National Building Code of Canada 1990

Fourth Revisions and Errata

Issued by the
Canadian Commission on Building and Fire Codes
National Research Council of Canada
Ottawa

January 1993

The attached pages identify revisions and errata to the National Building Code of Canada 1990. The revisions have been approved by the Canadian Commission on Building and Fire Codes for immediate implementation.

In accordance with the CCBFC Policies and Procedures, the list of referenced documents in Table 2.7.3.A. of the 1990 NBC is updated annually. The revisions contained herein include updates to 30 June 1992. Where changes to the title have been made, the relevant requirements have also been updated.

Part 3 contains significant changes in requirements. Several Articles which covered electrical wires and cables now include optical fibre cables as well. Articles 3.1.4.3., 3.1.5.8., 3.1.5.12., 3.1.5.15., 3.1.5.17., 3.1.5.19., 3.1.11.12., 3.2.2.41., 3.2.2.46., 3.2.5.13., and 3.5.4.3. are new or contain new Sentences, Clauses or Subclauses. Most of the other changes are renumberings resulting from the insertion of new requirements.

New Sentence 9.10.14.12.(3) permits the use of vinyl cladding on an exposing building face under some circumstances. Article 9.26.2.1. references a new standard for asphalt shingles made from glass felt.

The errata are corrections which have been identified and are included to facilitate the use of the Code. Revisions are identified by an ***r*** in the margin nearest the change; ***r4*** designates a revision issued in January 1993. Errata are identified by an ***e***.

1993 fourth revisions and errata

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

1.1.4. Abbreviations

1.1.4.1. Abbreviations of Proper Names.

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

ACNBC ..... Associate Committee on the National Building Code (National Research Council of Canada, Ottawa, Ontario K1A 0R6)

ASHRAE ..... American Society of Heating, Refrigerating and Air-Conditioning Engineers (1791 Tullie Circle N.E., Atlanta, Georgia 30329 U.S.A.)

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

CAN ..... National Standard of Canada designation (The number or name following the CAN designation represents the agency under whose auspices the standard is issued. CAN1 designates CGA, CAN2 designates CGSB, CAN3 designates CSA, and CAN4 designates ULC.)

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

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

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

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

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

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

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

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

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

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

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

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

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

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

cm	centimetre(s)
°	degree(s)
°C	degree(s) Celsius
diam	diameter
g	gram(s)
ga	gauge
h	hour(s)
Hz	hertz
Inc.	Incorporated
J	joule(s)
kg	kilogram(s)
kN	kilonewton(s)
kPa	kilopascal(s)
kW	kilowatt(s)
L	litre(s)

e

2.6.2. Review of Construction

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

2.6.3. Review of Shop Drawings

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

2.6.4. Workmanship and Materials

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

2.6.5. Off-Site Review

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

Section 2.7 Referenced Documents

2.7.1. Application

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

2.7.2. Conflicting Requirements

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

2.7.3. Effective Date

2.7.3.1. Unless otherwise specified herein, the documents referenced in this Code shall include all amendments, revisions and supplements effective to 30 June 1992. r4

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

Table 2.7.3.A.

Forming Part of Article 2.7.3.2.

	Documents Referenced in the National Building Code of Canada 1990			
	Issuing Agency	Document Number	Title of Document	Code Reference
r	ASTM	A123-89A	Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products	Table 9.20.16.A.
	ASTM	A-153-82 (1987)	Zinc Coating (Hot-Dip) on Iron and Steel Hardware	Table 9.20.16.A.
r	ASTM	A252-90	Welded and Seamless Steel Pipe Piles	4.2.3.8.
r4	ASTM	A283/A283M-92	Low and Intermediate Tensile Strength Carbon Steel Plates	4.2.3.8.
r2	ASTM	A525-91B	Steel Sheet, Zinc-Coated (Galvanized) by the Hot-Dip Process	9.3.3.2.
r4	ASTM	A570/A570M-92	Steel, Sheet and Strip, Carbon, Hot Rolled, Structural Quality	4.2.3.8.
r4	ASTM	A611-92	Steel, Cold-Rolled Sheet, Carbon Structural	4.2.3.8.
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Table 2.7.3.A. (Cont'd)

