moving only in the direction of *exit* travel.

Restricted use of exits

3.4.1.4.(1) A *horizontal exit* shall not be permitted as a required *exit* from a room or *floor area* having a *high occupant load*.

(2) *Horizontal exits* shall not comprise more than ½ of the required number of *exits* from any *floor area*.

(3) A fire escape shall not be erected on any new *building*.

(4) A fire escape shall not be erected on an existing *building* unless it can be demonstrated to the satisfaction of the *authority having jurisdiction* that it is impractical to provide one or more of the *exit* facilities in Article 3.4.1.3.

(5) 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.

3.4.1.5. 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*.

SUBSECTION 3.4.2. NUMBER AND LOCATION OF EXITS FROM FLOOR AREAS

Minimum number required

3.4.2.1.(1) Except as provided in Sentence (2) and Sentence 3.3.4.2.(6), every *floor area* as regulated in Sentence 3.4.1.1.(1) shall be served by not fewer than 2 *exits*.

(2) Except for *dwelling units*, *floor areas* designed for an *occupant load* of not more than 60 persons in *buildings* not exceeding 2 *storeys* in *building height* may be served by 1 *exit* provided the *floor area* and travel distance requirements conform to Table 3.4.2.A.

(3) For the purposes of this Subsection, travel distance means the distance from any point in the *floor area* to an *exit* measured along the path of *exit* travel, except that when a *floor area* is subdivided into suites of rooms or rooms not within suites and served by a corridor required to provide a *fire separation* from such adjacent rooms or suites of rooms or by an exterior passageway, the travel distance shall be measured from the door of such rooms or suites to the nearest *exit*.

(4) Except for *mezzanines* that are not 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.

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
Group A	1,500	50
Group B	750[1]	35[1]
Group C	1,000[1][2]	50[1][2]
Group D	2,000	75
Group E	1,500	50
Group F, Division 2	1,500	35
Group F, Division 3	2,000	50
Column 1	2	3

Notes to Table 3.4.2.A.:

(1) Single *exit* is permitted only when such *exit* is an exterior door at or near ground level.

(2) See Sentence 3.3.4.2.(6) for *dwelling units*.

Distance between exits

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

(a) one half the maximum diagonal dimension of the *floor area*, but need not be more than 30 ft for a *floor area* having a *public corridor* serving more than 1 tenant, or

(b) one half the maximum diagonal dimension of the *floor area*, but not less than 30 ft 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*.

Location of exits

3.4.2.3.(1) 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.(3) shall be not more than

(a) 75 ft in any Group F, Division 1 *occupancy*,

(b) 150 ft in any *sprinklered floor area* that contains an *occupancy* other than Group F, Division 1,

(c) 125 ft in any Group D *occupancy*, and

(d) 100 ft 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 200 ft 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 ½ 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.

3.4.2.4. Except as provided in Article 3.3.2.11. for outdoor places of assembly, the number of *exits* from each *floor area* in which there is a *high occupant load* shall conform to Table 3.4.2.B.

Table 3.4.2.B.

Forming Part of Article 3.4.2.4.

Total Number of Persons	Minimum Number of *Exits* Required
61 - 600 601 - 1,000 over 1,000	2 3 4
Column 1	2

Exits for covered malls

3.4.2.5.(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 200 ft, and

(b) have an unobstructed pedestrian travel space at least 12 ft 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) and Article 3.4.3.4. and Sentence 3.4.8.16.(7), the clear width of every *exit* shall be at least 36 in.

(3) The clear width of any corridor used as an *exit* shall be at least 44 in.

(4) The clear width of any *exit* serving patients in bed shall be at least 44 in.

(5) The width of an *exit* stair shall be at least 44 in. where the stair serves 1 or more *floor areas* having a combined *occupant load* greater than 100 persons.

(6) Every door leaf in an *exit* doorway shall be

(a) not more than 48 in. in width,

(b) not less than 24 in. in width where there is more than 1 leaf provided in the width of a doorway, and

(c) not less than 32 in. 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.

Width based on occupant load

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.

(2) The aggregate width of *exits* from a room or *floor area* expressed as units of *exit* width (22 in.) 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 inches shall be divided by 22. When the remainder is less than 12 in., it shall not be considered as contributing to the number of units. Where the remainder is 12 in. or more, it shall be considered as contributing ¼ unit of *exit* width in the case of stairs, and ½ unit of *exit* width in the case of other *exit* facilities.

(4) Except as provided in Sentences (5) and (6), the required units of *exit* width shall be cumulative where 2 or more *exits* converge.

(5) Except as provided in Sentences (6) and (7), 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 1 or more *floor areas* containing a *high occupant load* shall be increased by an amount required for the *high occupant load*, except that such increase need not extend to more than 5 *storeys* beneath the *storeys* with the *high occupant loads* in *buildings* within the scope of Subsection 3.2.6.

Exits from interconnected floor spaces

(7) 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

(a) such stairs provide at least 3 sq ft of area of treads and landings for each occupant of the *interconnected floor spaces*, 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 5 sq ft per occupant of the *interconnected floor spaces*.

(The objective of Clause 3.4.3.2.(7) (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 3 sq ft per person is provided in the stairshaft between the floor level served and the floor level immediately beneath it.)

Capacity per unit of exit width

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).

(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.

Reduction of exit width

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 (5).

(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 2 in. 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 30 in. 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 3½ in. into the required width of an *exit.*

(5) In places having a *high occupant load* where persons are admitted to the *building* and allowed to wait until seats become available, special waiting areas shall be provided which shall

(a) not encroach on the required *exit* width,
(b) be separated from the required *means of egress* by *partitions* or *guards* not less than 42 in. in height, and
(c) be provided with an aggregate width of *exit* determined on the basis of Subsection 3.1.14. and Article 3.4.3.3.

Headroom clearance

3.4.3.5.(1) Except as provided in Sentences (2) to (4), every *means of egress* shall have a headroom clearance of at least 7 ft.

(2) The headroom clearance for stairways measured vertically above any landing or the nosing of any stair tread shall be at least 6 ft 9 in.

(3) The headroom clearance for doorways shall be at least 6 ft 8 in.

(4) No device such as a door closer shall be installed so as to reduce the headroom clearance of a doorway to less than 6 ft 6 in.

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.(6) 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 separations

3.4.5.1.(1) Except as provided in Sentences (2), (6) and (7) 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* conforming to Table 3.4.5.A. for the grade of *fire separation* required for the floor assemblies of the *storeys* through which it penetrates or which it serves. This requirement shall not be deemed to prohibit *unprotected openings* in walls of an *exit* enclosure that are not *fire separations.*

(2) Where an *exit* has sides or faces that may be exposed to the hazards of a fire from openings in the exterior wall of the *floor area,* openings in either the exposed face of the *exit* or the exterior wall of the *floor area* shall be protected with wired glass or glass block conforming to Article 3.1.7.3. when the openings in the exterior wall of the *floor area* are

(a) within 10 ft horizontally,
(b) less than 3 *storeys* or 35 ft below, or
(c) less than 6 ft above any of the *exit* openings in the exposed face.

Table 3.4.5.A.

Forming Part of Sentence 3.4.5.1.(1)

Grade of *Fire Separation*, Required for Floor Assembly, hr	Minimum *Fire-Resistance Rating*, for *Fire Separation* of *Exit*, hr
less than ¾	¾
¾	¾
1	¾
1½	1
2	1½
3	2
4	3
Column 1	2

(3) Except as permitted in Sentence (4), the total area of wired glass and glass block between an *exit* and the adjacent *floor area* shall not exceed 9 sq ft in any *exit* at each *storey* in *buildings* not more than 3 *storeys* in *building height* and 100 sq in. in other *buildings*.

(4) The area of glass block and wired glass between an exit shaft and the adjacent *public corridor* or vestibule located within the *floor area* may exceed the area limitations in Sentence (3) in not more than 1 *exit* shaft in *buildings* not exceeding 3 *storeys* in *building height* where the *fire separation* for *exits* is permitted to be ¾ hr.

(5) Except as provided in Sentence (6), 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.

Exit leading through a lobby

(6) Not more than 1 required *exit* from a *floor area* may lead through a lobby where

(a) the lobby floor is not more than 15 ft above *grade*,
(b) the path of travel through the lobby does not exceed 50 ft,
(c) the adjacent rooms or premises do not contain a Group C or Group F *occupancy*,
(d) the *building* does not contain a Group B, Division 2 *major occupancy*,
(e) the lobby is not within an *interconnected floor space*, and
(f) the lobby conforms in all respects with the requirements for *exits*, except that
  (i) rooms other than garbage rooms, furnace rooms, boiler rooms, incinerator rooms and janitors' 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*.

(7) The requirements in Sentence (1) 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.

Integrity of exits

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.

(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 with a *high occupant load* of more than 60, except as provided in Clause 3.3.2.4.(2)(a),
(d) a room or *floor area* that has a fire escape as part of a required *means of egress,* or
(e) a corridor exceeding 75 ft in length and serving patients' or inmates' bedrooms in Group B, Division 2 *occupancies.*

(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 3.2.8.2.(2) where emergency lighting is required in Sentence 3.2.8.2.(1).

(3) Lettering on *exit* signs shall be

(a) red letters on a contrasting background or white letters on a red background, at least 4½ in. high with ¾-in. 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 6 in. in height with ¾-in. 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

3.4.8.1. Except when stated otherwise, the requirements apply to both interior and exterior *exits.* Stairs and ramps

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 35 ft 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 12 ft between floors or landings, except that flights of stairs serving as *exits* from rooms intended for *infirm persons,* or having a *high occupant load,* shall have a vertical rise of not more than 8 ft between floors or landings.

(2) The length and width of landings shall be at least the width of stairways in which they occur, except that in a straight run the length of a landing need not exceed 44 in.

3.4.8.5.(1) Every *exit* ramp or stairway shall have a handrail on at least 1 side, and where 44 in. or more in width shall have handrails on both sides. Handrails

(2) Where the required width of a ramp or flight of stairs exceeds 88 in., 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 66 in. 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 32 in. and not more than 36 in. 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 1½ in. shall be provided between every handrail and any wall to which it is fastened.

(6) Windows in *exit* stairways that extend to less than 42 in. above the landing shall be protected by a barrier or railing located approximately 42 in. above such landing.

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. Guards

(2) Except as provided in Sentence (3), the height of *guards* on *exit* stairs shall be not less than 36 in. measured vertically to the top of the *guard* from a line drawn through the outside edges of the stair nosings and 42 in. around landings.

(3) The height of *guards* on exterior stairs and landings more than 35 ft above adjacent ground level shall be not less than 60 in. 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 4 in. in *buildings* of *residential occupancy* and 8 in. in buildings of other *occupancy*, unless it can be shown to the satisfaction of the *authority having jurisdiction* that the location and size of the openings that exceed this limit do not present a hazardous condition.

Sign for basement stair

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*.

Ramp gradient and landings

3.4.8.8.(1) The maximum gradient of ramps shall be

(a) 1 in 10 in any Group A, B or C *occupancy*,
(b) 1 in 6 in rooms or *floor areas* classified as Group E or Group F *occupancy*,
(c) 1 in 8 from any other *floor area*, and
(d) 1 in 10 for every exterior ramp.

(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 12 in. 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 36 in.

Stair treads and risers

3.4.8.9.(1) Treads and risers in every *exit* stair, except a fire escape stair, shall be proportioned so that the product of the rise and run in inches shall be not less than 70 and no more than 75; risers shall have a maximum rise of 7¾ in. and a minimum rise of 5 in.; treads shall have a minimum run of 9 in. exclusive of nosing.

(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 10 in., a nosing of at least 1 in. 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.

Curved stairs prohibited

3.4.8.10. No winders or curved stairs shall be used in a required *exit*.

Escalators and moving walks

3.4.8.11.(1) Any escalator of the horizontal tread-type enclosed in accordance with the requirements of this Part, and any moving walks enclosed in accordance with this Part and designed in accordance with the provisions for ramps in this Part may be considered as an *exit* provided it conforms to this Article.

(2) An escalator or moving walk that pierces a required *fire separation* and serves as a required *exit* shall be enclosed in the same manner as *exit* stairs.

(3) Where any escalator serves as a required *exit*, the width of the tread shall be at least 35 in., the rise shall not exceed 8½ in. and the run shall be at least 15¾ in.; there shall be a clear width of at least 44 in. at the handrails, and the escalator may be considered to have 2 units of *exit* width.

(4) No escalator or inclined moving walk shall have a vertical travel of more than 1 *storey*.

(5) Every escalator or inclined moving walk shall have top and bottom landings, as required herein for stairs.

3.4.8.12.(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 5 sq ft of clear floor space per person, except that 16 sq ft shall be provided for persons in wheelchairs and 24 sq ft 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 3½ in.

(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 *approved* 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,
(b) be mounted in separate openings or mounted in 1 opening and meet on a mullion unless otherwise *approved* provided the size of such opening shall not exceed that specified in Article 3.1.7.2., and
(c) 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.

(7) Where *horizontal exits* utilize bridges between *buildings* or outside balconies, such bridges or balconies shall conform to Article 3.2.3.15. Bridges and balconies as horizontal exits

(8) *Guards* shall be at least 4 ft in height and the least dimension of any opening through the *guard* shall not be greater than 4 in.

(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 3.4.8.16.(3), except that where bridges have solid sides not less than 6 ft in height, such protection of wall openings may be omitted.

3.4.8.13. Passageways and stairways shall be designed so as to keep the length of travel to a minimum. Passageways

3.4.8.14.(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 1 ft 6 in. on any side shall have *guards* on the open sides at least 42 in. high.

3.4.8.15.(1) No *exit* door shall open immediately onto a flight of stairs, but shall open onto a landing at least 1 ft wider and longer than the width of such door. Doors

(2) No riser of any flight of stairs shall be located within 1 ft of an *exit* door.

(3) *Exit* doors shall be clearly identifiable and no hangings or draperies shall be placed over *exit* doors to conceal or obscure any *exit.*

(4) No mirrors shall be placed in or adjacent to any *exit* in such a manner as to confuse the direction of *exit.*

(5) 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 6 in. in height.

(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.

(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 3.1.7.2.(10).

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 *approved* 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,
(d) not be used at the foot of any stairway, and
(e) not be used as an *exit* for *floor areas* containing a *high occupant load* or Group B or Group F, Division 1 *occupancies.*

(10) A revolving door may be considered to provide not more than ½ unit of *exit* width.

(11) *Approved* hardware that will release and allow the door to swing wide open when a force of 20 lb 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 20 lb, 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 the use of keys, except that this requirement shall not apply to the doors of rooms where persons are under legal restraint.

Emergency access to floor areas

(14) In *buildings* that are regulated by the provisions of Subsection 3.2.6.
(a) 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
(b) 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.

(15) Where access to *floor areas* is required in Clause (14)(b), 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.*

Fire escapes

3.4.8.16.(1) Fire escapes shall be installed in conformance with Sentence 3.4.1.2.(2) and Sentences 3.4.1.4.(3) and (4), and 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 4 in. in their least nominal dimension and all other woodwork is at least 2 in. in its least nominal dimension.

(2) 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 42 in. high, by 22 in. wide with a sill height of not more than 36 in. above the inside floor.

(3) 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 3.1.7. where they are located within 10 ft horizontally of, 3 *storeys* or 35 ft below, or 6 ft above any balcony, platform or stairway of a fire escape.

(4) Stairs shall be inclined at an angle of not more than 45 deg. with the horizontal, and shall have risers of not more than 8⅜ in. in height and treads of not less than 8¾ in. in width exclusive of nosing.

(5) Stairway headroom shall be not less than 6 ft 4 in. plus the height of one riser measured vertically above the nosing of any tread or platform.

(6) Where doors open onto fire escape balconies, such balconies shall have a clear area of not less than 12 sq ft.

(7) The width of a fire escape shall conform to Sentence 3.4.3.1.(1), except that the width of a fire escape shall be at least 22 in. when serving
(a) not more than 3 *storeys*, and
(b) not more than 15 persons.

(8) The open sides of every platform, balcony and stairway shall be protected by *guards* at least 3 ft in height measured vertically above the nosing of any tread or platform.

(9) Two equally spaced rails not more than 18 in. 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.

(10) A wall handrail shall be installed where the fire escape is more than 22 in. in width.

(11) Unless otherwise *approved*, the flight of stairs leading to the ground at the foot of a fire escape shall be fixed in position. Where such flight of stairs is not fixed in position, it shall be held in the 'up' position without a latch or locking device, and shall be fitted with an *approved* 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

3.5.1.1. The provisions of this Section apply to attic, duct, crawl and shaft spaces and *service rooms*, mechanical penthouses and facilities contained therein. Scope

3.5.1.2. All service facilities including ductwork, piping and associated coverings, insulation and linings shall conform to the installation requirements in the ACNBC Canadian Heating, Ventilating and Air-Conditioning Code 1977. Installation of service facilities

3.5.1.3. All service facilities passing through required *fire separations* shall conform to Subsections 3.1.6., 3.1.7., 3.5.3. and 3.5.4. to ensure that the integrity of the *fire separation* is maintained. Integrity of fire separations

3.5.1.4. *Service spaces* provided to contain service facilities shall not be designed to facilitate subsequent use as storage space. Storage use prohibited

3.5.1.5. Where a fuel-fired heating *appliance* is installed on the roof of a *building*, it shall be installed in conformance with Article 2.5.1. of the ACNBC Canadian Heating, Ventilating and Air-Conditioning Code 1977.

SUBSECTION 3.5.2. SERVICE ROOMS

Fire separations

3.5.2.1.(1) Fuel-fired *appliances* shall not be installed in any *exit* or any corridor serving as *access to exit*.

(2) Except as provided in Sentences (3) and (4), fuel-fired *appliances* shall be located in a *service room* or *service space* separated from the remainder of the *building* by a *fire separation* having a *fire-resistance rating* of not less than

(a) 2 hr in *buildings* classified as Group B or Group F, Division 1 *occupancy* where such *buildings* exceed 2 *storeys* in *building height* or 4,000 sq ft in *building area*, and

(b) 1 hr in *buildings* having an *occupancy* classification 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* provided the deletion of such separation is *approved*, and the *appliance*

(a) serves a single room, space or suite of rooms, or

(b) serves a *building* with a *building area* of not more than 4,000 sq ft 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 Article 3.1.5.4. and Sentence 3.1.6.2.(1).

Service rooms prohibited under exits

3.5.2.2. *Service rooms* containing service equipment subject to possible explosion such as *boilers* operating in excess of 15 psig and some types of refrigerating machinery and transformers shall not be located directly under required *exits*.

Service equipment

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 machinery rooms

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 hr when the *floor area* containing such rooms is not *sprinklered* and is not intended to contain a hazardous substance.

(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.

Incinerator rooms

3.5.2.5.(1) Every *service room* containing an incinerator shall be separated from the remainder of the *building* by at least a 2-hr *fire separation*.

(2) With the approval of the *authority having jurisdiction*, every *service room* containing an incinerator may contain other fuel-fired *appliances*.

(3) Every *service room* containing an incinerator may contain *building* service machinery.

3.5.2.6. Except as provided in Sentence 3.5.3.2.(5), 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-hr *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 3.4.5.1.(6).) Doors to service rooms

3.5.2.8.(1) Where a transformer vault is required by the provisions of CSA C22.1-1975, "Canadian Electrical Code, Part I," 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 hr if the vault is not *sprinklered* or provided with any other *approved* automatic fire extinguishing system, and not less than 2 hr 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) an *approved 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) *Approved* 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 the ACNBC Canadian Heating, Ventilating and Air-Conditioning Code 1977 designed to prevent the ambient temperature in the vault from exceeding 104°F.

(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 the ACNBC Canadian Plumbing Code 1977.

(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 4 in. in height.

3.5.2.9.(1) 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. Flame-spread rating

(2) Foamed plastic in *service rooms* shall be protected in conformance with Article 3.1.11.2. Foamed plastic

SUBSECTION 3.5.3. VERTICAL SERVICE SPACES AND SERVICE FACILITIES

Fire separations

3.5.3.1.(1) Where vertical service facilities are enclosed in shafts, the *vertical service space* shall be separated from the remainder of the *building* it serves 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* which it penetrates and to the requirements of this Subsection.

Table 3.5.3.A.

Forming Part of Sentence 3.5.3.1.(1)

Grade of *Fire Separation* (Floor Assembly), hr	Minimum *Fire-Resistance Ratings* of *Vertical Service Spaces*, hr	Minimum *Fire-Resistance Ratings* of Elevator Shafts, hr
less than ¾	(1)	¾
¾	¾	¾
1	¾	¾
1½	1	1
2	1	1½
3	1½	2
4	2	3
Column 1	2	3

Note to Table 3.5.3.A.:

(1) The *closure* for an opening through a *fire separation* not required to have a *fire-resistance rating* need not have a *fire-protection rating*.

(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 shaft enclosing 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 shaft enclosing walls.

(4) Vents from shafts 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 shafts.

(5) Only openings that are necessary for the purposes of the shaftway shall be permitted in shaft enclosures.

(6) The walls of every vertical service shaft 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.

Foamed plastic

(7) Foamed plastic insulation in vertical service shafts shall be protected in conformance with Article 3.1.11.2.

Refuse chutes

3.5.3.2.(1) Every refuse chute shall be enclosed in a shaft.

(2) Every shaft containing a 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 Table 3.5.3.A. for the grade of *fire separation* through which it passes, but not less than

(a) 1 hr where the chute outlet for the discharge room is protected by an *approved*, automatic, self-latching *closure* held open by a fusible link, or
(b) 2 hr where no *closure* is provided at the chute outlet into the discharge room.

(3) Every refuse chute shall be constructed to permit the escape of the products of combustion to the outdoors in conformance with Section 6.6 of Part 6 of this Bylaw.

(4) Intake openings for refuse chutes shall be located in rooms or compartments that
(a) have no dimension less than 30 in.,
(b) are separated from the remainder of the *building* by at least a ¾-hr *fire separation*, and
(c) are designed for no other purpose unless *approved*.

(5) A refuse chute shall discharge only into a room or bin separated from the remainder of the *building* by at least a 2-hr *fire separation*.

(6) Subject to the approval of the *authority having jurisdiction*, rooms into which refuse chutes discharge may contain other service equipment.

(7) Every refuse chute shall be equipped at the top with spray equipment for washing-down purposes.

(8) *Approved* automatic sprinklers shall be installed at the top of a refuse chute, at alternate floor levels and in the room or bin into which the chute discharges.

Linen chutes

3.5.3.3.(1) Every linen chute shall be enclosed in a shaft and shall conform to Sentences 3.5.3.2.(1) to (4) and Sentence 3.5.3.2.(8).

(2) The room into which a linen chute discharges shall be separated from the remainder of the *building* by at least a 1-hr *fire separation*.

SUBSECTION 3.5.4. HORIZONTAL SERVICE SPACES AND SERVICE FACILITIES

Scope

3.5.4.1. This Subsection applies to *horizontal service spaces* and service facilities, including ceiling spaces, duct spaces, crawl spaces and *attic or roof spaces*.

Fire separations

3.5.4.2. A *horizontal service space* that penetrates a required vertical *fire separation* shall be separated from the remainder of the *building* it serves in conformance with Sentence 3.1.6.3.(2).

Access

3.5.4.3.(1) On *buildings* more than 3 *storeys* in *building height* where the slope of the roof is less than 3 in. in 12 in., all main roof areas shall be provided with direct access from the *floor areas* immediately below, either by a stairway or by a hatchway at least 22 in. by 36 in. with a suitable fixed ladder.

(2) Every *attic space* more than 2 ft in height shall be provided with access from the floor immediately below by a hatchway at least 22 in. by 36 in. or by a stairway.

(3) *Horizontal service spaces* consisting of ceiling and duct spaces which are more than 4 ft in height and 2 ft in width shall have access doors at least 2 ft in both horizontal and vertical dimensions, or shall have inspection doors at least 1 ft 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 22 in. by 36 in.

(5) Unless otherwise permitted by the *authority having jurisdiction*, small elevated or depressed areas used for machinery, equipment or storage not considered as *floor areas*, shall be provided with adequate steps, ramps or fixed ladders.

Ventilation of horizontal service spaces

3.5.4.4. Every unheated crawl space, *attic or roof space* shall be ventilated by natural or mechanical means in accordance with Part 9 of this Bylaw.

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 of this Bylaw.

(3) The clear height above and below a *mezzanine* floor assembly shall be at least 7 ft unless *approved*.

3.6.1.2. The areas and widths of rooms in *dwelling units* shall conform to Part 9 of this Bylaw.

SUBSECTION 3.6.2. WINDOWS

3.6.2.1. Unless otherwise *approved* 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 of this Bylaw.

SUBSECTION 3.6.3. VENTILATION

Air contaminants

3.6.3.1. 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.

Room ventilation

3.6.3.2.(1) All rooms and spaces shall be ventilated in conformance with Sentences (2) to (4).

(2) The ventilation of rooms or spaces by natural methods in Group C *occupancies* shall conform to Part 9 of this Bylaw.

(3) The ventilation of rooms or spaces by mechanical methods shall conform to the requirements of the ACNBC Canadian Heating, Ventilating and Air-Conditioning Code 1977.

(4) The ventilation of rooms and spaces in *occupancies* other than *residential occupancies* by natural methods shall be permitted in lieu of mechanical ventilation when the *authority having jurisdiction* is satisfied that such ventilation will provide sufficient air change to provide healthful conditions in that *occupancy*.

3.6.3.3.(1) Except as provided in Sentences (4) and (5), an enclosed *storage garage* and repair areas in a garage shall have a mechanical ventilation system designed to limit the average concentration of carbon monoxide to not more than 100 parts per million parts of air for periods longer than 1 hr with a maximum concentration at any time of not more than 400 parts of carbon monoxide per million parts of air when measured between 3 ft and 4 ft from the floor.

(2) The requirement in Sentence (1) is considered to be met by a system designed to provide a continuous supply of fresh air at a rate equal to at least 0.75 cu ft of air per minute for each square foot of floor area. (See also Sentences 3.3.7.7.-(4) and 3.3.1.14.(1).)

(3) Mechanical ventilation systems provided in accordance with Sentence (1) shall include automatic ventilating fan control by means of *approved* carbon monoxide monitoring devices, or by other *approved* means located so as to provide full protection for the *occupancy*.

(4) In garages subject to the requirements of Sentences (1), (2) and (3), where motor vehicles are parked by mechanical means, the ventilation requirements may be reduced by one half.

(5) *Storage garages* with a total capacity of less than 20 motor vehicles need not have mechanical ventilating systems if the downward slope of the floor to the outside door is 1 in. for each 10 ft and the garage floor is above outside ground level.

(6) The requirements of Sentences (1) to (5) shall not apply to any *storage garage* provided

(a) 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,
(b) no portion of any floor of the garage is more than 3 ft below *grade*, and
(c) no tarpaulins, glass or other materials are used to close the required exterior openings at any time.

SUBSECTION 3.6.4. PLUMBING FACILITIES

Systems required

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.

(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 *approved* means for the disposal of human waste shall be provided.

(3) *Plumbing systems* shall be designed and installed in accordance with the ACNBC Canadian Plumbing Code 1977.

Minimum number of fixtures

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 may be assumed that the *occupancy* is equally divided between the sexes.

(2) Where more than 2 water closets are required in this Subsection, urinals may be substituted for ⅔ of the required number of water closets and may be counted as 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 20 in. of its circumference is considered to be the equivalent of 1 lavatory.

(5) The number of water closets required for Group A, Division 1, 3 and 4 *occupancies* and for auditoria, gymnasia, lecture halls, secondary schools, nonresidential colleges and similar occupancies shall conform to Table 3.6.4.A.

(6) The number of water closets required for Group D *occupancies* and for restaurants, nonresidential clubs, bowling alleys, community halls, lodge rooms,

passenger stations and depots, art galleries, exhibition halls, libraries, museums, court rooms and similar *occupancies* shall conform to Table 3.6.4.B.

(7) The number of water closets required for primary schools and day-care centres shall be at least 1 fixture for each 30 males and 1 fixture for each 25 females.

Table 3.6.4.A.

Forming Part of Sentence 3.6.4.2.(5)

Number of Persons	Minimum Number of Water Closets	
	Male	Female
1– 50	1	2
51–100	2	4
101–200	4	6
201–400	6	8
Over 400	6 plus 1 for each additional 200 males over 400	8 plus 1 for each additional 150 females over 400
Column 1	2	3

(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 *institutional occupancies* shall conform to good practice and shall be subject to the approval of the *authority having jurisidiction.*

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	2 plus 1 for each additional 50 persons of each sex over 50
Column 1	2

(10) 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 of this Bylaw.

(11) 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.

(12) The number of water closets required for *industrial occupancies* shall conform to Table 3.6.4.C.

(13) 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.

Table 3.6.4.C.

Forming Part of Sentence 3.6.4.2.(11)

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	5 plus 1 for each additional 30 persons of each sex over 100
Column 1	2

(14) Where a service *building* is required by Sentence (13), 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.

3.6.4.3. Glass, other than safety glass, shall not be used for a shower or bathtub enclosure.

3.6.4.4. In every *public building* where washrooms are provided for the public, 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 NBC Supplement No. 5, "Building Standards for the Handicapped 1977."

PART 4

DESIGN

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PART 4 DESIGN

SECTION 4.1 STRUCTURAL LOADS AND PROCEDURES

SUBSECTION 4.1.1. GENERAL

Application of Part 4

4.1.1.1.(1) This Part applies to the design of all structural members and their assemblies used in the following:

(a) all *buildings* used for the following *occupancies:*
  (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 6,000 sq ft in *building area* or exceeding 3 *storeys* in height used for the following *occupancies:*
  (i) Group C, *residential occupancies,*
  (ii) Group D, *business and personal services occupancies,*
  (iii) Group E, *mercantile occupancies,* and
  (iv) Group F, Divisions 2 and 3, *medium* and *low hazard industrial occupancies.*

(2) For *buildings* not listed in Sentence (1), requirements for design will be found in Part 9 of this Bylaw.

Definitions in Part 4

4.1.1.2.(1) Words that appear in italics in this Part are defined in Part 1 of this Bylaw.

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 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. Minimum safety and performance

(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. In addition, 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. Loads during construction

4.1.1.4.(1) *Buildings* and their structural members shall be designed by one of the following methods: Design basis

(a) standard design procedures and practices provided by Sections 4.2 to 4.8 inclusive of this Bylaw and any standards and specifications referred to therein, except that in cases of conflict the provisions of this Bylaw shall govern, or

(b) one of the following 3 bases of design:
(i) analysis based on generally established theory,
(ii) evaluation of a given full-scale structure or a prototype by a loading test, or
(iii) studies of model analogues,
provided the design is carried out to the satisfaction of the *authority having jurisdiction* by a person especially qualified in the specific method applied, and provided the design ensures a level of safety and performance at least equivalent to that provided for, or implicit in, design carried out by the methods referred to in Clause (a).

Deflections

4.1.1.5.(1) Structural members shall be designed so that their deflections under specified loads will be acceptable with regard to
(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.

Sway effects

(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.

(Information on deflections can be found in the Commentary on Serviceability Criteria for Deflections and Vibrations in NBC Supplement No. 4, "Commentaries on Part 4 1977.")

(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.

Lateral deflection of buildings due to wind

(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. Except as provided in Sentence (5), the total drift per *storey* under specified wind and gravity loads shall not exceed 1/500 of the *storey* height unless otherwise approved or unless other drift limits are specified in the design standards referenced in Sections 4.3 to 4.7.

(5) The deflection limits required in Sentence (4) do not apply to industrial *buildings* or sheds if it is known by experience that greater movement is acceptable.

(Information on lateral deflection of tall *buildings* may be found in the Commentary on Wind Loads in NBC Supplement No. 4, "Commentaries on Part 4 1977.")

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 *occupancy* of the *building*.

(Information on floor vibration can be found in the Commentary on Serviceability Criteria for Deflections and Vibrations in NBC Supplement No. 4, "Commentaries on Part 4 1977.")

Lateral vibrations of tall buildings

(2) Unusually flexible *buildings* and *buildings* whose ratio of height to minimum effective width exceeds 4 to 1 shall be investigated for lateral vibrations under dynamic wind load. Lateral accelerations of the *building* shall be checked to ensure that such accelerations are acceptable to the intended *occupancy* of the *building*.

(Information on lateral vibrations and accelerations under dynamic wind loads can be found in the Commentary on Wind Loads in NBC Supplement No. 4, "Commentaries on Part 4 1977.")

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.

4.1.1.8. Structural systems for *buildings* shall be designed to minimize the probability that an initial local failure of a structural element, caused by an abnormal event or severe overload, will spread to other structural members and precipitate the collapse of a disproportionately large portion of the structure. Structural integrity

(Information on structural integrity can be found in the Commentary on Progressive Collapse and Structural Integrity in NBC Supplement No. 4, "Commentaries on Part 4 1977.")

Drawings and Calculations

4.1.1.9.(1) 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.* Drawings and calculations

(2) Structural drawings and related documents submitted with the application to build shall indicate in addition to those items specified in Section 4.2 and other Sections of Part 4 applicable to a specific material

(a) the name and address of the person responsible for the structural design,
(b) the date of issue of the NBC and any other codes or 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.

(3) 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.

(4) The calculations and analysis made in the design of the structural members, including parts and components, of a *building* shall be available upon request for inspection by the *authority having jurisdiction.*

Inspection of Construction

4.1.1.10.(1) Inspection of the construction of any *building* or part thereof shall be carried out by the *designer,* or by another suitably qualified person responsible to the *designer,* to determine whether or not the construction conforms to the design. Inspection of construction

(2) The *designer,* or another suitably qualified person responsible to the *designer,* shall review all shop drawings and other related documents relevant to the design to determine conformance with the design. Review of shop drawings

(3) Workmanship and materials shall be inspected and all reports of material tests shall be reviewed by the *designer* or another suitably qualified person responsible to the *designer* during the process of construction. Workmanship and materials

(4) Where a *building* or a component of a *building* is assembled off the *building* site in a manner that it cannot be inspected on site, *approved* off-site inspection shall be provided when required by the *authority having jurisdiction* to determine compliance with this Bylaw. Off-site inspections

(5) Copies of all inspection reports shall be made available by the *designer* upon request to the *authority having jurisdiction.* Inspection reports

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 *building* and its structural members and connections:

D—*dead loads* as provided for in Subsection 4.1.5.

L—*live load* due to intended use and *occupancy* (includes vertical loads due to cranes); snow, ice and rain; earth and hydrostatic pressure; horizontal components of static or inertia forces.

Q—wind or earthquake, whichever produces the more unfavourable effect.

T—contraction or expansion due to temperature changes, shrinkage, moisture changes, creep in component materials, movement due to differential settlement or combination thereof.

(Information on effects due to temperature changes can be found in the Commentary on Effects of Deformations in Building Components in NBC Supplement No. 4, "Commentaries on Part 4 1977.")

(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 *building* or structural member can be expected to be subjected to loads, forces or other effects not listed in Article 4.1.2.1., such effects shall be taken into account in the design based on the most appropriate information available.

(2) If it can be shown by engineering principles, or if it is known from experience, that neglect of some or all of the effects due to **T** 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 *buildings* and their structural members, all of the loads listed in Article 4.1.2.1. shall be considered to act in the following combinations, whichever combination produces the most unfavourable effects in the *building, foundation* or structural member concerned, when appropriately reduced according to Article 4.1.3.2.:

(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**

Load combination factors

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).

Stress reversal

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.

(Information on load combinations can be found in the Commentary on Load Combinations for Structural Design in NBC Supplement No. 4, "Commentaries on Part 4 1977.")

4.1.3.4. 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. 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. Overturning and sliding

SUBSECTION 4.1.4. LIMIT STATES DESIGN

Introductory Note

(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. CSA A23.3, "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, CSA A23.3 should be followed as required in Sentence 4.1.4.2.(6). Committees on other structural standards such as wood and masonry plan to introduce limit states design at a later date.)

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. 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.(3) 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 Sentence 4.1.4.2.(4) 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.(5) 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 (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 (3) is greater than the stabilizing effect of *dead load* multiplied by a load factor of 0.85 as given in Sentence (3).

Effect of factored loads

(2) Except as provided in Sentence (6), the effect of factored loads is the structural effect due to the specified loads multiplied by load factors, α, in Sentence (3), a load combination factor, ψ, in Sentence (4) and an importance factor, γ, in Sentence (5). The factored load combinations shall be taken as

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

Load factors

(3) 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

(4) 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.

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

(5) Unless otherwise *approved*, the importance factor, γ, shall be

(a) equal to 1.0 for all *buildings*, except as provided in Clause (b), and
(b) not less than 0.8 for
  (i) farm *buildings* having an *occupant load* not greater than 1 person per 500 sq ft of floor area during normal periods of use of 4 hr or longer, and
  (ii) *buildings* where it can be shown that collapse is not likely to cause injury or other serious consequences.

Concrete buildings

(6) For concrete *buildings*, the load factors and load combination factors to establish the effect of factored loads shall be determined in accordance with CSA A23.3-1973, "Code for the Design of Concrete Structures for Buildings."

Serviceability and fatigue

4.1.4.3. 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 of this Bylaw. Where more than 1 load contributes to the stress in a member, the combination of loads shall be assumed to be

$$\mathbf{D} + \psi[\mathbf{L} + \mathbf{Q} + \mathbf{T}]$$

where ψ is in conformance with Sentence 4.1.4.2.(4).

(Information on limit states design can be found in the Commentary on Limit States Design in NBC Supplement No. 4, "Commentaries on Part 4 1977.")

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.

(2) Except as provided in Sentence (3), 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*. This allowance shall be determined from the actual or anticipated weight of the *partitions* placed in any probable position, but shall be not less than 20 psf over the area of floor being considered. *Partition* loads used in design shall be shown on the drawings as provided in Clause 4.1.1.9.(2)(d). Non-permanent partitions

(3) In cases where the *dead load* is counteractive, the load allowances as provided in Sentence (2) 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 (4) or (5), applied Full and partial loading
(a) uniformly over the entire area, or
(b) on any portions of the area,
whichever produces the most critical effects in the members concerned.

(2) 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

(3) When the *occupancy* of a *building* is changed, the *building* shall conform to the requirements of this Bylaw for the new *occupancy*. Change in occupancy

(4) Where a structural member supports a tributary area of floor, roof or combination of these greater than 900 sq ft 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

$$0.5 + 15/\sqrt{A}$$

where A is the tributary area in square feet for this type of use and *occupancy*.

(5) Where a structural member supports a tributary area of floor, roof or combination of these greater than 200 sq ft for any use or *occupancy* other than those indicated in Sentence (4), the specified *live load* due to use and *occupancy*, excluding snow, is the load provided for in Sentence (1) multiplied by

$$0.3 + 10/\sqrt{B}$$

where B is the tributary area in square feet for this type of use and *occupancy*.

(Information on tributary area can be found in the Commentary on Tributary Area in NBC Supplement No. 4, "Commentaries on Part 4 1977.")

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 Gymnasia 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
Exits 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	250
Kitchens (other than residential)	100
Libraries	
Stack rooms	150
Reading and study rooms	60
Office areas in office *buildings* and other *buildings* (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 (for roof snow loads see Article 4.1.7.1.)	20[3]
Sidewalks and driveways over areaways and basements	250
Storage areas	100[2]
Toilet areas	50
Underground slabs with earth cover	[2]
Warehouses (see Storage areas)	
Column 1	2

Notes to Table 4.1.6.A.:

(1) Corridors, lobbies and aisles shall be designed to carry not less than the specified load required for the *occupancies* they serve.

(2) Loads due to the intended use must be calculated and allowed for in the design.

(3) To cover occasional short term loads such as due to workmen. This load is not additive to loads due to snow, ice or rain.

Concentrated loads

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 2½ ft by 2½ ft located so as to cause maximum effects, except that for *occupancies* not listed in Table 4.1.6.B. the concentrations of load shall be determined in accordance with Article 4.1.6.2.

Table 4.1.6.B.

Forming Part of Article 4.1.6.4.

Area of Floor or Roof	Minimum Concentrated Load, lb
Roof surfaces	300
Floors of classrooms	1,000
Floors of offices, manufacturing *buildings*, hospital wards and stages	2,000
Floors and areas used by passenger cars	2,500
Floors and areas used by vehicles not exceeding 8,000 lb gross weight	4,000
Floors and areas used by vehicles exceeding 8,000 but not exceeding 20,000 lb gross weight	8,000
Floors and areas used by vehicles exceeding 20,000 lb gross weight	12,000[1]
Driveways and sidewalks over areaways and basements	12,000[1]
Column 1	2

Note to Table 4.1.6.B.:

[1] Requires special study and where appropriate the designer should refer to CSA S6-1974, "Design of Highway Bridges."

4.1.6.5. 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 specified in the Table of Climatic Data in Part 2 of this Bylaw, 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 20 psf for roofs with a slope of 30 deg. 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) full load distributed over the entire area,

(b) full load distributed on any one portion of the area and half load on the remainder of the area,

whichever produces 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*.

Snow load coefficients

4.1.7.3.(1) The basic snow load coefficient C_s is 0.8, except for roofs exposed to wind as provided for in Article 4.1.7.4. The basic snow load coefficient shall be further increased or decreased to account for the following influences:

(a) the decrease of snow load because of the effect of slope for roof slopes exceeding 30 deg.,
(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 multispan 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 15 ft 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. The magnitude and distribution of the increase shall be appropriate to the relative portions and sizes of the surfaces.

(Information on coefficients for snow loads on roofs can be found in the Commentary on Snow Loads in NBC Supplement No. 4, "Commentaries on Part 4 1977.")

Roofs exposed to wind

4.1.7.4.(1) The basic snow load coefficient of 0.8 may be reduced to 0.6 provided the *designer* has demonstrated to the satisfaction of the *authority having jurisdiction* that the following conditions are fulfilled:

(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 feet of g divided by 25 where g is the ground snow load in pounds per square foot, which may prevent snow from being blown off the roof.

Rain loads

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-hr rainfall specified in the Table of Climatic Data in Part 2 of this Bylaw over the horizontal projection of the surface and all tributary surfaces. This provision applies whether or not the surface is provided with drainage, such as rain water leaders.

(Information on rain loads can be found in the Commentary on Rain Loads in NBC Supplement No. 4, "Commentaries on Part 4 1977.")

(2) Loads due to rain need not be considered to act simultaneously with loads due to snow.

SUBSECTION 4.1.8. EFFECTS OF WIND

External pressure or suction

4.1.8.1.(1) The specified external pressure or suction due to wind on a *building* as a whole or on cladding shall be calculated from

$$p = qC_eC_gC_p$$

where p = the specified external pressure acting statically and in a direction normal to the surface either as a pressure (directed towards the surface) or as a suction (directed away from the surface),

q = the reference velocity pressure as provided for in Sentence (3),

C_e = the exposure factor as provided for in Sentence (4),

C_g = the gust effect factor as provided for in Sentence (5),

C_p = the external pressure coefficient for the cladding location considered or the shape factor for the *building* as a whole. The shape factor is equal to the algebraic difference of the external pressure coefficients for the windward and leeward sides of the *building*.

(Information on pressure coefficients can be found in the Commentary on Wind Loads in NBC Supplement No. 4, "Commentaries on Part 4 1977.")

Internal pressure or suction on cladding

(2) The net specified pressure due to wind on cladding 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 cladding either as a pressure (directed outwards) or as a suction (directed inwards),

q, C_e, C_g are as provided for in Sentences (3), (4) and (5) 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.

(Information on pressure coefficients can be found in the Commentary on Wind Loads in NBC Supplement No. 4, "Commentaries on Part 4 1977.")

Reference velocity pressure

(3) The reference velocity pressure q is the appropriate value specified in the Table of Climatic Data in Part 2 of this Bylaw for the following conditions:

Cladding (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,

Deflection of structural members (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,

Strength of structural members (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

Post-disaster buildings (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

(4) The exposure factor C_e shall be

(a) the value shown in Table 4.1.8.A. for the appropriate height of the surface or part of the surface,

(b) the value of the function: $(h/30)^{1/5}$ but not less than 1.0 where h is the height above *grade* in feet of 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.

(Information on a dynamic approach can be found in the Commentary on Wind Loads in NBC Supplement No. 4, "Commentaries on Part 4 1977.")

Table 4.1.8.A.

Forming Part of Sentence 4.1.8.1.(4)

Height, ft	Exposure Factor
0 to 40	1.0
Over 40 to 60	1.1
" 60 to 90	1.2
" 90 to 130	1.3
" 130 to 190	1.4
" 190 to 270	1.5
" 270 to 420	1.6
" 420 to 740	1.8
" 740 to 1,200	2.0
Column 1	2

Gust effect factor

(5) The gust effect factor C_g is one of the following values:

(a) 2.0 for 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.

(Information on a dynamic approach to the action of wind gusts can be found in the Commentary on Wind Loads in NBC Supplement No. 4, "Commentaries on Part 4 1977.")

Dynamic effects of wind

4.1.8.2.(1) *Buildings* whose height is greater than 4 times their minimum effective width or greater than 400 ft and other *buildings* whose light weight, low frequency and low damping properties make them susceptible to vibration shall be

(a) designed by experimental methods for the danger of dynamic overloading and vibration and the effects of fatigue, or

(b) designed using a dynamic approach to the action of wind gusts.

(Information on dynamic approach to the action of wind gusts can be found in the Commentary on Wind Loads in NBC Supplement No. 4, "Commentaries on Part 4 1977.")

Full and partial loading

4.1.8.3.(1) *Buildings* and structural members shall be capable of withstanding the effects of

(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.

Interior walls and partitions

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

(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. EFFECTS OF EARTHQUAKES

Types of analysis

4.1.9.1.(1) The specified loading due to earthquake motion shall be determined

(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 given in the Table of Climatic Data in Part 2 of this Bylaw 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).

(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 NBC Supplement No. 4, "Commentaries on Part 4 1977.")

Nomenclature

(2) In this Subsection

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_s = the dimension of the lateral force-resisting system in a direction parallel to the applied forces.

e = computed eccentricity between the centre of mass and 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.(9).

F_t = portion of V to be concentrated at the top of the structure as defined in Sentence 4.1.9.1.(11).

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.(8).

J = numerical reduction coefficient for base overturning moment as defined in Sentence 4.1.9.1.(14).

J_x = numerical reduction coefficient for moment at level "x" as defined in Sentence 4.1.9.1.(15).

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 structure, 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.(4); 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 where required otherwise by the *authority having jurisdiction,* 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.

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, given in the Table of Climatic Data in Part 2 of this Bylaw, and the value of this ground acceleration is assumed constant within each seismic zone as defined in the Commentary on Effects of Earthquakes in NBC Supplement No. 4, "Commentaries on Part 4 1977."

(Within seismic Zone 3, peak horizontal ground accelerations corresponding to 1 in 100 probability of annual 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 NBC Supplement No. 4, "Commentaries on Part 4 1977.")

Seismic response factor

(5) The seismic response factor, S, shall be equal to $0.5/(T^{1/3})$ but need not exceed 1.00.

Fundamental period

(6) Except where technical data proves otherwise, the fundamental period, T, in Sentence (5) shall be equal to $0.05h_n/\sqrt{D}$ where h_n and D are in feet, 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.

Types of construction

(7) Values of the numerical coefficient, K, shall conform to Table 4.1.9.A.

Importance factor

(8) The importance factor, I, shall equal 1.3 for all *post-disaster buildings* and schools, and 1.0 for all other *buildings.*

Foundation factor

(9) The foundation factor, F, shall conform to Table 4.1.9.B., except that the product FS need not exceed 1.

Table 4.1.9.A.

Forming Part of Sentence 4.1.9.1.(7)

Case[1]	Type or Arrangement of Resisting Elements	Value of K
1	*Buildings* with a ductile moment-resisting space frame[2],[3] with the capacity to resist the total required force.	0.7
2	*Buildings* with a dual structural system consisting of a complete ductile moment-resisting space frame and ductile flexural walls[4] 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	*Buildings* with a dual structural system consisting of a complete ductile moment-resisting space frame and shear walls[5] 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	*Buildings* with ductile flexural walls[4] and *buildings* with ductile framing systems not otherwise classified in this Table as Cases 1, 2, 3 or 5.	1.0
5	*Buildings* 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	*Buildings* (other than Cases 1 , 2, 3, 4 and 5) of (a) continuously reinforced concrete, (b) structural steel, and (c) reinforced masonry shear walls.	1.3[6]
7	*Buildings* 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 *building*, 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.(14) shall be 1.0. (c) The torsional requirements of Sentence 4.1.9.1.(15) shall apply.	3.0
Col-umn 1	2	3

Notes to Table 4.1.9.A.:

(1) Explanatory notes on the various cases can be found in the Commentary on Effects of Earthquakes in NBC Supplement No. 4, "Commentaries on Part 4 1977."

(2) A space frame is a 3 dimensional structural system composed of interconnected members laterally supported so as to function as a complete self-contained unit with or without horizontal diaphragms.

(3) A ductile moment-resisting space frame is a space frame that is designed to resist the specified seismic forces and that, in addition, has adequate ductility or energy-absorptive capacity.
(Information on ductile moment-resisting space frames can be found in the Commentary on Effects of Earthquakes in NBC Supplement No. 4, "Commentaries on Part 4 1977.")

(4) A ductile flexural wall is a ductile flexural member cantilevering from the *foundation* consisting of a ductile reinforced concrete wall designed and detailed according to CSA A23.3-1973, "Code for the Design of Concrete Structures for Buildings," Chapter 19, Special Provisions for Seismic Design.

(5) Shear walls may be either flexural walls or shear walls as defined in CSA A23.3-1973, "Code for the Design of Concrete Structures for Buildings," Chapter 19, Special Provisions for Seismic Design.

(6) Except as required by Sentence 4.1.9.3.(1).

Weight of structure

(10) The weight, W, of the structure shall be calculated in accordance with the following formula:

$$W = \sum_{i=1}^{n} W_i$$

Distribution of lateral seismic force

(11) The total lateral seismic force, V, shall be distributed as follows:

(a) a portion F_t shall be assumed to be concentrated at the top of the structure and equal to $0.004V(h_n/D_s)^2$, except that F_t need not exceed 0.15 V and may be considered as zero for $(h_n/D_s) \leqslant 3$.

(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.B.

Forming Part of Sentence 4.1.9.1.(9)

Type and Depth of *Soil*[1]	F
Rock, dense and very dense coarse-grained *soils*, very stiff and hard fine-grained *soils*; compact coarse-grained *soils* and firm and stiff fine-grained *soils* from 0 to 50 ft deep	1.0
Compact coarse-grained *soils*, firm and stiff fine-grained *soils* with a depth greater than 50 ft; very loose and loose coarse-grained *soils* and very soft and soft fine-grained *soils* from 0 to 50 ft deep	1.3
Very loose and loose coarse-grained *soils*, and very soft and soft fine-grained *soils* with depths greater than 50 ft	1.5[2][3]
Column 1	2

Notes to Table 4.1.9.B.:

(1) *Soil* depth shall be measured from *foundation* or *pile* cap level. Descriptive terminology relating to the *soils* is as defined in Section 4.2.

(2) Where *soil* deposits are of the order of 300 ft or more, amplification factors greater than those given in the Table may arise in the case of tall *buildings*.

(3) The possibility of ground failure beneath the structure due to excessive settlement or liquifaction of very loose sands and loss of strength of sensitive clays shall be considered.

(12) 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.

(13) The values of S_p in Sentence (12) shall conform to Table 4.1.9.C.

Overturning

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

(a) $J = 1$ where T is less than 0.5,

(b) $J = (1.1 - 0.2T)$ where T is at least 0.5, but not more than 1.5, and

(c) $J = 0.8$ where T is greater than 1.5.

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

$$J_x = J + (1\text{-}J)\,(h_x/h_n)^3$$

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*.

Table 4.1.9.C.

Forming Part of Sentence 4.1.9.1.(13)

Category	Part or Portion of *Building*	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	Towers, *chimneys*, smokestacks, all when less than 10 ft high above the *building*, machinery, fixtures and equipment, pipes, tanks plus contents and penthouses, all when connected to or forming part of a *building*	Any direction	2[1],[2]
5	Towers, *chimneys* and smokestacks more than 10 ft high above the *building*	Any direction	3[3]
6	Tanks plus contents when resting on the ground	Any direction	1[2]
7	Floors and roofs acting as diaphragms	Any direction	1[4]
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

Notes to Table 4.1.9.C.:

(1) When h/D of any *building* is equal to or greater than 5 to 1, increase value by 50 per cent.

(2) The value shall be increased 50 per cent for pipes and containers for toxic or explosive materials, for materials having a flash point below 100°F or for firefighting fluids.

(3) Lower values of S_p may be used if they can be proven by analysis.

(4) Floors and roofs acting as diaphragms shall be designed for a minimum force corresponding to a value of $S_p = 1$ applied to loads tributary from that *storey*, unless a greater force F_x is assigned to the level under consideration as in Sentence 4.1.9.1.(11).

Torsional moments

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

$$M_{tx} = \left(V - \sum_{i=1}^{x} F_i\right) e_x$$

(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 NBC Supplement No. 4, "Commentaries on Part 4 1977.")

Design eccentricity

(17) The design eccentricity, e_x, in Sentence (16) shall be computed by one of the following equations, whichever provides the greater stresses:

(a) $e_x = 1.5e + 0.05D_n$, or
(b) $e_x = 0.5e - 0.05D_n$

(18) 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.(16) shall be doubled.

(Information on a dynamic analysis can be found in the Commentary on Dynamic Analysis for the Seismic Response of Buildings in NBC Supplement No. 4, "Commentaries on Part 4 1977.")

Setbacks

(19) The *building* design shall take full account of the possible effects of 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 NBC Supplement No. 4, "Commentaries on Part 4 1977.")

General provisions

4.1.9.2.(1) Lateral deflections of a *storey* relative to its adjacent *storeys* shall be considered in accordance with accepted practice.

(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. (11) 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.(11) 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 loading, unless it can be demonstrated that equivalent restraints can be provided by other means.

Special Provisions

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, 2, 3, 4, 5 and 6 of Table 4.1.9.A. In addition, for *buildings* in seismic Zone 3 more than 200 ft in height and 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 CSA S304-1977, "Masonry Design and Construction in 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 40 lb per sq ft in weight, and
  (ii) do not exceed 10 ft 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) 40 lb/lineal ft for exterior balconies of individual residential units and a concentrated load of 200 lb applied concurrently,
(b) 100 lb/lineal ft for *exits* and stairs,
(c) 150 lb/lineal ft for *assembly occupancies,* except for grandstands and stadia,
(d) 250 lb/lineal ft for grandstands and stadia including ramps,
(e) 300 lb/lineal ft for vehicle guard rails for parking garages applied 21 in. above the roadway and minimum total load of 2,500 lb uniformly distributed over each vehicle space applied 21 in. above the roadway, and
(f) a 125-lb concentrated load applied at any point for industrial catwalks and other areas where crowding by many people is very improbable.

(2) Individual elements within the *guard,* including solid panels and pickets, shall be designed for 20 psf or 100 lb of concentrated load at any point in the element, whichever results in the more critical loading condition. The loads need not be considered to act simultaneously with the loads provided for in Sentence (1) and (3).

(3) The minimum specified load applied vertically at the top of every required *guard* shall be 100 lb/lineal ft 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 20 lb per lineal foot of seats acting parallel to each row of seats, and at least 10 lb per lineal foot acting at right angles to each row of seats, assuming such forces to be acting independently of each other.

Impact and vibrations

4.1.10.3. 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. Where dynamic effects such as resonance and fatigue are likely to be important as a result of vibration of equipment or machinery, a dynamic analysis shall be carried out.

Table 4.1.10.A.

Forming Part of Article 4.1.10.3.

Impact Due to	Factor
Operation of motor driven cranes	1.25
Operation of hand driven cranes	1.10
Live loads on hanger supported floors and stairs	1.33
Operation of elevators	See CSA B44-1975, Clause 2.6.2.
Supports for light machinery, shaft or motor driven	1.20
Supports for reciprocating machinery or power driven units	1.50
Column 1	2

Horizontal crane loads

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.

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. DOCUMENTS, APPROVAL AND INSPECTION

Subsurface investigation

4.2.2.1. Unless exempted by the *authority having jurisdiction* a *subsurface investigation,* including *groundwater* conditions, shall be carried out under the direction of a

person competent in this field of work, who shall prepare a report on the results of this investigation, and this report shall be submitted with the application to excavate or build.

Drawings and evidence

4.2.2.2.(1) Drawings submitted with the application to build a *building* or to excavate shall 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 by the *authority having jurisdiction,* evidence that justifies the information contained on the drawings shall be submitted with the application to excavate or build.

Inspection

4.2.2.3.(1) Inspection shall be carried out by the *designer,* or by another suitably qualified person responsible to the *designer,* to ensure that the subsurface conditions are consistent with the design and that construction is carried out in accordance with the design and good engineering practice.

(2) Inspection required in Sentence (1) shall be carried out

(a) on a continuous basis
  (i) during the construction of all *deep foundation units,* 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.

Reports of foundation inspections

4.2.2.4. The person responsible for the inspections required in Article 4.2.2.3. shall prepare and sign a report of each inspection and send the report as soon as practical to the *authority having jurisdiction.*

Altered subsurface conditions

4.2.2.5.(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* to the satisfaction of the *authority having jurisdiction.*

(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* to the satisfaction of the *authority having jurisdiction.*

"As constructed" drawings

4.2.2.6. Where conditions as described under Sentences 4.2.2.5. (1) and (2) are encountered, or where *foundation units* or their locations were altered, this information shall be recorded on appropriate drawings or new "as constructed" drawings prepared and submitted to the *authority having jurisdiction.*

(It is recommended that the *authority having jurisdiction* keep files of such drawings for future reference.)

Notification

4.2.2.7. The *authority having jurisdiction* shall be notified and given an opportunity to inspect the site before excavation, before a foundation is placed and before a superstructure is placed on a foundation.

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 of this Bylaw.

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 of this Bylaw.

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 of this Bylaw.

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 CSA A23.1-1973, "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.

Steel piles

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 G40.21-1976, "Structural Quality Steels,"
ASTM A252-75, "Welded and Seamless Steel Pipe Piles,"
ASTM A283-75, "Low and Intermediate Tensile Strength Carbon Steel Plates of Structural Quality,"
ASTM A570-75, "Hot-Rolled Carbon Steel Sheets and Strip of Structural Quality," or
ASTM A611-72, "Steel, Cold-Rolled Sheet, Carbon Structural."

High strength steel tendons

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 CSA A23.1-1973, "Concrete Materials and Methods of Concrete Construction."

Corrosion of steel

4.2.3.10. Where conditions are corrosive to steel, adequate protection of exposed steel shall be provided.

Other Materials

4.2.3.11. Materials other than those described in this Subsection may be used in *foundations* provided they conform with the minimum requirements of this Subsection and are *approved.*

SUBSECTION 4.2.4. DESIGN REQUIREMENTS

Basis of design for foundations

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:

(a) application of generally accepted geotechnical and civil engineering principles by a person competent in this field of work as provided in this Section and other Sections of Part 4 of this Bylaw,

(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,

(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, or

(d) innovative approaches, provided the design is carried out to the satisfaction of the *authority having jurisdiction* by a person specially qualified in the specific method applied, and provided the design gives a level of safety and performance at least equivalent to that provided for or implicit in design carried out by the methods referred to in Clauses (a) and (b) and provision is made for monitoring the subsequent performance of such structures.

Subsurface investigation

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.*

Identification and classification of soil, rock and groundwater

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.

Loads on foundations

4.2.4.4. The *foundation* of a *building* shall be capable of resisting all loads as stipulated in Section 4.1 of this Bylaw.

Total and differential movement

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.

Depth of foundations

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.*

(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 *foundation* 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 *foundation units,* this effect shall be fully investigated and provided for in the design.

Dynamic loading

4.2.4.9. Where dynamic loading conditions apply, *allowable loads* or *allowable bearing pressures* shall be assessed by a special investigation of these conditions.

Hydrostatic uplift

4.2.4.10. Where a *foundation* or any part of a *building* 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 *groundwater level*, 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 *soil* or *rock* are encountered or proven to exist, the design of the *foundation* shall be based upon analysis of these conditions by a person competent in that field of work.

Swelling and shrinking soil

4.2.4.13. Where swelling or shrinking *soils*, in which movements resulting from moisture content changes may be sufficient to cause damage to a structure, are encountered or known to exist, such a condition shall be fully investigated and provided for in the design.

Expanding and deteriorating rock

4.2.4.14. Where *rock* which expands or deteriorates when subjected to unfavourable environmental conditions or to stress release is known to exist, such condition shall be fully investigated and provided for in the design.

Construction on fill

4.2.4.15.(1) *Buildings* may be placed on *fill* if it can be shown by *subsurface investigation* that

(a) the *fill* is or can be made capable of supporting the *design loads*,
(b) detrimental movement of the *building* or services leading to the *building* will not occur, and
(c) explosive gases can be controlled or do not exist.

Structural design of foundations

4.2.4.16. The structural design of the *foundation* of a *building*, the procedures and construction practices shall conform with the appropriate Sections of this Bylaw unless otherwise specified in Section 4.2.

SUBSECTION 4.2.5. EXCAVATIONS

Excavation design

4.2.5.1. The design of *excavations* and of supports for the sides of *excavations* shall conform with the requirements of Subsection 4.2.4. and to this Subsection.

(Information on excavations can be found in the Commentary on Foundations in NBC Supplement No. 4, "Commentaries on Part 4 1977.")

Excavation construction

4.2.5.2.(1) Every *excavation* shall be undertaken in such a manner as to

(a) prevent movement which would cause damage to adjacent property, existing structures, utilities, roads and sidewalks at all stages of construction, and
(b) comply with the appropriate requirements of Part 8 of this Bylaw.

(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.

Supported excavations

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.

Unsupported 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 competent in this field of work in conformance with the requirements of Articles 4.2.5.1. and 4.2.5.2.

Control of water around 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.

Loss of ground

4.2.5.6. At all stages of *excavation* and construction, loss of ground due to water or any other cause shall be prevented.

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 Backfilling
(a) provide lateral support to the *soil* adjacent to the *excavation,* and
(b) prevent detrimental movements.

(2) The material used as backfill or *fill* supporting a footing, *foundation* or a floor on *grade* shall be of a type that is not subject to detrimental volume change with changes in moisture content and temperature.

SUBSECTION 4.2.6. SHALLOW FOUNDATIONS

4.2.6.1. The design of *shallow foundations* shall be in conformance with Subsection 4.2.4., "Design Requirements" and the requirements of this Subsection. Design of shallow foundations
(Information on shallow foundations can be found in the Commentary on Foundations in NBC Supplement No. 4, "Commentaries on Part 4 1977.")

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 to the satisfaction of the *authority having jurisdiction,* and action taken as required in Article 4.2.2.6. 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 to the satisfaction of the *authority having jurisdiction,* and action taken as required in Article 4.2.2.6. 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. It can be pre-manufactured or cast-in-place; it can be driven, jacked, jetted, screwed, bored or excavated; it can be of wood, concrete or steel or a combination thereof. General

4.2.7.2.(1) *Deep foundation units* shall be designed in conformance with Subsection 4.2.4. and this Subsection. Design of deep foundations
(Information on deep foundations can be found in the Commentary on Foundations in NBC Supplement No. 4, "Commentaries on Part 4 1977.")

(2) Where *deep foundation units* 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, "Load Settlement Relationship for Individual Vertical Piles under Static Axial Load" or other acceptable methods, and the results interpreted by a person competent in this field of work to the satisfaction of the *authority having jurisdiction.* Load testing of deep foundations

(3) Where *deep foundation units* are not load tested as outlined in Clause 4.2.4.1.(1)(c), and where well established local practice as outlined in Clause 4.2.4.1.(1)(b) is Deep foundations not load tested

not applicable, the design procedures and the appropriate stringent factors of safety shall be determined by a person competent in this type of work to the satisfaction of the *authority having jurisdiction.*

Allowable load

4.2.7.3.(1) The *allowable load* on a *deep foundation* shall be determined on the basis of geotechnical considerations taking into account

(a) the method of installation,
(b) the degree of inspection,
(c) the spacing of *foundation units* and group effects, and
(d) other requirements of this Subsection.

(2) The *allowable load* on a *deep foundation* as determined in Sentence (1) shall not be 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 *deep foundation* unit permanently in contact with soil or rock shall be structurally designed as a laterally supported compression member.

(4) The portion of a *deep foundation unit* in contact with air or water shall be structurally designed as a laterally unsupported compression member.

(5) The structural design of prefabricated *deep foundation units* shall allow for all stresses resulting from driving, handling and testing.

Tolerance in location and alignment

4.2.7.4. Permissible deviations from the design alignment and the location of the top of *deep foundation units* shall be determined by design analysis, and shall be indicated on the drawings.

Incorrect location or alignment

4.2.7.5. Where a *deep foundation unit* has not been placed within the permissible deviations referred to in Article 4.2.7.4., the condition of the *foundation* shall be assessed by the person responsible for the design, any necessary changes made to the satisfaction of the *authority having jurisdiction* and action taken as required in Article 4.2.2.6.

Installation of deep foundations

4.2.7.6.(1) *Deep foundation units* shall be installed in such a manner as not to impair

(a) the strength of the *deep foundation units* and the properties of the *soil* or *rock* on or in which they are placed beyond the calculated or anticipated limits,
(b) the integrity of previously installed *deep foundation units,* or
(c) the integrity of neighbouring structures and services.

Installation records

4.2.7.7. The installation of each *deep foundation unit* shall be inspected in conformance with Articles 4.2.2.3. and 4.2.2.4., and in such a manner that all pertinent information is recorded.

Damaged deep foundation unit

4.2.7.8. Where inspection shows that a *deep foundation unit* is damaged or not consistent with design or good engineering practice, the *allowable load* of such a unit shall be reassessed by the person responsible for the design, any necessary changes made to the satisfaction of the *authority having jurisdiction* and action taken as required in Article 4.2.2.6.

SUBSECTION 4.2.8. SPECIAL FOUNDATIONS

Special foundation systems

4.2.8.1. Where special *foundation* systems are used, such systems shall conform to Subsection 4.2.4. "Design Requirements," and evidence shall be provided to the *authority having jurisdiction* to demonstrate the adequacy of the *foundation* for the purpose intended.

Use of existing foundations

4.2.8.2. Existing *foundations* may be used to support new or altered *buildings* provided they comply with all pertinent requirements of Section 4.2.

SECTION 4.3 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 of this Bylaw.

4.3.1.3. In areas known to be infested by termites, the requirements in Articles 9.3.-3.7., 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 set forth in Article 4.1.1.4., *buildings* and their structural members made of wood shall conform to CSA O86-1976, "Code for the Engineering Design of Wood."

4.3.2.2. Glued-laminated members shall be fabricated in plants conforming to CSA O177-1965, "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 of this Bylaw.

SUBSECTION 4.4.2. DESIGN REQUIREMENTS

4.4.2.1. Except as set forth in Article 4.1.1.4., *buildings* and their structural members made of plain and reinforced masonry shall conform to CSA S304-1977, "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 of this Bylaw.

SUBSECTION 4.5.2. DESIGN REQUIREMENTS

4.5.2.1. Except as set forth in Article 4.1.1.4., *buildings* and their structural members made of plain, reinforced and prestressed concrete shall conform to CSA A23.3-1973, "Code for the Design of Concrete Structures for Buildings."

(CSA A23.3-1973, "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.")

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 light gauge 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 of this Bylaw.

SUBSECTION 4.6.2. DESIGN REQUIREMENTS

4.6.2.1. Except as provided in Article 4.1.1.4., *buildings* and their structural members made of structural steel shall conform to CSA S16-1969, "Steel Structures for Buildings," or CSA S16.1-1974, "Steel Structures for Buildings—Limit States Design."

4.6.2.2. Except as set forth in Article 4.1.1.4., *buildings* and their structural members made of light gauge steel shall conform to CSA S136-1974, "Cold Formed Steel Structural Members."

(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 CSA S16.1-1974, "Steel Structures for Buildings—Limit States Design.")

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 of this Bylaw.

SUBSECTION 4.7.2. DESIGN REQUIREMENTS

4.7.2.1. Except as set forth in Article 4.1.1.4., *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 set forth in Article 4.1.1.4., *buildings* and their structural members made of light gauge aluminum shall conform to CSA S190-1968, "Design of Light Gauge Aluminum Products."

SECTION 4.8 WIND, WATER AND VAPOUR PROTECTION

SUBSECTION 4.8.1. GENERAL

Scope

4.8.1.1.(1) This Section 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.

(2) The design and structural requirements of other Sections of this Part and of other Parts of this Bylaw shall apply.

Control of Condensation

4.8.1.2.(1) Except as provided in Sentence (3), 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. Vapour and air barriers

(2) Except as provided in Sentence (3), 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.

(3) The requirements of Sentences (1) and (2) do not apply where proof is provided to the *authority having jurisdiction* to show that the performance of a *building* assembly is satisfactory with respect to the control of condensation.

Control of Wind and Rain Penetration

4.8.1.3.(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. Joints

(2) Components of a *building* assembly shall be so constructed as to limit the amount of air infiltration and exfiltration at junctions of components. Air infiltration and exfiltration

(3) An opening in an exterior wall or roof shall be so constructed as to prevent the entrance of rain or snow into the *building.*

(4) Roofing shall be installed so as to Roofing

(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.

Parapets

(5) 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.

Exterior wall cladding

(6) 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.

Control of Groundwater

Through-wall flashing

4.8.1.4.(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.

(2) 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 of this Bylaw where such wall or floor is not impervious to water.

(3) Crawl spaces shall be provided with a ground cover in conformance with Part 9 of this Bylaw.

(4) 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.

SUBSECTION 4.8.2. MATERIALS

Material specifications

4.8.2.1. 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 of this Bylaw.

Materials resistant to deterioration

4.8.2.2. A material exposed to corrosive conditions shall be corrosion-resistant or shall be resistant to deterioration under those conditions.

Fastening devices

4.8.2.3. 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.

SUBSECTION 4.8.3. PRACTICES

Installation practices

4.8.3.1. Except as provided in Article 4.8.3.2. 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 of this Bylaw.

4.8.3.2. Glass shall be designed and installed according to good engineering practice to resist the loads specified in Section 4.1.

4.8.3.3.(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.

4.8.3.4. *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.

Attachment to accommodate stresses and deformations

(Information on effects of deformations in *building* components can be found in the Commentary on Effects of Deformations in Building Components in NBC Supplement No. 4, "Commentaries on Part 4 1977.")

PART 5

MATERIALS

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PART 5 MATERIALS

SECTION 5.1 MATERIAL STANDARDS AND METHODS OF TESTING

SUBSECTION 5.1.1. MATERIAL STANDARDS

5.1.1.1. Unless otherwise specified or *approved,** materials used in fulfilment of the requirements of this Bylaw shall conform to the appropriate standards referenced in this Bylaw. (See also Subsection 2.2.3. of Part 2 of this Bylaw.)

5.1.1.2. Lumber shall conform to the grades for specific end uses listed in Table 9.3.3.A. in Part 9 of this Bylaw.

5.1.1.3. Lumber dimensions of less than 1 in. referred to in this Bylaw are actual dimensions. Lumber dimensions of 1 in. or more referred to in this Bylaw are nominal dimensions. The corresponding actual dimensions shall be those shown in CSA O141-1970, "Softwood Lumber."

SECTION 5.2 EQUIVALENT MATERIALS

SUBSECTION 5.2.1. The provisions of this Bylaw are not intended to prevent the use of any material not specifically prescribed herein. Any such material may be *approved* 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 Bylaw.

SUBSECTION 5.2.2. Approval in writing shall be obtained by the *owner* or his agent before any proposed equivalent material is used. The *authority having jurisdiction* shall base such approval on the principle set forth in Subsection 5.2.1., and shall require that tests be made or sufficient evidence or proof be submitted, at the expense of the *owner* or his agent, to substantiate any claim for the proposed material.

SECTION 5.3 USED MATERIALS

SUBSECTION 5.3.1. Unless otherwise specified, used materials may be reused where they meet the requirements of this Bylaw for new materials, and are otherwise satisfactory for the intended use.

SECTION 5.4 STORAGE OF MATERIALS

SUBSECTION 5.4.1. All *building* materials shall be stored on the *building* site in such a way as to prevent deterioration or the loss or impairment of their structural and other essential properties.

*Words which are in italics in this Part are defined in Part 1.

PART 6

BUILDING SERVICES

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PART 6 BUILDING SERVICES

SECTION 6.1 GENERAL

SUBSECTION 6.1.1. APPLICATION

6.1.1.1.(1) This Part applies to the design and installation of systems and equipment for *building* services.

(2) This Part applies 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 6,000 sq ft 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, Divisions 2 and 3, *medium* and *low hazard industrial occupancies.*

(3) For *buildings* not listed in Sentence (2), requirements for *building* services will be found in Part 9 of this Bylaw.

SUBSECTION 6.1.2. SCOPE

6.1.2.1.(1) This Part applies to systems and equipment for the following:
(a) heating, ventilating and air-conditioning services,
(b) incinerators,
(c) electrical services,
(d) elevators, dumbwaiters and escalators,
(e) service shafts and chutes,
(f) fire alarm and fire extinguishing services, and
(g) non-flammable medical gas piping systems.

6.1.2.2.(1) *Service water heaters* shall conform to Subsection 2.5. of the ACNBC Canadian Heating, Ventilating and Air-Conditioning Code 1977, in addition to Part 7 of this Bylaw.

(2) Pressure vessels shall conform to CSA B51-1975, "Code for the Contruction and Inspection of Boilers and Pressure Vessels."

SUBSECTION 6.1.3. DEFINITIONS

6.1.3.1. Words that appear in italics are defined in Part 1 of this Bylaw.

SUBSECTION 6.1.4. MINIMUM METAL THICKNESS

6.1.4.1. Minimum metal thickness in this Part is specified in inches. Where reference documents in this Part specify minimum metal thickness by gauge number, inches shall be substituted for gauge numbers according to Table 6.1.4.A.

Table 6.1.4.A.

Forming Part of Article 6.1.4.1.

SUBSTITUTION OF DECIMAL INCHES FOR GAUGE NUMBERS IN THE DESIGNATION OF MINIMUM SHEET METAL THICKNESSES[1]				
Gauge No.	Minimum Thickness of Sheet Metal, in.			
	Galvanized Sheet Gauge (GSG)[2] ASTM A525-75	Manufacturers' Standard Gauge (MSG)[3] ASTM A568-74	United States Standard Gauge (USSG)[4] ASTM A167-74	Brown & Sharpe Gauge (B&SG)[5] ASTM B209-76
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

Notes to Table 6.1.4.A.:

(1) Minimum thickness in this Table is the nominal thickness corresponding to the gauge number reduced by the greatest allowable minus-thickness-tolerance specified in the appropriate ASTM standard.

(2) Applies to galvanized (zinc-coated) steel and is the over-all thickness including coating.

(3) Applies to uncoated steel.

(4) Applies to stainless steel.

(5) Applies to aluminum alloy sheets up to 84 in. in width.

SUBSECTION 6.1.5. REFERENCE DOCUMENTS

6.1.5.1. When a specification or reference document listed herein contains requirements that conflict with specific requirements in this Part, the requirements in this Part shall govern.

SUBSECTION 6.1.6. NON-FLAMMABLE MEDICAL GAS PIPING SYSTEMS

6.1.6.1. Non-flammable medical gas piping systems shall be installed in conformance with CSA Z305.1-1975, "Non-Flammable Medical Gas Piping Systems in Health Care Facilities."

SECTION 6.2 HEATING, VENTILATING AND AIR-CONDITIONING SYSTEMS AND EQUIPMENT

SUBSECTION 6.2.1. GENERAL

6.2.1.1. Heating, ventilating and air-conditioning systems and equipment shall be designed and installed in conformance with the ACNBC Canadian Heating, Ventilating and Air-Conditioning Code 1977.

SECTION 6.3 INCINERATORS

SUBSECTION 6.3.1. GENERAL

6.3.1.1. The design, construction, installation and *alteration* of every indoor incinerator shall conform to NFPA 82-1972, "Incinerators and Rubbish Handling."

SUBSECTION 6.3.2. INSTALLATION

Chimney flue

6.3.2.1.(1) Every incinerator shall be served by a *chimney flue* conforming to Article 2.8.8. of the ACNBC Canadian Heating, Ventilating and Air-Conditioning Code 1977.

(2) A *chimney flue* serving a flue-fed incinerator shall serve no other *appliance.*

Separation

6.3.2.2. Rooms containing incinerators shall be separated from the remainder of the *building* in accordance with Subsection 3.5.2. of Part 3 of this Bylaw.

SECTION 6.4 ELECTRICAL EQUIPMENT, INSTALLATIONS AND WIRING

SUBSECTION 6.4.1. GENERAL

6.4.1.1. The installation of electrical equipment and wiring, including electrical communication systems and emergency systems, shall conform to CSA C22.1-1975, "Canadian Electrical Code, Part I."

Clear space for maintenance and inspection

6.4.1.2. Sufficient clear space shall be provided around electrical equipment to provide for maintenance and inspection where this is considered necessary because of the nature of the equipment.

SUBSECTION 6.4.2. EMERGENCY ELECTRIC POWER SYSTEMS

6.4.2.1. Except as provided in Article 6.4.2.2., 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.)

6.4.2.2. Where a liquid or gas fuel-fired engine or turbine for an emergency electric power supply is dependent on a fuel supply from outside the building, such fuel supply shall be provided with a suitably-identified separate shut-off valve outside the building.

SECTION 6.5 ELEVATORS, DUMBWAITERS AND ESCALATORS

SUBSECTION 6.5.1. GENERAL

6.5.1.1. The design, construction, installation and *alteration* of every elevator, dumbwaiter and escalator shall conform to CSA B44-1975, "Safety Code for Elevators, Dumbwaiters, Escalators, and Moving Walks."

6.5.1.2. Before being placed in service, every elevator, dumbwaiter or escalator installation including safety and control devices shall be inspected and tested in accordance with CSA B44-1975, "Safety Code for Elevators, Dumbwaiters, Escalators and Moving Walks."

SUBSECTION 6.5.2. ELEVATORS AND DUMBWAITERS

Hoistways

6.5.2.1. Elevator and dumbwaiter hoistways shall conform to Subsections 3.2.6. and 3.5.3. of Part 3 of this Bylaw.

Machinery room

6.5.2.2. Every machinery room for elevators and dumbwaiters shall conform to Subsection 3.5.2. of Part 3 of this Bylaw.

Sidewalk type

6.5.2.3.(1) Sidewalk-type elevators shall not be installed unless *approved.*

(2) Sidewalk-type elevators shall not be installed in a public thoroughfare.

SUBSECTION 6.5.3. ESCALATORS

6.5.3.1.(1) Where escalators serve as a required *means of egress,* they shall conform to Part 3 of this Bylaw.

(2) Enclosures for escalators shall conform to Part 3 of this Bylaw.

(3) The escalator machinery shall be separated from the remainder of the *building* by a *fire separation* conforming to Subsection 3.5.2. of Part 3 of this Bylaw.

SECTION 6.6 SERVICE SHAFTS AND CHUTES

SUBSECTION 6.6.1. GENERAL

6.6.1.1. Service shafts, linen and refuse chutes shall conform to Subsections 3.2.6. and 3.5.3. of Part 3 of this Bylaw in addition to this Section.

SUBSECTION 6.6.2. LINEN AND REFUSE CHUTES

6.6.2.1. Linen and refuse chutes shall be enclosed in a shaft conforming to Subsection 3.5.3. of Part 3 of this Bylaw and shall be internally smooth, impervious to moisture, corrosion-resistant and *noncombustible.* Shaft enclosed

6.6.2.2. Every intake opening for a chute shall be no greater in area than 60 per cent of the cross-sectional area of the chute. Intake openings

6.6.2.3. Intake openings for linen and refuse chutes shall be fitted with *approved closures* designed to close automatically and latch after use.