	Issuing Agency	Document Number	Title of Document	Code Reference
r2	ASTM	C4-62 (1991)	Clay Drain Tile	9.14.3.1.(1)
r4	ASTM	C5-79 (1992)	Quicklime for Structural Purposes	9.20.3.1.(1)
	ASTM	C27-84 (88)	Classification of Fireclay and High-Alumina Refractory Brick	9.21.3.4.
r4	ASTM	C126-91	Ceramic Glazed Structural Clay Facing Tile, Facing Brick, and Solid Masonry Units	9.20.2.1.(1)
r4	ASTM	C207-91 (1992)	Hydrated Lime for Masonry Purposes	9.20.3.1.(1)
r4	ASTM	C212-91	Structural Clay Facing Tile	9.20.2.1.(1)
r2	ASTM	C315-91	Clay Flue Linings	9.21.3.3.(1)
r4	ASTM	C411-82 (1992)	Hot-Surface Performance of High-Temperature Thermal Insulation	6.2.3.6.(3) 6.2.9.2.(2)
r	ASTM	C412M-90	Concrete Drain Tile	9.14.3.1.(1)
r2	ASTM	C444M-91	Perforated Concrete Pipe (Metric)	9.14.3.1.(1)
r2	ASTM	C700-91	Vitrified Clay Pipe, Extra Strength, Standard Strength and Perforated	9.14.3.1.(1)
	ASTM	C1002-88	Steel Drill Screws for the Application of Gypsum Board or Metal Plaster Bases	9.24.1.4. 9.29.5.7.
r2	ASTM	D323-90	Vapour Pressure of Petroleum Products (Reid Method)	1.1.3.2.
	ASTM	D2898-81(86)	Test Method for Accelerated Weathering of Fire-Retardant-Treated Wood for Fire Testing	3.1.5.5.(7) 3.1.5.5.(8)
r	ASTM	E90-90	Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions	9.11.1.1.
r	ASTM	E336-90	Measurement of Airborne Sound Insulation in Buildings	9.11.1.1.
	ASTM	E413-87	Classification for Rating Sound Insulation	9.11.1.1.
r2	ASTM	F476-84(1991)	Test Methods for Security of Swinging Door Assemblies	9.6.6.10.
r2	CGA	CAN/CGA-B149.1-M91	Natural Gas Installation Code	6.2.1.4.(1) 8.2.2.11.(1)
r2	CGA	CAN/CGA-B149.2-M91	Propane Installation Code	6.2.1.4.(1) 8.2.2.11.(1)
	CGSB	CAN/CGSB-7.1-M86	Cold Formed Steel Framing Components	9.24.1.2.
r	CGSB	CAN/CGSB-7.2-M88	Adjustable Metal Columns	9.17.3.4.
r4	CGSB	CAN/CGSB-10.3-92	Air Setting Refractory Mortar	9.21.3.4. 9.21.3.9.(1) 9.22.2.2.(1)
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Table 2.7.3.A. (Cont'd)

Issuing Agency	Document Number	Title of Document	Code Reference
CGSB	37-GP-55M-79	Application of Sheet Applied Flexible Polyvinyl Chloride Roofing Membrane	9.26.16.1.
GGSB	37-GP-56M-80	Membrane, Modified,Bituminous, Prefabricated, and Reinforced for Roofing	9.26.2.1.(1)
CGSB	41-GP-6M-1976	Sheets, Thermosetting Polyester Plastics, Glass Fiber Reinforced	9.26.2.1.(1)
CGSB	41-GP-24Ma-1983	Siding, Soffits and Fascia, Rigid Vinyl	9.27.13.1.
CGSB	41-GP-29Ma-1983	Tubing, Plastic, Corrugated, Drainage	9.14.3.1.(1)
CGSB	CAN/CGSB 51.20-M87	Thermal Insulation, Polystyrene, Boards and Pipe Covering	Table 9.23.16.A. 9.25.3.1.(1) 9.25.3.3.
CGSB	51-GP-21M-1978	Thermal Insulation, Urethane and Isocyanurate, Unfaced	Table 9.23.16.A. 9.25.3.1.(1)
CGSB	CAN/CGSB-51.25-M87	Thermal Insulation, Phenolic, Faced	Table 9.23.16.A. 9.25.3.1.(1)
CGSB	CAN/CGSB-51.26-M86	Thermal Insulation, Urethane and Isocyanurate, Boards, Faced	Table 9.23.16.A. 9.25.3.1.(1)
CGSB	51-GP-27M-1979	Thermal Insulation, Polystyrene, Loose Fill	9.25.3.1.(1)
CGSB	CAN2-51.32-M77	Sheathing, Membrane, Breather Type	9.20.13.10.(1) 9.23.17.1. 9.26.2.1.(1)
r CGSB	CAN/CGSB-51.33-M89	Vapour Barrier Sheet, Excluding Polyethylene, for Use in Building Construction	9.25.3.5.(1)
CGSB	CAN/CGSB-51.34-M86	Vapour Barrier, Polyethylene Sheet for use in Building Construction	9.13.2.1.(1) 9.18.6.1.(3) 9.25.3.4.(2) 9.25.3.5.(1)
r CGSB	CAN/CGSB-51.60-M-90	Cellulose Fibre Loose Fill Thermal Insulation	9.25.3.1.(1)
CGSB	CAN/CGSB-63.14-M89	Plastic Skylights	9.7.7.1. 9.7.7.2.
CGSB	CAN/CGSB-82.1-M89	Sliding Doors	9.6.4.2.
CGSB	CAN/CGSB-82.5-M88	Insulated Steel Doors	9.6.4.3.
CGSB	CAN/CGSB-82.6-M86	Doors, Mirrored Glass, Siding or Folding Wardrobe	9.6.5.3.
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Table 2.7.3.A. (Cont'd)

	Issuing Agency	Document Number	Title of Document	Code Reference
	CGSB	CAN/CGSB-93.1-M85	Sheet, Aluminum Alloy, Prefinished, Residential	9.27.12.1.(4)
r2	CGSB	CAN/CGSB-93.2-M91	Prefinished Aluminum Siding, Soffits and Fascia for Residential Use	9.27.12.1.(3)
r2	CGSB	CAN/CGSB-93.3-M91	Prefinished Galvanized and Aluminum-Zinc Alloy Steel Sheet for Residential Use	9.27.12.1.(2)
r4	CGSB	CAN/CGSB-93.4-M92	Galvanized Steel and Aluminum-Zinc Alloy Coated Steel Siding, Soffits and Fascia, Prefinished, Residential	9.27.12.1.(1)
e	CSA	CAN/CSA-A5-M88	Portland Cement	9.3.1.2. 9.20.3.1.(1) 9.28.2.1.
e	CSA	CAN/CSA-A8-M88	Masonry Cement	9.20.3.1.(1)
r	CSA	CAN/CSA-A23.1-M90	Concrete Materials and Methods of Concrete Construction	4.2.3.6. 4.2.3.9. 9.3.1.3.(1) 9.3.1.4.
r	CSA	CAN/CSA-A23.2-M90	Methods of Test for Concrete	9.3.1.8.(1)
	CSA	CAN3-A23.3-M84	Design of Concrete Structures for Buildings	4.1.9.B., 4.3.3.1.
	CSA	CAN/CSA-A82.1-M87	Burned Clay Brick (Solid Masonry Units Made from Clay or Shale)	9.20.2.1.(1)
	CSA	A82.3-M1978	Calcium Silicate (Sand-Lime) Building Brick	9.20.2.1.(1)
	CSA	A82.4-M1978	Structural Clay Load-Bearing Wall Tile	9.20.2.1.(1)
	CSA	A82.5-M1978	Structural Clay Non-Load-Bearing Tile	9.20.2.1.(1)
	CSA	A82.22-M1977	Gypsum Plasters	9.20.3.1.(1)
	CSA	A82.27-M1977	Gypsum Board Products	3.1.5.11.(4) Table 9.23.16.A. 9.29.5.2.
	CSA	A82.30-M1980	Interior Furring, Lathing and Gypsum Plastering	9.29.4.1.
	CSA	A82.31-M1980	Gypsum Board Application	9.29.5.1.(2)
	CSA	A82.56-M1976	Aggregate for Masonry Mortar	9.20.3.1.(1)
	CSA	CAN3-A93-M82	Natural Airflow Ventilators for Buildings	9.19.1.1.(4)
	CSA	A101-M1983	Thermal Insulation, Mineral Fibre, for Buildings	9.25.3.1.(1) Table 9.23.16.A.
	CSA	A123.1-M1979	Asphalt Shingles Surfaced with Mineral Granules	9.26.2.1.(1)
	CSA	A123.2-M1979	Asphalt Coated Roofing Sheets	9.26.2.1.(1)
	CSA	A123.3-M1979	Asphalt or Tar Saturated Roofing Felt	9.26.2.1.(1)
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Table 2.7.3.A. (Cont'd)