6.6.2.4.(1) Except when exempted by the *authority having jurisdiction,* every interior linen or refuse chute shall be vented through the roof and shall extend at least 3 ft above the roof. Such vents shall Venting of chutes

(a) have an area at least 10 per cent of the cross-sectional area of the chute, and
(b) be covered with an *approved* skylight or *approved* shutter that shall open automatically in the event of fire.

(2) Skylights over chutes shall be
(a) constructed of *noncombustible* material or of metal-covered wood framing, and
(b) glazed with glass of no greater thickness than ⅛ in. or other *noncombustible* material that can be easily pierced by fire-fighting personnel.

(3) A window or other venting arrangement in the side of the chute may replace a skylight or shutter provided that
(a) the bottom of the opening for the window or vent is at least 3 ft above the adjacent roof level, and at least 2 ft above a roof surface or structure within a horizontal distance of 10 ft from the shaft,
(b) the window or other venting arrangement opens automatically in the event of fire, and
(c) the window conforms to Subsection 3.2.3. of Part 3 of this Bylaw.

6.6.2.5. 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 a water supply and a floor drain. Chute discharge

SECTION 6.7 FIRE ALARM AND FIRE EXTINGUISHING EQUIPMENT

SUBSECTION 6.7.1. GENERAL

6.7.1.1. Fire protection equipment including fire alarm systems, sprinkler systems, standpipe and hose systems shall be *approved.*

6.7.1.2. 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 6.7.2. LOCAL FIRE ALARM SYSTEMS

6.7.2.1. Except as required in Article 6.7.2.3., where a local fire alarm system is required in Subsection 3.2.4. of Part 3 or Subsection 9.10.18. of Part 9 of this Bylaw, such system shall be installed in conformance with CSA B222.0-1974, "Installation Code for Local Fire Alarm Systems." Installation

Mounted notice

6.7.2.2. Where the local fire alarm system has been installed with no connections to alert 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.

Area of coverage of alarm initiating circuits

6.7.2.3. Unless otherwise required by the *authority having jurisdiction* in *buildings* in which Subsection 3.2.4. of this Bylaw requires a fire alarm system to be equipped with an annunciator, the area of coverage of an alarm initiating circuit in such fire alarm system shall not exceed 1 *storey.*

SUBSECTION 6.7.3. STANDPIPE AND HOSE SYSTEMS

6.7.3.1. Except as provided in Articles 6.7.3.2. to 6.7.3.8. and Sentence 6.7.4.1.(1), where standpipe and hose systems are required elsewhere in this Bylaw, the design, construction, installation and testing of such standpipe and hose systems shall be in conformance with NFPA 14-1976, "Installation of Standpipe and Hose Systems."

Dry standpipes not permitted

6.7.3.2. Dry standpipes that are not connected to a water supply shall not be considered as fulfilling the requirements of this Subsection.

Location of hose stations

6.7.3.3. Required hose stations shall be located within *floor areas* near *exits* unless otherwise *approved.*

6.7.3.4. 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.*

6.7.3.5.(1) Every hose cabinet shall be provided with a glass viewing panel 3/16 in. thick constituting at least 70 per cent of the door area.

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

Additional water supply required

6.7.3.6. In *buildings* greater than 275 ft in *building height,* in addition to the primary water supply for the standpipe and hose system required in NFPA 14-1976, "Installation of Standpipe and Hose Systems," a secondary independent water supply of capacity at least equal to that required in NFPA 14-1976 shall be provided.

Location of fire department connections

6.7.3.7. Fire department connections for standpipe and hose systems shall be located not more than 150 ft from an *approved* hydrant.

Electrical supervision of valves required

6.7.3.8. In *buildings* where a fire alarm system is required to have an annunciator, except for hose valves, all valves controlling water supplies in a standpipe and hose system shall be equipped with an electrical supervisory switch which shall transmit a signal to an annunciator panel in the event of movement of the valve handle.

SUBSECTION 6.7.4. SPRINKLER SYSTEMS

6.7.4.1.(1) Where the installation of sprinkler systems is required elsewhere in this Bylaw, they shall be designed, constructed, installed and tested in conformance with NFPA 13-1975, "Installation of Sprinkler Systems."

(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, and shall be *approved.*

(3) Where a *building* contains fewer than 9 sprinkler heads, such heads may be connected to a water supply serving other equipment in the *building*. Where additional sprinkler heads are installed, such sprinkler heads shall be connected to a separate water supply.

(4) Where a water supply serves both a sprinkler system and a system serving other equipment, *approved* control valves shall be provided so that either system can be shut off independently.

SUBSECTION 6.7.5. VOICE COMMUNICATION SYSTEMS

6.7.5.1. Voice communciation systems required in Subsection 3.2.6. of Part 3 of this Bylaw shall conform to the requirements of this Subsection.

Integrated systems

6.7.5.2. A voice communication system that is integrated with the *building* fire alarm system shall be designed so that a fault in one system does not impair the performance of the other system.

6.7.5.3.(1) A voice communication system shall be designed to provide a tone that
(a) is distinctive from that of the fire alarm signal or any other *building* signal,
(b) precedes voice communication, and
(c) produces a sound pressure level of at least 90 db at the loudspeakers and is clearly heard throughout the *building*.

Loudspeaker requirements

6.7.5.4.(1) Loudspeakers for a voice communication system shall
(a) provide a sound pressure level of at least 85 db at the speakers,
(b) be located so that messages can be clearly heard throughout the *building*, and
(c) have a frequency response of 100 hz to 5,000 hz.

Loudspeaker circuits

6.7.5.5. A separate loudspeaker circuit shall be provided for each *floor area* and for each *exit* stairwell.

6.7.5.6. Loudspeaker and telephone handset circuits shall be designed so that a fault in any one circuit does not interfere with any other circuit.

6.7.5.7. Loudspeaker and telephone handset circuits shall be electrically supervised so that an open or ground fault on any circuit shall be indicated by an audible and visual signal at the central alarm and control facility.

Telephone handset requirements

6.7.5.8.(1) At least 1 telephone handset for 2-way communication shall be provided on each *floor area* and shall be accessible to all occupants on the *floor area.*

(2) The location of telephone handsets in Sentence (1) shall be clearly indicated near the handset.

(3) Telephone handsets shall be installed so that lifting the receiver of a handset from its cradle will cause an audible and visual signal at the central alarm and control facility.

Selection switch required

6.7.5.9. In addition to the provisions in Part 3 of this Bylaw, a central alarm and control facility shall be equipped with a selection switch for each loudspeaker circuit and telephone handset circuit.

PART 7

PLUMBING SERVICES

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PART 7 PLUMBING SERVICES

SECTION 7.1 GENERAL

SUBSECTION 7.1.1. SCOPE

7.1.1.1. This Part applies to the construction, extension, *alteration,* renewal or repair of *plumbing systems* .

SUBSECTION 7.1.2. APPLICATION

7.1.2.1. Every *plumbing system* shall be designed and installed in conformance with the ACNBC Canadian Plumbing Code 1977.

SUBSECTION 7.1.3. REQUIRED FACILITIES

7.1.3.1. Except as required in Article 7.1.3.2., *buildings* shall be equipped with plumbing facilities as required in Subsection 3.6.4. of Part 3 of this Bylaw.

7.1.3.2. *Dwelling units* shall be equipped with plumbing facilities as required in Section 9.32 of Part 9 of this Bylaw.

SUBSECTION 7.1.4. ADMINISTRATION

7.1.4.1. In addition to the administrative requirements in Part 2 of this Bylaw, the appropriate administrative requirements of the ACNBC Canadian Plumbing Code 1977 shall apply.

SUBSECTION 7.1.5. DEFINITIONS

7.1.5.1. Words that appear in italics are defined in Part 1 of this Bylaw.

PART 8

CONSTRUCTION SAFETY MEASURES

–PUBLIC SAFETY AT CONSTRUCTION SITES

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PART 8 CONSTRUCTION SAFETY MEASURES

SECTION 8.1 GENERAL

SUBSECTION 8.1.1. SCOPE

8.1.1.1. This Part applies to the protection of the public during the construction, *alteration* or demolition of every *building*, including any incompleted or abandoned *building*.

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 Section 2 of the ACNBC Canadian Construction Safety Code 1977.

SUBSECTION 8.1.3. ADMINISTRATION

8.1.3.1. In addition to the administrative requirements in Part 2 of this Bylaw, the appropriate administrative requirements in Subsection 1.3 of the ACNBC Canadian Construction Safety Code 1977 shall apply.

SUBSECTION 8.1.4. DEFINITIONS

8.1.4.1. Words that appear in italics are defined in Part 1 of this Bylaw.

PART 9

HOUSING AND SMALL BUILDINGS

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PART 9 HOUSING AND SMALL BUILDINGS

SECTION 9.1 GENERAL

SUBSECTION 9.1.1. APPLICATION

9.1.1.1. This Part applies to *buildings* of 3 *storeys* or less in *building height*, having a *building area* not exceeding 6,000 sq ft and which are used or intended to be used for *residential* (Group C), *business and personal services* (Group D), *mercantile* (Group E), and *medium* and *low hazard industrial occupancy* (Group F, Divisions 2 and 3). This Part applies both to site assembled and factory made *buildings*. Scope

9.1.1.2. Measures to ensure the safety of the public during construction shall conform to the appropriate requirements in Part 8 of this Bylaw. Public safety

9.1.1.3. *Buildings* other than those described in Article 9.1.1.1. are regulated by the appropriate provisions contained in Parts 1, 2, 3, 4, 5, 6, 7 and 8 of this Bylaw.

9.1.1.4. Where a *building* or a component of a *building* is assembled off the *building* site in such a manner that it cannot be inspected on site, *approved* off-site inspection shall be provided when required by the *authority having jurisdiction* to ensure compliance with this Bylaw.

SECTION 9.2 DEFINITIONS

SUBSECTION 9.2.1. GENERAL

9.2.1.1. Words in italics are defined in Part 1 of this Bylaw. Words in italics

SECTION 9.3 MATERIALS, SYSTEMS AND EQUIPMENT

SUBSECTION 9.3.1. GENERAL

9.3.1.1. Materials, systems and equipment shall possess the essential properties necessary to perform their intended functions. Performance

9.3.1.2. When required by the *authority having jurisdiction*, materials, systems or equipment shall be tested to determine the suitability for their intended use. Required tests

9.3.1.3. Except as provided in Article 9.3.1.5., the test method used to determine the suitability of materials, systems or equipment shall be one that is published by a recognized agency. Published test methods

9.3.1.4. Materials, systems and equipment not specifically described herein, or which vary from the specific requirements in this Part, 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 good engineering practice or on the basis of tests described in Article 9.3.1.5. Assessment of materials, systems and equipment

9.3.1.5. Where no published test method exists the tests shall be designed to simulate or exceed anticipated service conditions or shall be designed to compare the performance of the material, system or equipment with similar material, system or equipment that is known to be acceptable. Where no published test methods exist

9.3.1.6. Every test shall be carried out by a testing laboratory acceptable to the *authority having jurisdiction*. Testing laboratories

Conflicts with reference documents

9.3.1.7. When a specification or reference document listed herein contains requirements that conflict with specific requirements in this Part, the requirements in this Part shall govern.

SUBSECTION 9.3.2. CONCRETE

Design criteria

9.3.2.1. Concrete shall be designed, mixed, placed and cured in accordance with CSA A23.1-1973, "Concrete Materials and Methods of Concrete Construction," and tested in accordance with CSA A23.2-1973, "Methods of Test for Concrete."

Sulphate soils

9.3.2.2. Cement shall meet the requirements of CSA A5-1971, "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 25 of CSA A23.1-1973, "Concrete Materials and Methods of Concrete Construction."

Aggregate

9.3.2.3. Aggregates shall consist of sand, gravel, crushed rock, crushed air-cooled blast furnace slag, expanded shale or expanded clay conforming to CSA A23.1-1973, "Concrete Materials and Methods of Concrete Construction." Aggregate shall be clean, well-graded and free of injurious amounts of organic and other deleterious material.

Water

9.3.2.4. Water shall be clean and free of injurious amounts of oil, organic matter, sediment or any other deleterious material.

Compressive strength

9.3.2.5. Unless otherwise specifically required elsewhere in this Part, the compressive strength of unreinforced concrete shall be not less than 2,000 psi after 28 days.

9.3.2.6. When concrete is used for garage and carport floors and exterior steps, it shall have a minimum compressive strength of 3,000 psi after 28 days and shall have air entrainment of 5 to 7 per cent.

Concrete mix

9.3.2.7. The concrete mixes described in Table 9.3.2.A. shall be considered acceptable if the slump does not exceed 4 in. when measured according to the slump test described in CSA A23.2-1973, "Methods of Test for Concrete."

Table 9.3.2.A.

Forming Part of Article 9.3.2.7.

CONCRETE MIXES, BY VOLUME			
Concrete Strength, psi	Cement, part	Sand, parts	Coarse Aggregate[1]
2,000	1	2	4 parts
	1	—	6 parts pit run gravel
2,500	1	2	3½ parts up to 1½ in. in size
	1	—	5½ parts pit run gravel
Column 1	2	3	4

Note to Table 9.3.2.A.:

[1] Size of aggregate shall not exceed 2 in.

9.3.2.8. The use of admixtures other than those for air entrainment shall be subject to the approval of the *authority having jurisdiction.* Admixtures shall conform to CSA A266.1-1973, "Air Entraining Admixtures for Concrete" or CSA A266.2-1973, "Chemical Admixtures for Concrete," as applicable. Admixtures

9.3.2.9. Reinforced concrete shall be designed to conform to the requirements of Part 4 of this Bylaw. Reinforced concrete design

9.3.2.10. When the air temperature is below 40°F, concrete shall be kept at a temperature of not less than 50°F or more than 80°F while being mixed and placed, and maintained at a temperature of not less than 50°F for 72 hr after placing. No frozen material or ice shall be used in the mix. Cold weather requirements

SUBSECTION 9.3.3. LUMBER AND WOOD PRODUCTS

9.3.3.1. Lumber for the uses listed in Table 9.3.3.A. shall be identified by the grade stamp of an association or independent grading agency approved to grade stamp lumber by an appropriate organization acceptable to the *authority having jurisdiction.* Grade marking

9.3.3.2. Exterior-type particleboard 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.

9.3.3.3. Lumber grades shall conform to Table 9.3.3.A., for the particular use. On-site cross-cutting of a piece shall not be considered to affect the grade of the piece as originally marked.

9.3.3.4. Moisture content of lumber shall be not greater than 19 per cent at the time of installation. Moisture content

9.3.3.5. Lumber dimensions of less than 1 in. referred to in this Part are actual dimensions. Lumber dimensions of 1 in. or more referred to in this Part are nominal dimensions. The corresponding actual dimensions shall be those shown in CSA O141-1970, "Softwood Lumber."

9.3.3.6. 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.

9.3.3.7. 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 9.3.4. METAL

9.3.4.1. Minimum thicknesses for sheet metal material given in this Part refer to the actual minimum thicknesses measured at any point of the material, and in the case of galvanized steel includes the thickness of the coating unless otherwise indicated.

Table 9.3.3.A.

Forming part of Article 9.3.3.3.

MINIMUM LUMBER GRADES FOR SPECIFIC END USES[1]						
	BOARDS				FRAMING	
USE	Paragraph in the 1970 NLGA grading rules under which boards are graded[2]				2-4 in. thick 2-5 in. wide	2-4 in. thick 6 in. and wider
	All species			Eastern white pine & red pine	All Species	All Species
	Para 111	Para 113	Para 114	Para 115		
Stud wall framing (*loadbearing* members)	–	–	–	–	Standard, Stud, No. 2	No. 2
Stud wall framing (non-*loadbearing* members)	–	–	–	–	Stud, Utility, No. 3	No. 3
Floor, roof & ceiling framing	–	–	–	–	[3]	[3]
Plank frame construction (*loadbearing* members)	Standard	No. 3 Common	–	No. 3	–	No. 2
Plank frame construction (non-*loadbearing* members)	Economy	No. 5 Common	–	No. 5	Economy, No. 3	Economy, No. 3
Posts and beams	–	–	–	–	Standard, No. 2[4]	No. 2[4]
Roof sheathing	Standard	No. 3 Common	Standard	No. 4	–	–
Subflooring	Standard	No. 3 Common	Standard	No. 3	–	–
Wall sheathing[5]	Utility	No. 4 Common	Utility	No. 4	–	–
Column 1	2	3	4	5	6	7

Notes to Table 9.3.3.A.:

[1] Graded in conformance with the 1970 NLGA Standard Grading Rules for Canadian Lumber, published by the National Lumber Grades Authority, Vancouver.

[2] To identify board grades, the paragraph number of the NLGA rules under which the lumber is graded must be shown in the grade mark. The grade descriptions in Paragraph 113 of the NLGA rules are the same as the 1970 Standard Grading Rules for Western Lumber published by WWPA. The grade descriptions in paragraph 114 are the same as the 1970 Standard Grading Rules for West Coast Lumber, No. 16, published by WCLIB. When graded in accordance with WWPA or WCLIB rules, the grade mark will not contain a paragraph number.

[3] Grades to conform to those listed in ACNBC Span Tables for Wood Joists, Rafters, Trusses and Beams 1977 (see Articles 9.23.13.14. and 9.23.13.15. for roof trusses).

[4] Where 5 in. or thicker lumber is used for posts or beams, the grade shall be not less than "Standard."

[5] Where wall sheathing is not required as a nailing base, one grade lower than those specified is permitted.

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 of this Bylaw, except that design *live loads* and deflection limits shall conform to Subsections 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. applied uniformly over the entire area, or the load listed in Table 9.4.2.B. applied over an area 2½ ft by 2½ ft located so as to cause maximum effects, whichever causes the greater stresses.

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, lobbies and aisles over 4 ft in width, except for *public corridors* above the *first storey* in *residential occupancies*	100
Public corridors above the *first storey* in *residential occupancies*	40
Corridors, lobbies and aisles not over 4 ft in width	(2)
Balconies	100
Equipment rooms	75(1)
Exits	100
Factories	125(1)
Garages	
for passenger cars	50
for unloaded buses and light trucks	125
for loaded trucks and buses and all trucking spaces	250
Kitchens	
other than domestic type	100
Office areas	
basements and *first storeys*	100
other *storeys*	50
Laboratories	75
Residential occupancies	
attics not accessible by a stairway	10
attics accessible by a stairway	30
bedrooms	30
all other rooms	40
stairs within *dwelling units*	75
Mercantile occupancies	100
Driveways(3)	250
Sidewalks(3) adjacent to driveways that may be subject to loads from cars or trucks	250
Walks(3) that will not be subject to loads from cars or trucks	100
Storage areas	100(1)
Water-closet rooms	
except in *residential occupancies*	50
Column 1	2

Notes to Table 9.4.2.A.:

(1) Total equipment loads must be calculated and allowed for in the design.

(2) Corridors, lobbies and aisles not over 4 ft in width shall be designed to carry not less than the design load required for the *occupancies* they serve.

(3) Applies to driveways, sidewalks or walks that are not supported by the ground, such as those over basements or cellars.

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	2,000
Floors and areas used by passenger cars	2,500
Floors and areas used by vehicles not exceeding 8,000 lb gross weight and walks not subject to vehicular traffic over basements, cellars or other open areas	4,000
Floors and areas used by vehicles exceeding 8,000 lb but not exceeding 20,000 lb gross weight	8,000
Floors and areas used by vehicles exceeding 20,000 lb gross weight	12,000
Driveways or sidewalks adjacent to driveways over basements, cellars or other open areas	12,000
Column 1	2

SUBSECTION 9.4.3. SNOW LOADS

Snow loads

9.4.3.1. Except as provided in Articles 9.4.3.2., 9.4.3.3. and 9.4.3.4., design snow loads shall be not less than 60 per cent of the appropriate ground snow load listed in NBC Supplement No. 1, "Climatic Information for Building Design in Canada 1977," but in no case shall the snow load be considered less than 20 psf of horizontal roof projection.

9.4.3.2. Where the entire width of a roof does not exceed 14 ft, the design snow load shall be not less than 50 per cent of the appropriate ground snow load listed in NBC Supplement No. 1, "Climatic Information for Building Design in Canada 1977," but in no case less than 20 psf of horizontal roof projection.

9.4.3.3. Bow string, arch or semi-circular roof trusses having an unsupported span greater than 20 ft, steel or wood roof framing members having an unsupported span greater than 40 ft or a spacing greater than 2 ft and reinforced concrete roof slabs shall be designed in conformance with the snow load requirements in Section 4.1 of this Bylaw.

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 of this Bylaw where the greatest horizontal area of the *building* above *grade,* measured within the exterior surfaces of the exterior walls, exceeds 6,000 sq ft.

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 of this Bylaw.

SUBSECTION 9.4.5. 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. 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 *dwelling units*	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 *dwelling units*	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 of this Bylaw where the greatest horizontal area of the *building* above *grade*, measured within the exterior surfaces of the exterior walls, exceeds 6,000 sq ft.

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 of this Bylaw where the greatest horizontal area of the *building* above *grade*, measured within the exterior surfaces of the exterior walls, does not exceed 6,000 sq ft.

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 of this Bylaw.

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 of this Bylaw.

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 3 ft, the *allowable bearing pressure* for soil or rock shall be determined in conformance with ASTM D1194-72, "Bearing Capacity of Soil for Static Load on Spread Footings," provided the bearing plate used in the test is at least 12 in. by 12 in. and the *allowable bearing pressure* does not exceed ⅓ the ultimate bearing capacity of the soil or rock, and does not exceed ⅓ the pressure that would cause the plate to settle 1 in.

9.4.7.2. Where a foundation rests on rock or on soil that has been identified in conformance with the "Guide to the Field Description of Soils," published by the Associate Committee on Geotechnical Research, National Research Council of Canada, to the satisfaction of the *authority having jurisdiction* to a depth equal to at least twice the width of the footing, the values in Table 9.4.7.A. may be used in determining the *allowable bearing pressures* for soil or rock.

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 frustrum extending downward from the footing at an angle of 60 deg. 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 of Part 4 of this Bylaw 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, approved* measures shall be taken in conformance with good practice 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 in accordance with accepted engineering practice. Walls supporting drained earth may be designed for pressure equivalent to that exerted by a fluid weighing not less than 30 lb/cu ft and having a depth equal to that of the retained earth. Any surcharge shall be in addition to the equivalent fluid pressure.

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 sand, dense sand and gravel[1]	6,000
Compact sand, compact sand and gravel[1]	3,000
Loose sand, loose sand and gravel[1]	1,000
Dense silt[2]	3,000
Compact silt[2]	2,000
Very stiff clay[2]	6,000
Stiff clay[2]	3,000
Firm clay[2]	1,500
Soft clay[2]	750
Till, dense or hard	8,000
Till, compact or firm	3,000
Cemented sand and gravel	10,000
Clay shale	6,000
Sound rock	10,000
Column 1	2

Notes to Table 9.4.7.A.:

(1) Sand, or sand and gravel may be classified by means of a picket test in which a 2 in. by 2 in. picket bevelled at the end at 45 deg. to a point, is pushed into the soil. Such material is classified as "dense" if a man of average weight cannot push the picket more than 1½ in. into the soil, "compact" if the picket penetrates more than 1½ in. but less than 8 in. into the soil and "loose" if the picket penetrates 8 in. or more.

(2) Clay and cohesive silts may be classified as "very stiff" if it is impossible to indent by thumb pressure, "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 penetrated several inches by thumb pressure, where this test is carried out on undisturbed soil in the wall of a test pit.

SECTION 9.5 ROOM AND SPACE DIMENSIONS

SUBSECTION 9.5.1. GENERAL

9.5.1.1. This Section applies only to *dwelling units* that are intended for use on a continuing or year-round basis as the principal residence of the occupant.

9.5.1.2. 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 to the satisfaction of the *authority having jurisdiction* 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.

SUBSECTION 9.5.2. CEILING HEIGHTS

Room heights

9.5.2.1. Heights of rooms or spaces in *residential occupancies* shall conform to Table 9.5.2.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 6 in. over at least 75 per cent of the required floor area with a clear height of 7 ft at any point over the required area
Bedroom or bedroom space	7 ft 6 in. over at least 50 per cent of the required floor area or 7 ft over all of the required floor area Any part of the floor having a clear height of less than 4 ft 6 in. shall not be considered in computing the required floor area
Unfinished basement or cellar including laundry area therein	6 ft 4 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 *grade*	7 ft 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	7 ft
Column 1	2

9.5.2.2. The clear height above and below a *mezzanine* floor assembly in all *occupancies* shall be not less than 7 ft, unless otherwise permitted by the *authority having jurisdiction.*

9.5.2.3. The clear height in a *storage garage* shall be not less than 6 ft 6 in.

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 145 sq ft of floor area and shall have no dimension less than 9 ft 10 in. 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 120 sq ft.

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 35 sq ft. Dining rooms not combined with other space shall have a minimum area of 75 sq ft.

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 7 ft 6 in. 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 5 ft 6 in.

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 45 sq ft of floor area including the area occupied by the base cabinets, except that in *bachelor dwelling units* the minimum floor area shall be 40 sq ft.

SUBSECTION 9.5.6. BEDROOM OR SPACE IN DWELLING UNITS

Main bedroom area

9.5.6.1. Except as provided in Article 9.5.6.3., at least 1 bedroom in every *dwelling unit* shall have at least 105 sq ft of floor area where built-in cabinets are not provided and 95 sq ft of floor area where built-in cabinets are provided. The minimum dimension within the required area shall be 8 ft 10 in.

Other bedroom areas

9.5.6.2. Except as provided in Article 9.5.6.3., additional bedrooms shall have at least 75 sq ft of floor area where built-in cabinets are not provided and 65 sq ft of floor area where built-in cabinets are provided. The minimum dimension within the required area shall be 6 ft 6 in.

Combination bedroom areas

9.5.6.3. Bedroom spaces in combination with other spaces shall have at least 45 sq ft of floor area and have no dimension less than 6 ft 6 in. within the required area.

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 2 ft 10 in., except that in *buildings* not exceeding 14 ft in width the hallway width may be 2 ft 4 in. where a second *exit* is provided near the end of the hallway farthest from the living area.

SECTION 9.6 DOORS

SUBSECTION 9.6.1. GENERAL

Doors in fire separations

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.

SUBSECTION 9.6.2. REQUIRED DOORS

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 in multiple dwelling units

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.

SUBSECTION 9.6.3. DOORWAY SIZES

Doorway openings

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.

Table 9.6.3.A.

Forming Part of Article 9.6.3.1.

MINIMUM SIZE OF DOORS		
At Entrance to	Width, ft—in.	Height, ft—in.
Dwelling unit (required entrance) Vestibule or entrance hall	2 — 8	6 — 6
Stairs to a floor level that contains a finished space All doors in at least 1 line of passage from the exterior to the basement Utility rooms	2 — 8	6 — 6
Walk-in closet	2 — 0	6 — 6
Bathroom, water-closet room, shower room	2 — 0	6 — 6
Rooms not mentioned above, exterior balconies	2 — 6(1)	6 — 6
Column 1	2	3

Note to Table 9.6.3.A.:
(1) Where 2 ft 4 in. hallways are permitted, doors may be 2 ft wide.

9.6.3.2. Doors to public water-closet rooms shall be not less than 2 ft 8 in. in width and 6 ft 8 in. in height.

SUBSECTION 9.6.4. EXTERIOR DOORS

Exterior doors

9.6.4.1. Exterior wood doors shall be exterior type conforming to CSA O132.2-1972, "Wood Doors."

9.6.4.2. All sliding glass doors shall conform to the appropriate requirements in CGSB 82-GP-1a(1972), "Doors, Glass, Aluminum Frame, Sliding, Standard-Duty" or to CGSB 82-GP-2a(1972), "Doors, Glass, Aluminum Frame, Sliding, Medium-Duty."

SUBSECTION 9.6.5. GLASS

9.6.5.1. 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 Weight or Thickness	Maximum Perimeter, in.
18 oz. 24 oz. 32 oz. 3/16 in. 7/32 in.	80 120 160 180 not limited
Column 1	2

9.6.5.2. Glass side lights greater than 18 in. 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 CGSB 12-GP-1c(1973), "Glass, Safety, Tempered or Laminated, for Building Construction," or shall be of wired glass conforming to CGSB 12-GP-11 (1973), "Glass, Wired, Safety, for Building Construction."

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 5 sq ft and extends to less than 36 in. 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

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.* Natural lighting

9.7.1.2. Requirements for windows in relation to fire protection are described in Section 9.10.

9.7.1.3. Requirements for ventilation are described in Section 9.33. Ventilation

SUBSECTION 9.7.2. GENERAL

Window design

9.7.2.1. Windows shall be designed and installed so that they shed water.

Minimum window glass areas

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.

Windows in public spaces

9.7.2.3. Wherever practicable, windows shall be provided to light corridors, stairways and similar public space in *buildings*.

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	4 sq ft	Windows not required
Kitchen, kitchen space, kitchen alcove	10 per cent of area served	Windows not required
Living rooms, Dining rooms, Bedrooms and other finished rooms not mentioned above	10 per cent of area served	10 per cent of area served
Column 1	2	3

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 O132.1-1975, "Wood Windows,"
CGSB 12-GP-8 (1966), "Factory-Sealed Double-Glazing Units,"
CGSB 63-GP-2b(1974), "Windows, Extruded Aluminum, Vertical and Horizontal Sliding, Medium Duty,"
CGSB 63-GP-3b(1974), "Windows: Extruded Aluminum, Vertical and Horizontal Sliding, Standard Duty,"
CGSB 63-GP-4a(1971), "Windows: Sashless, Horizontal Sliding,"

CGSB 63-GP-5a(1970), "Windows: Steel, Vertical and Horizontal Sliding, Standard Duty," or
CGSB 63-GP-6(1970), "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:
CGSB 12-GP-1c(1973), "Glass, Safety, Tempered or Laminated for Building Construction,"
CGSB 12-GP-2a(1970), "Glass, Sheet: Flat, Clear," or
CGSB 12-GP-3b(1970), "Glass, Plate: Flat, Polished Plate or Float."

Thickness of glass

9.7.4.2. Thickness of glass in windows shall conform to Table 9.7.4.A., except as provided in Article 9.7.4.3.

9.7.4.3. Sashless window glass thickness shall conform to CGSB 63-GP-4a(1971), "Windows: Sashless, Horizontal Sliding."

Table 9.7.4.A.

Forming Part of Article 9.7.4.2.

MAXIMUM GLASS SIZE FOR VARIOUS THICKNESSES			
Minimum Glass Thickness or Weight of Inner and Outer Panes	Sash Type or Fixed Glazing	Factory-Sealed Double Glazing	
		Fused Edges	Other than Fused Edges
18 oz. 24 oz. 32 oz. 3/16 in. 7/32 in. ¼ in.	120 in. perimeter 168 in. perimeter 240 in. perimeter 280 in. perimeter 50 sq ft no limit	180 in. perimeter 252 in. perimeter 360 in. perimeter 420 in. perimeter 113 sq ft no limit	150 in. perimeter 210 in. perimeter 300 in. perimeter 350 in. perimeter 78 sq ft 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 of an *approved* type and 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 42 in. above the landing shall be protected by barriers or railings located approximately 42 in. 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 9.6.5.5., except that such *partitions* shall be suitably marked to indicate their existence and position.

SECTION 9.8 STAIRS, RAMPS, HANDRAILS AND GUARDS

SUBSECTION 9.8.1. SCOPE

Design and construction of stairs

9.8.1.1. This Section applies to the design and construction of interior and exterior stairs, steps, ramps, railings and *guards*.

Stairs as part of exit

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.

Escalators and moving walkways

9.8.1.3. Escalators and moving *walkways* shall conform to the appropriate requirements in Part 3 of this Bylaw.

SUBSECTION 9.8.2. GENERAL

Treads and risers

9.8.2.1. Treads and risers shall have uniform rise and run in any one flight.

Number of risers required in stairs

9.8.2.2. Except for interior stairs within a *dwelling unit*, at least 3 risers shall be provided for interior stairs.

Stairway protection

9.8.2.3. Interior stairways extending through the roof of a *building* shall be protected from ice and snow.

SUBSECTION 9.8.3. STAIR DIMENSIONS

Stair dimensions

9.8.3.1. Interior stairs within *dwelling units* to areas used only for storage, laundry and mechanical equipment, such as unfinished basements, cellars and attics, shall have a maximum rise of 9 in., a minimum run of 8 in. and a minimum tread width of 9 in.

Maximum rise, minimum run and tread width

9.8.3.2. Interior stairs within *dwelling units* other than those listed in Article 9.8.3.1. and exterior stairs serving *dwelling units* shall have a maximum rise of 8 in., a minimum run of 8¼ in. and a minimum tread width of 9¼ in.

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 7¾ in., a minimum rise of 5 in., a minimum run of 9 in. and a minimum tread width of 10 in. The product of the run and rise (expressed in inches) for such stairs shall be not less than 70 nor more than 75.

Nosing

9.8.3.4. Where the run of any stair is less than 10 in., a nosing of at least 1 in. shall be provided beyond the face of the riser, or an equivalent back slope on the risers shall be provided.

Stairway width

9.8.3.5. Except as required in Article 9.9.3.3., *exit* stairs and stairs used by the public shall have a width, measured between wall faces or *guards*, of at least 36 in., except that where the stair serves 1 or more *floor areas* having a combined *occupant load* greater than 100 persons, the width shall be at least 44 in.

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 2 ft 10 in.

9.8.3.7. The head room measured vertically from a line drawn through the outer edges of the nosings shall be at least 6 ft 4 in. for stairs located in *dwelling units* and 6 ft 9 in. 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 36 in., and the length of landing for all other stairs in a straight run need not exceed 44 in. 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 stairs.

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.

9.8.4.5. The vertical height between any landings shall not exceed 12 ft. Height between landings

9.8.4.6. The clear height over landings shall be at least 6 ft 4 in. in *dwelling units* and 6 ft 9 in. for other landings. Clear height over landings

SUBSECTION 9.8.5. CURVED STAIRS AND WINDERS

9.8.5.1. Curved stairs used in *exits* shall conform to the requirements for *exit* stairs in this Section. Curved stairs 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 8 in. and a minimum run of 6 in. and shall have risers conforming to Articles 9.8.3.1. to 9.8.3.3. Curved stairs not in exits

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 deg. and individual treads turn through an angle of 30 deg. Only 1 set of such winders shall be permitted between floor levels. Winders

SUBSECTION 9.8.6. 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. Maximum gradient for 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 12 in. on either side of the wall opening. Level area in 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 36 in. Doorways near ramps

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 44 in. in width, and on 2 sides of stairs 44 in. in width or greater.

9.8.7.2. Handrails are not required for stairs within a *dwelling unit* that has fewer than 3 risers.

9.8.7.3. Only 1 handrail is required on exterior stairs more than 44 in. in width and having 3 or more risers provided such stairs serve not more than 1 *dwelling unit.*

9.8.7.4. Handrails on stairways shall be located between 32 and 36 in. measured vertically above a line drawn through the outside edges of the stair nosings.

9.8.7.5. A clearance of at least 1½ in. 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 3½ in. 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, *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 24 in., 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 24 in.

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 42 in. in height.

9.8.8.4. Except as provided in Article 9.8.8.5., *guards* for stairs shall be at least 36 in. in height measured vertically from a line drawn through the outside edges of the stair nosings, and 42 in. 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 32 in. measured vertically above a line drawn through the outside edges of stair nosings, and at least 36 in. above landings. All other required *guards* within *dwelling units* shall be at least 36 in. in height.

9.8.8.6. Except for floors of garages in Section 9.36, a continuous curb at least 6 in. in height and a *guard* not less than 42 in. 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 2 ft or more above an adjacent ground or floor level.

9.8.8.7. Openings through a *guard* on a balcony 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 4 in. in *residential occupancies* and 8 in. in other *occupancies*, unless it can be shown to the satisfaction of the *authority having jurisdiction* 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 of *buildings* of *residential occupancy* shall be designed so that no member, attachment or opening located between 4 in. and 36 in. 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

Support for exterior stairs

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 6 in. by 6 in. 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 *grade* 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 an *approved* wood preservative.

Wooden stair stringers

9.8.9.2. Wooden stair stringers shall have a minimum effective depth of 3½ in. and an over-all depth of at least 9¼ in. Stringers shall be supported and secured top and bottom. Stringers shall be at least 1 in. actual thickness if supported along their length and 1½ in. actual thickness if unsupported along their length. Stringers shall be spaced not more than 3 ft o.c. in *dwelling units* and 2 ft 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 4 ft 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 1 in. actual thickness, except that if open risers are used, and the distance between stringers exceeds 2 ft 6 in., the treads shall be at least 1½ in. 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 8 in. 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 *approved* 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. *Exits* shall be provided from every *floor area.* Except for *mezzanines* that are not enclosed and are of a size permitted in Table 9.9.8.A. to have a single egress, *mezzanines* shall be provided with *exits* on the same basis as required for *floor areas* in this Section.

9.9.2.2. 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 of rooms in Article 9.9.8.8.

9.9.2.3. *Exits* may consist of doorways, passageways, ramps, stairways, fire escapes as permitted in Article 9.9.2.7., *horizontal exits,* escalators and moving *walkways,* provided that where escalators or moving *walkways* are used as required *exits,* they are capable of moving only in the direction of *exit* travel.

Not considered as exits

9.9.2.4. Elevators, slide escapes or windows shall not be considered as being part of a required *means of egress.*

Use of exits

9.9.2.5. An *exit* shall be designed for no purpose other than for exiting except that an *exit* may also serve as an access to a *floor area.*

9.9.2.6. *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.*

Fire escapes

9.9.2.7. Fire escapes shall not be installed on any new *building,* and shall not be installed on an existing *building,* unless permitted by the *authority having jurisdiction.*

9.9.2.8. When a fire escape is installed on an existing *building* it shall conform to Part 3 of this Bylaw.

Horizontal exits

9.9.2.9. Where a *horizontal exit* is used, it shall conform to Part 3 of this Bylaw.

9.9.2.10. Every *public building* shall have at least 1 principal entrance designed in conformance with NBC Supplement No. 5, "Building Standards for the Handicapped 1977" for use by physically handicapped persons, opening to the outdoors at sidewalk level or to a ramp leading to a sidewalk.

9.9.2.11. Every *public building* shall provide access for physically handicapped persons from the entrance described in Article 9.9.2.10. to public spaces on the entrance floor, and to at least 1 elevator when elevators are provided in conformance with NBC Supplement No. 5, "Building Standards for the Handicapped 1977."

SUBSECTION 9.9.3. DIMENSIONS OF MEANS OF EGRESS

Scope

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.*

Occupant load

9.9.3.2. The *occupant load* of *floor areas* 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 *approved.*

Exit width

9.9.3.3. Except as provided in Subsection 9.9.6., the width of an *exit* corridor shall be at least 44 in. and the width of other *exits* at least 36 in., 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 9.9.3.6.) 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.)

Access to exit width

9.9.3.4. 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 9.9.3.6.) 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 44 in.

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, sq ft
Residential	
Dwelling units	(1)
Dormitories	50
Business and personal services	
Shops	50
Offices	100
Mercantile	
Retail sales floors at *grade,* cellar or basement	30
Other mercantile uses	60
Industrial	
Manufacturing or process rooms	50
Storage garage	500
Warehouse storage space	300
Other storage space	500
Aircraft hangars	500
Other uses	
Cleaning and repair	50
Kitchens	100
Column 1	2

Note to Table 9.9.3.A.:

(1) *Occupant load* shall be based on 2 persons per bedroom or sleeping area.

Width of stairs in an access to exit

9.9.3.5. 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 9.9.3.6.).

Calculation of units of exit width

9.9.3.6. The units of *exit* width in Articles 9.9.3.3. to 9.9.3.5. shall be determined by dividing the width (in inches) of an *exit* by 22. Where the remainder is less than 12 in., it shall not be considered as contributing to the number of units. Where the remainder is 12 in. or more, it shall be considered as contributing ¼ unit of *exit* width in the case of stairs and ½ unit of *exit* width in the case of other *exit* facilities.

Aggregate width of exits

9.9.3.7. 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

9.9.3.8. Except as provided in Subsection 9.9.6. and Article 9.8.3.7., the minimum height of *exits* and corridors which provide *access to exits* shall be 7 ft.

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 ¾ hr. 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.

Wired glass in exits

9.9.4.3. Except as provided in Article 9.9.4.4., the total area of wired glass or glass block separating an *exit* and an adjacent *floor area* in each *exit* at each *storey* shall not exceed 9 sq ft. Such glass shall conform to the requirements in Articles 9.10.14.3. and 9.10.14.4.

9.9.4.4. The area of wired glass or glass block separating an *exit* and an adjacent *public corridor* or vestibule located within the *floor area* may exceed the area limitation in Article 9.9.4.3. in not more than 1 *exit* shaft in *buildings* having at least 2 *exits*.

Protection of windows in exits

9.9.4.5. Openings in the exterior wall of an *exit* shall be protected with wired glass or glass block installed in accordance with Articles 9.10.14.3. and 9.10.14.4., where openings may be exposed to the hazard of a fire in another *fire compartment* of the same *building*.

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

Scope

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*.

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 30 in. 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 15 psig, 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 2 in. for each full unit of *exit* width (22 in.), and where such doors lead out of stairs or ramps in the direction of *exit* travel they shall not be less than ¾ 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 30 in., 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 6 ft 6 in. 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 individually rented rooms, suites of rooms or *dwelling units* shall be not less than 6 ft 8 in. in height. Except as required in Articles 9.6.3.1. and 9.9.6.2., such doors shall be at least 32 in. in width when only 1 door leaf is installed in an opening, and 24 in. 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 48 in. 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 of rooms where such room or suite of rooms is used or intended for use by 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 Direction of door swing

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 *approved* 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.

Size of landings

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 1 ft wider and longer than the width of the door. Such doors either in the open or closed position shall be not closer than 12 in. to the nearest riser.

Exterior doors

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 6 in.

Exit door swing

9.9.6.9. Every required *exit* door including an *exit* door serving not more than 1 *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 *approved* 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.

Door latches

9.9.6.11. *Exit* doors and doors to *dwelling units* shall be openable from the inside without the use of keys.

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 individually owned or rented rooms, suites of rooms or *dwelling units* 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 20 lb applied at the knob or other latch releasing device.

SUBSECTION 9.9.7. EXITS FROM FLOOR AREAS

Number of exits

9.9.7.1. Except as provided in Articles 9.9.7.6. and 9.9.7.7., at least 2 *exits* shall be provided from every *storey* spaced so that the travel distance to the nearest *exit* shall be not greater than 125 ft in the case of *business and personal services occupancies* and 100 ft for all other occupancies. Where the *floor area* is *sprinklered* and is subdivided into individually owned or rented rooms, suites of rooms or *dwelling units,* the travel distance may be increased to 150 ft for all *occupancies.* (See Article 9.9.7.2. for explanation of travel distance.)

Travel distance

9.9.7.2. For the purpose 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 when a *floor area* is subdivided into individually owned or rented rooms, suites of rooms or *dwelling units,* and is served by a corridor required to provide a *fire separation* from such adjacent rooms, suites of rooms or *dwelling units* or by an exterior passageway, the travel distance shall be measured from the door of such rooms, suites of rooms or *dwelling units* to the nearest *exit.*

9.9.7.3. Not more than ½ the required *exits* from a *floor area* may be *horizontal exits.* Horizontal exits

9.9.7.4. Where more than 1 *exit* is required from a *floor area,* each *exit* shall be considered as contributing not more than ½ the required units of *exit* width. Size of exits

9.9.7.5. 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

9.9.7.6. In *buildings* of 1 and 2 *storeys* in *building height,* a single *exit* is permitted from each *storey* provided the *floor area* and travel distance requirements conform to Table 9.9.7.A. Single exit permitted

Table 9.9.7.A.

Forming Part of Article 9.9.7.6.

SINGLE EXITS FROM FLOOR AREAS		
Occupancy of *Floor Area*	Maximum *Floor Area,* sq ft	Maximum Travel Distance,[1] ft
Group C[2),3)]	1,000[2),3)]	50[2),3)]
Group D	2,000	75
Group E	1,500	50
Group F, Division 2	1,500	35
Group F, Division 3	2,000	50
Column 1	2	3

Notes to Table 9.9.7.A.:

(1) See Article 9.9.7.2. for explanation of travel distance.

(2) Single *exit* permitted only when such *exit* is an exterior door at or near ground level.

(3) See Article 9.9.7.7. for *dwelling units.*

9.9.7.7. A *dwelling unit* containing more than 1 *storey* shall have an *exit* or doorway into a public *access to exit* from each of its top and bottom *storeys,* except that a single *exit* is permitted from a *dwelling unit* provided the *exit* is an exterior door leading directly from a *storey* of the *dwelling unit* at or near ground level. The floor level of the uppermost *storey* of such *dwelling unit* shall be not more than 20 ft above the floor or landing level adjacent to the *exit.* Exits from dwelling units

9.9.7.8. 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 15 ft above *grade,* and the path of travel through the lobby shall not exceed 50 ft. 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, janitors' storage closets and rooms containing a *residential 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

SUBSECTION 9.9.8. ACCESS TO EXITS

Scope

9.9.8.1. This Subsection applies to *access to exits* within *floor areas* except within individually rented rooms, suites of rooms or *dwelling units* unless otherwise stated herein.

General requirements

9.9.8.2. Except as permitted in Articles 9.9.8.3. and 9.9.8.8., each individually rented room or suite of rooms on a *floor area* occupied by more than 1 tenancy and each *dwelling unit* shall have an exterior doorway at or near ground level or a doorway leading to an exterior passageway open to the outdoors or to an interior 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.

9.9.8.3. A doorway to a *dwelling unit* is permitted into an *exit* stairway or into a *public corridor* served by a single *exit* stairway where each *dwelling unit* is provided with a second and separate *means of egress*.

Dead-end corridors

9.9.8.4. Except as permitted in Article 9.9.8.3., a dead-end *public corridor* is acceptable in *residential occupancies* provided it does not exceed 20 ft in length, measured from the end of the corridor to the nearest *exit*. Such dead-ends shall contain no door openings except entrance doors to individually rented rooms, suites of rooms or *dwelling units*. Such doors shall be located so that it shall not be necessary to pass more than 2 doors in travelling to the nearest *exit*. Such doors in dead-end *public corridors* shall be equipped with self-closing devices.

9.9.8.5. Except as provided in Article 9.9.8.7., dead-end *public corridors* are permitted in *industrial occupancies* only when the *occupant load* served by the *public corridor* does not exceed 30 persons and the travel distance from the most remote part of the dead end to the nearest *exit* does not exceed 30 ft.

9.9.8.6. Except as provided in Article 9.9.8.7., dead-end *public corridors* are permitted in *business and personal services occupancies* only when the *occupant load* served by the *public corridor* does not exceed 30 persons and the dead-end portion does not exceed 30 ft in length, measured from the end of the corridor to the nearest *exit*. Such dead-end corridors shall contain no door openings other than to individually rented rooms or suites, and such door openings shall be located so that it is not necessary to pass more than 2 doors in travelling to the nearest *exit*. Doors in such openings shall be equipped with self-closing devices and shall be designed not to lock automatically.

9.9.8.7. Dead-end *public corridors* in *mercantile occupancies* and dead-end *public corridors* which do not conform to the requirements in Articles 9.9.8.5. and 9.9.8.6. are permitted provided the areas served by the dead-end portion have a second and separate *means of egress*.

Number of egress doors

9.9.8.8. Except as provided in Article 9.9.7.7., at least 2 egress doors shall be provided when the area of an individually owned or rented room or suite of rooms, or the distance measured from any point within the room or suite to the nearest door opening directly into a *public corridor*, exceeds the values in Table 9.9.8.A. 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

9.9.8.9. Required *access to exit* from individually rented rooms, suites of rooms or *dwelling units* shall not be through any other *dwelling unit*, *service room* or other *occupancy*.

Table 9.9.8.A.

Forming part of Article 9.9.8.8.

SINGLE EGRESS DOORS FROM ROOMS OR SUITES		
Occupancy of Room, Suite or *Floor Area*	Maximum Area of Room, Suite or *Floor Area*, sq ft	Maximum Distance to Egress Door, ft
Group C	1,000(1)	50(1)
Group D	2,000	75
Group E	1,500	50
Group F, Division 2	1,500	35
Group F, Division 3	2,000	50
Column 1	2	3

Note to Table 9.9.8.A.:
(1) See Article 9.9.7.7. for *dwelling units*.

SUBSECTION 9.9.9. EXIT SIGNS

9.9.9.1. This Subsection applies to all *exits* except those serving not more than 1 *dwelling unit*. Scope

9.9.9.2. *Exits* shall be located so as to be clearly visible or their locations shall be clearly indicated. Location

9.9.9.3. Except for the main entrance door to a *building*, every *exit* door in a 3-*storey building*, or a *building* having an *occupant load* greater than 150, shall have an *exit* sign over it.

9.9.9.4. *Exit* direction signs shall be placed in corridors and passageways where necessary to indicate the direction of *exit* travel. Exit direction sign

9.9.9.5. *Exit* signs shall be installed so as to be visible from the *exit* 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 ¾-in.-wide strokes and be at least 6 in. high when the signs are externally lighted, and at least 4½ in. high if the sign is internally lighted.

9.9.9.6. Provisions shall be made to illuminate *exit* signs required in Article 9.9.9.3. by an electrical circuit separate from other electrical circuits. Illumination

9.9.9.7. In 3-*storey buildings* any part of an *exit* ramp or stair that continues past the *exit* door at ground level shall be clearly marked to indicate that it does not lead to an *exit*, where there is a possibility that the portion below ground level may be mistaken as the direction of *exit* travel.

SUBSECTION 9.9.10. LIGHTING

Scope

9.9.10.1. This Subsection applies to the lighting of all *exits* except those serving not more than 1 *dwelling unit.*

Means of egress lighting

9.9.10.2. Every *exit* and *public corridor* shall be provided with lighting in accordance with the requirements in Article 9.35.2.9.

Emergency lighting

9.9.10.3. Emergency lighting shall be provided in *exits,* corridors used by the public and principal routes providing *access to exit* in an open *floor area* where such *exits,* corridors and access routes are below *grade,* are windowless or are required in *buildings* in Subsection 9.10.18. to have a fire alarm system.

Automatic emergency lighting

9.9.10.4. Emergency lighting required in Article 9.9.10.3. shall be provided from a source of energy separate from the electrical supply for the *building.* 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 1 footcandle for a period of at least ½ hr. Where incandescent lighting is provided, lighting equal to 1 W per 10 sq ft of floor area shall be considered to meet this requirement.

9.9.10.5. 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

Scope of fire protection

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.*

SUBSECTION 9.10.2. GENERAL

Support of rated assemblies

9.10.2.1. Except as provided in Article 9.10.2.2., a construction required to have a *fire-resistance rating* shall be supported by construction having at least the same *fire-resistance rating.*

9.10.2.2. Floors over crawl spaces that are not required by Article 9.10.8.4. to have a *fire-resistance rating* and construction supporting a *service room* need not conform to Article 9.10.2.1. (See Note (4) to Table 9.10.8.A.)

Support of noncombustible construction

9.10.2.3. An assembly required to be of *noncombustible construction* shall be supported by *noncombustible construction.*

Connected buildings

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 9.10.11.10.

Basements or cellars

9.10.2.5. For the purposes of this Section, a basement or cellar means any *storey* located below the *first storey.*

9.10.2.6. Facilities for the dispensing of gasoline shall not be installed above any space intended for *occupancy* or in any *building,* except that this requirement does not apply to a canopy which is open on at least 75 per cent of its perimeter or, when *approved,* to a *building* of Group F *occupancy.* — Gasoline dispensing

9.10.2.7. In kitchens containing commercial cooking equipment used in processes producing grease-laden vapours, the equipment shall be designed and installed in conformance with Sentence 2.3.5.(3) of the ACNBC Canadian Heating, Ventilating and Air-Conditioning Code 1977. — Commercial cooking equipment

9.10.2.8. The finish of every garage floor shall be of asphalt, *noncombustible* material or other *approved* material. — Garage floors

9.10.2.9. Tents, air-supported structures, transformer vaults, covered malls, *walkways,* elevators and escalators shall conform to Part 3 of this Bylaw. — Tents, etc.

9.10.2.10. 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 of this Bylaw. — Openings through floors

9.10.2.11. 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 of this Bylaw. — Special occupancies

9.10.2.12. Where fuel-fired *appliances* are installed on a roof, such *appliances* shall be installed in conformance with the ACNBC Canadian Heating, Ventilating and Air-Conditioning Code 1977. — Roof top appliances

9.10.2.13. Where sprinkler, standpipe and hose systems or fire alarm and detection systems are installed, they shall be installed to conform to Part 6 of this Bylaw. — Sprinklers, standpipes, fire alarm and detection systems

SUBSECTION 9.10.3. OCCUPANCY 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.

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. — Building classification

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). — Residential 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, fire stations, self-service laundries, medical offices, offices, police stations without detention quarters, radio stations, small tool and appliance rental and service establishments and telephone exchanges. — Business and personal services occupancy

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 10 lb or 100,000 Btu per sq ft 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 of this Bylaw 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 10 lb or 100,000 Btu per sq ft 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

Test methods

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 the test methods described in Part 3 of this Bylaw, in NBC Supplement No. 2, "Fire Performance Ratings 1977" or in Tables I-A, I-B and I-C. (See page 354.)

Flame-spread rating

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 of this Bylaw, or in accordance with NBC Supplement No. 2, "Fire Performance Ratings 1977." 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.

Floors and roofs

9.10.4.3. Floor and roof assemblies shall be rated for exposure to fire on the underside.

Exterior walls

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 4 ft, and due allowance is made for the effects of heat radiation in accordance with the requirements in Part 3 of this Bylaw.

Firewalls

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.

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 *approved* 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. to 9.10.5.4., a membrane forming part of an assembly required to have a *fire-resistance rating* shall not be pierced by openings into the assembly unless the assembly has been tested and rated for such openings.

Permitted 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 *noncombustible* electrical and similar service outlet boxes provided such outlet boxes are tightly fitted.

Openings for ducts

9.10.5.3. Except as provided in Article 9.10.5.4., 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 7 ft apart and do not constitute more than 1 per cent of the ceiling area within a *fire compartment.* Individual openings shall not exceed 1 sq ft in area, and if greater than 20 sq in shall be protected by a *fire stop flap* as described in Article 9.10.14.10.

9.10.5.4. Where ducts within a ceiling space are protected within such space by construction providing a *fire-resistance rating* of not less than ½ that required for the assembly, the opening into such ducts through a ceiling membrane is not restricted as described in Article 9.10.5.3.

SUBSECTION 9.10.6. CONSTRUCTION TYPES

Non-combustible construction

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. of Part 3 of this Bylaw.

Heavy timber construction

9.10.6.2. *Heavy timber construction* shall be considered to have ¾-hr *fire-resistance rating* when it is constructed in accordance with the requirements for *heavy timber construction* in Part 3 of this Bylaw.

SUBSECTION 9.10.7. PROTECTION OF STEEL MEMBERS

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 in an *approved* manner to provide the required *fire resistance.*

Lintels

9.10.7.2. Steel lintels in *loadbearing* walls spanning not more than 6 ft and steel lintels in non-*loadbearing* walls spanning not more than 10 ft need not be protected.

Shelf angles

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.

Elevator shafts

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.

Stairs and escalators

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.

Porches, balconies, stairways, fire escapes, cornices and marquees

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*.

9.10.7.7. Except in *buildings* of *medium hazard industrial occupancy* or *mercantile occupancy*, steel members not less than 10 ft from a property line or a centreline of a public thoroughfare and which are at least 3 ft away from an *unprotected opening* need not be protected.

Loadbearing walls, columns and arches

9.10.7.8. *Loadbearing* steel or concrete members such as columns, beams and arches at least 10 ft 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.

SUBSECTION 9.10.8. FIRE RESISTANCE IN RELATION TO OCCUPANCY AND HEIGHT

Fire-resistance ratings

9.10.8.1. *Fire-resistance ratings* of floors, roofs, walls, columns, arches and *mezzanines* shall conform to Table 9.10.8.A., except that where a *mezzanine* is required to be counted as a *storey* in Article 9.10.8.6., it shall be constructed in conformance with the requirements in Column 4 of Table 9.10.8.A. for other floor assemblies.

9.10.8.2. Except as permitted in Article 9.10.8.3., 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 ¾ hr.

9.10.8.3. 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 9.10.8.2. provided they are not classified as Group F, Division 2 *occupancies*.

Crawl space

9.10.8.4. Where a crawl space exceeds 6 ft 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.

Storey height

9.10.8.5. 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.

Table 9.10.8.A.

Forming Part of Article 9.10.8.1.

MINIMUM REQUIRED FIRE-RESISTANCE RATINGS FOR STRUCTURAL MEMBERS AND ASSEMBLIES, hr						
Major occupancy	Maximum *Building Height, Storeys*	*Building* Element				
		Floors Above Basements and Cellars	Other Floors Except Floors Over Crawl Spaces	*Mezzanines*	Roofs	*Loadbearing* Walls, Columns and Arches
Residential (Group C)	3	¾[2]	¾[2]	¾[3]	—	[1]
Business and personal services (Group D)	2	¾	¾[3]	—	—	[4]
	3	1	¾[3]	¾[3]	¾[3]	[4]
Mercantile (Group E)	2	¾	¾	—	—	[1]
	3	1 [5]	¾	¾[3]	¾	[4]
Medium hazard industrial (Group F Division 2)	2	¾	¾[3]	—	—	[4]
	3	1 [6]	¾	¾[3]	¾[3]	[4]
Low hazard industrial (Group F Division 3)	2	¾	¾[3]	—	—	[4]
	3	1	¾[3]	¾[3]	¾[3]	[4]
Column 1	2	3	4	5	6	7

Notes to Table 9.10.8.A.:

[1] *Fire-resistance rating* shall be not less than that required for supported construction.

[2] No *fire-resistance rating* is required for floors within a *dwelling unit* where there is no *dwelling unit* above another *dwelling unit* or above another *major occupancy.*

[3] No *fire-resistance rating* is required if built of *noncombustible construction,* but such floor assemblies shown in Column 4 shall be constructed as a *fire separation.*

[4] *Fire-resistance rating* shall be not less than that required for the supported assembly, except that when the supported assembly is not required to be a *fire separation,* unrated *noncombustible construction* may be used for *loadbearing* walls, columns and arches.

[5] May be of *heavy timber construction* where basement or cellar is *sprinklered.*

[6] Shall be of *noncombustible construction.*

9.10.8.6. *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 42 in. 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*.

Roofs considered as walls

9.10.8.7. Roofs with slopes at 60 deg. or more to the horizontal and which are adjacent to a room or space intended for *occupancy* shall be considered as a wall in applying the requirements in Article 9.10.8.1.

Basements and cellars

9.10.8.8. Basements and cellars containing more than one *storey* or exceeding 6,000 sq ft in area shall conform to the requirements contained in Part 3 of this Bylaw.

9.10.8.9. Where a *storage garage* is located below the *first storey* and is connected to 2 or more spatially separated portions of the same *building* extending above the *storage garage*, each such separated portion may be considered as a separate *building* for the purpose of this Section provided the *storage garage* is separated from the remainder of the *building* by a *noncombustible fire separation* having a *fire-resistance rating* of at least 2 hr.

SUBSECTION 9.10.9. FIRE SEPARATIONS BETWEEN ROOMS AND SPACES WITHIN BUILDINGS

Scope

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*.

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*.

Closures

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.

Floor assemblies

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*.

Openings in 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*, the *authority having jurisdiction* may permit the omission of *closures* for such openings provided adequate precautions are taken to offset the fire hazard caused by such openings.

Crawl spaces

9.10.9.6. Where a crawl space is not required by Article 9.10.8.4. to be constructed as a basement or cellar, the floor above it need not be constructed as a *fire separation*.

Open stairways

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*.

Openings in floors for ramps

9.10.9.8. Openings in floors for vehicle ramps in a *low hazard industrial occupancy* need not be protected with *closures*.

Fire stopping of pipes and ducts

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. Unenciosed ducts that penetrate through a required *fire separation* shall be provided with *fire dampers* installed to conform to the ACNBC Canadian Heating, Ventilating and Air-Conditioning Code 1977 (see also Subsection 9.10.5.).

Pipes, ducts, outlet boxes, etc.

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 1 in. in overall diameter or enclosed in a *noncombustible* conduit shall be permitted without such tests. Where wires are grouped together, the 1-in. 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 ¾ hr, the *fire-resistance rating* of the ceiling may be reduced to 30 min.

Separation of major occupancies

9.10.9.15. Except as provided in Articles 9.10.9.16. and 9.10.9.17., 2 or more *major occupancies* having different *occupancy* classifications shall be separated from each other by a *fire separation* having a *fire-resistance rating* of not less than 1 hr.

9.10.9.16. A *medium hazard industrial occupancy* shall be separated from a *residential occupancy* by a *fire separation* having not less than a 2-hr *fire-resistance rating.*

9.10.9.17. Where 3 or more *dwelling units* are contained in a *building* having a *mercantile occupancy,* such *mercantile occupancy* shall be separated from the *dwelling units* by a *fire separation* having not less than a 2-hr *fire-resistance rating.*

Separation between suites, rooms and dwelling units

9.10.9.18. In *buildings* classified as *residential occupancy, dwelling units* containing not more than 1 *storey,* suites and sleeping rooms that do not form part of a suite shall be separated from adjacent *dwelling units,* suites and rooms by a *fire separation* having a *fire-resistance rating* of at least ¾ hr.

9.10.9.19. *Dwelling units* which contain 2 or more floor levels including basements or cellars shall be separated from adjacent *dwelling units* and from other parts of the *building* by a *fire separation* having a *fire-resistance rating* of not less than 1 hr.

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 ¾-hr *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 15 ft in unobstructed width. No *fire separation* is required for such corridors where they exceed 15 ft 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.*

Separation of garages

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-hr *fire-resistance rating.* A *repair garage* shall be separated from other *occupancies* by a *fire separation* having not less than a 2-hr *fire-resistance rating.*

Separation of storage garages, 5 cars or fewer

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 hr.

Separation of garages serving 1 dwelling unit

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-resistant rating* required in Article 9.10.9.23. need not be provided for the separation 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 9.10.14.13. 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, D, E, I or K finishes in Tables I-A to I-C, or the ceiling of the garage shall be protected with a similar membrane.

Separation of shafts, chutes and service rooms

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.

9.10.9.26. *Combustible* drain, waste and vent piping shall not be used in a *plumbing system* within a *building* where part of the system is located within or passes through a *fire separation,* except that where drain, waste and vent piping penetrates through a vertical *fire separation,* the piping on one side of the separation may be *combustible* provided the *combustible* piping is not located in a vertical shaft or in a *fire separation.*

SUBSECTION 9.10.10. SERVICE ROOMS

Application

9.10.10.1. This Subsection applies to *service rooms* in all *buildings* except rooms located within a *dwelling unit.*

Fire separation

9.10.10.2. Except as required in Articles 9.10.10.3., 9.10.10.6. and 9.10.10.10., *service rooms* shall be separated from the remainder of the *building* by a *fire separation* having a *fire-resistance rating* of at least 1 hr when the *floor area* containing the *service room* 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.

9.10.10.4. Except as provided in Articles 9.10.10.5. and 9.10.10.6., or unless otherwise permitted by the *authority having jurisdiction,* fuel-fired *appliances* other than fireplaces shall be located in a *service room* or *service space* designed for that purpose, and separated from the remainder of the *building* by a *fire separation* having not less than a 1-hr *fire-resistance rating.* Separation of fuel-fired appliances

9.10.10.5. Where prior approval has been obtained from the *authority having jurisdiction,* fuel-fired *space-heating appliances,* space-cooling *appliances* and *service water heaters* that serve a single room, space or suite of rooms, or serving a *building* having a *building area* of not more than 4,000 sq ft containing not more than 2 *storeys* in *building height* need not be separated from the remainder of the *building* as required in Article 9.10.10.4. Exception

9.10.10.6. *Service rooms* containing incinerators shall be separated from the remainder of the *building* by a *fire separation* having a *fire-resistance rating* of not less than 2 hr. Incinerator rooms

9.10.10.7. The design, construction, installation and alteration of each indoor incinerator shall conform to NFPA 82-1972, "Incinerators and Rubbish Handling." Incinerators

9.10.10.8. Every incinerator shall be connected to a *chimney flue* conforming to the requirements in Section 9.21. Such *chimney flue* shall serve no other *appliance.* Chimneys for incinerators

9.10.10.9. An incinerator shall not be located in a room with other fuel-fired *appliances* unless permitted by the *authority having jurisdiction.*

9.10.10.10. Rooms for the temporary storage of *combustible* refuse in all *occupancies* or for public storage in *residential occupancies* shall be separated from the remainder of the *building* by a *fire separation* having not less than a 1-hr *fire-resistance rating,* except that a ¾-hr *fire separation* is permitted where the *fire-resistance rating* of the floor assembly is not required to exceed ¾ hr, or where such rooms are *sprinklered.* Storage rooms

SUBSECTION 9.10.11. FIREWALLS

9.10.11.1. Except as provided in Article 9.10.11.2., a *party wall* on a property line shall be constructed as a *firewall.* Firewalls

9.10.11.2. In a *building* of *residential occupancy* in which there is no *dwelling unit* above another *dwelling unit,* a *party wall* on a property line between *dwelling units* need not be constructed as a *firewall* provided it is constructed as a *fire separation* having not less than a 1-hr *fire-resistance rating.* 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 *noncombustible* material. Party walls between dwelling units

9.10.11.3. A required *firewall* (see Articles 9.10.2.4. and 9.10.11.1.) shall be constructed as a *fire separation* of *noncombustible construction* having a *fire-resistance rating* of not less than 2 hr, except that where there is a *mercantile* or *medium hazard industrial occupancy* adjacent to a *firewall,* the *fire-resistance rating* of the firewall shall be not less than 4 hr. Except for *closures,* the required *fire-resistance rating* of every *firewall* shall be provided by masonry or concrete. Fire-resistance rating

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 ½ 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.

Piping and conduit

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.*

Parapets for firewalls

9.10.11.7. Except as permitted in Article 9.10.11.8., every *firewall* shall extend from the top of the footings continuously through all *storeys* and not less than 6 in. above the roof surface where the *firewall* is required to have a 2-hr *fire-resistance rating,* and not less than 36 in. above the roof surface where the *firewall* is required to have a 4-hr *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 10 ft.

Parapet not required

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-hr *fire-resistance rating* where the *firewall* is required to have a 2-hr *fire-resistance rating,* and not less than a 2-hr *fire-resistance rating* where the *firewall* is required to have a 4-hr *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.*

Openings

9.10.11.9. 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 650F° after 30 min. when a 2-hr *firewall* is required, and 450F° after 30 min. when a 4-hr *firewall* is required, when tested in conformance with the test method described in Part 3 for *closures.*

External walls meeting at a firewall

9.10.11.10. Where the external walls of 2 *buildings* meet at a *firewall* at an external angle of 135 deg. or less, the requirements of Article 9.10.15.12. shall apply.

SUBSECTION 9.10.12. CHUTES AND VERTICAL SHAFTS

Scope

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.*

9.10.12.2. Where a vertical shaft penetrates a floor construction required to be a *fire separation,* the shaft shall be separated from the *floor area* by a *fire separation.*

Fire-resistance rating

9.10.12.3. Except as provided in Article 9.10.12.5., where the floor assembly through which a shaft passes is required to be a *fire separation,* the shaft walls shall have a *fire-resistance rating* conforming to Table 9.10.12.A.

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.

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* of Floor Assembly Through Which the Shaft Passes, hr	Type of Shaft	
	Exit and Elevator Shafts, hr	Other Shafts, hr
Less than ¾	¾	—
¾	¾	¾
1	¾	¾
1½	1	1
2	1½	1
Column 1	2	3

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 hr where the chute outlet is protected with an *approved* 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-hr *fire-resistance rating.*

Lining

9.10.12.6. Linen and refuse chutes shall be lined with not less than 0.016-in.-thick copper-bearing galvanized steel, 0.019-in.-thick aluminum or other *approved* material.

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 30 in., separated from the remainder of the *building* by a *fire separation* having a *fire-resistance rating* of not less than ¾ hr. Such compartment shall be used only as a facility for separating the intake opening from the remainder of the *floor area,* unless otherwise permitted by the *authority having jurisdiction,* 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 hr in the case of linen chutes and not less than 2 hr 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 other service equipment unless permitted by the *authority having jurisdiction.*

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.

Venting

9.10.12.12. Refuse and linen chutes exceeding 1 sq ft in cross-sectional area shall be vented to the exterior to conform to Part 6 of this Bylaw.

SUBSECTION 9.10.13. PREVENTION OF FIRE SPREAD AT EXTERIOR WALLS AND BETWEEN STOREYS

Separation of openings

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 3 ft of wall, or a canopy or balcony not less than 3 ft 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 hr.

9.10.13.2. Except as provided in Articles 9.10.2.10., 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 9.10.8.6.

Protection of openings above roofs

9.10.13.4. Where an exterior wall of a *building* is located above an adjacent roof having a *fire-resistance rating* of less than 1 hr and is part of a *fire compartment* in the same *building,* separate from that enclosed by the roof, every opening in such wall above the roof and within 15 ft horizontally of the roof shall be protected with wired glass in steel frames or glass blocks.

Exterior walls meeting at an angle

9.10.13.5. Except as provided in Article 9.10.15.12., where exterior walls of a *building* meet at an external angle of 135 deg. or less, the horizontal distance from an opening in one wall to another opening in the other wall shall be not less than 4 ft where the openings are in different *fire compartments.*

SUBSECTION 9.10.14. DOORS, DAMPERS AND OTHER CLOSURES IN FIRE SEPARATIONS

Installation

9.10.14.1. Openings in required *fire separations* shall be protected with *closures* conforming to Table 9.10.14.A., which shall be installed in accordance with NFPA 80-1975, "Fire Doors and Windows," unless otherwise specified herein (see also Article 9.10.4.1.).

Doors in a public means of egress

9.10.14.2. 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

9.10.14.3. Wired glass which 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 hr provided such glass is not less than ¼ in. thick and conforms to CGSB 12-GP-11(1973), "Glass, Wired, Safety for Building Construction." Such glass shall be mounted in fixed steel frames. Individual panes of such glass shall not exceed 9 sq ft in area or 4 ft 6 in. in height or width, and the area of glass between structural mullions shall not exceed 80 sq ft.

Glass block

9.10.14.4. 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 hr provided each horizontal joint is reinforced with metal.

Table 9.10.14.A.

Forming Part of Article 9.10.14.1.

FIRE-PROTECTION RATINGS FOR CLOSURES	
Minimum *Fire-Resistance Rating* of *Fire Separation,* hr	Minimum *Fire-Protection Rating* of *Closure,* hr
Less than ¾	No minimum
¾	⅓[1],[2]
1	¾[1],[2]
1½	1
2	1½
3	2
4	3
Column 1	2

Notes to Table 9.10.14.A.:

(1) A 1¾-in.-thick solid core wood door may be used where a minimum *fire-protection rating* of ⅓ hr is permitted, or between a *public corridor* and an individually rented room, *dwelling unit* or suite of rooms. Such door shall have not more than ¼-in. clearance beneath and not more than ⅛ in. at the sides and top. Such doors shall conform to CSA O132.2-1972, "Wood Doors."

(2) Doors required to provide a ⅓-hr *fire-protection rating* or permitted to be 1¾-in. solid core wood shall be mounted in a wood frame of at least 2-in. thickness where the frame has not been tested and rated.

Maximum closure size

9.10.14.5. *Closures* in *fire separations* shall not exceed 120 sq ft in area, and 12 ft in height or width. Except in *exits* the aggregate width of such openings shall not exceed 25 per cent of the length of the *fire separation* in which they occur.

Self-closing devices and latches

9.10.14.6. Every door in an interior *fire separation* shall have an *approved* self-closing device and latch or other *approved* device designed to close and hold the door closed, except that self-closing devices need not be provided for doors between *public corridors* and rooms or suites of *business and personal services occupancy.*

9.10.14.7. Where permitted by the *authority having jurisdiction, approved* hold-open devices may be installed on *closures* except in *exit* stairshafts provided the safety of the occupants is not impaired. Such devices shall be actuated by *approved smoke detectors,* the *building* alarm system or an *approved* heat actuated device designed for this purpose.

Service room doors

9.10.14.8. 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 9.9.2.6.)

Fire dampers

9.10.14.9. Except as permitted in Articles 9.10.2.7., 9.10.5.3., 9.10.5.4., 9.10.14.10, 9.10.14.11. and 9.10.14.12., where a duct pierces a vertical *fire separation* required to have a *fire-resistance rating,* a *fire damper* shall be installed in the duct at the *fire separation* in conformance with Article 2.4.9. of the ACNBC Canadian Heating, Ventilating and Air-Conditioning Code 1977.

Fire stop flaps

9.10.14.10. *Fire stop flaps* in ceiling membranes required in Article 9.10.5.3. shall be constructed of not less than 0.058-in.-thick sheet steel with 1/16-in.-thick asbestos on the unexposed side and be equipped with corrosion-resistant pins and hinges. Such flaps shall be designed to close automatically at a temperature 50F° above the maximum temperature that will normally be encountered in the system.

Fire dampers not required

9.10.14.11. When a *noncombustible* branch duct having a melting point of at least 1,400°F and a cross-sectional area less than 20 sq in supplies only air-conditioning units or combined air-conditioning and heating units discharging air at not more than 4 ft above the floor, no *fire damper* is required where the branch duct pierces a required *fire separation* provided the duct does not pierce the floor at more than one place.

9.10.14.12. Where a *noncombustible* branch duct having a melting point of at least 1,400°F pierces a required *fire separation* around an *exhaust duct* riser in which the air flow is upward, no *fire damper* is required provided the branch duct is carried up the riser at least 22 in.

Doors between garages and dwelling units

9.10.14.13. 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.

9.10.14.14. Where a 1¾-in.-thick solid core wood door is permitted in a required *fire separation*, the requirement for a *noncombustible* sill in NFPA 80-1975, "Fire Doors and Windows" shall not apply.

Door stops

9.10.14.15. Where a door is installed so that it may damage the integrity of a *fire separation* if its swing is unrestricted, *approved* door stops shall be installed to prevent such damage.

SUBSECTION 9.10.15. SPATIAL SEPARATIONS BETWEEN BUILDINGS

9.10.15.1. 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. of Part 3 of this Bylaw, whichever is the least restrictive for the *occupancy* being considered.

9.10.15.2. Where a paid or volunteer fire department is not available, the *limiting distance* determined from 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 9.10.14.3. and 9.10.14.4.

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 30 ft.

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 10 ft.

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*	*Limiting Distance*											
		Less than 4 ft	4 ft	6 ft	8 ft	10 ft	15 ft	20 ft	30 ft	40 ft	50 ft	60 ft	80 ft
Residential, business and personal services, and *low hazard industrial*	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	—
Mercantile and *medium hazard industrial*	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

Design of exposing building face

9.10.15.7. Except as permitted in Articles 9.10.15.8. and 9.10.15.9., each *exposing building face* shall be constructed to conform to Table 9.10.15.B. and Subsection 9.10.8.

Fire resistance of exterior walls of houses

9.10.15.8. Except as required in Article 9.10.15.11., 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 ¾ hr where the *limiting distance* is less than 4 ft, and when the *limiting distance* is less than 2 ft, 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 4 ft and shall be limited in conformance with the requirements for *unprotected openings* in Article 9.10.15.1. where the *limiting distance* is 4 ft or greater.

Fire resistance of a garage serving a dwelling unit

9.10.15.9. Except as required in Article 9.10.15.11., the *exposing building face* of a detached garage that serves 1 *dwelling unit* only shall have a *fire-resistance rating* of at least ¾ hr, except that no *fire-resistance rating* is required where the *limiting distance* is 2 ft 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*.

Unrated non-combustible construction permitted

9.10.15.10. Except as required in Article 9.10.15.11., 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,

Table 9.10.15.B.

Forming Part of Article 9.10.15.7.

MINIMUM CONSTRUCTION REQUIREMENTS FOR EXTERIOR WALLS		
Occupancy Classification of *Building*	Maximum Percentage of *Unprotected Openings* Permitted (See Article 9.10.15.1.), per cent	Minimum Required *Fire-Resistance Rating* for *Exposing Building Face*,[1] hr
Residential, business and personal services, and *low hazard industrial*	10 25 Less than 100	1[2][3] 1[3] ¾
Mercantile, and *medium hazard industrial*	10 25 Less than 100	2[2][3] 2[3] 1
Column 1	2	3

Notes to Table 9.10.15.B.:

[1] Heavy timber and steel columns need not comply with these requirements where the *limiting distance* is 10 ft or more.

[2] Shall be of *noncombustible construction.*

[3] Cladding shall be *noncombustible.*

non-*loadbearing* wall components need not have a minimum *fire-resistance rating* provided the *limiting distance* is 10 ft or more.

9.10.15.11. 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 9.10.15.10. shall be doubled.

Firewalls

9.10.15.12. Where 2 exterior walls meet at a *firewall* at an external angle of 135 deg. 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. in Part 3 of this Bylaw.

SUBSECTION 9.10.16. FIRE STOPPING

Fire stopping between storeys

9.10.16.1. *Fire stops* shall be provided at floor, ceiling and roof levels to cut off all concealed draft openings occurring between *storeys* and between the top *storey* and roof space.

9.10.16.2. *Fire stops* shall be provided at the ceiling and floor level of furred walls and *partitions.* The vertical dimension of any concealed space in a wall or *partition* of *combustible construction* shall not exceed 10 ft.

Stairs

9.10.16.3. *Fire stops* shall be provided at the top and bottom of each run of stairs where they pass through a floor containing concealed space.

Concealed spaces

9.10.16.4. In unsprinklered *buildings* of *combustible construction,* every concealed space created by a suspended ceiling, roof space or unoccupied attic space shall be separated by *fire stops* into draft-tight compartments not more than 3,000 sq ft in area where such space contains materials having a *flame-spread rating* greater than 25. No dimension of such space shall exceed 60 ft.