	Issuing Agency	Document Number	Title of Document	Code Reference
	CSA	A123.4-M1979	Bitumen for Use in Construction of Built-Up Roof Coverings and Dampproofing and Waterproofing Systems	9.13.2.1.(1) 9.26.2.1.(1)
r4	CSA	CAN/CSA A123.5-M90	Asphalt Shingles Made from Glass Felt and Surfaced with Mineral Granules	9.26.2.1.(1)
	CSA	A123.17-1963	Asphalt-Saturated Felted Glass-Fibre Mat for Use in Construction of Built-Up Roofs	9.26.2.1.(1)
	CSA	CAN3-A123.51-M85	Asphalt Shingle Application on Roof Slopes 1:3 and Steeper	9.26.1.2.
	CSA	CAN3-A123.52-M85	Asphalt Shingle Application on Roof Slopes 1:6 to less than 1:3	9.26.1.2.
	CSA	CAN3-A165.1-M85	Concrete Masonry Units	9.15.2.2. 9.20.2.1.(1) 9.20.2.6.(1)
	CSA	CAN3-A165.2-M85	Concrete Brick Masonry Units	9.20.2.1.(1)
	CSA	CAN3-A165.3-M85	Prefaced Concrete Masonry Units	9.20.2.1.(1)
	CSA	CAN3-A165.4-M85	Autoclaved Cellular Units	9.20.2.1.(1)
	CSA	CAN/CSA-A247-M86	Insulating Fibreboard	9.23.15.6.(3) Table 9.23.16.A. 9.25.3.1.(1) 9.29.8.1.
	CSA	CAN3-A266.1-M78	Air-Entraining Admixtures for Concrete	9.3.1.9.
	CSA	CAN3-A266.2-M78	Chemical Admixtures for Concrete	9.3.1.9.
	CSA	CAN3-A371-M84	Masonry Construction for Buildings	9.20.15.2.
	CSA	CAN/CSA-A405-M87	Design and Construction of Masonry Chimneys and Fireplaces	9.21.3.5. 9.22.5.2.(2)
	CSA	CAN3-A438-M84	Concrete Construction for Housing and Small Buildings	9.3.1.1.
r	CSA	CAN/CSA-A440-M90	Windows	9.7.2.1. 9.7.6.1.
e	CSA	CAN/CSA-B44-M90	Safety Code for Elevators	3.5.5.1.(1) 3.5.5.1.(2) 3.5.5.2. 3.7.3.5.(1) Table 4.1.10.A.
r2	CSA	B51-M1991	Boiler, Pressure Vessel and Pressure Piping Code	6.2.1.4.(1)
r2	CSA	B52-M1991	Mechanical Refrigeration Code	6.2.1.4.(1)
	CSA	CAN/CSA-B72-M87	Installation Code for Lightning Protection Systems	6.3.1.4.
	CSA	B111-1974	Wire Nails, Spikes and Staples	9.23.3.1. 9.26.2.2.(1) 9.29.5.6.
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Table 2.7.3.A. (Cont'd)

	Issuing Agency	Document Number	Title of Document	Code Reference
r	CSA	CAN/CSA-B139-M91	Installation Code for Oil Burning Equipment	6.2.1.4.(1) 8.2.2.11.(1)
r4	CSA	CAN/CSA-B182.1-M-92	Plastic Drain and Sewer Pipe and Pipe Fittings	9.14.3.1.(1)
	CSA	B228.1-1968	Pipes, Ducts, and Fittings for Residential Type Air Conditioning Systems	6.2.4.2.(2)
	CSA	CAN/CSA-B355-M86	Elevating Devices for the Handicapped	3.7.3.5.(2)
r2	CSA	CAN/CSA-B365-M91	Installation Code for Solid-Fuel Burning Appliances and Equipment	6.2.1.4.(1) 9.21.1.3.(2) 9.22.10.1. 9.33.1.2.
r	CSA	C22.1-1990	Canadian Electrical Code, Part 1	3.5.1.2. 3.5.2.1.(5) 3.5.2.9.(1) 6.2.1.4.(1) 8.2.2.9.(2) 9.34.1.1.
	CSA	C22.2 No. 0.3-M1985	Test Methods for Electrical Wires and Cables	3.1.4.3.(1) 3.1.5.17.(1) 3.5.4.3.(1)
	CSA	C22.2 No.113-M1984	Fans and Ventilators	9.32.3.3.(2)
	CSA	C22.2 No.141-M1985	Unit Equipment for Emergency Lighting	3.2.7.4.(2) 9.9.11.3.(6)
r4	CSA	C22.2 No. 211.0-M1984	General Requirements and Methods of Testing for Nonmetallic Conduit	3.1.5.19.
	CSA	CAN/CSA-C282-M89	Emergency Electrical Power Supply for Buildings	3.2.7.5.
	CSA	CAN/CSA-C444-M87	Installation Requirements for Heat Recovery Ventilators	6.2.1.7.
r	CSA	CAN/CSA-F280-M90	Determining the Required Capacity of Residential Space Heating and Cooling Appliances	6.2.1.2.
r2	CSA	CAN/CSA-G40.21-M91	Structural Quality Steels	4.2.3.8. 9.23.4.2.(2)
	CSA	CAN3-G401-M81	Corrugated Steel Pipe Products	9.14.3.1.(1)
	CSA	CAN/CSA-O80-M89	Wood Preservation	3.1.4.4.(1)
	CSA	CAN/CSA-O80.1-M89	Preservative Treatment of All Timber Products by Pressure Processes	9.3.2.9.(1)
	Column 1	2	3	4

Table 2.7.3.A. (Cont'd)