9.10.16.5. Concealed spaces in mansard roofs, exterior cornices, balconies and canopies of *combustible construction* shall be *fire stopped* from the point where such concealed spaces extend across the ends of required *fire separations.* Mansard roofs, balconies and canopies

9.10.16.6. *Fire stops* shall consist of not less than 0.036-in. sheet steel, ¼-in. asbestos board, ½-in. gypsum board, ½-in. plywood with joints backed with similar material, 2 layers of 1-in. lumber with joints staggered or 2-in. lumber. Fire-stopping materials

9.10.16.7. Where *fire stops* are pierced by pipes, ducts or other elements, the effectiveness of the *fire stops* shall be maintained around such elements. Pipes and ducts piercing fire stops

SUBSECTION 9.10.17. INTERIOR FINISH FLAME SPREAD LIMITS

9.10.17.1. Except as provided in Articles 9.10.17.2. to 9.10.17.6., the exposed surface of every wall and ceiling shall have a surface *flame-spread rating* of not more than 150. Flame-spread rating of interior finishes

9.10.17.2. Not less than 90 per cent of the exposed surface of every ceiling in an *exit,* or unsprinklered ceiling in a *public corridor* shall have a surface *flame-spread rating* of not more than 25. Means of egress ceilings

9.10.17.3. Not less than 90 per cent of the exposed surfaces of every wall of an *exit,* exclusive of doors, shall have a surface *flame-spread rating* of not more than 25, except that 25 per cent of the wall surface of a lobby at or near *grade* used as an *exit* may have a surface *flame-spread rating* of not more than 150. Exit walls

9.10.17.4. At least 90 per cent of the total wall surface, exclusive of doors, in any unsprinklered *public corridor* shall have a surface *flame-spread rating* 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 *flame-spread rating* of not more than 25. Walls in a public access to exit

9.10.17.5. Where a *public corridor* or a corridor used by the public contains an *occupancy,* the interior finish materials used on the walls or ceiling of such *occupancy* shall have a *flame-spread rating* in conformance with that required for *public corridors.*

9.10.17.6. Where transparent or translucent lighting elements such as light diffusers and lenses are used which have *flame-spread ratings* that exceed those permitted for the ceiling finish, such elements shall conform to the requirements of Article 3.1.11.1. of Part 3 of this Bylaw. Plastic light diffusers and lenses

9.10.17.7. Where a covering or a lining is used with a duct, such lining or covering shall have a *flame-spread rating* conforming to Article 2.4.6. of the ACNBC Canadian Heating, Ventilating and Air-Conditioning Code 1977. Duct covers and liners

SUBSECTION 9.10.18. ALARM AND DETECTION SYSTEMS

9.10.18.1. Except as provided in Articles 9.10.18.3. to 9.10.18.5., an *approved* fire alarm system shall be provided in *buildings* containing 4 *storeys* including *storeys* below *grade.*

9.10.18.2. Except as provided in Article 9.10.18.3., in any *building* where a fire alarm system is required, *approved heat detectors* or *smoke detectors* shall be installed in storage rooms, storage locker rooms, *service rooms* including furnace rooms and incinerator rooms, elevator shafts, chutes, *exit* stair shafts, janitors' closets and any other rooms where hazardous substances are intended to be used or stored.

9.10.18.3. Where a *building* is *sprinklered* and the sprinkler system electrically supervised and equipped with a water flow alarm, a fire detection system is not required.

Exceptions

9.10.18.4. A fire alarm and a fire detection system need not be provided in *buildings* of *residential occupancy* where each *dwelling unit* or individually rented sleeping room has direct access to outdoors by a door at ground level or to a balcony with access to ground level.

9.10.18.5. An *approved* fire alarm and a fire detection system shall be provided where sleeping accommodation is provided for more than 10 persons in *buildings* of *residential occupancy,* except that such systems need not be provided in *buildings* where the *public corridor* or *exit* serves not more than 4 *dwelling units* or individually rented sleeping rooms.

Business and personal services occupancy

9.10.18.6. In *buildings* of *business and personal services occupancy,* an *approved* fire alarm and fire detection system shall be provided where the *occupant load* above or below the *first storey* exceeds 150.

Mercantile occupancy

9.10.18.7. In *buildings* of *mercantile occupancy,* an *approved* fire alarm and fire detection system shall be provided where the total *occupant load* exceeds 300 or where the *occupant load* above or below the *first storey* exceeds 150.

9.10.18.8. In *buildings* of *medium hazard industrial occupancy* an *approved* fire alarm system shall be provided where the total *occupant load* exceeds 100 or where the *occupant load* above or below the *first storey* exceeds 25.

Low hazard industrial occupancy

9.10.18.9. In *buildings* of *low hazard industrial occupancy* an *approved* fire alarm and fire detection system shall be provided where the *occupant load* above or below the *first storey* exceeds 75 or where the *occupant load* of the *building* is 500 persons or more.

Smoke detection systems

9.10.18.10. Except for a recirculating air system serving not more than 1 *dwelling unit,* an *approved* smoke detection system shall be installed in recirculating air systems in *residential occupancies* where such systems supply more than 1 *storey* or more than 1 individually rented room or suite of rooms (see also Article 9.33.4.2.).

Buildings of mixed occupancy

9.10.18.11. In *buildings* of mixed *occupancy* the most restrictive fire alarm and detection requirements shall apply to all *occupancies.*

Installation

9.10.18.12. Fire alarm, fire detection and smoke detection devices shall be installed in accordance with Part 6 of this Bylaw.

SUBSECTION 9.10.19. FIRE FIGHTING

Access wall panels

9.10.19.1. Except as provided in Article 9.10.19.2., a window or access panel providing an opening not less than 42 in. high and 22 in. wide and having a sill height of not more than 36 in. 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

9.10.19.2. Access panels as described in Article 9.10.19.1. need not be provided in *buildings* containing only *dwelling units* where there is no *dwelling unit* above another *dwelling unit.*

9.10.19.3. Except in basements serving not more than 1 *dwelling unit*, each unsprinklered basement or cellar exceeding 75 ft 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 42 in. high and 22 in. wide, the sill height of which shall not be more than 36 in. above the floor. Access may also be provided by an interior stair accessible from the outdoors. Access to basements

9.10.19.4. Access for fire department equipment shall be provided to each *building* by means of a *street*, private roadway or yard.

9.10.19.5. Where access to a *building* as required in Article 9.10.19.4. is provided by means of a private roadway or yard, the design and location of such roadway or yard shall be subject to the approval of the *authority having jurisdiction*, 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." Test method

SUBSECTION 9.11.2. REQUIRED SOUND CONTROL LOCATIONS (AIRBORNE SOUND)

9.11.2.1. Construction shall provide a sound transmission class rating of not less than 45 between *dwelling units* in the same *building* and between a *dwelling unit* and any space common to 2 or more *dwelling units*. Sound transmission rating

9.11.2.2. Every *service room* or space such as a storage room, laundry, workshop or building maintenance room or garage serving more than 1 *dwelling unit* shall be separated from the *dwelling units* by a construction providing a sound transmission class rating of not less than 45.

9.11.2.3. Construction described in Tables I-A to I-C of this Part as having airborne sound ratings of I and II shall be deemed to satisfy the requirements of Articles 9.11.2.1. and 9.11.2.2. (See page 354.) Airborne sound rating

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 1 ft 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 *grade* 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 500 sq ft in *building area*.

Table 9.12.2.A.

Forming Part of Article 9.12.2.2.

MINIMUM DEPTHS OF FOUNDATIONS				
Type of Soil[1]	Foundation Containing Heated Basement, Cellar, or Crawl Space		Foundation Containing No Heated Space	
	Good Soil Drainage to at Least the Depth of Frost Penetration[2]	Poor Soil Drainage	Good Soil Drainage to at Least the Depth of Frost Penetration[2]	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[2]
Silt	No limit	No limit	Below the depth of frost penetration[2]	Below the depth of frost penetration[2]
Clay or soils not clearly defined[3]	4 ft	4 ft	4 ft but not less than the depth of frost penetration[2]	4 ft but not less than the depth of frost penetration[2]
Column 1	2	3	4	5

Notes to Table 9.12.2.A.:

(1) A description of the soil types is provided in "Guide to the Field Description of Soils," published by the Associate Committee on Geotechnical Research, National Research Council of Canada (NRC No. 3813).

(2) Depth of frost penetration shall be as established by the *authority having jurisdiction*.

(3) Intended to apply to soils that are subject to significant volume changes with changes in soil moisture content.

SUBSECTION 9.12.3. BACKFILL

9.12.3.1. Backfill shall be placed to avoid damaging the drainage tile or the waterproofing of walls. Placing

9.12.3.2. Backfill shall be graded to prevent drainage towards the foundation after settling. Grading

9.12.3.3. Backfill within 2 ft of the foundation shall be free of deleterious debris and boulders larger than 10 in. diam. Boulders

SUBSECTION 9.12.4. TRENCHES BENEATH FOOTINGS

9.12.4.1. The soil in trenches beneath footings for sewers and watermains shall be compacted by tamping up to the level of the footing base, or shall be filled with concrete having a strength not less than 1,500 psi to support the footing. Trenches beneath footings

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. The method of application of all bituminous waterproofing and dampproofing materials shall conform to one of the following: Method of application

CGSB 37-GP-3b(1971), "Application of Emulsified Asphalts for Dampproofing or Waterproofing,"

CGSB 37-GP-12b(1971), "Application of Unfilled Cutback Asphalt for Dampproofing," or

CGSB 37-GP-22b(1971), "Application of Unfilled Tar Cutback 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-2c(1971), "Emulsified Asphalt Mineral Colloid Type, Unfilled, for Dampproofing and Waterproofing and for Roof Coatings,"

CGSB 37-GP-6c(1971), "Cutback Asphalt: Unfilled, for Dampproofing,"

CGSB 37-GP-16c(1971), "Cutback Asphalt: Filled, for Dampproofing and Waterproofing,"

CGSB 37-GP-18c(1971), "Cutback: Tar, Unfilled, for Dampproofing," or CSA A123.7-1973, "Asphalt for Use in Construction of Built-Up Roof Coverings and Dampproofing and Waterproofing Systems."

SUBSECTION 9.13.3. WATERPROOFING OF WALLS

Parging

9.13.3.1. Unit masonry walls to be waterproofed shall be parged on exterior surfaces below ground level with not less than ¼ in. 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.

Waterproofing membranes for walls

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.

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 3 in. 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 ¼ in. of mortar conforming to Section 9.20, and shall be coved 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 *approved* 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 2-mil polyethylene lapped 4 in. at the joints, or at least 2 mopped-on coats of bitumen 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 6-mil polyethylene or 45-lb roll roofing. Dampproofing shall be lapped not less than 4 in. at the joints.

9.13.6.3. When installed above the slab, dampproofing shall consist of at least 2 mopped-on coats of bitumen, 2-mil polyethylene or other material providing equivalent performance. Dampproof coatings

SECTION 9.14 DRAINAGE

SUBSECTION 9.14.1. SCOPE

9.14.1.1. This Section applies to subsurface drainage and to surface drainage. Drainage

9.14.1.2. Drainage for crawl spaces shall conform to Section 9.18. Drainage of crawl spaces

9.14.1.3. Drainage requirements beneath floor slabs shall conform to Section 9.16. Floor slabs

SUBSECTION 9.14.2. GENERAL

9.14.2.1. Unless otherwise permitted by the *authority having jurisdiction*, all exterior foundation walls shall be drained by drainage tile or pipe laid around the exterior of the foundation so that the top of the tile or pipe is below the bottom of the floor slab or crawl space. Footing tile drains

SUBSECTION 9.14.3. MATERIAL

9.14.3.1. Drain tile and drain pipe used for foundation drainage shall conform to the following: Drainage material specifications

ASTM A444-71, "Steel Sheet, Zinc Coated, (Galvanized) by the Hot-Dip Process for Culverts and Underdrains,"
ASTM C4-62(1975), "Clay Drain Tile,"
ASTM C700-74, "Vitrified Clay Pipe, Extra Strength, Standard Strength and Perforated,"
ASTM C412-74, "Concrete Drain Tile,"
ASTM C444-73, "Perforated Concrete Pipe,"
CGSB 34-GP-22b(1973), "Pipe: Drain Asbestos Cement,"
CGSB 41-GP-29a(1976), "Tubing, Drainage, Corrugated, Plastic," or
CSA B182.1-1967, "Plastic Drain and Sewer Pipe and Pipe Fittings for Use Underground."

9.14.3.2. Drain tile or pipe used for foundation drainage shall have at least a 4-in. diam.

SUBSECTION 9.14.4. INSTALLATION

9.14.4.1. Drain tile or pipe shall be laid on undisturbed or well-compacted soil.

9.14.4.2. Drain tile or pipe with butt joints shall be laid with ¼-in. to ⅜-in. open joints. The top half of such joints shall be covered with sheathing paper, 4-mil polyethylene or No. 15 asphalt or tar-saturated felt. Tile joints

9.14.4.3. The top and sides of drain pipe or tile shall be covered with not less than 6 in. of crushed stone or other coarse clean granular material containing not more than 10 per cent of material that will pass a No. 4 sieve. Granular cover

SUBSECTION 9.14.5. DRAINAGE DISPOSAL

9.14.5.1. Drain pipe or tile shall drain to a sewer, drainage ditch or dry well.

Sumps

9.14.5.2. Where gravity drainage is not practical, a covered sump with an automatic pump shall be provided to discharge the water into a sewer, drainage ditch or dry well.

Dry wells

9.14.5.3. Dry wells shall be not less than 15 ft from the *building* foundation and located so that drainage is away from the *building*. Dry wells may be used only when located in areas where the natural *groundwater level* is below the bottom of the dry well.

SUBSECTION 9.14.6. SURFACE DRAINAGE

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*.

9.14.6.2. Surface drainage shall be directed away from the location of a water supply well or septic tank disposal bed.

Interference with surface drainage

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.

Downspouts

9.14.6.4. Where downspouts are provided and are not connected to a sewer, provisions shall be made to prevent soil erosion.

SECTION 9.15 FOOTINGS AND FOUNDATIONS

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 of this Bylaw, 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 of Part 4 of this Bylaw.

(A description of soil types is provided in the "Guide to the Field Description of Soils," published by the Associate Committee on Geotechnical Research, National Research Council of Canada (see also notes to Table 9.4.7.A.).)

SUBSECTION 9.15.2. GENERAL

Deviation from specific requirements

9.15.2.1. The *authority having jurisdiction* may permit a foundation design to deviate from the requirements in this Section where it is designed for the existing soil conditions in accordance with accepted engineering practice or where past experience shows the foundation design to be adequate.

Concrete

9.15.2.2. Concrete shall conform to Section 9.3. Concrete for unreinforced footings and foundation walls shall have a minimum compressive strength of 2,000 psi after 28 days.

9.15.2.3. Concrete block shall be *loadbearing* type conforming to CSA A165.1-1972, "Concrete Masonry Units" and shall have a compressive strength over the gross area of the block of at least 1,000 psi for hollow units and 1,800 psi for solid units. Concrete block

9.15.2.4. Mortar, mortar joints, corbelling and protection for unit masonry shall conform to Section 9.20.

9.15.2.5. Where pier type foundations are used, the piers shall be designed to support the applied loads from the superstructure in conformance with good engineering practice.

9.15.2.6. 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 12 ft 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 14 ft 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 or rock.

9.15.3.3. Footings shall be of a size to support adequately all superimposed loads. Except as required in Article 9.15.3.4., the minimum footing size shall be as shown in Table 9.15.3.A. provided the length of supported joists does not exceed 16 ft and the design *live load* on any floor supported by the footing does not exceed 50 psf (Table 9.4.2.A.). Where the design *live load* exceeds 50 psf or the length of the supported joists exceeds 16 ft, footings shall be designed in accordance with Section 4.2 of this Bylaw. Size of footings

9.15.3.4. 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 shown in Table 9.15.3.A. Effect of water table depth

9.15.3.5. Footings for non-*loadbearing* masonry *partitions* shall be at least 8 in. wide for *partitions* up to 18 ft high and shall be increased by 4 in. for each additional 9 ft of height.

9.15.3.6. The thickness of footings shall be not less than the projection beyond the face of the supported elements, except where the footing is suitably reinforced. In no case shall the footing thickness be less than 4 in. Footing thicknesses

Table 9.15.3.A.

Forming Part of Articles 9.15.3.3. and 9.15.3.4.

MINIMUM FOOTING SIZES			
No. of Floors Supported	Minimum Width of Strip Footings, in.		Minimum Area of Column[1] Footings, sq ft
	Supporting Exterior Walls	Supporting Interior Walls	
1	10[2]	8[3]	4½
2	14[2]	14[3]	8
3	18[2]	20[3]	11
Column 1	2	3	4

Notes to Table 9.15.3.A.:

(1) Sizes are based on columns spaced 10 ft o.c. For other column spacings, footing areas shall be adjusted in proportion to the distance between columns.

(2) For each *storey* of masonry veneer over wood-frame construction, footing widths shall be increased by 2½ in. For each *storey* of masonry construction other than foundation walls, the footing width shall be increased by 5 in.

(3) For each *storey* of masonry supported by the footing, the footing width shall be increased by 4 in.

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 8 ft in unsupported height.

Height above grade

9.15.4.2. Exterior foundation walls shall extend not less than 6 in. above finished ground level.

Reduction in thickness

9.15.4.3. 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 14 in. and not less than 3⅝ in. thick.

9.15.4.4. 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 3⅝ in. thick and tied to the facing material with metal ties conforming to Article 9.20.9.5. spaced not more than 8 in. o.c. vertically and 36 in. o.c. horizontally. The space between wall and facing shall be filled with mortar.

Corbelling

9.15.4.5. Corbelling of foundation walls supporting cavity walls shall conform to Article 9.20.12.2.

Crack control joints

9.15.4.6. Crack control joints shall be provided in foundation walls exceeding 80 ft in length at intervals of not more than 50 ft. 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.

Walls not subject to earth pressure

9.15.4.7. Interior masonry foundation walls not subject to lateral earth pressure shall conform to Section 9.20.

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) to (4) ft—in.	Foundation Wall Laterally Supported At the Top, (1) to (4) ft—in.
Solid concrete (2,000 psi min. strength)	6 8 10 12	2—6 4—0 4—6 5—0	5—0 7—0 7—6 7—6
Solid concrete (3,000 psi min. strength)	6 8 10 12	2—6 4—0 4—6 5—0	6—0 7—6 7—6 7—6
Unit masonry	6 8 10 12	2—0 3—0 4—0 4—6	2—0 4—0 6—0 7—0
Column 1	2	3	4

Notes to Table 9.15.4.A.:

(1) Foundation walls are considered laterally supported at the top if the floor joists are embedded in the top of the foundation walls or 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.

(2) When a foundation wall contains an opening more than 4 ft in length or 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.

(3) 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.

(4) When foundation walls support solid masonry walls, the foundation wall is considered to be laterally supported by the first floor.

SUBSECTION 9.15.5. JOIST AND BEAM SUPPORT

Capping of walls

9.15.5.1. Foundation walls of hollow unit masonry supporting floor joists shall be capped with at least 2 in. 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 2 in. by 4 in. where the siding overlaps the foundation wall not less than ½ in.

Beam support

9.15.5.2. Not less than an 8-in. 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.

Pilasters

9.15.5.3. Pilasters shall be provided under beams that frame into 6-in. unit masonry foundation walls. Pilasters shall be not less than 4 in. by 12 in. and shall be bonded or tied into the wall. The top 8 in. of pilasters shall be solid.

SUBSECTION 9.15.6. PARGING AND FINISHING

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.

Removal of form ties

9.15.6.2. All form ties shall be removed at least flush with the concrete surface.

Exterior finish of block foundation

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.

SUBSECTION 9.15.7. FOUNDATIONS ON PERMAFROST

Design to prevent thawing

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.

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 to the satisfaction of the *authority having jurisdiction* 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 2 ft 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 of the National Building Code.

9.15.7.5. *Buildings* not more than one *storey* in height and 500 sq ft in area, without external plumbing or heating connections, may be supported directly on a layer of coarse granular material at least 6 in. thick.

9.15.7.6. *Buildings* with basements or cellars shall be permitted only where, in the opinion of the *authority having jurisdiction*, the design is such that detrimental settlement will not develop due to thawing of permafrost.

Natural ground cover and trees

9.15.7.7. The natural ground cover and trees over a construction area shall not be removed without permission of the *authority having jurisdiction.*

Protection of work area

9.15.7.8. Prior to the start of construction, a layer of coarse granular fill at least 6 in. 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

9.15.7.9. 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

9.15.7.10. Except as provided in Article 9.15.7.5., surface foundations shall be placed on coarse granular fill having a maximum particle size of 3 in., and shall be at least 24 in. above existing ground level, except that for *buildings* over 1,500 sq ft in *building area*, the fill shall be at least 36 in. above ground level. The top surface of the fill shall extend a minimum of 3 ft beyond the edge of the supporting footings and at least 1 ft from the exterior wall of the *building*. The fill shall be placed in compacted layers not exceeding 12 in. in thickness.

Buried foundations

9.15.7.11. Buried foundations shall not be used unless *approved*. 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

9.15.7.12. 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 10 ft. Where such piles are placed with the use of heat, the heating shall be controlled to keep disturbance of the permafrost to a minimum.

9.15.7.13. Wood piles shall meet the requirements of CSA O56-1962, "Round Timber Piles." Wood piles shall be treated with an *approved* preservative applied to the portion of pile that may be exposed to soil that is subject to seasonal thawing to a point at least 1 ft above adjacent ground level.

Wood

9.15.7.14. Unless otherwise *approved*, wood exposed to soil shall be at least 6 in. by 6 in.

9.15.7.15. When *approved*, untreated timber may be used for surface foundations described in Articles 9.15.7.5. and 9.15.7.10. providing the timber is exposed to free circulation of air.

SECTION 9.16 SLABS-ON-GROUND

SUBSECTION 9.16.1. SCOPE

Slabs-on-grade

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.

Design of floor 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.

SUBSECTION 9.16.2. SLAB SUPPORTS

Granular fill

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 5 in. of coarse clean granular material containing not more than 15 per cent by weight of material passing a No. 10 sieve. Where dampproofing or waterproofing is provided, such fill is not required.

Soil compaction

9.16.2.2. The soil beneath concrete slabs-on-grade shall be compacted. Not less than 5 in. of coarse clean granular material containing not more than 15 per cent by weight of material passing a No. 10 sieve shall be provided beneath the slab and shall be compacted.

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

Uplift pressures

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.

Drainage

9.16.4.2. The accumulation of water underneath a slab-on-grade shall be prevented by grading, drainage or other method.

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

Maximum slump of concrete

9.16.5.1. Concrete for floor slabs shall conform to Section 9.3 and shall have a maximum slump of 3 in.

Surface finish

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.

Topping

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.

SUBSECTION 9.16.6. THICKNESS AND HEIGHT

Thickness

9.16.6.1. Concrete slabs-on-ground shall be not less than 3 in. thick exclusive of concrete topping. When concrete topping is provided it shall be not less than ¾ in. thick.

Height above ground level

9.16.6.2. The top of every slab-on-grade shall be not less than 6 in. above exterior finished 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 *approved* corrosion protection.

Encasement of ducts

9.16.7.2. Ducts in slabs shall be completely encased with not less than 2 in. 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 or other filler *approved* for this purpose.

SECTION 9.17 COLUMNS

SUBSECTION 9.17.1. 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 16 ft and the *live load* on any floor does not exceed 50 psf. (See Table 9.4.2.A.) Scope

9.17.1.2. Columns for applications other than as described in Article 9.17.1.1. shall be designed in accordance with good engineering practice.

SUBSECTION 9.17.2. GENERAL

9.17.2.1. Columns shall be centrally located on a footing conforming to Section 9.15. Column support

9.17.2.2. Columns shall be securely fastened to the supported member to prevent lateral movement.

SUBSECTION 9.17.3. STEEL COLUMNS

9.17.3.1. Except as permitted in Article 9.17.3.2., steel pipe columns shall have a minimum outside diameter of 2⅞ in. and a minimum wall thickness of 3/16 in. Size

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. Exception

9.17.3.3. Except as permitted in Article 9.17.3.4., steel columns shall be fitted with not less than 4-in. by 4-in. by ¼-in. 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. Bearing plates

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 by welding or other *approved* method. Exception

9.17.3.5. Steel columns shall be treated on the outside surface with at least 1 coat of rust-inhibitive paint. Rust prevention

SUBSECTION 9.17.4. WOOD COLUMNS

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 8 in. for round columns and 6 in. by 6 in. for rectangular columns, unless calculations are provided to show that lesser sizes are adequate. Size

9.17.4.2. Wood columns shall be either solid, glued-laminated or built-up. Built-up columns shall consist of not less than 2-in.-thick full-length members bolted together with not less than ⅜-in. diam. bolts spaced not more than 18 in. o.c., or nailed together with not less than 3-in. nails spaced not more than 12 in. o.c. Glued-laminated columns shall conform to Section 4.3 of Part 4 of this Bylaw. Construction

9.17.4.3. Wood columns shall be separated from concrete in contact with the ground by 2-mil polyethylene film or 45-lb roll roofing or other *approved* dampproofing material. Dampproofing

SUBSECTION 9.17.5. UNIT MASONRY COLUMNS

Material

9.17.5.1. Unit masonry columns shall be built of *loadbearing* masonry units.

Size

9.17.5.2. Unit masonry columns shall have minimum nominal dimensions of 12 in. by 12 in. or 10 in. by 16 in.

SUBSECTION 9.17.6. SOLID CONCRETE COLUMNS

Material

9.17.6.1. Concrete shall conform to Section 9.3.

Size

9.17.6.2. Concrete columns shall be not less than 8 in. by 8 in. for rectangular columns and 9 in. diameter for circular columns.

SECTION 9.18 CRAWL SPACES

SUBSECTION 9.18.1. GENERAL

Crawl spaces

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.

Foundation

9.18.1.2. Foundations enclosing crawl spaces shall conform to Section 9.15.

Insulation

9.18.1.3. Insulation shall conform to Section 9.26.

Heating

9.18.1.4. Heating of crawl spaces shall conform to Section 9.34.

SUBSECTION 9.18.2. ACCESS

Size

9.18.2.1. An access opening of not less than 1 ft 8 in. by 2 ft 4 in. shall be provided to each crawl space where the crawl space serves a single *dwelling unit,* and not less than 1 ft 10 in. by 3 ft for other crawl spaces.

Access hatch

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.

SUBSECTION 9.18.3. VENTILATION

9.18.3.1. Crawl spaces shall be ventilated by natural or mechanical means.

Size of vents

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 1 sq ft of unobstructed vent area for every 500 sq ft of floor area.

Design 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.

Distribution of vents

9.18.3.4. Vents for crawl spaces shall be uniformly distributed on opposite sides of the *building.*

Ventilation not required

9.18.3.5. Ventilation to the outside air is not required when the crawl space is used as a warm-air *plenum,* or if the crawl space is vented to an adjacent basement or cellar with an opening conforming to Article 9.18.3.2.

SUBSECTION 9.18.4. CLEARANCE

9.18.4.1. The ground level in a crawl space shall be not less than 12 in. 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 18 in., unless the joists are pressure treated with an *approved* chemical that is toxic to termites. Clearance in crawl space

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 2 ft shall be provided from the access door to the equipment and for a distance of 3 ft on the side or sides of the equipment to be serviced. Service clearance

SUBSECTION 9.18.5. 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. Drainage

9.18.5.2. Drains shall conform to Section 9.14.

SUBSECTION 9.18.6. GROUND COVER

9.18.6.1. A ground cover consisting of not less than 2 in. of asphalt or 1,500 psi portland cement concrete, of 45-lb roll roofing or 4-mil polyethylene shall be provided in every crawl space. Joints in sheet-type ground cover shall be lapped not less than 4 in. and weighted down with stone, or by other *approved* means. Ground cover

SUBSECTION 9.18.7. FIRE PROTECTION

9.18.7.1. Crawl spaces used as warm-air *plenums* in *buildings* of *residential occupancy* shall be restricted to 1-*storey* portions of *dwelling units*. Enclosing material including insulation shall have a surface *flame-spread rating* not greater than 150. *Combustible* ground cover shall be covered with *noncombustible* material or have *noncombustible* receptacles beneath the register openings. Fire protection

SECTION 9.19 ROOF SPACES

SUBSECTION 9.19.1. VENTILATION

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." Area

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 9.26.3.3.), 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 2 in 12 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 2 in. by 2 in. 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 1 in. below the top of the roof joists.

SUBSECTION 9.19.2. ACCESS

Access to attic

9.19.2.1. Every attic space more than 2 ft in height at the highest point shall be provided with an access stair or shall have a hatchway of not less than 22 in. by 36 in., except that where such hatchway serves not more than 1 *dwelling unit*, the hatchway may be reduced to 20 in. by 28 in. Hatchways shall be fitted with doors or covers.

SECTION 9.20 ABOVE-GRADE MASONRY

SUBSECTION 9.20.1. SCOPE

Above-grade masonry

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 36 ft, and in which the roof or floor system above the *first storey* is not of concrete construction.

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 of this Bylaw 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

Material specifications for masonry units

9.20.2.1. Masonry units shall comply with one of the following:
CSA A82.1-1965, "Burned Clay Brick,"
CSA A82.3-1973, "Calcium Silicate (Sand-Lime) Building Brick,"
CSA A82.4-1954, "Structural Clay Load-Bearing Wall Tile,"
CSA A82.5-1954, "Structural Clay Non-Load-Bearing Tile,"
CSA A82.25-1950, "Gypsum Partition Tile or Block,"
CSA A165.1-1972, "Concrete Masonry Units,"
CSA A165.2-1972, "Concrete Brick Masonry Units,"
CSA A165.3-1973, "Prefaced Concrete Masonry Units,"
CSA A165.4-1973, "Coreless Autoclaved Cellular Concrete Masonry Units for Load-Bearing and Non-Load-Bearing Use,"
ASTM C126-71, "Ceramic Glazed Structural Clay Facing Tile, Facing Brick, and Solid Masonry Units," or
ASTM C212-60(1975), "Structural Clay Facing Tile."

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.

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 unless *approved* for this purpose.

Limitation on use of glass block, gypsum and foamed concrete

9.20.2.4. Stone shall be sound and durable.

Stone

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 A165.1-1972, "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. The compressive strength of masonry units shall conform to Table 9.20.2.A.

Table 9.20.2.A.

Forming Part of Article 9.20.2.6.

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 *loadbearing* concrete units	1,000	700
Solid *loadbearing* concrete units	1,800	1,200
Hollow non-*loadbearing* concrete units	1,000	350
Solid non-*loadbearing* concrete units	1,800	1,200
Solid *loadbearing* cellular units	Not permitted	700
Solid non-*loadbearing* cellular units	Not permitted	275
Column 1	2	3

SUBSECTION 9.20.3. MORTAR

9.20.3.1. Cementitious materials and aggregates for mortar shall comply with the following:

Materials specifications for mortar

CSA A5-1971, "Portland Cements,"
CSA A8-1970, "Masonry Cement,"
CSA A82.22-1963, "Gypsum Plasters,"

CSA A82.26-1950, "Keene's Cement,"
CSA A82.42-1950, "Quicklime for Structural Purposes,"
CSA A82.43-1950, "Hydrated Lime for Masonry Purposes," or
CSA A82.56-1950, "Aggregate for Masonry Mortar."

Water and aggregate

9.20.3.2. Water and aggregate shall be clean and free of significant amounts of deleterious materials.

Lime

9.20.3.3. Lime used in mortar shall be hydrated.

Lime putty

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 hr (see Appendix to CSA Standard A82.42-1950, "Quicklime for Structural Purposes") or soaking hydrated lime in water for not less than 12 hr.

Mortar mixes

9.20.3.5. Except as provided in Articles 9.20.3.6. and 9.20.3.7., mortar mixes shall conform to Table 9.20.3.A. Mortar containing portland cement shall not be used later than 2½ hr after mixing.

Table 9.20.3.A.

Forming Part of Article 9.20.3.5.

MORTAR MIX PROPORTIONS (by volume)				
Permissible Use of Mortar	Portland Cement	Masonry Cement (Type H)	Lime	Aggregate
All locations [1]	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 [1] except foundation walls and piers	— 1	1 —	— ½ to 1¼	
All locations except *loadbearing* walls of hollow units, parapet walls and *chimneys*	1	—	1¼ to 2½	
All non-*loadbearing partitions* and all *loadbearing* walls of solid units, except foundation walls, parapet walls and *chimneys*	1 —	— —	2¼ to 4 1	
Column 1	2	3	4	5

Note to Table 9.20.3.A.:

[1] Because of their relatively high strength, these mixes are not to be used with sand-lime brick or concrete brick, since this could result in cracking of the masonry units, except that a mix incorporating 1 part of masonry cement to 3 parts of aggregate by volume is permitted in addition to the lower strength mixes shown.

9.20.3.6. Mortar for gypsum units shall consist of 1 part gypsum and not more than 3 parts aggregate by weight. Mortar for gypsum units

9.20.3.7. 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 ½ in. Maximum thickness of an individual joint shall be ¾ in. 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 SUPPORT

9.20.5.1. All masonry shall be supported on masonry, concrete or steel. Masonry support

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. Lintels

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

Minimum Angle Size, in.	Brick		Stone
	3 in.	3⅝ in.	4 in.
	ft—in.	ft—in.	ft—in.
3½ x 3 x ¼	8— 4	—	—
3½ x 3½ x ¼	8— 5	8— 1	7— 7
4 x 3½ x ¼	9— 3	8—10	8— 3
5 x 3½ x ¼	10—10	10— 4	9— 7
6 x 3½ x ¼	12— 3	11— 8	10—11
Column 1	2	3	4

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. Thickness of supporting wall

SUBSECTION 9.20.6. THICKNESS AND HEIGHT

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 5½ in. thick provided the walls are not more than 9 ft high at the eaves and 15 ft high at the peaks of gable Thickness of solid exterior walls

ends. The exterior walls of the bottom *storeys* of 2-*storey buildings* and walls of 3-*storey buildings* shall be not less than 7½ in. thick. In walls composed of more than one wythe, each wythe shall be not less than 3⅝ in. thick.

Thickness of cavity walls

9.20.6.2. Cavity walls shall be made with not less than 3⅝-in.-wide units if the joints are raked and not less than 3-in.-wide units if the joints are not raked. Wythes shall be separated by a cavity of not less than 2 in. nor more than 3 in., except that where the wythes are bonded together with masonry units, the cavity shall be not less than 3 in. and not more than 4 in. The minimum thickness of cavity walls above the supporting base shall be 10 in. for the top 25 ft and 14 in. for the remaining portion, except that where 3-in.-wide units are used, the wall height above the top of the foundation wall shall not exceed 20 ft.

Thickness of interior walls

9.20.6.3. The thickness of *loadbearing* interior walls shall be determined on the basis of Article 9.20.10.1.

9.20.6.4. Interior non-*loadbearing partitions* shall be not less than 2⅝ in. thick (see Article 9.20.10.1.).

Masonry veneer

9.20.6.5. Masonry veneer resting on a bearing support shall be of solid units not less than 3 in. thick for wall heights up to 36 ft. Such veneer over wood-frame walls shall have not less than a 1-in. air space behind the veneer. Masonry veneer less than 3⅝ in. thick shall have unraked joints.

Individually supported veneer units

9.20.6.6. Masonry veneer individually supported by the back-up material shall conform to the appropriate requirements contained in Section 4.4 of Part 4 of this Bylaw.

Parapet walls

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 1 ft below the adjacent roof level.

Limestone slab facings

9.20.6.8. Limestone slab facings and precast concrete panel facings shall conform to the appropriate requirements of Section 4.4 of Part 4 of this Bylaw.

SUBSECTION 9.20.7. CHASES AND RECESSES

Size of 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 ⅓ the thickness of the wall, and the horizontal projection of the chase or recess shall not exceed 20 in.

Chases or recesses prohibited

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 8 in. or less in thickness.

9.20.7.3. Recesses may be constructed in 8-in. walls provided they do not exceed 4 in. in depth and 30 in. in height, and the horizontal projection of the recess does not exceed 20 in.

Location of chases and recesses

9.20.7.4. Chases and recesses shall be not less than 4 times the wall thickness apart and not less than 2 ft away from any pilaster, cross wall, buttress or other vertical element providing required lateral support for the wall.

Oversized 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.

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

Capping of walls

9.20.8.1. *Loadbearing* walls of hollow masonry units supporting roof or floor framing members shall be capped with not less than 2 in. 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 2 in. thick, the same width as the masonry wall.

Floor joist support

9.20.8.2. Floor joists supported on cavity walls shall be supported on solid units not less than 2½ in. 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 2½ in. of solid masonry, bridging the full thickness of the wall, or a wood plate not less than 2 in. thick, bearing not less than 2 in. on each wythe.

Bearing area

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 3⅜ in. The length of end bearing of floor, roof or ceiling joists supported on masonry shall be not less than 1½ in.

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 8 in. Not less than 8-in. 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 2 in. by 12 in.; unit masonry pilasters shall be not less than 4 in. by 12 in.

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 1¼ in., except as otherwise permitted in Section 4.4 of Part 4 of this Bylaw.

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 0.148 in. diam. placed in the horizontal joints at vertical intervals not exceeding 18 in. Where joints in the reinforcing occur, the bars shall be lapped not less than 6 in.

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 24 in. o.c. vertically and horizontally in the case of brick masonry and 36 in. o.c. in the case of block or tile. Such units shall extend not less than 3⅜ in. 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 0.0276 sq in. Such ties shall have not less than a 2-in. portion bent at right angles at each end.

9.20.9.6. Metal ties of the individual rod type shall extend from within 1 in. of the outer face of the wall to within 1 in. 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 12 in. of openings and spaced not more than 36 in. apart around openings. Ties at other locations shall be spaced not more than 36 in. apart horizontally and 18 in. 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 24 in. apart horizontally within 4 in. of the bottom of each floor or roof assembly where the cavity extends below the assemblies and not more than 36 in. apart around openings within 12 in. of the openings. At other locations, the ties shall be spaced not more than 36 in. apart horizontally and 18 in. apart vertically.

Masonry veneer reinforcing

9.20.9.9. Masonry veneer 3 in. 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 0.016-in.-thick, ⅞-in.-wide corrosion-resistant straps spaced in accordance with Table 9.20.9.A. and shaped to provide a key with the mortar.

Table 9.20.9.A.

Forming Part of Article 9.20.9.9.

VENEER TIE SPACING	
Maximum Vertical Spacing, in.	Maximum Horizontal Spacing, in.
16 20 24	32 24 16
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 of Part 4 of this Bylaw.

Glass block reinforcing

9.20.9.11. Glass block shall have horizontal joint reinforcement of 2 corrosion-resistant bars of not less than 0.148-in. diam. or expanded metal strips not less than 3 in. wide spaced at vertical intervals not exceeding 24 in. for units 8 in. or less in height and in every horizontal joint for units higher than 8 in. Reinforcement shall be lapped not less than 6 in.

SUBSECTION 9.20.10. LATERAL SUPPORT

Lateral support of masonry walls

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.

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.

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
Loadbearing walls of solid units	20 times the wall thickness
Loadbearing walls of hollow units or cavity walls	18 times the wall thickness
Non-*loadbearing* walls or *partitions*	36 times the wall thickness
Column 1	2

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 6 ft 8 in., except that anchorage of floor joists not more than 3 ft above *grade* may be omitted. Ties shall be corrosion-resistant and be not less than the equivalent of 1½-in. by 3/16-in.-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 3/16-in. by 1½-in. steel strapping shall be provided. Such ties shall be spaced not more than 2 ft. 8 in. 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 3/16-in.-diam. corrosion-resistant steel rods spaced not more than 36 in. 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 ½-in.-diam. anchor bolts, spaced not more than 8 ft apart, embedded not less than 4 in. into the masonry and fastened to a rafter plate of not less than nominal 2-in.-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 3⅝ in., 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 12 in. 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 1 in. and the total projection does not exceed ⅓ 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 1 in. 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 ½ the height or ⅓ the width of the corbelled unit and the total corbel does not exceed ⅓ the foundation wall thickness.

9.20.12.3. Masonry veneer resting on a bearing support shall not project more than 1 in. beyond the supporting base where the veneer is at least 3⅝ in. thick, and ½ in. beyond the supporting base where the veneer is less than 3⅝ in. thick. In the case of rough stone veneer, the projection, measured as the average projection of the stone units, shall not exceed ⅓ the bed width beyond the supporting base.

SUBSECTION 9.20.13. FLASHING

9.20.13.1. Exposed flashing shall consist of not less than 0.068-in. sheet lead, 0.013-in. galvanized steel, 0.014-in. copper, 0.018-in. zinc or 0.019-in.-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 0.068-in. sheet lead, 0.013-in. galvanized steel, 0.014-in. copper, 0.018-in. zinc, 45-lb roll roofing, 6-mil polyethylene or 0.002-in. copper or aluminum laminated to felt or kraft paper.

Fastening devices for flashing

9.20.13.3. Fastening devices for flashing shall be corrosion-resistant and compatible with the flashing with respect to galvanic action.

Flashing in masonry and masonry veneer walls

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 ¼ of the horizontal eave overhang.