	Issuing Agency	Document Number	Title of Document	Code Reference
	CSA	CAN/CSA-O80.2-M89	Preservative Treatment of Lumber, Timber, Bridge Ties, and Mine Ties by Pressure Processes	4.2.3.2. 9.3.2.9.(1)
	CSA	CAN/CSA-O80.3-M89	Preservative Treatment of Piles by Pressure Processes	4.2.3.2.
	CSA	CAN/CSA-O80.9-M1989	Preservative Treatment of Plywood by Pressure Processes	9.3.2.9.(1)
	CSA	CAN/CSA-O80.15-M89	Preservative Treatment of Wood for Building Foundation Systems, Basements, and Crawl Spaces by Pressure Processes	4.2.3.2. 9.3.2.9.(1)
	CSA	CAN3-O86-M84	Engineering Design in Wood (Working Stress Design)	4.3.1.1.
e	CSA	CAN/CSA-O86.1-M89	Engineering Design in Wood (Limit States Design)	Table 4.1.9.B. 4.3.1.1.
	CSA	O115-M1982	Hardwood and Decorative Plywood	9.27.9.1. 9.30.2.2.(1)
	CSA	O118.1-M88	Western Red Cedar Shingles and Shakes	9.26.2.1.(1) 9.27.7.1.(1)
	CSA	O121-M1978	Douglas Fir Plywood	9.23.14.2.(1) 9.23.15.1.(1) Table 9.23.16.A. 9.27.9.1. 9.30.2.2.(1)
r	CSA	CAN/CSA-O122-M89	Structural Glued-Laminated Timber	9.23.4.3.(2)
r	CSA	CAN/CSA-O132.2-M90	Wood Flush Doors	9.6.4.1.(1)
r2	CSA	CAN/CSA-O141-91	Softwood Lumber	3.1.4.6.(2) 9.3.2.6.
	CSA	O151- M1978	Canadian Softwood Plywood	9.23.14.2.(1) 9.23.15.1.(1) Table 9.23.16.A. 9.27.9.1. 9.30.2.2.(1)
	CSA	O153-M1980	Poplar Plywood	9.23.14.2.(1) 9.23.15.1.(1) Table 9.23.16.A. 9.27.9.1. 9.30.2.2.(1)
	Column 1	2	3	4

Table 2.7.3.A. (Cont'd)

	Issuing Agency	Document Number	Title of Document	Code Reference
	CSA	CAN/CSA-O177-M89	Qualification Code for Manufacturers of Structural Glued-Laminated Timber	4.3.1.2.
	CSA	CAN3-O188.1-M78	Interior Mat-Formed Wood Particleboard	9.23.14.2.(3) 9.29.9.1.(1) 9.30.2.2.(1)
r3	CSA	CAN/CSA-O325.0-92	Construction Sheathing	9.23.14.2.(1) 9.23.15.1.(1) Table 9.23.16.B.
	CSA	CAN3-O437.0-M85	Waferboard and Strandboard	9.23.14.2.(1) 9.23.15.1.(1) Table 9.23.16.A. 9.27.11.1. 9.29.9.1.(2) 9.30.2.2.(1)
	CSA	CAN/CSA-S16.1-M89	Limit States Design of Steel Structures	Table 4.1.9.B. 4.3.4.1.
	CSA	CAN/CSA-S136-M89	Cold Formed Steel Structural Members	4.3.4.2.
	CSA	CAN3-S157-M83	Strength Design in Aluminum	4.3.5.1.
	CSA	S269.1-1975	Falsework for Construction Purposes	4.1.1.3.(3)
	CSA	CAN3-S304-M84	Masonry Design for Buildings	Table 4.1.9.B. 4.1.9.3.(6) 4.3.2.1.
	CSA	S307-M1980	Load Test Procedure for Wood Roof Trusses for Houses and Small Buildings	9.23.13.11.(9)
	CSA	S350-M1980	Code of Practice for Safety in Demolition of Structures	8.1.1.3.
	CSA	CAN3-S367-M81	Air Supported Structures	4.4.1.1.
r4	CSA	CAN3-S406-M92	Construction of Preserved Wood Foundations	9.15.1.3.(3)
r2	CSA	CAN/CSA-S413-M87	Parking Structures	4.4.2.1.
	CSA	CAN/CSA Z32.4-M86	Essential Electrical Systems for Hospitals	3.2.7.6.
	CSA	Z305.1-M1984	Non-Flammable Medical Gas Piping Systems	3.6.5.1.
r4	NFPA	13-1989	Installation of Sprinkler Systems	3.2.4.16.(2) 3.2.5.13.(1), (6) 3.2.8.2.(7) 3.3.2.13.(3)
	Column 1	2	3	4

Table 2.7.3.A. (Cont'd)

	Issuing Agency	Document Number	Title of Document	Code Reference
r4	NFPA	13D-1991	Standard for the Installation of Sprinkler Systems in One- and Two-Family Dwellings and Mobile Homes	3.2.5.13.(3)
r4	NFPA	13R-1991	Standard for the Installation of Sprinkler Systems in Residential Occupancies up to Four Stories in Height	3.2.5.13.(2)
r	NFPA	14-1990	Installation of Standpipe and Hose Systems	3.2.5.10.(1)
r	NFPA	71-1989	Installation, Maintenance and Use of Central Station Signaling Systems	3.2.4.7.(3)
r2	NFPA	72-1990	Installation, Maintenance and Use of Proprietary Protective Signaling Systems	3.2.4.7.(3)
r	NFPA	80-1990	Fire Doors and Windows	3.1.8.5.(2) 3.1.8.10.(2) 3.1.8.12.(2) 3.1.8.14.(1) 9.10.13.1. 9.10.13.2.(3)
r	NFPA	82-1990	Incinerators, Waste and Linen Handling Systems and Equipment	6.2.6.1.(1) 9.10.10.5.(2)
r2	NFPA	96-1991	Installation of Equipment for the Removal of Smoke and Grease-Laden Vapors from Commercial Cooking Equipment	6.2.2.6.
r4	NFPA	211-1992	Chimneys, Fireplaces, Vents, and Solid-Fuel Burning Appliances	6.3.1.2.(2) 6.3.1.3.
r4	NFPA	214-1992	Water-Cooling Towers	6.2.3.15.(4)
r2	NLGA	1991	Standard Grading Rules for Canadian Lumber	9.3.2.1. Table 9.3.2.A.
e	ULC	C199P-M1988	Combustible Piping for Sprinkler Systems	3.2.5.14.(2)
r	ULC	CAN/ULC-S101-M89	Standard Methods of Fire Endurance Tests of Building Construction and Materials	3.1.5.11.(3) 3.1.5.11.(4), (6) 3.1.7.1.(1) 3.1.11.7.(1) 3.2.3.7.(3) 3.2.6.9.(6)
	ULC	CAN/ULC-S102-M88	Standard Method of Test for Surface Burning Characteristics of Building Materials and Assemblies	3.1.12.1.(1)
	ULC	CAN/ULC-S102.2-M88	Standard Method of Test for Surface Burning Characteristics of Flooring, Floor Covering, and Miscellaneous Materials and Assemblies	3.1.12.1.(2) 3.1.13.4.(1)
	Column 1	2	3	4

Table 2.7.3.A. (Cont'd)

Issuing Agency	Document Number	Title of Document	Code Reference
ULC	S102.3-M1982	Standard Method of Fire Test of Light Diffusers and Lenses	3.1.13.4.(1)
ULC	CAN4-S104-M80	Standard Method for Fire Tests of Door Assemblies	3.1.8.4.(1) 3.2.6.9.(3)
ULC	CAN4-S105-M85	Standard Specification for Fire Door Frames Meeting the Performance Required by CAN4-S104	9.10.13.6.
ULC	CAN4-S106-M80	Standard Method for Fire Tests of Window and Glass Block Assemblies	3.1.8.4.(1)
ULC	CAN/ULC-S107-M87	Standard Methods of Fire Tests of Roof Coverings	3.1.15.1.
ULC	CAN/ULC-S109-M87	Standard for Flame Tests of Flame-Resistant Fabrics and Films	3.1.6.5. 6.2.3.4.(1) 6.2.3.5.
ULC	CAN/ULC S110-M86	Standard Methods of Test for Air Ducts	6.2.3.2.(2) 6.2.3.2.(4)
ULC	CAN4-S111-M80	Standard Method of Fire Tests for Air Filter Units	6.2.3.14.(1)
r ULC	CAN/ULC-S112-M90	Standard Method of Fire Test of Fire-Damper Assemblies	3.1.8.4.(1)
ULC	CAN4-S113-79	Standard Specification for Wood Core Doors Meeting the Performance Required by CAN4-S104-77 for Twenty Minute Fire Rated Closure Assemblies	9.10.13.2.(1)
ULC	CAN4-S114-M80	Standard Method of Test for Determination of Non-Combustibility in Building Materials	1.1.3.2.
r4 ULC	CAN4-S115-M85	Standard Method of Fire Tests for Fire Stop Systems	3.1.5.15.(3) 3.1.9.1.(1), (2) 3.1.9.4.(4) 9.10.9.7.(3)
ULC	CAN4-S124-M85	Standard Method of Test for the Evaluation of Protective Coverings for Foamed Plastic	3.1.5.11.(2)
ULC	CAN/ULC-S126-M86	Standard Method of Test For Fire Spread under Roof-Deck Assemblies	3.1.14.1.(1) 3.1.14.2.(1)
ULC	S505-1974	Standard for Fusible Links for Fire Protection Service	3.1.8.9.(2)
ULC	CAN/ULC-S524-M86	Standard for the Installation of Fire Alarm Systems	3.2.4.5.(1)
ULC	CAN/ULC-S531-M87	Standard for Smoke Alarms	3.2.4.21.(1) 9.10.18.1.
ULC	CAN/ULC-S537-M86	Standard for the Verification of Fire Alarm Systems	3.2.4.5.(2)
Column 1	2	3	4