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 1 in. 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 6 in. up behind the sheathing paper.

SUBSECTION 9.20.14. WEEP HOLES

Weep holes

9.20.14.1. Weep holes spaced not more than 2 ft apart shall be provided at the bottom of the cavity in cavity wall and masonry veneer wall construction to drain the cavity to the exterior.

SUBSECTION 9.20.15. DAMPPROOFING

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 CGSB 9-GP-2a(1971), "Building Paper: Cellulosic Fibre, Water Repellent, Breather Type," lapped at least 4 in. 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 parging and sheathing paper do not apply.

Prevention of bridging in cavity walls

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.

Caulking

9.20.15.3. The junction between door and window frames with masonry shall be caulked in conformance with Subsection 9.28.4.

Sill drip

9.20.15.4. Where no flashing is installed beneath window sills, such sills shall be provided with a drip not less than 1 in. from the wall surface.

SUBSECTION 9.20.16. EXTERIOR FINISH

Concrete 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. PROTECTION

Laying temperature of mortar and masonry

9.20.17.1. Mortar and masonry shall be maintained at a temperature of not less than 40°F during installation and for not less than 48 hr 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 ⅓ 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 CSA S304-1977, "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 40 ft in height or where the cross-sectional area of a *flue* exceeds 126 sq in or where the capacity of an *appliance* connected to a *flue* has a rated input exceeding 400,000 Btu per hr, the requirements in the ACNBC Canadian Heating, Ventilating and Air-Conditioning Code 1977 shall apply.

9.21.1.2. *Metal chimneys* consisting of a single thickness of metal shall conform to the requirements in the ACNBC Canadian Heating, Ventilating and Air-Conditioning Code 1977.

9.21.1.3. *Factory-built chimneys* shall conform to ULC-S604-1974, "Chimneys, Factory-Built, Residential Type and Building Heating Appliance."

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 CGA B149.1-1976, "Installation Code for Natural Gas Burning Appliances and Equipment" or CGA B149.2-1976, "Installation Code for Propane Burning Appliances and Equipment."

Dampers and draft regulators

9.21.1.5. Dampers and draft regulators in *flue pipes* serving oil-fired *appliances* shall conform to CSA B139-1976, "Installation Code for Oil Burning Equipment."

Gas vents

9.21.1.6. *Chimneys* or *gas vents approved* for gas *appliances* but not suitable for solid- or liquid-fuel-fired *appliances* shall be plainly and permanently marked to that effect.

Testing of chimney, vent or flue pipe

9.21.1.7. The *authority having jurisdiction* may require a *chimney,* vent or *flue pipe* to be tested for gas, smoke and flame tightness.

SUBSECTION 9.21.2. CHIMNEY FLUES

Chimney flue limitation

9.21.2.1. A *chimney flue* serving a fireplace or incinerator shall not serve any other *appliance.*

9.21.2.2. Two or more fuel-burning *appliances,* other than fireplaces, may be connected to the same *flue* provided adequate draft is maintained for the connected *appliances* and the connections are made at different elevations.

Angle of chimney flue

9.21.2.3. *Chimney flues* shall not be inclined more than 45 deg. to the vertical.

Size of chimney flue

9.21.2.4. The size of a *chimney flue* shall conform to Table 9.21.2.A. unless calculations are provided to show that smaller sizes can be justified.

9.21.2.5. The width of an oval *chimney flue* shall not be less than ⅔ its breadth.

Table 9.21.2.A.

Forming Part of Article 9.21.2.4.

FLUE SIZES		
Maximum Rated Input[1] of One or More *Appliances*, Btu/hr	Minimum Size of *Flue*[2]	
	Round	Rectangular
105,000	6-in. diam.	8 in. x 8 in. nom.
175,000	7-in. diam.	8 in. x 8 in. nom.
280,000	8-in. diam.	8 in. x 8 in. nom.
400,000	9-in. diam.	8 in. x 12 in. nom.
Column 1	2	3

Notes to Table 9.21.2.A.:

(1) Minimum size required for fireplace *flues* shall be 9 in. in diameter for round *flues* and 8 in. by 12 in. for rectangular *flues*.

(2) Where the *flues* serve only one *appliance*, the *flue* area shall be at least equal to that of the *flue pipe* connected to it.

SUBSECTION 9.21.3. CHIMNEY LINING

9.21.3.1. Every *masonry or concrete chimney* shall have a lining of clay, firebrick, asbestos-cement or other *approved* material. — Chimney lining

9.21.3.2. Clay liners shall conform to ASTM C315-56 (1972), "Clay Flue Linings." Such liners shall be not less than ⅝ in. thick and shall be capable of resisting, without softening or cracking, a temperature of 2,000°F. — Clay liner specifications

9.21.3.3. Firebrick liners shall conform to ASTM C64-72, "Refractories for Incinerators and Boilers." Such firebrick shall be laid with high temperature cement mortar conforming to CGSB 10-GP-3c(1969), "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 7½ in. 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 8 in. below the lowest *flue pipe* connection to a point not less than 2 in. 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

9.21.4.2. Concrete shall conform to Section 9.3. — Concrete for chimneys

9.21.4.3. Footings for *masonry chimneys* and *concrete chimneys* shall conform to the requirements in Section 9.15. — Footings for chimneys

Height of chimney flues

9.21.4.4. A *chimney flue* shall extend not less than 3 ft above the highest point at which the *chimney* comes in contact with the roof, and not less than 2 ft above the highest roof surface or structure within 10 ft of the *chimney.* Not more than 8 in. 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.

Chimney caps

9.21.4.5. The top of a *chimney* shall have a waterproof cap of concrete, metal or other *approved* material. The cap shall slope from the lining and be provided with a drip not less than 1 in. 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 3 in. thick.

Separation of chimney flues

9.21.4.8. *Flue* liners in the same *chimney* shall be separated by not less than 3 in. of masonry or concrete exclusive of liners where clay liners are used, or 3½ in. 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 fuel-burning *appliance* to a *chimney flue* shall be made of metal conforming to Table 9.21.5.A.

9.21.5.2. *Flue pipes* shall be as short and as straight as possible.

9.21.5.3. 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.

Table 9.21.5.A.

Forming Part of Article 9.21.5.1.

WALL THICKNESS OF FLUE PIPES					
Maximum Diameter of *Flue Pipe,* in.	Minimum Metal Thickness, in.				
	Galvanized Steel		Uncoated Steel		Aluminum
	Oil and Gas Fuels	Solid Fuels	Oil and Gas Fuels	Solid Fuels	Gas Fuels
4	0.016	0.016	0.016	0.016	0.016
5	0.016	0.016	0.016	0.016	0.016
8	0.016	0.019	0.016	0.021	0.016
10	0.019	0.024	0.021	0.027	0.021
Column 1	2	3	4	5	6

9.21.5.4. 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

9.21.5.5. A *flue pipe* shall be supported by metal or other *noncombustible* supports. Flue pipe support

9.21.5.6. 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 2 in. for interior *chimneys* and ½ in. for exterior *chimneys.* Clearance from combustible construction

9.21.6.2. A clearance of not less than 6 in. shall be provided between a cleanout opening and *combustible* material.

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 ½-in. clearance from *masonry or concrete chimneys.* Wood trim shall be separated from *masonry or concrete chimneys* by not less than ⅛ in. of asbestos, asbestos millboard or other *noncombustible* material. Flooring and wood trim separation

9.21.6.5. The clearance between *flue pipes* and unprotected *combustible* material shall be not less than 18 in., except that where the flue gas temperature does not exceed 750°F, the clearance may be reduced to 9 in. Where an 18-in. 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

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 *combustible* material unless otherwise specified and covering all surfaces within 18 in. of the *flue pipe*	Clearance between *flue pipe* and *combustible* material, in.
¼-in. asbestos millboard spaced out 1 in. by *noncombustible* material	12
0.013-in. sheet metal on ¼-in. asbestos millboard	12
0.013-in. sheet metal spaced out 1 in. by *noncombustible* material	9
0.013-in. sheet metal on ⅛-in. asbestos millboard spaced out 1 in. by *noncombustible* material	9
1½-in. asbestos-cement covering on *flue pipe*	9
0.027-in. sheet metal on 1-in. mineral wool batts reinforced with wire mesh or equivalent	3
Column 1	2

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 12 in. 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.

SUBSECTION 9.22.2. FIREPLACE LINERS

Fireplace liners

9.22.2.1. Except where a fireplace is equipped with an *approved* steel liner, every fireplace shall have a firebrick liner not less than 2 in. thick for the sides and back and not less than 1 in. 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-3C(1969), "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 7½ in. thick where a metal liner or a 2-in.-thick firebrick liner is used, including the thickness of the masonry liner. Portions of the back exposed to the outside may be 5½ in. 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 3½-in. thickness of solid masonry units or 7½-in. 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 16 in. in front of the fireplace opening and not less than 8 in. beyond each side of the fireplace opening.

9.22.5.2. The hearth shall be supported on not less than a 6-in.-thick trimmer arch of solid masonry units or not less than a 4-in.-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

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 deg. to the vertical. Smoke chambers

9.22.7.2. The thickness of masonry walls surrounding the smoke chamber shall be at least 7½ in. at the sides, front and back, except that the portions of the back exposed to the outside may be 5½ in. thick.

SUBSECTION 9.22.8. FACTORY-BUILT FIREPLACES

9.22.8.1. Factory-built fireplaces shall conform to ULC S610-1974, "Factory-Built Fireplaces" or to ULC S611-1976, "Factory-Built Free-Standing Fireplaces." Specifications for factory-built fireplaces

9.22.8.2. Unless otherwise *approved*, the minimum clearance requirements around factory-built fireplaces shall conform to Article 9.34.10.2.

9.22.8.3. Unless otherwise *approved, combustible* floor material beneath factory-built fireplaces shall be protected in conformance with Article 9.34.10.4.

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 6 in. of the fireplace opening, except that where the *combustible* material projects more than 1½ in. out from the face of the fireplace above the opening, such material shall be at least 12 in. 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 2-in. 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 4-in. clearance shall be provided between the back and sides of a fireplace and *combustible* framing, except that a 2-in. clearance is permitted where the fireplace is located in an exterior wall.

9.22.9.4. At least a 2-in. clearance shall be provided between the back and sides of the smoke chamber of a fireplace and *combustible* framing, except that a 1-in. 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 24 in. 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 50 psf. 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 50 psf 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 of Part 4 of this Bylaw.

Post, beam and plank construction

9.23.1.5. Post, beam and plank construction and plank frame wall construction shall conform to Section 9.24.

SUBSECTION 9.23.2. GENERAL

Rigidity

9.23.2.1. All members shall be so framed, anchored, fastened, tied and braced to provide the necessary strength and 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 ½-in. 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 2-mil polyethylene film, 45-lb roll roofing or other *approved* dampproofing material, except that such dampproofing is not required where the wood member is at least 6 in. above the ground.

9.23.2.4. Lumber shall conform to the appropriate requirements in Subsection 9.3.3.

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. Other nails providing at least equivalent performance may also be used.

Nail length

9.23.3.2. All nails shall be long enough so that not less than half 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. Nailing of framing shall conform to Table 9.23.3.A.

Table 9.23.3.A.

Forming Part of Article 9.23.3.3.

NAILING FOR FRAMING		
Construction Detail	Minimum Length of Nails, in.	Minimum Number or Maximum Spacing of Nails
Floor joist to plate—toe nail	3¼	2
Wood or metal strapping to underside of floor joists	2¼	2
Cross bridging to joists	2¼	2 each end
Doubled 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) toe nail or end nail	2½ 3¼	4 2
Doubled studs at openings, or studs at *partition* 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 *partitions* to framing or subflooring	3¼	24 in. o.c.
Horizontal member over openings in non-*loadbearing partitions*—each end	3¼	2
Lintels to studs	3¼	2 at each end
Ceiling joist to plate—toe nail each end	3¼	2
Roof rafter, roof truss or roof joist to plate—toe nail	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—toe nail	2¼	4
—end nail	3¼	3
Collar tie to rafter —each end	3	3
Column 1	2	3

Table 9.23.3.A. (Cont'd)

Construction Detail	Minimum Length of Nails, in.	Minimum Number or Maximum Spacing of Nails
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 *partition*—toe nail	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) Alternatively, the exterior wall may be fastened to the floor framing by having plywood or particleboard sheathing extend down over floor framing and fastened to the floor framing by nails or staples conforming to Article 9.23.3.4., or by tying the wall framing to the floor framing by 2-in. wide galvanized-metal strips of at least 0.016 in. in thickness spaced not more than 4 ft apart and fastened at each end with at least two 2½-in. nails.

9.23.3.4. Fastening of sheathing and subflooring shall conform to Table 9.23.3.B.

Table 9.23.3.B.

Forming Part of Article 9.23.3.4.

SHEATHING AND SUBFLOOR ATTACHMENT			
Element	Min. Nail Length, in.	Min. Staple Length, in.(3)	Min. No. or Max. Spacing
5/16- and ⅜-in. plywood or particleboard	2(1)	1½	6 in. o.c. along edges and 12 in. o.c. along intermediate supports
½-in. to ¾-in plywood or particleboard	2(1)	2	
⅞-in. plywood or particleboard	2¼(1)	N/A	
7/16-in. and ½-in. fibreboard sheathing	1¾(2)	1½	
½-in. gypsum sheathing	1¾(2)	N/A	
Board lumber 8 in. or less wide	2	2	2 per support
Board lumber more than 8 in. wide	2	2	3 per support
Column 1	2	3	4

Notes to Table 9.23.3.B.:

(1) Nail length may be reduced ¼ in. if nails are annular grooved.

(2) Nails shall be not less than 0.126 in. diam. with minimum head diameter of 7/16 in.

(3) Staples shall be not less than 0.063 in diam. or thickness, with not less than a ⅜-in. crown, driven with crown parallel to framing.

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 ACNBC Span Tables for Wood Joists, Rafters, Trusses and Beams 1977 for the uniform *live loads* shown in the tables for lumber graded under the grading rules shown in Table 9.3.3.A.

9.23.4.2. The spans for steel beams supporting 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 44W steel in CSA G40.21-76, "Structural Quality Steels."

Table 9.23.4.A.

Forming Part of Article 9.23.4.2.

MAXIMUM SPANS FOR STEEL BEAMS SUPPORTING FLOORS IN DWELLINGS, ft—in.[1],[3]

No. of Floors Supported	Minimum Depth, in.	Minimum Weight/ Ft, lb	Width[2] of Floor to be Supported				
			8 ft	10 ft	12 ft	14 ft	16 ft
1	4	7.7[4]	13—4	11—11	10—11	10—1	9—6
	5	10.0[4]	16—9	15—0	13—9	12—9	11—11
	6	12.5[4]	20—6	18—5	16—11	15—8	14—8
	6	15.5[5]	23—0	20—8	18—11	17—7	16—6
	8	17.0[5]	27—2	24—5	22—4	20—9	19—5
	8	18.4[4]	28—5	25—7	23—0	21—9	20—4
2	4	7.7[4]	10—1	9—0	8—3	7—8	7—2
	5	10.0[4]	12—9	11—5	10—5	9—8	9—0
	6	12.5[4]	15—8	14—0	12—10	11—10	11—1
	6	15.5[5]	17—7	15—9	14—5	13—4	12—6
	8	17.0[5]	20—9	18—7	17—0	15—9	14—9
	8	18.4[4]	21—9	19—6	17—10	16—6	15—6
Column 1	2	3	4	5	6	7	8

Notes to Table 9.23.4.A.:

(1) This table applies only to beams with laterally supported top flanges. A beam may be considered to be laterally supported if wood joists bear on its top flange at intervals of 24 in. or less over its entire length, and if all the load being applied to this beam is transmitted through the joists, and if 1-in. by 2-in. 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.

(2) Supported joist length means ½ the sum of the joist spans on both sides of the beam.

(3) For supported joist lengths intermediate between those shown in the table, straightline interpolation may be used in determining the maximum beam span.

(4) Based on I-shaped sections.

(5) Based on wide flange sections.

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 of Part 4 of this Bylaw.

SUBSECTION 9.23.5. NOTCHING AND DRILLING

Notches and drilling

9.23.5.1. Holes drilled in roof, floor or ceiling framing members shall be not larger than ¼ the depth of the member and shall be located not less than 2 in. from the edges, unless the depth of the member is increased by the size of the hole.

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 ½ the joist depth from the edge of bearing and is not deeper than ⅓ 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 ⅔ the depth of the stud if the stud is *loadbearing* or 1⅜ in. 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 2 in., 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

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.

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 ½-in. diam. anchor bolts spaced not more than 8 ft o.c. Such anchor bolts shall be embedded not less than 4 in. 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 14 ft 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 ½-in 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 such rod or cable shall be anchored to the ground by means of ground anchors having a withdrawal resistance of not less than 35 lb per lineal foot 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 2-in. by 4-in. 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 1 in. 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 3½-in. 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 2 in. 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 such joint shall occur over a support or at or within 6 in. 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 2-in. 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 3½ in. in length, spaced not more than 18 in. apart in each row with the end nails located 4 in. to 6 in. from the end of each piece.

9.23.8.7. Where 2-in. 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 ½-in.-diam. bolts equipped with washers and spaced not more than 4 ft o.c., with the end bolts located not more than 24 in. 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 1½-in. length of end bearing. Ribbon boards shall be not less than 1-in. by 4-in. 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 2-in. by 3-in. ledger strips nailed to the side of the beam, except that 2-in. by 2-in. ledger strips may be used provided each joist is nailed to the beam by at least four 3½-in. 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 2-in. by 2-in. lumber bolted to the web with not less than ¼-in.-diam. bolts spaced not more than 24 in. apart. Such joists shall be spliced above the beam with not less than 2-in. by 2-in. lumber at least 2 ft long to support the flooring. Not less than a ½-in. 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 7 ft. 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 1-in. by 3-in. or 1½-in. by 2-in cross bridging, or 1-in. by ⅛-in steel strapping or 1-in. by 4-in. continuous wood strapping nailed to each joist and fastened at each end to the header or sill to prevent over-all movement. Blocking tightly fitted between joists and securely nailed in place is also acceptable for restraining joist twisting.

Double joists

9.23.9.6. Header joists around floor openings shall be doubled when they exceed 4 ft in length. The size of header joists exceeding 10 ft 8 in. in length shall be determined by calculations.

9.23.9.7. Trimmer joists around floor openings shall be doubled when the length of the header joist exceeds 32 in. When the header joist exceeds 6 ft 8 in. in length the size of the trimmer joists shall be determined by calculations.

Joist hangers

9.23.9.8. When tail joists and header joists are supported by the floor framing, they shall be supported by suitable joist hangers, nailing or other *approved* connectors.

Support of non-load-bearing partitions

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 6 ft 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 6 ft in length need not be supported on framing but may be supported by the subfloor. Doubled joists may be separated not more than 8 in. by blocking if the blocking is not less than 2-in. by 4-in. lumber spaced not more than 4 ft apart.

9.23.9.10. Non-*loadbearing partitions* at right angles to the floor joists are not restricted as to location.

Support of loadbearing partitions

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.

9.23.9.12. *Loadbearing* interior walls at right angles to floor joists shall be located not more than 3 ft from the joist support when the wall does not support a floor, and not more than 2 ft 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 beyond their supports a distance greater than 1½ times their required nominal depths, and the cantilevered portions shall not support floor loads from other storeys unless calculations are provided to show that the allowable design stresses of the cantilevered joists is not exceeded. Cantilevered floor joists

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

9.23.10.1. Wall studs shall be continuous for the full *storey* height except at openings and shall not be spliced, except by *approved* types of glued joints. Wall studs

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.* (See Note 1 to Table 9.23.10.A.) Position of wall studs

9.23.10.3. 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. Design of corners and intersections

9.23.10.4. Except as provided in Article 9.23.10.5., 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. Double studs

9.23.10.5. Single studs may be used on either side of openings in non-*loadbearing partitions* provided the studs extend from the top wall plate to the bottom wall plate. Single studs

9.23.10.6. The size and spacing of studs shall conform to Table 9.23.10.A.

Table 9.23.10.A.

Forming Part of Article 9.23.10.6.

SIZE AND SPACING OF STUDS				
Type of Wall	Supported Loads (including *dead loads)*	Minimum Stud Size, in.	Maximum Stud Spacing, in.	Maximum Unsupported Height, ft
Interior	No load	2 by 2 2 by 4 flat	16 16	8 12
	Limited attic storage[1], [3]	2 by 3 2 by 4	24 24	10 12
	Full attic storage[2] plus 1 floor or roof load plus 1 floor or limited attic storage[1] plus 2 floors	2 by 4	16	12
	Full attic storage[2] or roof load or limited attic storage[1] plus 1 floor	2 by 4 2 by 3	24 16	12 8
	Full attic storage[2] plus 2 floors or roof load plus 2 floors	2 by 4 3 by 4 2 by 6	12 16 16	12 12 14
	Full attic storage[2] plus 3 floors or roof load plus 3 floors	2 by 6	12	14
Exterior	Roof with or without attic storage	2 by 3 2 by 4	16 24	8 10
	Roof with or without attic storage plus 1 floor	2 by 4 2 by 6	16 24	10 10
	Roof with or without attic storage plus 2 floors	2 by 4 3 by 4 2 by 6	12 16 16	10 10 12
	Roof with or without attic storage plus 3 floors	2 by 6	12	6
Column 1	2	3	4	5

Notes to Table 9.23.10.A.:

(1) Applies to attics not accessible by a stairway.

(2) Applies to attics accessible by a stairway.

(3) Studs may be placed parallel to the wall provided the stud height does not exceed 8 ft, the stud spacing does not exceed 16 in. o.c., the studs are clad on at least one side with plywood or particleboard sheathing fastened to the face of the studs with an approved adhesive and the portion of the roof supported by the studs does not exceed 7 ft in width.

SUBSECTION 9.23.11. WALL PLATES

Wall plates

9.23.11.1. Wall plates shall be not less than 2 in. 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 ¾ in. 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 ⅓ the plate width over the support.

Top plates in loadbearing walls

9.23.11.3. Except as permitted in Articles 9.23.11.4., 9.23.11.5. and 9.23.11.6., no fewer than 2 top plates shall be provided in *loadbearing* walls and *partitions.*

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 2 in. 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 3-in. by 6-in. by 0.036-in.-thick galvanized steel, or 1-in. by 4-in. by 12-in. wood splice nailed to each wall section with no fewer than three 2½-in. 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 3-in. by 6-in. by 0.036-in.-thick galvanized steel nailed to each wall with at least the equivalent of three 2½-in. nails.

SUBSECTION 9.23.12. FRAMING OVER OPENINGS

9.23.12.1. Except as provided in Article 9.23.12.4., openings in non-*loadbearing* walls shall be bridged with not less than 2-in. material the same width as the studs securely nailed to adjacent studs.

9.23.12.2. Openings in *loadbearing* walls shall be bridged with lintels designed to carry the superimposed loads to adjacent studs. Except as provided in Article 9.23.12.4., where 2 or more members are used in lintels, they shall be fastened together with not less than 3¼-in. nails in a double row, with nails not more than 18 in. apart in each row. The lintel members may be separated by filler pieces.

9.23.12.3. In *buildings* of *residential occupancy* where the wall studs exceed 2 in. by 3 in. in size, and where the spans of supported joists do not exceed 16 ft and the spans of trusses do not exceed 32 ft, the spans for wood lintels shown in Table 9.23.12.A. may be used.

9.23.12.4. In *loadbearing* exterior and interior walls of 2-in. by 3-in. framing members, lintels shall consist of solid 3-in.-thick members on edge or 2-in.-thick and ¾-in.-thick members securely nailed together. Such lintels shall be at least 2 in. greater in depth than those shown in Table 9.23.12.A. for the allowable spans, and shall not exceed 8 ft in length.

Table 9.23.12.A.

Forming Part of Articles 9.23.12.3. and 9.23.12.4.

WOOD LINTEL SPANS[1]			
Location of Lintels	Supported Loads Including *Dead Loads* and Ceiling	Nominal Depth of Lintels, in.	Maximum Allowable Spans, ft — in.
Interior walls	Limited attic storage	4 6 8 10 12	4 — 0 6 — 0 8 — 0 10 — 0 12 — 6
	Full attic storage or roof load or limited attic storage plus 1 floor	4 6 8 10 12	2 — 0 3 — 0 4 — 0 5 — 0 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 8 10 12	— 2 — 6 3 — 0 4 — 0 5 — 0
	Full attic storage plus 2 or 3 floors or roof load plus 2 or 3 floors	4 6 8 10 12	— 2 — 0 3 — 0 3 — 6 4 — 0
Exterior walls	Roof with or without attic storage	4 6 8 10 12	3 — 8 5 — 6 7 — 4 9 — 2 11 — 0
	Roof with or without attic storage plus 1 floor	4 6 8 10 12	1 — 10 4 — 7 6 — 5 7 — 4 8 — 3
	Roof with or without attic storage plus 2 or 3 floors	4 6 8 10 12	1 — 10 3 — 8 5 — 6 6 — 5 7 — 4
Column 1	2	3	4

Note to Table 9.23.12.A.:

[1] Spans apply to 4-in.-thick lumber or 2 pieces of 2-in.-thick lumber on edge.

SUBSECTION 9.23.13. ROOF AND CEILING FRAMING

Roof and ceiling framing members

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.

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 1½ in.

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 11/16 in. 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 8 in. by 3 in. by 0.016 in. thick spaced not more than 4 ft apart and nailed at each end to the framing by at least two 2½-in. 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 2 in. greater in depth than the common rafters and not less than 1½ in. thick, actual dimension.

Collar ties and ceiling joists

9.23.13.7. Ceiling joists and collar ties of not less than 2-in. by 4-in. lumber may be assumed to provide intermediate support to reduce the span for rafters and joists where the roof slope is 4/12 or greater. Such collar ties more than 8 ft in length shall be laterally supported near their centres by not less than 1-in. by 4-in. 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 2-in. by 4-in. material extending from each rafter to a *loadbearing* wall at an angle of not less than 45 deg. 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 *loadbearing* 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 *loadbearing* wall extending from the ridge to suitable bearing or by a ridge beam of not less than 2-in. by 6-in. material. Such ridge beam shall be supported at intervals not exceeding 4 ft by not less than 2-in. by 4-in. 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 4/12 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. Members may be fastened together either directly or through a gusset plate.

Table 9.23.13.A.

Forming Part of Article 9.23.13.11.

MINIMUM RAFTER-TO-JOIST NAILING[1],[2]
(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			*Building* Width up to 32 ft			*Building* Width up to 26 ft			*Building* Width up to 32 ft		
		Roof Snow Load											
		20 psf or less	30 psf	40 psf or more	20 psf or less	30 psf	40 psf or more	20 psf or less	30 psf	40 psf or more	20 psf or less	30 psf	40 psf or more
4/12	16	4	5	6	5	6	8	11	–	–	–	–	–
	24	6	8	9	8	11	–	11	–	–	–	–	–
5/12	16	4	4	5	5	6	7	7	9	–	9	–	–
	24	5	6	8	7	8	11	7	9	–	–	–	–
6/12	16	4	4	4	4	4	5	6	8	9	8	11	–
	24	4	5	6	5	6	8	6	8	9	8	11	–
7/12	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
9/12	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
12/12	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
Column 1	2	3	4	5	6	7	8	9	10	11	12	13	14

Notes to Table 9.23.13.A.:

(1) Nails not less than 3 in.

(2) Ceiling joists shall be fastened together with at least 1 more nail per joist splice than required for the rafter-to-joist connection.

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 1 in. greater in depth than required for ceiling joists not supporting part of the roof load, except that when the roof slope is 3/12 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 of this Bylaw, except that where the span of a roof truss does not exceed 40 ft and the roof truss spacing does not exceed 24 in. o.c., roof trusses are acceptable provided they conform to the requirements in Articles 9.23.13.15. and 9.23.13.16.

9.23.13.15. The member sizes for wood roof trusses of the Howe or Fink configuration which are to be supported at or near their ends may be determined in conformance with the span tables for wood roof trusses in ACNBC Span Tables for Wood Joists, Rafters, Trusses and Beams 1977. The joint connections used in such trusses shall be designed in conformance with the requirements in Section 4.3 of Part 4 of this Bylaw.

Roof trusses

9.23.13.16. Except as permitted in Article 9.23.13.15., lumber roof trusses with spans that do not exceed 40 ft and spaced not more than 24 in. o.c. and which are not designed in conformance with Part 4 of this Bylaw shall be capable of supporting a load at least equal to the ceiling load plus 2⅔ the design roof load for 24 hr, and shall not exceed the deflections shown in Table 9.23.13.B. when loaded with the ceiling load plus 1⅓ the design roof snow load for 1 hr. Testing of lumber roof trusses shall be in conformance with CSA S307-1977, "Road Test Procedure for Wood Roof Trusses for Houses and Small Buildings."

Table 9.23.13.B.
Forming Part of Article 9.23.13.16.

MAXIMUM ROOF TRUSS DEFLECTIONS		
Truss Span	Type of Ceiling	Maximum Deflection
14 ft or less	Plaster or gypsum board	1/360 of the span
	Other than plaster or gypsum board	1/180 of the span
over 14 ft	Plaster or gypsum board	1/360 of the span
	Other than plaster or gypsum board	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 O121-1973, "Douglas Fir Plywood," CSA O151-1974, "Canadian Softwood Plywood" or CSA O153-1976, "Poplar Plywood." Particleboard subflooring shall meet the exterior bond and test requirements for Grade P or Q board in CSA O188-1975, "Mat-Formed Wood Particleboard."

Edge support

9.23.14.3. Where the edges of panel-type subflooring are required to be supported (see Article 9.31.2.2.), such support shall consist of not less than 2-in. by 2-in. blocking securely nailed between framing members or tongued-and-grooved edge plywood.

Installation of plywood subflooring

9.23.14.4. 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

9.23.14.5. Subfloors shall conform to Table 9.23.14.A.

Nails in plywood subflooring

9.23.14.6. When resilient flooring is applied directly to a particleboard or plywood subfloor, the subfloor shall be fastened to the supports with annular grooved nails.

Laying angle of subflooring

9.23.14.7. Lumber subflooring shall be laid at an angle of not less than 45 deg. to the joists. Lumber subflooring shall be fully supported at the ends on solid bearing.

Table 9.23.14.A.

Forming Part of Article 9.23.14.5.

THICKNESS OF SUBFLOORING			
Maximum Joist Spacing, in.	Minimum Plywood Thickness, in.	Minimum Particleboard Thickness, in.	Minimum Lumber Thickness, in.(2)
16	½	⅝	11/16
20	⅝(1)	¾(1)	¾
24	¾(1)	1(1)	¾
Column 1	2	3	4

Notes to Table 9.23.14.A.:

(1) Plywood may be ½ in. thick and particleboard ⅝ in. thick if the finish flooring consists of matched wood strip flooring not less than ¾ in. thick laid at right angles to the joists.

(2) Lumber shall be of uniform thickness and not more than 8 in. wide.

SUBSECTION 9.23.15. ROOF SHEATHING

Plywood and particleboard specifications

9.23.15.1. Plywood used for roof sheathing shall be exterior type plywood conforming to CSA O121-1973, "Douglas Fir Plywood" CSA O151-1974, "Canadian Softwood Plywood" or CSA O153-1976, "Poplar Plywood." Particleboard for roof sheathing shall meet the exterior bond and test requirements for Grade P or Q board in CSA O188-1975, "Mat-Formed Wood Particleboard."

Application

9.23.15.2. Plywood roof sheathing shall be installed with the surface grain at right angles to the roof framing.

9.23.15.3. Particleboard and plywood roof sheathing shall be installed with at least a 1/16-in. gap between sheets.

9.23.15.4. Lumber roof sheathing shall be applied so that all ends are supported with end joints staggered.

Supports of edges

9.23.15.5. Where panel-type roof sheathing requires edge support, the support shall be not less than 2-in. by 2-in. blocking securely nailed between framing members or metal H clips. Such supports are not required when tongued-and-grooved edge plywood is used.

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 7/16 in. thick conforming to CSA A247.2-1969, "Insulating Fibreboard Sheathing" may be used as a roof sheathing over supports spaced not more than 16 in. o.c. provided the roofing consists of a continuous sheet of galvanized steel of at least 0.013 in. in thickness or a continuous sheet of aluminum of at least 0.024 in. in thickness. All edges of such sheathing shall be supported by blocking or framing.

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 Particleboard Thickness, Edges Supported, in.	Minimum Lumber Thickness, in.(1)
	Edges Supported	Edges Unsupported		
12	5/16	5/16	3/8	11/16
16	5/16	3/8	3/8	11/16
20	3/8	1/2	7/16	3/4
24	3/8	1/2	7/16	3/4
Column 1	2	3	4	5

Note to Table 9.23.15.A.:
(1) Lumber shall be not wider than 12 in.

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, in.(1)		Material Standards
	With Supports 16 in. o.c.	With Supports 24 in. o.c.	
Lumber	11/16	11/16	See Table 9.3.3.A.
Fibreboard (insulating)	3/8	7/16	CSA A247.2-1969
Gypsum board	3/8	1/2	CSA A82.28-1962
Plywood (exterior type)	1/4	5/16	CSA O121-1973 CSA O151-1974 CSA O153-1976
Particleboard	1/4	5/16	CSA O188-1975 (Equivalent to Grade P or Q)
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 0.126 in. diam. with a minimum head diameter of 7/16 in.

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 1/16 in. shall be left between sheets of plywood, particleboard or fibreboard.

SUBSECTION 9.23.17. WALL SHEATHING PAPER

9.23.17.1. Sheathing paper shall conform to CGSB 9-GP-2a(1971), "Building Paper: Cellulosic Fibre, Water Repellent, 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 4 in., and if applied horizontally, the upper sheets shall overlap the lower sheets.

Where no sheathing is used

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 6 in. 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 sheathing paper is not required

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.

9.23.17.7. Siding consisting of sheets of plywood, hardboard, particleboard 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 1-in. by 4-in. wood members applied diagonally to the studs at an angle of approximately 45 deg. 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 2½-in. 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 24 in. 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 of Part 4 of this Bylaw, 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.

9.24.2.3. Lumber shall conform to the appropriate requirements in Subsection 9.3.3. Grades of lumber

SUBSECTION 9.24.3. DECKING

9.24.3.1. Floor and roof decking shall consist of not less than 2-in. lumber laid on the flat or on edge, or exterior type plywood conforming to CSA O121-1973, "Douglas Fir Plywood," CSA O151-1974, "Canadian Softwood Plywood" or CSA O153-1976, "Poplar Plywood." Specifications for floor and roof decking

9.24.3.2. Plank floor decking laid on the flat shall be not more than 8 in. 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. Plank floor 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 1½ in.

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 according to good practice.

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 0.047-in.-thick steel angles or other *approved* anchors.

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 12 in. o.c. and at least twice as long as the individual member thickness, or with not less than ⅜-in. diam. bolts fitted with washers and spaced not more than 18 in. o.c.

Intermediate studs

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.

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 2-in. vertical plank non-*loadbearing partitions* shall not exceed 12 ft.

9.24.6.2. Vertical framing in plank frame walls shall consist of not less than 10-in.-wide planks spaced not more than 8 ft o.c.

Table 9.24.6.A.

Forming Part of Article 9.24.6.1.

NOMINAL THICKNESS OF PLANK FRAMING	
Supported Load (Including *dead load* 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

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 2 ft 6 in. 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 1½-in. 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 16 ft and the spans of trusses do not exceed 32 ft, 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	
Nominal 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

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 of this Bylaw.

9.25.1.3. Steel studs and runners shall conform to ASTM C645-75, "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 C646-72, "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 *approved* fasteners at the appropriate spacing as described in Section 9.30 for interior finishes. Screws used for attaching wall finishes shall penetrate at least ⅜ in. through the metal.

SUBSECTION 9.25.2. SIZE OF FRAMING

9.25.2.1. The size and spacing of steel studs for non-*loadbearing partitions* shall conform to Table 9.25.2.A. Such studs shall have a metal thickness of not less than 0.018 in., exclusive of galvanizing.

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
1¼ x 1⅝	16 24	10 9
1¼ x 2½	16 24	13 12
1¼ x 3⅝	16 24	17 16
Column 1	2	3

9.25.2.2. 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 9.25.2.2.

STEEL STUDS FOR NON-LOADBEARING EXTERIOR WALLS				
Minimum Stud Size, in.	Minimum Nominal Metal Thickness, in. (excluding coating)	Maximum Stud Length, ft		
		Spacing of Studs		
		12 in. o.c.	16 in. o.c.	24 in. o.c.
1¼ x 3⅝	0.021	10	8	—
1¼ x 3⅝	0.027	11	9	8
1¼ x 3⅝	0.033	12	10	9
1¼ x 3⅝	0.039	13	11	10
Column 1	2	3	4	5

SUBSECTION 9.25.3. INSTALLATION

9.25.3.1. Runners having a thickness of at least 0.018 in. exclusive of coatings, and having at least 1-in. flanges shall be provided at the top and bottom of walls and *partitions*. Such runners shall be securely attached to the *building* at approximately 2 in. from the end of the runner, and at intervals of not more than 24 in. o.c. for interior studs and 12 in. o.c. for exterior studs. Such fasteners shall consist of the equivalent of 2½-in. nails or 1-in. 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 ½-in. 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 9.25.3.7., studs in such walls shall not be attached to the runners in a manner that will prevent such expansion.

9.25.3.4. 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.

9.25.3.5. Corners and intersections of walls and *partitions* shall be constructed to provide support for the cladding materials.

9.25.3.6. 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 8 ft in width. Such studs shall be suitably tied together to act as a single structural unit in resisting transverse loads.

9.25.3.7. 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.

(The ACNBC Residential Standards 1977 provides recommended minimum values of thermal resistance for *building* assemblies based on economic considerations.)

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.

SUBSECTION 9.26.3. MATERIALS

Insulation 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.

Specifications

9.26.3.2. Insulating materials shall conform to the following:
CSA A101-1975, "Mineral Fibre Thermal Building Insulation,"
CSA A247.1-1969, "Fibreboard Roof Insulation,"
CSA A247.2-1969, "Insulating Fibreboard Sheathing,"
CGSB 41-GP-14a(1972), "Thermal Insulation, Expanded Polystyrene,"
or
CGSB 41-GP-16b(1975), "Urethane and Isocyanurate, Unfaced, Preformed, Rigid Cellular Thermal Insulation."

Vapour barriers

9.26.3.3. Vapour barriers shall conform to CGSB 70-GP-1a(1970), "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.

SUBSECTION 9.26.4. AREAS TO BE INSULATED

Areas to be insulated

9.26.4.1. Except as provided in Article 9.26.4.2., insulation shall be provided between heated and unheated spaces and between heated spaces and the exterior, and around the perimeter of concrete slabs-on-grade.

Where insulation is not required

9.26.4.2. Insulation need not be provided for masonry or concrete basement or cellar walls, including the space between the joists, enclosing unfinished space or crawl space walls where the crawl space is not used as a *plenum.*

SUBSECTION 9.26.5. INSTALLATION OF INSULATION

Installation of insulation

9.26.5.1. Insulation shall be installed so that there is a reasonably uniform insulating value over the entire face of the insulated area.

Application of insulation

9.26.5.2. Insulation shall be applied to the full width and length of the space between furring or framing.

Batt-type insulation

9.26.5.3. 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.

Loose-fill insulation

9.26.5.4. Loose-fill insulation may be used on horizontal surfaces only, except that *approved* water-repellent types may be used between the outer and inner wythes of cavity walls. 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.

Insulation of heated finished space

9.26.5.5. The upper part of foundation walls enclosing heated finished space or a crawl space used as a warm-air *plenum* shall be insulated to not less than 12 in. below the finished ground level.

Insulation of foundation walls enclosing crawl space

9.26.5.6. Insulation on the interior of foundation walls enclosing a crawl space shall be applied so that there is not less than a 2-in. clearance above the crawl space floor if the insulation is of a type that may be damaged by water.