Table 2.7.3.A. (Cont'd)

Issuing Agency	Document Number	Title of Document	Code Reference
ULC	CAN/ULC-S610-M87	Standard for Factory-Built Fireplaces	9.22.8.1.
ULC	CAN/ULC-S629-M87	Standard for 650°C Factory-Built Chimneys	9.21.1.2.
ULC	CAN/ULC-S639-M87	Standard for Steel Liner Assemblies for Solid-Fuel Burning Masonry Fireplace	9.22.2.3.
Column 1	2	3	4

is not more than 10 per cent of the *floor area* of the *storey* on which they are located, these *major occupancies* need not be considered as *major occupancies* for the purposes of Subsection 3.2.2. provided they are not classified as Group F, Division 1 or 2 *occupancies*.

3.1.3.6. Separation of Major Occupancies

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

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

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

3.1.3.7. Prohibition of Occupancy Combinations

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

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

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

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

Notes to Table 3.1.3.A.:

(1) Section 3.3 contains requirements for the separation of *occupancies* and tenancies that are in addition to the requirements for the separation of *major occupancies*.

(2) See Sentence 3.1.3.7.(1).

(3) See Sentence 3.1.3.6.(2).

(4) See Sentence 3.1.3.7.(2).

3.1.4. Combustible Construction

3.1.4.1. Combustible Materials Permitted.

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

3.1.4.2. Protection of Foamed Plastics

(1) Foamed plastics which form part of a wall or ceiling assembly in *combustible construction* shall be protected from adjacent spaces in the *building*, other than adjacent concealed spaces within *attic or roof spaces*, crawl spaces, and wall assemblies, by

(a) one of the interior finishes described in Subsections 9.29.4. to 9.29.9.,

(b) sheet metal mechanically fastened to the supporting assembly independent of the insulation, not less than 0.38 mm thick and with a melting point not below 650°C provided the *building* does not contain a Group B or Group C *major occupancy*, or

(c) any thermal barrier that meets the requirements of Sentence 3.1.5.11.(2). (See Appendix A.)

3.1.4.3. Electrical Wires and Cables

r4 **(1)** Optical fibre cables and electrical wires and cables installed in *buildings* permitted to be of *combustible construction* shall

(a) not convey flame or continue to burn for more than 1 min when tested in conformance with the Vertical Flame Test in Clause 4.11.1. of CSA C22.2 No. 0.3, "Test Methods for Electrical Wires and Cables," or

(b) be located in

(i) totally enclosed *noncombustible* raceways (see Appendix A),

(ii) masonry walls,

(iii) concrete slabs, or

r4 (iv) totally enclosed nonmetallic raceways conforming to Article 3.1.5.19.

(See also Article 3.5.4.3.)

(See Appendix A.)

3.1.4.4. Fire-Retardant Treated Wood

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

(a) be pressure impregnated with fire-retardant chemicals in conformance with CAN/CSA-O80-M, "Wood Preservation," and

(b) have a *flame-spread rating* of not more than 25.

3.1.4.5. Heavy Timber Construction Alternative.

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

3.1.4.6. Heavy Timber Construction

(1) Wood elements in *heavy timber construction* shall be arranged in heavy solid masses and with essentially smooth flat surfaces to avoid thin sections and sharp projections.

(2) The actual dimensions of solid-sawn lumber used in *heavy timber construction* in this Article shall conform to CSA O141, "Softwood Lumber."

(3) Except as provided in Sentences (4) to (6), the minimum dimensions of wood elements in *heavy timber construction* shall conform to Table 3.1.4.A.

(4) Roof arches supported on the tops of walls or abutments, roof trusses, roof beams and roof girders shall be spliced where necessary with splice plates not less than 64 mm thick and be

(a) not less than 64 mm thick where 2 or more spaced members are used for the construction, with intervening spaces blocked solidly throughout or tightly closed by a continuous wood cover plate not less than 38 mm thick secured to the underside of the members, or

(b) not less than 64 mm thick when protected by automatic sprinklers under the roof deck.