9.26.5.7. Insulation around concrete slabs-on-grade shall extend not less than 12 in. below exterior ground level, and 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.

9.26.5.8. Where the insulation around concrete slabs-on-grade is exposed to the weather and subject to mechanical damage, it shall be protected with not less than ¼-in. asbestos-cement board, or ½-in. cement parging on wire lath applied to the exposed face and edge.

Protection of insulation

9.26.5.9. Insulation between a garage and an adjacent *dwelling unit* shall be protected from mechanical damage by a covering of gypsum board, plywood, particleboard, hard-pressed fibreboard or other *approved* material.

9.26.5.10. 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 ½ in. 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 1.

SUBSECTION 9.26.6. MEASURES TO PREVENT CONDENSATION

Installation of vapour barriers

9.26.6.1. Except as provided in Article 9.26.6.2., 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 9.26.3.3.

Lightweight cellular plastic-type insulation

9.26.6.2. Lightweight cellular plastic-type insulation may be used without additional vapour barrier protection provided such insulation has a permeance rating of not more than 4 perm-inches, and is installed in continuous contact with masonry or concrete walls.

Coverage

9.26.6.3. Every vapour barrier shall be installed to protect the entire wall surface including framing members.

9.26.6.4. 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.

9.26.6.5. 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.

9.26.6.6. Except as provided in Article 9.26.6.13., every vapour barrier joint shall lap not less than 1 in. when located over supporting members, and shall be covered with a strip of vapour barrier which shall extend not less than 4 in. on both sides of the joint where not located over supporting members.

Openings

9.26.6.7. Openings such as for electrical boxes and registers shall be cut so that the vapour barrier fits snugly around them.

Access hatches

9.26.6.8. Access hatches into attics shall be weather stripped around the perimeters of the hatches.

Prevention of leakage

9.26.6.9. 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.

9.26.6.10. 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.

9.26.6.11. 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

9.26.6.12. Where insulation is placed below the roof sheathing, and the roof slope is less than 2 in 12, or the roof incorporates no attic space, the requirements in Articles 9.26.6.13. and 9.26.6.14. shall apply in addition to the other requirements in this Section.

9.26.6.13. Insulation installed in ceilings described in Article 9.26.6.12. shall be protected by Type I vapour barriers, installed so that all joints occur at framing members, furring or blocking, and lapped at least 4 in. at all joints.

9.26.6.14. Holes through vapour barriers installed in ceilings described in Article 9.26.6.12. for the installation of electrical wiring, electrical boxes, piping or ductwork shall be effectively sealed with caulking, tape or other *approved* material to maintain the integrity of the vapour barrier over the entire ceiling.

SECTION 9.27 ROOFING

SUBSECTION 9.27.1. GENERAL

Roof protection

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.

SUBSECTION 9.27.2. ROOFING MATERIALS

Materials specifications

9.27.2.1. Roofing materials shall conform to the following:

CGSB 9-GP-2a(1971), "Building Paper: Cellulosic Fiber, Water Repellent, Breather Type,"

CGSB 37-GP-4b(1971), "Cement: Lap, Asphalt Cutback, Fibrated, for Asphalt Roofing,"

CGSB 37-GP-5c(1971), "Cement: Plastic, Cutback Asphalt,"
CGSB 37-GP-8c(1971), "Asphalt, Cutback: Filled, for Roof Coating,"
CGSB 37-GP-9c(1971), "Asphalt Primer for Asphalt Roofing, Dampproofing and Waterproofing,"
CGSB 37-GP-21c(1971), "Roof Coating: Tar Cutback, Fibrated,"
CGSB 41-GP-6b(1973), "Sheets, Thermosetting Polyester Plastics, Glass Fibre Reinforced,"
CSA A123.1-1964, "Asphalt Shingles Surfaced with Mineral Granules,"
CSA A123.2-1966, "Asphalt Roofing Surfaced with Mineral Granules,"
CSA A123.3-1973, "Asphalt Roofing Surfaced with Fine Mineral Matter,"
CSA A123.4-1965, "Wide Selvage Asphalt Roofing Surfaced with Mineral Granules,"
CSA A123.6-1953, "Asphalt-Saturated Roofing Felt for Use in Waterproofing and in Constructing Built-Up Roofs,"
CSA A123.7-1973, "Asphalt for Use in Construction of Built-Up Roof Coverings and Dampproofing and Waterproofing Systems,"
CSA A123.8-1953, "Coal-Tar Saturated Roofing Felt for Use in Waterproofing and in Constructing Built-Up Roofs,"
CSA A123.9-1953, "Asphalt-Saturated Asbestos Felts for Use in Waterproofing and in Constructing Built-Up Roofs,"
CSA A123.10-1953, "Coal-Tar Saturated Asbestos Felts for Use in Waterproofing and in Constructing Built-Up Roofs,"
CSA A123.13-1953, "Coal-Tar Pitch for Roofing, Dampproofing, and Waterproofing,"
CSA A123.17-1963, "Asphalt-Saturated Felted Glass-Fibre Mat for Use in Construction of Built-Up Roofs," or
CSA O118-1960, "Western Red Cedar Shingles, Machine Grooved Shakes, and Handsplit Red Cedar Shakes."

Roofing nails

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 ½ in. into roof sheathing. Nails used with asphalt roofing shall have a head diameter of not less than ⅜ in. and a shank thickness of not less than 0.116 in. Nails used with wood shingles or shakes shall have a head diameter of not less than 3/16 in. and a shank thickness of not less than 0.080 in.

Roofing staples

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 wood shingles shall be not less than 1⅛ in. long, 0.063-in. diam. or thickness, with not less than a ⅜-in. crown. Staples used with asphalt shingles shall be not less than ¾ in. long, 0.063 in. diam. or thickness, with not less than a 1-in. crown, except that a 7/16-in. crown may be used if the number of staples specified in Article 9.27.7.4. is increased by ⅓.

SUBSECTION 9.27.3. ROOF SLOPE

Roof slopes

9.27.3.1. 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)	0 in 12	3 in 12
Asphalt base (without gravel)	½ in 12	6 in 12
Asphalt base (surfaced with wide selvage asphalt roofing)	2 in 12	no limit
Coal-tar base (gravelled)	0 in 12	½ in 12
Cold process	½ in 12	9 in 12
Asphalt Shingles		
Normal application	4 in 12	no limit
Low slope application	2 in 12	no limit
Roll Roofing		
Smooth and mineral surfaced	3 in 12	no limit
19-in.-wide selvage asphalt roofing	2 in 12	no limit
Cold application felt	¼ in 12	9 in 12
Wood Shingles	3 in 12	no limit
Handsplit Shakes	4 in 12	no limit
Asbestos-Cement Shingles	4 in 12	no limit
Asbestos-Cement Corrugated Sheets	3 in 12	no limit
Sheet Metal Roofing	0 in 12	no limit
Corrugated Metal Roofing	3 in 12	no limit
Sheet Metal Shingles	3 in 12	no limit
Slate Shingles	6 in 12	no limit
Clay Tile	6 in 12	no limit
Glass Fibre Reinforced Polyester Roofing Panels	3 in 12	no limit
Column 1	2	3

SUBSECTION 9.27.4. FLASHING AT INTERSECTIONS

9.27.4.1. Sheet metal flashing shall consist of not less than 0.068-in.-thick sheet lead, 0.013-in.-thick galvanized steel, 0.014-in.-thick copper, 0.018-in.-thick zinc or 0.019-in.-thick aluminum.

Underlay for metal roof flashing

9.27.4.2. A layer of No. 15 roofing paper or felt shall be provided beneath metal roof flashing.

Valley flashing

9.27.4.3. 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 10 in 12.

Open valley flashing

9.27.4.4. Open valleys shall be flashed with not less than 1 layer of sheet metal not less than 24 in. wide, or 2 layers of roll roofing. The bottom layer shall consist of not less than 55-lb smooth surface roll roofing or 90-lb mineral surface roll roofing (mineral surface down) not less than 18 in. wide, centred in the valley and fastened with nails spaced not more than 18 in. o.c. located 1 in. away from the edges. The top

layer shall consist of not less than 90-lb mineral surface roll roofing (mineral surface up), 36 in. wide, centred in the valley, applied over a 4-in.-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.

Closed valley flashing

9.27.4.5. Closed valley flashing shall consist of sheet metal, 6-mil polyethylene or 55-lb roll roofing not less than 24 in. wide. Nails shall not penetrate the flashing within 3 in. of the top of the valley or 5 in. of the bottom of the valley, measured from the centreline of the valley.

Intersection flashing

9.27.4.6. The intersection of shingle roofs and masonry walls or *chimneys* shall be protected with flashing. Counter flashing embedded not less than 1 in. in the masonry shall extend not less than 6 in. down the masonry and lap the lower flashing not less than 4 in. Flashing along the slopes of a roof shall be stepped so that there is not less than a 3-in. 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.

9.27.4.7. 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 3 in. behind the sheathing paper, and extends not less than 3 in. horizontally. Along the slope of the roof, the flashing shall be stepped with not less than a 3-in. head lap.

9.27.4.8. 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 6 in. up the wall. Counter flashing installed over the intersection shall be embedded not less than 1 in. in the masonry, and shall be of sufficient length to extend down not less than 6 in., lapping the membrane on the masonry not less than 4 in.

9.27.4.9. 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 6 in. up the wall behind the sheathing paper.

Requirements and installation of chimney saddles

9.27.4.10. Except as otherwise permitted in Article 9.27.4.11., *chimney* saddles shall be installed where the upper side of a *chimney* on a sloping roof is more than 30 in. 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 9.27.4.6.

9.27.4.11. 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 6 in., 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 9.27.4.6.

SUBSECTION 9.27.5. EAVE PROTECTION FOR SHINGLES AND SHAKES

Required eave protection

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 3 ft up the roof slope to a line not less than 12 in. inside the inner face of the exterior wall.

9.27.5.2. Eave protection shall consist of not less than 6-mil polyethylene laid as a continuous sheet without the use of cement, or No. 15 asphalt-saturated felt laid in two plies lapped 19 in. and cemented together with lap cement, or 45-lb roll roofing. Roll roofing shall be laid with not less than 4-in. 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 3 ft 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 4 lb per square, or No. 15 plain or perforated asphalt-saturated felt or 2-mil 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 2 in. 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 4 in. (See Article 9.27.10.2. for underlay beneath wood shakes.)

SUBSECTION 9.27.7. ASPHALT SHINGLES ON SLOPES OF 4 IN 12 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 ½ in. beyond the eaves and rake of the roof and fastened along the bottom edge with nails spaced not more than 12 in. o.c. Such starter strips shall be not less than 85-lb mineral-surfaced roll roofing not less than 12 in. 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 85-lb mineral-surfaced roll roofing is provided.

Minimum head lap

9.27.7.3. Shingles shall have a head lap of not less than 2 in.

Fastening

9.27.7.4. Shingles shall be fastened with at least 4 nails or staples for 36-in.-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 *approved* interlocking devices are used.

Location of fasteners

9.27.7.5. Fasteners shall be located 1 in. to 1½ in. from each end of each strip shingle with the other fasteners equally spaced between them. Such fasteners shall be located not less than ½ in. above the tops of the cutouts.

Shingle tabs fastening

9.27.7.6. Shingle tabs shall be secured by a 1-in.-diam. spot of plastic cement under the centre of each tab, or by *approved* interlocking devices or selfsealing strips.

9.27.7.7. Shingles on hips and ridges shall be applied so they extend not less than 4 in. on either side of the hip or ridge, and shall be lapped not less than 6 in. Shingles shall be fastened with nails or staples on each side located not more than 1 in. from the edge and 1 in. above the butt of the overlying shingle. Shingle application on hips and ridges

9.27.7.8. Eave protection shall conform to Subsection 9.27.5. Eave protection

9.27.7.9. Flashing shall conform to Subsection 9.27.4. Flashing

SUBSECTION 9.27.8. ASPHALT SHINGLES ON SLOPES OF LESS THAN 4 IN 12

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 8 in. wide. Starter strip

9.27.8.3. Shingle tabs shall be secured with cold application cement applied at the rate of not less than 1 gal. per 100 sq ft of cemented area, or hot application asphalt applied at the rate of 20 lb per 100 sq ft 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 4 in. and the band is located not less than 4 in. above the butt of the overlying course of shingles. Application of first course of shingles

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 2 in. Such band shall be located not less than 1 in. nor more than 2 in. 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 12 in. wide applied to provide triple coverage. Such shingles shall be cemented to the roof shingles and to each other with a coat of cement 1 in. from the edges of the shingles and fastened with nails or staples located 1½ in. above the butt of the overlying shingle and 2 in. 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. Shingles shall be not less than No. 2 grade. Grade

9.27.9.2. Decking for wood shingled roofs may be continuous or spaced. Decking

9.27.9.3. Wood shingles shall be not less than 16 in. long and not less than 3 in. nor more than 14 in. wide. Size

9.27.9.4. Shingles shall be spaced approximately ¼ in. apart and offset at the joints in adjacent courses not less than 1½ in. so that joints in alternate courses are staggered. Spacing

9.27.9.5. Shingles shall be fastened with at least 2 nails or staples located approximately ¾ in. from the sides of the shingle and 1½ in. above the exposure line. Fastening

Exposure

9.27.9.6. The exposure of wood roof shingles shall conform to Table 9.27.9.A.

Table 9.27.9.A.

Forming Part of Article 9.27.9.6.

EXPOSURE OF WOOD ROOF SHINGLES			
Roof Slope	Maximum Shingle Exposure, in.		
	16-in. Shingles	18-in. Shingles	24-in. Shingles
4 in 12 or less	3¾	4¼	5¾
over 4 in 12	5	5½	7½
Column 1	2	3	4

Flashing

9.27.9.7. Flashing shall conform to Subsection 9.27.4.

Eave protection

9.27.9.8. 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 18 in. long and not less than 4 in. nor more than 14 in. wide with a butt thickness of not more than 1¼ in.

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 36 in. wide along eaves and 12 in. wide along hips and ridges. Underlay shall be laid as a strip not less than 18 in. 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 ¼ in. apart and offset at the joints in adjacent courses not less than 1½ in. so that joints in alternate courses are staggered.

Fastening of shakes

9.27.10.4. Shakes shall be fastened with nails located approximately ¾ in. from the sides of the shakes and 1½ in. above the exposure line.

Exposure of shakes

9.27.10.5. The exposure of wood shakes shall conform to Table 9.27.10.A.

Table 9.27.10.A.

Forming Part of Article 9.27.10.5.

EXPOSURE OF HANDSPLIT WOOD SHAKES		
Minimum Length of Shakes, in.	Limiting Minimum Butt Thickness, in.	Maximum Exposure, in.
18	⅜	7½
24	⅜	10
32	⅜	13
Column 1	2	3

9.27.10.6. Flashing shall conform to Subsection 9.27.4. Flashing

9.27.10.7. Eave protection shall conform to Subsection 9.27.5. Eave protection

SUBSECTION 9.27.11. BUILT-UP ROOFS

9.27.11.1. Coal-tar products and asphalt products shall not be used together in built-up roof construction. Built-up roof construction

9.27.11.2. Aggregate used for surfacing shall be clean durable gravel, crushed stone or air-cooled blast furnace slag. Aggregate shall be dry and uniformly graded in particle size from ¼ in. to ⅝ in. Aggregate

9.27.11.3. Bitumen roofing felts shall be not less than No. 15. Roofing felts

9.27.11.4. In hot mix applications mopped-on layers of bitumen-saturated felt shall be laid while the bitumen is still hot, with each layer overlapping the previous one. The full width under each lap shall be mopped with bitumen so that in no place does felt touch felt. Mopping shall be from 3 to 5 ft ahead of each roll of felt as it is laid. 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. Hot mix application

9.27.11.5. Flashing shall conform to Subsection 9.27.4. Flashing

9.27.11.6. Bituminous materials, aggregate surfacing and roofing felts shall conform to Table 9.27.11.A. Materials

9.27.11.7. A gravel stop or a cant strip shall be provided at the edges of roofs and shall be cemented to the roofing membranes. Flashing shall extend over the edge of the roof to form a drip. Gravel stop

Table 9.27.11.A.

Forming Part of Article 9.27.11.6.

MATERIAL COMBINATIONS FOR BUILT-UP ROOFS						
Type of Roof	Amount of Bitumen per 100 sq ft of Roof Surface		Number of Plies of Dry Sheathing, Roofing Felts			Minimum Amount of Aggregate Surfacing per 100 sq ft of Roof Surface
			Wood Board or Plywood Deck		All other Decks	
	Mopping Coats Between Plies	Flood Coat	Dry Sheathing	Roofing Felts	Roofing Felts	
Asphalt and aggregate	20 lb	60 lb	1	4(1)	3(2)	400 lb gravel or crushed rock or 300 lb slag on level roof; 300 lb gravel or crushed rock or 225 lb slag on 3 in 12 slope. Proportional weights for intermediate roof slopes
Coal-tar pitch and aggregate	25 lb	75 lb	1	4(1)	3(2)	
Glass felt and aggregate	25 lb	60 lb	–	3(3)	2(4)	
Asphalt–smooth surface	20 lb	25 lb	1	4(1)	3(2)	–
Glass felt–smooth surface	20 lb	20 lb	–	3(3)	3(4)	–
Cold process roofing	1.5 gal. Cold process cement	4 gal. Cold process top coating	–	2	–	–
Column 1	2	3	4	5	6	7

Notes to Table 9.27.11.A.:

(1) Two layers of felt laid dry over the sheathing and 2 layers mopped with bitumen. Where the deck consists of plywood or particleboard no dry felts or dry sheathing paper need be provided where the joints in the plywood or particleboard are taped, the plywood or particleboard deck primed with asphalt, and 3 plies of asphalt paper mopped with asphalt, and flood coated as described in the table.

(2) All layers of felt mopped with bitumen.

(3) One combination felt laid dry and 2 layers of glass felt mopped with bitumen.

(4) All layers of glass felt mopped with bitumen.

SUBSECTION 9.27.12. SELVAGE ROOFING

Selvage asphalt roofing

9.27.12.1. Wide selvage asphalt roofing shall provide double coverage over the entire roof surface.

9.27.12.2. Plies of selvage roofing shall be cemented together with bitumen applied at not less than 20 lb per 100 sq ft of roof surface.

SUBSECTION 9.27.13. ASBESTOS-CEMENT SHINGLES

Weight of asbestos-cement shingles

9.27.13.1. Asbestos-cement shingles shall weigh not less than 250 lb per 100 sq ft of roof surface. Flashing of valleys, hips and ridges shall be of sheet metal as described in Subsection 9.27.4.

SUBSECTION 9.27.14. SHEET METAL ROOFING

9.27.14.1. Sheet metal roofing shall be not less than 0.013-in.-thick galvanized steel, 0.014-in.-thick copper, 0.018-in.-thick zinc or 0.019-in.-thick aluminum.

SUBSECTION 9.27.15. GLASS REINFORCED POLYESTER ROOFING

9.27.15.1. 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 in conformance with good engineering practice.

SUBSECTION 9.27.16. DOWNSPOUTS AND ROOF DRAINS

Downspouts and roof drains

9.27.16.1. 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.

Design

9.27.16.2. When roof drains are provided they shall conform to the ACNBC Canadian Plumbing Code 1977.

SECTION 9.28 SIDING

SUBSECTION 9.28.1. SCOPE

Exterior wall coverings

9.28.1.1. This Section applies to exterior wall coverings of lumber, wood shingles, shakes, asbestos-cement shingles and sheets, plywood, particleboard, hard-pressed fibreboard, asphalt shingles, vinyl, aluminum and steel including trim, soffits and flashing.

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

Protection

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.

Clearance from finished grade

9.28.2.2. Not less than an 8-in. clearance shall be provided between the finished ground level and siding that is adversely affected by moisture such as wood, plywood, particleboard and hard-pressed fibreboard.

9.28.2.3. Not less than a 2-in. clearance shall be provided between a roof surface and siding that is adversely affected by moisture such as wood, plywood, particleboard and hard-pressed fibreboard.

9.28.2.4. Insulating asphalt siding shall be ventilated by not less than a ⅛-in. air space behind the siding. (See Article 9.26.3.3.)

SUBSECTION 9.28.3. FLASHING

9.28.3.1. Flashing shall consist of not less than 0.068-in.-thick sheet lead, 0.013-in.-thick galvanized steel, 0.014-in.-thick copper, 0.018-in.-thick zinc or 0.019-in.-thick aluminum.

Flashing installation

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 over exterior wall openings

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 ¼ of the horizontal overhang of the eave.

9.28.3.4. Flashing shall be installed so that it extends upwards not less than 2 in. 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

Caulking

9.28.4.1. Caulking shall be provided where required to prevent the entry of water into the structure.

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.)

Specifications

9.28.4.3. Caulking shall conform to one of the following:

CGSB 19-GP-3b(1972), "Sealing Compound: Two Component, Polysulphide Base, Chemical Curing,"

CGSB 19-GP-5b(1971), "Sealing Compound: One Component, Acrylic Base, Solvent Curing,"

CGSB 19-GP-9b(1971), "Sealing Compound: One Component, Silicone Base, Chemical Curing,"

CGSB 19-GP-13a(1973), "Sealing Compound: One Component, Polysulphide Base, Chemical Curing,"

CGSB 19-GP-14(1970), "Sealing Compound: One Component, Butyl-Polyisobutylene Base, Solvent Curing," or

CGSB 19-GP-15a(1971), "Sealing Compound: Multicomponent, Polyurethane Base, Chemical Curing."

SUBSECTION 9.28.5. ATTACHMENT OF SIDING

Nailing 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.

Blocking of siding

9.28.5.2. Blocking for the attachment of siding shall be not less than 2-in. by 2-in. lumber securely nailed to the framing and spaced not more than 24 in. o.c.

Furring for 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 1-in. by 2-in. lumber when applied over sheathing. When applied without sheathing such furring shall be not less than 1-in. by 3-in. lumber on supports spaced not more than 16 in. o.c., and 1-in. by 4-in. on supports spaced not more than 24 in. o.c. Such furring shall be securely fastened to the framing and shall be spaced not more than 24 in. o.c.

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 9/16-in. lumber, ½-in. plywood or ⅝-in. particleboard.

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 9/16-in. lumber, 5/16-in. plywood or 5/16-in. particleboard.

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 9/16-in. lumber, ⅜-in. plywood or 7/16-in. particleboard.

Asbestos-cement shingles 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 2 in. by ⅜ in. thick securely nailed to the framing and applied as described in Article 9.28.7.5.

Wood shingles and shakes siding attachment

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 4 in. by ⅜ in. thick securely nailed to the framing. Such lath shall be applied so that it overlaps the preceding shingle course by not less than ¾ in.

9.28.5.9. Nails for the attachment of sidings and wood trim shall be corrosion-resistant and shall be compatible with the siding material. Nail size and spacing shall conform to Table 9.28.5.A.

Nails for attachment

Table 9.28.5.A.

Forming Part of Article 9.28.5.9.

NAILING OF SIDING			
Type of Siding	Min. Nail Length, in.	Min. No. of Nails	Maximum Nail Spacing
Wood trim	2[1]	—	24 in. o.c.
Lumber siding or horizontal siding made from sheet material	2[1]	—	24 in. o.c.
Metal siding	1½[1]	—	24 in. o.c. (nailed to framing) 16 in. o.c. (nailed to sheathing only)
Handsplit wood shakes	2[2]	2[3]	—
Wood shingles and machine grooved shakes	1¼[2]	2[3]	—
Asbestos-cement shingles	1¼[2]	2	—
Panel or sheet type siding up to ¼ in. thick Panel or sheet type siding greater than ¼ in. thickness	1½[1] 2[1]	— —	6 in. o.c. along edges 12 in. o.c. along intermediate supports
Column 1	2	3	4

Notes to Table 9.28.5.A.:

[1] Shall penetrate through the nail-holding base or not less than 1 in. into the framing. Staples of the same length as required for nails may also be used provided the staples are corrosion-resistant and compatible with the siding material and positioned to permit expansion and contraction of the siding.

[2] Shall penetrate through the nail-holding base or not less than ¾ in. into the framing.

[3] Shingles or shakes over 8 in. in width shall be fastened with no fewer than 3 nails.

SUBSECTION 9.28.6. LUMBER SIDING

Quality

9.28.6.1. Lumber siding shall be sound, free of knot holes, loose knots, through checks or splits.

Thickness

9.28.6.2. Drop, rustic, novelty, lapped board and vertical wood siding shall be not less than 9/16 in. thick and not more than 12 in. wide.

Bevel siding

9.28.6.3. Bevel siding shall be not less than 3/16 in. thick at the top and 15/32 in. thick at the butt for sidings 8 in. or less in width, and 9/16 in. thick at the butt for sidings wider than 8 in. Bevel siding shall be not more than 12 in. wide.

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 1/16 in. per inch width of lumber, but not less than ⅜ in. for matched siding, 1 in. for lapped bevel siding or ½ in. 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 O118-1960, "Western Red Cedar Shingles, Machine Grooved Shakes, and Handsplit Red Cedar 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 2½ in. nor more than 14 in. wide. Shingles and shakes width

9.28.7.3. Shingles or shakes shall be fastened with nails located approximately ¾ in. from each edge and not less than 1 in. above the exposure line for single-course applications, or approximately 2 in. above the butt for double-course applications. Fastening for shingles and shakes

9.28.7.4. In single-course application, joints in succeeding courses shall be offset at least 1½ in. 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 1½ in., and joints in succeeding courses shall be offset not less than 1½ in. Single and double shingle 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 ½ in. 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 ½ in. above the butts of the outer course. Shingles and shakes application

9.28.7.6. The exposure and butt thickness of shingles and shakes shall conform to Table 9.28.7.A. Exposure and butt thickness

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	2/5
18	8½	14	9/20
24	11½	16	½
Column 1	2	3	4

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-4b(1970), "Siding: Asbestos Cement, Shingles and Clapboards,"
CGSB 34-GP-5c(1970), "Sheets: Asbestos Cement, Corrugated,"
CGSB 34-GP-14a(1969), "Sheets: Asbestos Cement, Decorative,"
CGSB 34-GP-16b(1970), "Sheets: Asbestos Cement, Flat, Fully Compressed,"
CGSB 34-GP-17c(1970), "Sheets: Asbestos Cement, Flat, Semicompressed," or
CGSB 34-GP-21a(1970), "Sheets: Sandwich, Asbestos Cement and Fibreboard."

Asbestos-cement shingles and sheets thickness

9.28.8.2. Asbestos-cement shingles shall weigh not less than 165 lb per square. Asbestos-cement sheet shall be not less than 3/16 in. thick where applied to studs spaced not more than 16 in. o.c., nor less than ¼ in. thick where applied to studs spaced not more than 24 in. o.c. Where applied over sheathing, thickness shall be not less than ⅛ in.

Fastening

9.28.8.3. Asbestos-cement shingles shall be fastened with nails located not less than 1 in. 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 a 1-in. 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 O121-1973, "Douglas Fir Plywood," CSA O151-1974, "Canadian Softwood Plywood" or CSA O153-1976, "Poplar Plywood."

Plywood siding thickness

9.28.9.2. Plywood siding shall be not less than ¼ in. 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.

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 1/16-in. 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 1 in. or shall be suitably flashed.

Lapping

9.28.9.5. Plywood applied in horizontal lapped strips shall have not less than a 1/16-in. gap provided at the butted ends, which shall be caulked. The horizontal joints shall be lapped not less than 1 in. Wedges shall be inserted under all vertical butt joints and at all corners when horizontal lapped plywood is applied without sheathing.

Table 9.28.9.A.

Forming Part of Article 9.28.9.2.

PLYWOOD THICKNESS, EXTERIOR WALL FINISH				
Spacing of Supports, in.	Minimum Siding Thickness With Sheathing (over furring)		Minimum Siding Thickness Without Sheathing	
	Face Grain Parallel to Supports, in.	Face Grain Right Angles to Supports, in.	Face Grain Parallel to Supports, in	Face Grain Right Angles to Supports, in.
16	1/4	1/4	3/8	3/8
20	3/8	1/4	1/2	3/8
24	3/8	1/4	1/2	3/8
Column 1	2	3	4	5

SUBSECTION 9.28.10. HARD-PRESSED FIBREBOARD

Hard-pressed fibreboard specification

9.28.10.1. Factory-finished hard-pressed fibreboard siding shall conform to CGSB 11-GP-5(1972), "Precoated Hardboard, for Exterior Use." Hard-pressed fibreboard siding which is not factory finished shall conform to Types 1, 2 or 5 in CGSB 11-GP-3b (1972), "Standard for Hardboard."

Thickness

9.28.10.2. Hard-pressed fibreboard siding shall be not less than 1/4 in. thick where applied over sheathing, and 5/16 in. thick where applied without sheathing on supports not more than 16 in. o.c.

Edge support

9.28.10.3. Hard-pressed fibreboard siding applied in panels shall have all edges supported. Not less than a 3/16-in. 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 1 in. or shall be suitably flashed.

Horizontal lapped strips

9.28.10.4. Hard-pressed fibreboard applied in horizontal lapped strips shall have not less than a 3/16-in. 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 1 in. Wedges shall be inserted under all vertical butt joints and corners.

9.28.10.5. At least 1/8-in. clearance shall be provided between hard-pressed fibreboard siding and door or window frames.

SUBSECTION 9.28.11. PARTICLEBOARD

Particleboard siding

9.28.11.1. Particleboard siding shall meet the exterior bond and test requirements for Grade P or Q board in CSA O188-1975, "Mat-Formed Wood Particleboard."

Thickness

9.28.11.2. Particleboard shall be not less than 5/16 in. thick where applied directly to sheathing. Where applied directly to framing or over furring strips, particleboard shall be not less than 3/8 in. thick on supports spaced not more than 16 in. o.c. and 1/2 in. thick on supports spaced not more than 24 in. o.c.

Edge support

9.28.11.3. Particleboard applied in panels shall have all edges supported and treated with a primer or sealer. Not less than a ⅛-in. gap shall be provided between sheets. Vertical joints in such siding shall be protected with batten strips. Horizontal joints shall be lapped not less than 1 in. or shall be suitably flashed.

9.28.11.4. At least a ⅛-in. clearance shall be provided between particleboard 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-4(1971), "Siding, Soffits and Fascia: Steel, Zinc Coated, (Galvanized), Prefinished, Standard Duty for Residential Buildings."

9.28.12.2 Steel siding which does not conform to Article 9.28.12.1. shall have a minimum thickness of 0.013 in. and conform to CGSB 93-GP-3a(1975), "Steel Sheet, 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-2(1970), "Siding, Soffits and Facia: Aluminum, Coated, Standard Duty."

9.28.12.4. Aluminum siding which does not conform to Article 9.28.12.3. shall conform to CGSB 93-GP-1a(1974), "Sheet, Aluminum Alloy, Prefinished, Standard Duty" and shall have a minimum thickness of 0.023 in., except that siding supported by backing or sheathing shall have a minimum thickness of 0.018 in.

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-24(1972), "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 8 in. 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 CSA A5-1971, "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.

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

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 0.126 in. diam. with a head diameter of not less than 7/16 in. Staples shall be not less than 0.078 in. 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 1 in. 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 1½ in. long. Staples for stucco lath

SUBSECTION 9.29.4. STUCCO LATH

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 sheathing

9.29.4.2. Sheathing need not be provided beneath stucco where not less than 0.047-in.-diam. galvanized wire is applied horizontally to the framing at vertical intervals not exceeding 6 in., or where *approved* 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, 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]	⅜-in. rib lath	—	—	3.4 lb
	Cedar lath	—	—	—
Column 1	2	3	4	5

Note to Table 9.29.4.A.:
[1] *Approved* paper-backed welded wire lath may also be used on horizontal surfaces.

Furring for stucco lath

9.29.4.4. Stucco lath shall be held not less than ¼ in. 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 2 in. 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 6 in. on both sides of the corner, or the lath or reinforcing shall extend around corners not less than 6 in.

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 6 in. o.c. vertically and 16 in. o.c. horizontally, or 4 in. o.c. vertically and 24 in. o.c. horizontally. Other nailing patterns may be used provided there are not fewer than 16 fasteners per square yard of wall surface.

Spacing of fasteners on horizontal surface

9.29.4.8. Fasteners on horizontal surfaces shall be spaced not more than 6 in. o.c. along the framing members when members are spaced not more than 16 in. o.c., and 4 in. o.c. along members when members are spaced not more than 24 in. o.c.

SUBSECTION 9.29.5. STUCCO MIXES

9.29.5.1. Stucco mixes shall conform to Table 9.29.5.A. Stucco mixes

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. Pigment for stucco

9.29.5.3. Materials shall be thoroughly mixed before and after water is added. Stucco shall be applied not later than 3 hr after the initial mixing. 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 —	3¼ 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 50°F during application, and for not less than 48 hr 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 ⅝ in., 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 ¼ in. 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 ¼ in. 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 ⅛ in. 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

Interior wall and ceiling finishes

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 A82.30-1965, "Interior Furring, Lathing and Gypsum Plastering." Flame-spread requirements are contained in Subsection 9.10.17.

Foamed plastics

9.30.1.2. Where an assembly is permitted to be of *combustible construction,* foamed plastics shall not be used as an interior wall or ceiling finish or as a finish in vertical service shafts, but shall be protected on the interior surfaces by one of the finishes described in this Section.

9.30.1.3. In an assembly required to be of *non-combustible construction,* foamed plastic shall be protected in conformance with Article 3.1.11.2. of Part 3 of this Bylaw.

9.30.1.4. Where a wall or ceiling finish in this Section is required to provide a protective cover for foamed plastic insulation in Article 9.30.1.2., the protecting material shall consist of at least 1 of the finishes described in Subsections 9.30.4. to 9.30.12.

9.30.1.5. 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 6 ft above the floor in shower stalls, 46 in. above the rims of bathtubs equipped with showers and 16 in. 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 hard-pressed fibreboard, 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.

Nails for furring

9.30.3.2. Furring shall be fastened to the framing or to wood blocks with not less than 2-in. nails.

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

SUBSECTION 9.30.4. GYPSUM LATH

9.30.4.1. Gypsum lath shall conform to CSA A82.24-1962, "Gypsum Lath." — Specification

9.30.4.2. Gypsum lath shall be not less than ⅜ in. thick on supports not more than 16 in. o.c., and ½ in. thick on supports not more than 24 in. o.c. — Thickness

9.30.4.3. Gypsum lath shall be applied so that vertical joints do not occur at jamb studs above or below openings.

9.30.4.4. Gypsum lath shall be fastened at each support with no fewer than 4 uniformly spaced fasteners where 16-in.-wide lath is used on vertical supports spaced not more than 16 in. o.c. Such lath shall be fastened with no fewer than 5 fasteners per support for all other conditions. Lath 24 in. wide shall be fastened with no fewer than 6 fasteners per support. Lath need not be nailed to the framing at inside corners. — Fastening method

9.30.4.5. Nails for fastening gypsum lath shall be blued steel wire-nails not less than 1¼ in. long, with at least 0.090-in. shank diam. and 19/64-in. head diam. — Nails for gypsum lath

9.30.4.6. Staples for fastening gypsum lath shall be not less than 1 in. long for ⅜-in.-thick lath and 1⅛ in. long for ½-in. lath. Staples shall be not less than 0.063-in. diam. or thickness with not less than a ¾-in. crown. — Staples for gypsum lath

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

9.30.5.3. Nails for the attachment of metal lath shall be not less than 0.126-in. diam. large-head roofing nails not less than 1½ in. long for ceiling supports and 1 in. long for wall supports. Such nails shall be spaced not more than 6 in. o.c. — Nails for metal lath

9.30.5.4. Staples for the attachment of metal lath shall be not less than 0.078-in. diam. or thickness nor less than 1½ in. long with a ¾-in. crown. Such staples shall be spaced not more than 6 in. o.c. — Staples for metal lath

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 3.0	12 16	12 12
Flat rib	2.5 3.0	16 16	12 16
⅜-in. rib	2.5 3.0 3.5	16 20 24	16 20 24
Paper-backed welded wire	1.4[1] 1.95[2]	16 24	16 24
Column 1	2	3	4

Notes to Table 9.30.5.A.:

(1) Shall be not less than 0.063-in.-diam. wire.

(2) Shall be not less than 0.063-in.-diam. wire. Every third back wire at right angles to support shall be not less than 0.114-in. diam.

Application

9.30.5.5. Metal lath shall be applied at right angles to the supports. End joints shall be lapped not less than 1 in. Side joints of diamond mesh lath shall be lapped not less than ½ in. 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.

Furring for metal lath

9.30.5.6. When metal lath is applied over a continuous surface, it shall be held not less than ¼ in. from the back-up by means of furring strips, self-furring nails or self-furring lath.

SUBSECTION 9.30.6. CORNER REINFORCEMENT FOR PLASTER

Corner reinforcement

9.30.6.1. Material for corner reinforcement shall have at least the same corrosion resistance as metal plaster lath.

9.30.6.2. All internal corners of walls and ceilings shall be reinforced with metal lath or wire fabric having not less than 2-in.-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 6 in. by 18 in. long installed at an angle of 45 deg. 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

9.30.7.1. Materials used in plastering shall conform to the following: Plastering material specifications
CSA A82.21-1950, "Gypsum,"
CSA A82.22-1963, "Gypsum Plasters,"
CSA A82.26-1950, "Keene's Cement,"
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 A82.57-1954, "Inorganic Aggregates for Use in Interior Plaster."

9.30.7.2. Grounds shall be installed to ensure even and uniform plaster thickness. Grounds

9.30.7.3. Plaster shall be not less than ⅜ in. 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 ⅜ in. of plaster covering the cables. Plaster thickness

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.

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 over concrete or masonry

9.30.7.6. Plaster to embed cables used for electric heating shall not incorporate lightweight aggregate. Plaster for electric heating

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. Plaster mixes

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 .22-1963, "Gypsum Plasters."

9.30.7.10. In cold weather plaster shall be applied at from 50°F to 70°F and maintained at this temperature range for not less than 96 hr, and above freezing thereafter. Ventilation shall be provided for the proper drying of the plaster.

SUBSECTION 9.30.8. GYPSUM BOARD FINISH (TAPED JOINTS)

9.30.8.1. Gypsum board shall conform to CSA A82.27-1972, "Gypsum Wallboard." Gypsum board specification

9.30.8.2. Gypsum board applied as a single layer shall be not less than ⅜ in. thick on supports not more than 16 in. o.c., and ½ in. thick on supports not more than 24 in. o.c. When applied as 2 layers, each layer shall be not less than ⅜ in. thick on supports not more than 24 in. o.c. Application

Fasteners

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.

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
Fire-resistance rating not required	¾[1]	¾[1]
¾	¾	1⅛
1	¾	1⅞
1½	¾	2½
Column 1	2	3

Note to Table 9.30.8.A.:
[1] May be reduced to ⅝ in. for screws.

9.30.8.4. Nails for fastening gypsum board to wood supports shall be not less than 0.090-in.-shank diameter annular grooved nails with a head diameter of 7/32 in.

Gypsum board single-layer application

9.30.8.5. For single-layer application nails shall be spaced not more than 7 in. o.c. on ceiling supports and not more than 8 in. apart along vertical wall supports, except that nails may be spaced in pairs about 2 in. apart every 12 in. 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 8 in. below the ceiling. Nails shall be located not less than ⅜ in. 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 double-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. Where adhesives are used to attach gypsum board, the adhesive and its method of application shall be subject to the approval of the *authority having jurisdiction.*

Strip laminated application method

9.30.8.7. Where strip laminated method of application is used, strips of gypsum board not less than ⅜ in. thick and 6 in. 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.

Drywall screws

9.30.8.8. Where gypsum board is applied with drywall screws, the screws shall be spaced not more than 12 in. o.c. along supports, except that on vertical surfaces the screws may be spaced 16 in. o.c. where the supports are not more than 16 in. o.c.

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 50°F. Temperature for finishing gypsum board

SUBSECTION 9.30.9. PLYWOOD FINISH

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. Plywood finish thickness

Table 9.30.9.A.

Forming Part of Article 9.30.9.1.

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	3/16 ⅜	5/32 3/16
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.

9.30.9.3. Nails for attaching plywood finishes shall be not less than 1½-in. casing or finishing nails spaced not more than 6 in. o.c. along edge supports and 12 in. o.c. along intermediate supports, except that staples providing equivalent lateral resistance may also be used. Nails for plywood finish

9.30.9.4. All plywood edges shall be supported by furring, blocking or framing. Edges

SUBSECTION 9.30.10. HARD-PRESSED FIBREBOARD FINISH

9.30.10.1. Hard-pressed fibreboard shall conform to CGSB 11-GP-3b (1972), "Hardboard." Hard-pressed fibreboard specification

9.30.10.2. Hard-pressed fibreboard shall be not less than ⅛ in. thick where applied over continuous back-up, ¼ in. thick where applied to supports spaced not more than 16 in. o.c. and ⅜ in. thick where applied to supports spaced not more than 24 in. o.c. Thickness

9.30.10.3. Nails for fastening hard-pressed fibreboard shall be casing or finishing nails not less than 1½ in. long, spaced not more than 6 in. o.c. along edge supports and 12 in. o.c. along intermediate supports. Nails

9.30.10.4. All hard-pressed fibreboard edges shall be supported by furring, blocking or framing where the back-up is not continuous. Edges

SUBSECTION 9.30.11. INSULATING FIBREBOARD FINISH

Insulating fibreboard

9.30.11.1. Insulating fibreboard shall conform to CSA A247.3-1969, "Fibreboard Used in Interior Application."

Thickness

9.30.11.2. Insulating fibreboard sheets shall be not less than 7/16 in. thick on supports not more than 16 in. o.c. Insulating fibreboard tile shall be not less than ½ in. thick on supports spaced not more than 16 in. o.c.

Nails and nail spacing

9.30.11.3. Nails for fastening fibreboard sheets shall be not less than 0.102-in. shank diameter casing or finishing nails of sufficient length to penetrate at least ¾ in. into the supports. Nails shall be spaced not more than 4 in. o.c. along edge supports and 8 in. o.c. along intermediate supports.

Edge support

9.30.11.4. All fibreboard edges shall be supported by blocking, furring or framing.

SUBSECTION 9.30.12. PARTICLEBOARD FINISH

Particleboard finish

9.30.12.1. Particleboard finish shall conform to CSA O188-1975, "Mat-Formed Wood Particleboard."

Thickness

9.30.12.2. Particleboard shall be not less than ¼ in. thick on supports not more than 16 in. o.c., and not less than ⅜ in. thick on supports not more than 24 in. o.c., except that in walls where blocking is provided at mid-wall height, particleboard shall have a thickness of not less than ¼ in. on supports not more than 24 in. o.c.

Nails and nail spacing

9.30.12.3. Nails for fastening particleboard shall be not less than 1½-in. casing or finishing nails spaced not more than 6 in. o.c. along edge supports and 12 in. o.c. along intermediate supports.

Edge support

9.30.12.4. All particleboard edges shall be supported by furring, blocking or framing.

SUBSECTION 9.30.13. WALL TILE

Wall tile base and adhesive

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.

Mortar for ceramic tile

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 ¼ 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.

Adhesive 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.

Caulking compounds for wall tiles

9.30.13.4. The joints between wall tiles and a bathtub shall be suitably caulked with material conforming to CGSB 19-GP-3b(1972), "Sealing Compound: Two Component, Polysulphide Base, Chemical Curing" or CGSB 19-GP-9b(1971), "Sealing Compound: One Component, Silicone Base, Chemical Curing."

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 1 in. by 2 in. and shall be treated with a soaking coat of *approved* 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

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.) Panel-type underlay

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 9.23.14.3.)

9.31.2.3. Panel-type underlay shall be not less than ¼ in. thick and shall conform to one of the following: Panel-type underlay specifications

CSA O115-1967, "Hardwood Plywood,"
CSA O121-1973, "Douglas Fir Plywood,"
CSA O151-1974, "Canadian Softwood Plywood,"
CSA O153-1976, "Poplar Plywood,"
CSA O188-1975, "Mat-Formed Wood Particleboard," or
CGSB 11-GP-3b(1972), "Hardboard."

9.31.2.4. Panel-type underlay shall be fastened to the subfloor with staples or annular grooved flooring nails, spaced not more than 6 in. o.c. along the edges and 8 in. o.c. both ways at other locations. Fastening

9.31.2.5. Nails for panel-type underlay shall be not less than ¾ in. long for ¼-in.-thick underlay and ⅞ in. long for 5/16-in.-thick underlay. Staples for panel-type underlay shall have not less than a 0.047-in. shank diameter or thickness with a ⅜-in. crown and shall be not less than ⅞ in. long for ¼-in. underlay and 1⅛ in. long for 5/16- and ⅜-in. underlay. Nails for underlay

9.31.2.6. Where panel-type underlay is required to be installed over plywood or particleboard, the joints in the underlay shall be offset at least 8 in. from the joints in the underlying subfloor.

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. Underlay for resilient or ceramic floors

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.

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	5/16 5/16	3/4 1 5/16
Matched softwood (interior or exterior use)	16 24	3/4 3/4	3/4 1 1/4
Square edge softwood (exterior use only)	16 24	— —	1 1 1/2
Column 1	2	3	4

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. 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 1 in. 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.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.
5/16	1½[1]	8
7/16	2	12
¾	2¼	16
1	2½	16
1¼	2¾	24
1½	3¼	24
Column 1	2	3

Note to Table 9.31.3.B.:

(1) Staples not less than 1⅛ in. long with 0.047-in.-shank diameter or thickness and with 3/16-in. crowns may be used in lieu of nails.

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. Other types of resilient flooring may be used on slabs-on-ground when *approved*. 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

9.32.1.1. This Section applies to the facilities required in *plumbing systems* within *dwelling units*. Plumbing

9.32.1.2. Facilities in *plumbing systems* other than those required in *dwelling units* shall conform to Part 3 of this Bylaw.

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 the ACNBC Canadian Plumbing Code 1977.

SUBSECTION 9.32.3. WATER SUPPLY AND DISTRIBUTION

Potable water

9.32.3.1. Every *dwelling unit* shall be supplied with potable water from an *approved* public or community system when these systems are available.

Cold water storage

9.32.3.2. Where public or community systems are not available, every *dwelling unit* shall be supplied with an adequate supply of potable water from an *approved* private source.

Piping to facilities

9.32.3.3. 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. Where there is no piped water supply, other *approved* means of waste disposal shall be provided for every *dwelling unit*.

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 public laundry room, and in a garbage room, incinerator room, boiler or heating room serving more than 1 *dwelling unit*.

SUBSECTION 9.32.5. SEWAGE DISPOSAL

9.32.5.1. Except as provided in Article 9.32.4.1., wastes from every plumbing fixture shall be piped to the *building* sewer.

9.32.5.2. *Building* sewers shall discharge into a public sewage system where such system is available.

9.32.5.3. Where a public sewage system is not available, the *building* sewer shall discharge into a *private sewage disposal system* such as a septic tank and disposal field provided the design and installation is *approved*.

SUBSECTION 9.32.6. SERVICE WATER HEATING FACILITIES

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 140° to 165°F.

Distribution of service hot water

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*.

9.32.6.3. Every *service water heater* and its installation shall conform to the ACNBC Canadian Heating, Ventilating and Air-Conditioning Code 1977. 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 *approved* 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 *approved* 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 4,000 cfm. Ventilation

9.33.1.2. Where the rated fan capacity exceeds 4,000 cfm, mechanical ventilation shall conform to the ACNBC Canadian Heating, Ventilating and Air-Conditioning Code 1977. Mechanical ventilation

9.33.1.3. Ventilation of rooms and spaces in other than *residential occupancies* shall be in accordance with good engineering practice. Ventilation of rooms and spaces

(The procedures described in the ASHRAE Guide and Data Books and the ASHRAE Handbooks shall be considered as good engineering practice.)

9.33.1.4. A garage for parking more than 5 cars shall be ventilated in accordance with Part 3 of this Bylaw. Ventilation of garages

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 100 cfm at a pressure differential of 0.1 in. 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

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 the ACNBC Canadian Heating, Ventilating and Air-Conditioning Code 1977, and shall be provided with explosion relief devices and vents or other protective measures to conform with Part 3 of this Bylaw. Exhaust ventilation system

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.

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.

Table 9.33.3.A.

Forming Part of Article 9.33.3.1.

NATURAL VENTILATION		
Location		Minimum Unobstructed Area
Within *dwelling units*	Bathrooms or water-closet rooms	1 sq ft
	Unfinished basement space	0.2 per cent of the floor area
	Dining rooms, living rooms,(1) Bedrooms, kitchens, combined rooms,(1) Dens, recreation rooms and all other finished rooms	3 sq ft(2)
Other than within *dwelling units*	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

Notes to Table 9.33.3.A.:

(1) Ventilation to the outdoors may be through a vestibule opening directly off a living or dining room.

(2) Where living, dining or sleeping areas are contained in a single room, the 3 sq ft of minimum unobstructed area shall apply to the entire room.

SUBSECTION 9.33.4. MECHANICAL VENTILATION

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.

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. 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

9.33.4.5. *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

9.33.4.6. 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

9.33.4.7. Outdoor air intake and exhaust outlets shall be shielded from weather and insects. Screening shall be of rust-proof material. Air intake shield

9.33.4.8. 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 5-in. 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

9.33.4.9. Except as provided in Article 9.33.4.10., every ventilating duct shall conform to the requirements of Section 9.34 for *supply ducts.*

9.33.4.10. 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.

9.33.4.11. Underground ventilating ducts shall be adequately drained. Such ducts shall have no sewer connections and shall be provided with access for inspection and cleaning.

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 heating systems in which the heat input does not exceed 400,000 Btu per hr and to air-conditioning systems in which the rated fan capacity does not exceed 4,000 cfm.

Heat input exceeding 400,000 Btu/hr

9.34.1.2. Where the heat input of a heating system exceeds 400,000 Btu per hr or the rated fan capacity of an air-conditioning system exceeds 4,000 cfm, the ACNBC Canadian Heating, Ventilating and Air-Conditioning Code 1977 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.

(The procedures described in the ASHRAE Guide and Data Books, the ASHRAE Handbooks, the HRA Digest and the Hydronics Institute Manuals may be considered as good engineering practice.)

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.

Installation codes

9.34.2.3. Oil-burning, gas-burning and electric equipment shall be installed to conform to the following:

CSA B51-1975, "Code for the Construction and Inspection of Boilers and Pressure Vessels,"

CSA B52-1965, "Mechanical Refrigeration Code,"

CSA B139-1976, "Installation Code for Oil Burning Equipment,"

CGA B149.1-1976, "Installation Code for Natural Gas Burning Appliances and Equipment,"

CGA B149.2-1976, "Installation Code for Propane Burning Appliances and Equipment," and

CSA C22.1-1975, "Canadian Electrical Code, Part I."

9.34.2.4. The installation of solid-fuel-burning *appliances,* including mounting, clearances and requirements for safety devices, shall conform to the ACNBC Canadian Heating, Ventilating and Air-Conditioning Code 1977.

Temperature in residential buildings

Temperature in other buildings

9.34.2.5. 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 72°F at the outside winter design temperature, except as provided in Article 9.34.2.6. 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 2½ per cent design temperature as listed in NBC Supplement No. 1, "Climatic Information for Building Design in Canada 1977."

Temperature in basement or cellar

9.34.2.6. Heating facilities shall be provided which shall be capable of maintaining a temperature not less than 65°F 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 60°F.

SUBSECTION 9.34.3. HEATING SUPPLY DUCTS

9.34.3.1. The size of *supply ducts* shall conform to good engineering practice.

9.34.3.2. Except for heating *supply ducts* serving not more than 1 *dwelling unit* and encased in concrete slabs-on-ground, heating *supply ducts* shall be *noncombustible* or

shall be Class 1 ducts installed in conformance with the ACNBC Canadian Heating, Ventilating and Air-Conditioning Code 1977. *Combustible* ducts in concrete slabs-on-ground that are connected to a *furnace* supply *plenum* shall be located not closer than 2 ft from that *plenum*, and not less than 2 ft from its connection to a riser or register. Ducts in or beneath concrete slabs-on-ground shall be water tight, corrosion-resistant, decay-resistant and mildew-resistant.

9.34.3.3. Galvanized steel, aluminum or tin plate *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 12 in. wide shall be shaped to provide sufficient stiffness.

Table 9.34.3.A.

Forming Part of Article 9.34.3.3.

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	14 or under over 14	0.016(1) 0.019(1)	0.016 0.019	— —
Column 1	2	3	4	5

Note to Table 9.34.3.A.:

(1) In systems serving a single *dwelling unit*, thickness may be reduced to 0.013 in. for ducts 14 in. or smaller in size and to 0.016 in. for ducts over 14 in. in size, where the permissible duct clearance is ½ in. or less.

9.34.3.4. 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.

9.34.3.5. Vertical *supply ducts* located in closets or rooms shall be covered with not less than ¼-in. cellular-asbestos insulation or other *noncombustible* insulation.

Vertical ducts in closets or rooms

9.34.3.6. Ducts shall be securely supported by metal hangers, straps, lugs or brackets, except that where zero clearance is permitted as described in Articles 9.34.3.8. and 9.34.3.9., wooden brackets may be used.

Duct supports

9.34.3.7. The clearance of *furnace plenums* from *combustible* material shall conform to one of the following:

Minimum clearance of furnace plenums

- CSA B139-1976, "Installation Code for Oil Burning Equipment,"
- CGA B149.1-1976, "Installation Code for Natural Gas Burning Appliances and Equipment,"
- CGA B149.2-1976, "Installation Code for Propane Burning Appliances and Equipment," or
- The ACNBC Canadian Heating, Ventilating and Air-Conditioning Code 1977, for solid-fuel-burning *furnaces*.

Clearance of supply ducts

9.34.3.8. *Supply ducts* from warm-air *furnaces* having a required *plenum* clearance of 3 in. or less shall maintain this clearance from *combustible* material where the duct leaves the main *plenum.* This may be gradually reduced to ½-in. clearance at a distance of not less than 18 in. 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 radiation from the *furnace* heat exchanger.

9.34.3.9. *Supply ducts* from warm-air *furnaces* having a required *furnace plenum* clearance of over 3 in. but not more than 6 in. shall maintain this clearance from *combustible* material at the main *furnace plenum* and for a horizontal distance of 6 ft from the *furnace plenum.* This may be reduced to ½-in. 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.

9.34.3.10. *Supply ducts* from warm-air *furnaces* having a required *plenum* clearance of more than 6 in. 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 3 ft from the *furnace plenum.* This may be reduced to 6-in. clearance beyond this point and to 1-in. clearance at a horizontal distance of 6 ft from the *furnace plenum.* This may be further reduced to 5/16-in. 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.

Clearance for boots and register boxes

9.34.3.11. 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 ¼ in. of cellular-asbestos insulation is provided.

Register over pipeless furnace

9.34.3.12. Where a register is installed in a floor directly over a pipeless *furnace,* a double walled register box with not less than 4 in. 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 9.34.3.8. to 9.34.3.10.

Pipe joints

9.34.3.13. All round pipe joints shall be lapped not less than 1 in. and shall have a snug fit without undue crimping or distortion. Such joints need not be screw fastened or taped.

Rectangular duct connections

9.34.3.14. 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

9.34.3.15. 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 400 sq ft 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. No fewer than 4 supply outlets shall be provided in crawl spaces used as warm-air *plenums,* and located to direct the air towards the corners of the crawl space. Ducts for such outlets shall be not less than 6 ft in length.

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 10,000 Btu per hr 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. Furnace capacity

9.34.4.5. Registers for warm-air supply outlets in garages shall be located not less than 4 ft above the floor, and be fitted with an automatic damper to prevent garage vapours entering the heating system. Registers in garages

9.34.4.6. The temperature of supply air at the warm-air supply outlets shall not exceed 160°F. 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. INSULATION OF DUCTS

9.34.6.1. Supply ducts and return ducts in unheated spaces shall be insulated in conformance with good practice. Insulation of supply ducts

SUBSECTION 9.34.7. RETURN-AIR SYSTEMS

9.34.7.1. The return-air system shall be designed to handle the entire air supply. Return air system

9.34.7.2. 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 2 ft 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

9.34.7.3. *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

9.34.7.4. 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

9.34.7.5. A vertical *return duct* shall have openings to return air on not more than 1 floor. Vertical return ducts

Return air plenum

9.34.7.6. A *public corridor* or public stairway shall not be used as a return-air *plenum.*

Negative pressure

9.34.7.7. 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.*

Return air inlets

9.34.7.8. 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.

Warm air exhaust

9.34.7.9. 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.

Recirculation of return air

9.34.7.10. Return air from a *dwelling unit* shall not be recirculated to any other *dwelling unit.*

Return air inlets required

9.34.7.11. 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 60,000 Btu per hr.

Provisions for the return of air

9.34.7.12. 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.

Ceiling assembly used as plenum

9.34.7.13. Except for return-air *plenums* located within a *dwelling unit,* where a ceiling assembly is used as a *plenum,* the requirements of the ACNBC Canadian Heating, Ventilating and Air-Conditioning Code 1977 shall apply for such systems.

SUBSECTION 9.34.8. STEAM AND HOT WATER HEATING SYSTEMS

Steam and hot water heating system

9.34.8.1. Every steam and hot water pipe shall be constructed of *noncombustible* material having adequate strength and durability.

Insulation of pipes

9.34.8.2. 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 the ACNBC Canadian Heating, Ventilating and Air-Conditioning Code 1977 for *combustible* pipe insulation.

Clearance for steam and hot water pipes

9.34.8.3. Clearance between steam or hot water pipes and *combustible* construction shall be at least ½ in. for steam or water temperatures greater than 200°F, but not more than 250°F, and at least 1 in. for temperatures over 250°F.

Fire stopping of pipe spaces

9.34.8.4. The space around pipes passing through a wall or floor construction shall be *fire stopped* with *noncombustible* material.

Fire-resistance rating of pipe shafts

9.34.8.5. 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

9.34.8.6. Steam and hot water pipes shall be designed to allow for expansion and contraction with changes in temperature.

SUBSECTION 9.34.9. RADIATORS, CONVECTORS AND HEAT EXCHANGERS

Heat exchangers

9.34.9.1. 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

9.34.9.2. 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 9.34.10. STOVES, RANGES AND SPACE HEATERS BURNING SOLID FUEL

9.34.10.1. *Stoves, ranges, space heaters* and *service water heaters* using solid fuel shall be installed in a room or space sufficiently large to permit accessibility to the *appliance.*

Clearances

9.34.10.2. 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 9.34.10.A., except that where protection is provided as described in Table 2.5.D. of the ACNBC Canadian Heating, Ventilating and Air-Conditioning Code 1977, the clearance may be reduced in conformance to that Table.

Table 9.34.10.A.

Forming Part of Article 9.34.10.2.

MINIMUM CLEARANCES TO COMBUSTIBLE MATERIAL FOR STOVES, RANGES AND SPACE HEATERS USING SOLID FUEL

Appliances	Minimum Clearance, in.			
	Top	Sides	Rear	Front
Stoves and *ranges* without refractory lining	36	36[1]	36	48
Stoves and *ranges* with refractory lining	36	24[1]	24	48
Space heaters, circulating type	36	12	12	48
Space heaters, other than circulating type	36	36	36	48
Column 1	2	3	4	5

Note to Table 9.34.10.A.:

(1) The clearance from the side other than the fire box side of a *range* using solid fuel may be 18 in.

Mounting

9.34.10.3. Except as provided in Article 9.34.10.5., 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 4 in. in height, and shall be of a type in which flame or hot gases do not come in contact with its base.

9.34.10.4. 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 0.022 in. in thickness over ¼-in. asbestos cement or asbestos millboard for a distance of at least 18 in. beyond the *appliance* on the firing side and the side where ashes are removed, and extending at least 6 in. beyond the *appliance* on the other sides.

9.34.10.5. Solid-fuel-fired *appliances* other than those described in Article 9.34.10.3. shall be mounted in conformance with the ACNBC Canadian Heating, Ventilating and Air-Conditioning Code 1977.

SECTION 9.35 ELECTRICAL FACILITIES

SUBSECTION 9.35.1. GENERAL

Electrical installation requirements

9.35.1.1. Electrical installations, including the service capacity of the installation and the number and distribution of circuits, shall meet the requirements of the appropriate provincial or municipal statutes, or in the absence of such statutes, shall conform to CSA C22.1-1975, "Canadian Electrical Code, Part I."

Electrical services required

9.35.1.2. Unless otherwise *approved,* electrical facilities shall be provided for every *building* and every *dwelling unit* and public shared space in *buildings* containing *dwelling units.*

Capacity of electrical services

9.35.1.3. Electrical facilities shall have sufficient capacity to provide, without overloading, electrical energy for lighting, *appliances,* outlets and equipment installed in the *building.*

Protection of electrical equipment

9.35.1.4. 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.

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.

9.35.2.6. A lighting outlet with fixture shall be provided for each 300 sq ft 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.

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. Lighting in public areas

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
Service rooms and laundry areas	20	2
Garages	5	½
Public water-closet rooms	10	1
Public corridors and stairways	5	—
Service hallways and stairways	5	—
Recreation rooms	10	1
Column 1	2	3

SUBSECTION 9.35.3. RECEPTACLES

9.35.3.1. Except in kitchens, bathrooms, laundry rooms, water-closet rooms, utility rooms and hallways, wall receptacles shall be installed in every finished room or area in a *dwelling unit* so that no point along the floor line of any usable wall space is more than 6 ft from an outlet installed in the same room. Usable wall space shall be considered as wall space not less than 3 ft wide. Such space shall not include doorways, areas occupied by doors when fully opened, windows less than 12 in. above the floor, fireplaces or other permanent installations that would limit the use of the wall space. General requirements for receptacles

9.35.3.2. Where a switched receptacle is used in lieu of a lighting outlet and fixture as permitted in Article 9.35.2.3., it need not be additional to the requirements in Article 9.35.3.1. provided only half of a duplex receptacle is switched. Switched receptacles

9.35.3.3. No fewer than 2 receptacles shall be provided in kitchens in *dwelling units*. One such receptacle shall be provided over the countertop work surface and 1 shall be provided at the refrigerator space. In addition, a receptacle shall be provided in a dining area forming part of a kitchen. Receptacles in kitchens

Additional receptacles required

9.35.3.4. A duplex receptacle shall be provided in every laundry room or area, utility room or area or combined laundry-utility room. When grouped laundry facilities are provided, sufficient outlets shall be provided to serve adequately the equipment to be installed by the *building owner* or tenants.

Distance between receptacles in dwellings

9.35.3.5. Except for stairs leading to unfinished basements or cellars, no point in a hall or stairway in a *dwelling unit* shall be more than 15 ft from a receptacle.

Electric range connection facility

9.35.3.6. A special purpose outlet or cable shall be provided for the space where an electric range is to be installed.

Receptacles in public hallways

9.35.3.7. *Public corridors* and public stairs shall have at least 1 duplex receptacle for each 35-ft length or fraction thereof.

SUBSECTION 9.35.4. EMERGENCY LIGHTING

Emergency lighting

9.35.4.1. Emergency lighting shall conform to Subsection 9.9.10.

SECTION 9.36 GARAGES AND CARPORTS

SUBSECTION 9.36.1. SCOPE

Garages and carports

9.36.1.1. This Section applies to garages and carports serving not more than 1 *dwelling unit.*

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

Roofed enclosures used as parking for cars

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.

SUBSECTION 9.36.3. FOUNDATIONS

Foundations for carports and garages

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.

Foundation in clay soils

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.

Wood supports for detached garages

9.36.3.3. Detached garages of less than 500 sq ft floor area and not more than 1 *storey* in height may be supported on wood mud sills provided the garage is not of masonry or masonry veneer construction.

9.36.3.4. Piers for the support of carport columns shall extend not less than 6 in. above *grade*. Such piers shall project not less than 1 in. beyond the base of the column but in no case be less than 8 in. by 8 in. in size. Piers used as supports

SUBSECTION 9.36.4. FLOORS

9.36.4.1. Garage floors shall conform to Article 9.10.2.8. 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

9.36.5.2. Columns for garages and carports shall conform to Section 9.17, except that 4-in. by 4-in. wood columns may be used. Wood columns

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 or other *approved* anchorage shall be provided to resist wind uplift. Anchoring garages and carports to foundations

Table I-A

Forming Part of Articles 9.10.4.1. and 9.11.2.3.

FIRE AND SOUND RESISTANCE OF WALLS					
Type of Wall	No.	Description	Finish on Each Side (1)	*Fire-Resistance Rating,* hr(2)	Sound Rating (3)
Brick	1	4-in.-thick walls of shale, clay, concrete or sand-lime brick at least 75 per cent solid	None	1	II
	2	4-in.-thick walls of clay or shale brick	A	2	II
	3	6-in.-thick walls of clay or shale brick at least 80 per cent solid	A	4	II
	4	8-in.-thick walls, same as in 1	None	4	I
Hollow tile	5	8-in.-thick clay or shale tile with min. face shell thickness of ⅝ in., 2 cells in wall thickness	None	1	III
	6	Same as 5 and at least 37 per cent solid	A	2	II
	7	Same as 5 and at least 47 per cent solid	A	3	II
Hollow Concrete Block	8	4-in.-thick with at least 1-in. face shell with natural stone, gravel or lightweight aggregate with a low proportion of quartz with a total wall weight less than 35 psf	A	1	III
	9	Same as 8 but with a total wall weight of 35 psf or more	A	1	II
	10	6-in. hollow concrete block of expanded slag, expanded clay or shale aggregate concrete, with finish applied over furring strips. Units at least 48 per cent solid	H (at least one side)	1	II
	11	Same as 10 but with units at least 59 per cent solid	H (at least one side)	1½	II
	12	6-in. hollow concrete block of limestone aggregate, units at least 63 per cent solid	A, H or N (at least one side)	1	II
	13	8-in.-thick with at least 1-in. face shell weighing at least 40 psf made of natural stone or gravel aggregate with a low proportion of quartz	A, H or N (at least one side)	1	II
Column 1	2	3	4	5	6

Table I-A (Cont'd)

		FIRE AND SOUND RESISTANCE OF WALLS			
Type of Wall	No.	Description	Finish on Each Side (1)	*Fire-Resistance Rating,* hr (2)	Sound Rating (3)
Hollow Concrete Block (Cont'd)	14	Same as 13 but with lightweight aggregate, units weighing less than 40 psf	None	1½	III
	15	8-in.-thick made with expanded slag aggregate. Units at least 65 per cent solid	A, H, N	3	II
	16	8-in.-thick made with air-cooled slag or cinder aggregate. Units at least 66 per cent solid	A, H, N	2	II
	17	8-in.-thick made with limestone aggregate. Units at least 47 per cent solid	A, H or N (at least one side)	1	II
	18	Same as 17 but with units at least 57 per cent solid	A, H or N (at least one side)	1½	II
	19	Same as 17 but with units at least 66 per cent solid	A, H or N (at least one side)	2	I
Rein-forced concrete	20	4-in.-thick weighing at least 35 psf	A, H or N (at least one side)	1	II
Natural stone	21	8-in.-thick	A, H or N (at least one side)	I	I
Brick faced	22	4-in. face brick bonded to 4-in. hollow concrete block or 4-in. hollow clay tile	none	3	II
Cavity walls	23	2 wythes of shale, clay, concrete or sand-lime brick with 2-in. cavity	A, H or N (at least one side)	1	I
	24	2 wythes of 4-in.-thick hollow clay tile at least 40 per cent solid, or hollow concrete block at least 62 per cent solid provided the maximum load does not exceed 80 psi	A, H or N (at least one side)	1	I
	25	8-in. wall thickness with two 2-in.-thick wythes of solid gypsum block, 4-in. space, tied together with non-corroding metal ties	Z	3	II
	26	Same as 25 but with 2-in. mineral wool in cavity	Z	3	I
Column 1	2	3	4	5	6

Table I-A (Cont'd)

FIRE AND SOUND RESISTANCE OF WALLS					
Type of Wall	No.	Description	Finish on Each Side (1)	*Fire-Resistance Rating*, hr (2)	Sound Rating (3)
Gypsum block	27	3-in.-thick hollow gypsum block at least 70 per cent solid	None	1	III
	28	2-in.-thick solid gypsum block	None	1	III
	29	3-in.-thick solid gypsum with resilient clips on one side to attach metal lath	T on one side and Z on other side	2	I
	30	5-in.-thick solid block	Z	4	II
Wood stud	31	Two rows of staggered 2 x 4 studs with 2 x 6 top and bottom plates	Q	1	III
	32	Same as 31 with 2-in. mineral wool in cavity	B, Q	1	II
	33	Same as 31	D, F, O	1	II
	34	Same as 31, but with mineral wool blanket at least 1 in. thick weighing at least 2.2 lb per cu ft threaded between studs or 2-in. mineral wool batts applied between studs on both sides	I	1	II
	35	Same as 34	J	¾	III
	36	Same as 31 but with at least 2-in. mineral wool batts between studs on at least one side	K, B	1	II
	37	Single row of 2 x 4 studs	D, G, L, K, O, Q, U, V, W	1	III
	38	Same as 37 but with resilient fasteners on at least one side and with 2-in. mineral wool in cavity	K	1	II
	39	Same as 37 but with full thick mineral wool batts completely filling the stud spaces	I	1	III
	40	Same as 37 but with full thick mineral wool batts completely filling the stud spaces	J	¾	III
	41	Two rows of 2 x 4 studs with separate wall plates with 2-in. mineral wool in at least one row of studs	K	1	II
Plank wall	42	Two layers of 2 x 6 lumber placed vertically with joints staggered	H	1	III
Column 1	2	3	4	5	6

Table I-A (Cont'd)

FIRE AND SOUND RESISTANCE OF WALLS					
Type of Wall	No.	Description	Finish on Each Side (1)	*Fire-Resistance Rating*, hr(2)	Sound Rating (3)
3⅝-in. Sheet steel studs	43	Single row of steel studs 16 in. o.c., non-*loadbearing*	R	1	III
	44	Same as 43 but with 2-in. mineral wool in cavity	D, P, R, U, V, X	1	I
	45	Same as 43 but with 2-in. mineral wool in cavity	W	¾	I
	46	Single row of steel studs 24 in. o.c., 2-in. mineral wool in cavity	K	1	II
Column 1	2	3	4	5	6

(Notes for (1), (2) and (3) are to be found following Table C.)

Table I-B

Forming Part of Articles 9.10.4.1. and 9.11.2.3.

FIRE-RESISTANCE RATING OF EXTERIOR WOOD STUD WALLS				
Type of Wall	No.	Description	Interior Finish (1)	*Fire-Resistance Rating*, hr(2)
Wood stud	1	2 x 4 studs with mineral wool batts with ⅝-in. T & G sheathing or 7/16-in. fibreboard sheathing, or ½-in. gypsum board sheathing or 5/16-in. plywood sheathing, plus building paper and siding, stucco or masonry veneer	D, F, K	1
	2	Same as 1 except ⅜-in. plywood siding without sheathing	D, F, K	1
	3	Same as 1 with mineral wool batts of at least 1.2 psf or glass wool at least 0.6 psf	I	1
	4	Same as 1	B	¾
	5	Same as 3	H	¾
	6	Same as 1 but with mineral wool batts weighing at least 0.86 psf	M	¾
Column 1	2	3	4	5

(Notes for (1), (2) and (3) are to be found following Table C.)

Table I-C

Forming Part of Articles 9.10.4.1. and 9.11.2.3.

FIRE AND SOUND RESISTANCE OF FLOORS, CEILINGS AND ROOFS[4]

Type of Construction	No.	Description	Ceiling Finish [1]	*Fire-Resistance Rating*, hr[2]	Sound Rating [3]
Concrete slab	1	5-in. reinforced concrete with ¾-in. minimum cover over reinforcing steel	None	1	I
	2	3½-in. reinforced concrete with ¾-in. minimum cover over reinforcing steel	None	1	II
	3	3-in. reinforced concrete with limestone aggregate having ⅝-in. minimum cover over reinforcing steel	None	¾	III
Concrete joists	4	3-in. reinforced concrete (gravel aggregate) on precast concrete joists (expanded shale aggregate) with 1-in. minimum cover over reinforcing steel in joists. Two-inch wood furring wired to underside of joists to attach ceiling	J	1	I
Open web steel joists	5	2-in. reinforced concrete on metal lath on open web steel joists with ceiling secured to underside of joists	E	1	I
	6	Same as 5 but ceiling secured by metal screws to ¾-in. furring channels or 1¼-in. nails to ⅞-in. nailing channels	K	1	III
Heavy timber	7	1-in. nominal finish flooring or ⅝-in. phenolic bonded plywood on nominal 6-in. laminated plank deck	None	¾	—
	8	1-in. nominal finish flooring or ⅝-in. phenolic bonded plywood on nominal 3-in. T & G plank or 4-in. laminated plank deck	None	¾	—
	9	1-in. nominal finish flooring or ⅝-in. phenolic bonded plywood on 4-in. laminated plank deck treated with fire-retardant chemicals or a heavy coating of fire-retardant compound on underside	None	1	—
Column 1	2	3	4	5	6

Table I-C (Cont'd)

FIRE AND SOUND RESISTANCE OF FLOORS, CEILINGS AND ROOFS[4]					
Type of Construction	No.	Description	Ceiling Finish [1]	*Fire-Resistance Rating*, hr[2]	Sound Rating [3]
Wood joists	10	1-in. nominal T & G or ⅝-in. phenolic bonded plywood on 1- by 3-in. furring strips on asbestos paper weighing at least 14 lb/100 sq ft on ½-in. soft fibreboard on 1-in. nominal T & G or ⅝-in. phenolic bonded plywood subfloor on wood joist at 16 in. o.c., with no nails passing through the fibreboard into the subfloor	E, K	1	II
	11	Double wood floor of nominal 1-in. T & G subfloor or ⅝-in. phenolic bonded plywood subfloor with asbestos paper weighing at least 14 lb/100 sq ft between, on wood joists 16 in. o.c.	K	1	III
	12	same as 11	E, D (I with 1½-in.-long nails spaced 6 in. o.c.)	½	III
	13	Nominal 1-in. T & G subfloor or ⅝-in. phenolic bonded plywood subfloor on wood joists 16 in. o.c.	D, K, U, V, X	1	III
	14	Nominal 1-in. T & G lumber or ⅝-in.-thick phenolic bonded plywood subflooring on wood joists 16 in. o.c. with ceiling suspended on mild steel hangers with 3-in. mineral wool fill between joists	T	1	III
	15	Nominal 1-in. T & G lumber or ⅝-in. phenolic bonded plywood subfloor on wood joists 16 in. o.c. with metal ceiling supports spaced 18 in. o.c., 1½-in. by 3-in. steel channel sections 3 ft o.c. hung with mild steel hangers	¾ in. gypsum and sand plaster on ⅜ in. gypsum board	1	III
	16	Nominal 1-in. T & G lumber or ⅝-in. phenolic bonded plywood subfloor on wood floor joists 16 in. o.c. with separate ceiling joists at least 1 in. below the bottom of the floor joists. With 2-in. insulation between floor or ceiling joists	D, E, K	1	II
Column 1	2	3	4	5	6

Table I-C (Cont'd)

FIRE AND SOUND RESISTANCE OF FLOORS, CEILINGS AND ROOFS[4]					
Type of Construction	No.	Description	Ceiling Finish [1]	*Fire-Resistance Rating*, hr[2]	Sound Rating [3]
Trussed roof-ceiling	17	Nominal 2-in. framing members spaced not more than 24 in. o.c. with at least 3 in. of mineral wool batts without paper backing, no sheathing on top of framing members	G, K, R, U, X	½	—
Ceiling joists	18	Same as 17	G, K, R, U, X	½	—
Trussed Roof Construction	19	Same as 17	K K	1	—
Ceiling Joists	20	Same as 17	K K	1	—
Column 1	2	3	4	5	6

Notes to Tables I-A, I-B, and I-C.:

[1] The finishes designated by letter in Tables I-A, I-B, and I-C refer to the following: (The finishes shall be nailed in accordance with the requirements contained in this Part unless otherwise specified. Except as otherwise specified, the proportions of plaster mixes are by weight.)

- A ⅝-in. gypsum—sand plaster (1 part gypsum to 3 parts sand).
- B ½-in. gypsum—sand plaster (1 part gypsum to 2 parts sand) on ⅜-in. perforated gypsum lath or plain gypsum lath with lath pads.
- C Same as B but with 3-in.-wide strips of expanded metal over all joints.
- D ¾-in. gypsum—sand plaster (1 part gypsum to 2 parts sand) over metal lath.
- E ¾-in. gypsum—sand plaster (1 part gypsum to 2 parts sand for first coat, 1 part gypsum to 3 parts sand for second coat) over metal lath.
- F ⅞-in. portland cement—gypsum plaster (1 part portland cement to 2 parts sand for first coat and 1 part gypsum to 3 parts sand for second coat) over metal lath.
- G ⅝-in. gypsum—perlite plaster (100 lb gypsum to 2½ cu ft of aggregate) on ⅜-in. perforated gypsum lath.
- H ⅜-in. gypsum board.
- I Double layer of ⅜-in. gypsum board, joints staggered.
- J ½-in. gypsum board, taped joints.
- K ⅝-in. special fire-resistant type X gypsum board conforming to CSA A82.27-1972, "Gypsum Wallboard."
- KK Two layers of ⅝-in. special fire-resistant type X gypsum board conforming to CSA A82.27-1972, "Gypsum Wallboard," with joints of one layer staggered from joints of the other.
- L 3/16-in. asbestos-cement board on ⅜-in. gypsum board.
- M ½-in. phenolic bonded Douglas fir plywood.
- N Two coats of resin emulsion or other coating providing equivalent seal.
- O ⅞-in. portland cement—sand plaster on metal lath with 3 lb asbestos fibre per bag of cement.

P 1-in. portland cement—sand plaster on metal lath with 3 lb asbestos fibre per bag of cement.
Q ⅝-in. gypsum—sand plaster on ⅜-in. gypsum lath.
R ¾-in. gypsum—sand plaster on ⅜-in. gypsum lath.
S ½-in. gypsum—sand plaster on ⅜-in. gypsum lath with 0.063-in.-diam., 1-in. square wire mesh between lath and plaster.
T ⅞-in. gypsum—sand plaster on metal lath.
U ½-in. gypsum—perlite or gypsum—vermiculite plaster on ⅜-in. gypsum lath.
V ¾-in. gypsum—perlite or gypsum—vermiculite plaster on metal lath.
W Double layer of ½-in. gypsum board.
X Double layer of ½-in. gypsum board with 0.063-in.-diam., 1-in. square wire mesh between sheets.
Z ½-in. gypsum—sand plaster (1 part gypsum to 3 parts sand).

(2) The *fire-resistance ratings* in Tables I-A and I-C were based on tests conducted at a number of fire testing laboratories. The ratings in Table I-B are estimated.

(3) Rating I for airborne sound transmission signifies constructions with a sound transmission class rating of 50 or more and is considered to provide good resistance to transmission of airborne sound.

Rating II for airborne sound transmission signifies constructions with a sound transmission class rating of 45 to 50 and is considered to provide fair resistance to airborne sound. This is the minimum rating that satisfies the requirements in Subsection 9.11.2.

Rating III for airborne sound transmission signifies constructions with a sound transmission class rating of less than 45 and is not acceptable where sound-resistant construction is required.

(4) *Fire-resistance ratings* for floor constructions listed in Table I-C for steel joist or wood-frame assemblies may be applied to roof assemblies having the same ceiling construction. Where wood joists are used, the roof sheathing shall consist of not less than ½-in.-thick phenolic bonded plywood or nominal 1-in.-thick boards. Where steel joists are used, the roof deck shall be at least equivalent in *fire resistance* to 2-in. reinforced concrete.

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