(5) Floors shall be of glued-laminated or solid-sawn plank not less than 64 mm thick, splined or tongued and grooved, or not less than 38 mm wide and 89 mm deep set on edge and well-spiked together

(a) laid so that no continuous line of end joints will occur except at points of support, and covered with tongued and grooved flooring not less than 19 mm thick laid cross-wise or diagonally, or tongued and grooved phenolic-bonded

gate area of the glazing is not more than 25 per cent of the wall area of the *storey* in which it is located, and

(a) the glazing is installed in a *building* of 1 *storey* in *building height*, or

(b) the glazing in the *first storey* is separated from the glazing in the second *storey* by apron walls, spandrel walls or canopies conforming to Article 3.2.3.17.

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

(a) each window in an exterior wall face is an individual unit separated by *noncombustible* wall construction from every other opening in the wall,

(b) windows in exterior walls in contiguous *storeys* are separated by not less than 1 m of *noncombustible construction*, and

(c) the aggregate area of openings in an exterior wall face of a *fire compartment* is not more than 40 per cent of the area of the wall face.

3.1.5.5. Combustible Cladding

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

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

(a) is not less than 5 m wide and not less than 10 m high with an opening 2.5 ± 0.1 m wide by 1.4 ± 0.1 m high, located in the middle of the assembly not more than 3 m above the lowest edge,

(b) is representative of the exterior wall construction, except for the interior finish, and

(c) incorporates horizontal and vertical joints not more than 3 m vertically above the opening.

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

(a) 42 and 48 kW/m^2 measured 0.5 m above the opening, and

(b) 25 and 29 kW/m^2 measured 1.5 m above the opening.

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

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

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

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

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

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

3.1.5.6. Nailing Elements. Wood nailing elements attached directly to or set into a continuous *noncombustible* backing for the attachment of interior finishes, are permitted in a *building* required to be of

noncombustible construction provided the concealed space created by the wood elements is not more than 50 mm thick.

3.1.5.7. Combustible Millwork. *Combustible* millwork including interior trim, doors and door frames, show windows together with their frames, aprons and backing, handrails, shelves, cabinets and counters are permitted in a *building* required to be of *noncombustible construction*.

3.1.5.8. Combustible Flooring Elements

(1) *Combustible stage* flooring supported on *noncombustible* structural members is permitted in a *building* required to be of *noncombustible construction*.

(2) Wood members more than 50 mm but not more than 300 mm high applied directly to or set into a *noncombustible* floor slab are permitted for the construction of a raised platform in a *building* required to be of *noncombustible construction* provided the concealed spaces are fire stopped in conformance with Sentence 3.1.11.3.(2). F4

(3) The floor system for the raised platform referred to in Sentence (2) is permitted to include *combustible* subfloor and *combustible* finished flooring. F4

(4) *Combustible* finished flooring is permitted in a *building* required to be of *noncombustible construction*.

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

3.1.5.10. Combustible Interior Finish

(1) *Combustible* interior finish including paint, wallpaper, and other interior finishes not more than 1 mm thick are permitted in a *building* required to be of *noncombustible construction*.

(2) *Combustible* interior wall finishes, other than foamed plastics, are permitted in a *building* required to be of *noncombustible construction* provided they

(a) are not more than 25 mm thick, and
(b) have a *flame-spread rating* of not more than 150 on any exposed surface, or any surface that would be exposed by cutting through the material in any direction.

(3) *Combustible* interior ceiling finishes, other than foamed plastics, are permitted in a *building* required to be of *noncombustible construction* provided they

(a) are not more than 25 mm thick, except for exposed *fire-retardant treated wood* battens, and
(b) have a *flame-spread rating* of not more than 25 on any exposed surface or on any surface that would be exposed by cutting through the material in any direction or are of *fire-retardant treated wood*, except that not more than 10 per cent of the ceiling area within each *fire compartment* is permitted to have a *flame-spread rating* of not more than 150.

3.1.5.11. Combustible Insulation and its Protection

(1) *Combustible* insulation, other than foamed plastics, is permitted in a *building* required to be of *noncombustible construction* provided that it has a *flame-spread rating* of not more than 25 on any exposed surface or any surface that would be exposed by cutting through the material in any direction, where the insulation is not protected as described in Sentences (2) to (4).

(2) Foamed plastic insulation having a *flame-spread rating* of not more than 25 on any exposed surface or any surface that would be exposed by cutting through the material in any direction, is permitted in a *building* required to be of *noncombustible construction* provided the insulation is protected from adjacent space in the *building*, other than adjacent concealed spaces within *attic or roof spaces*, crawl spaces, and wall assemblies, by a thermal barrier consisting of

(a) not less than 12.7 mm thick gypsum board mechanically fastened to a supporting assembly independent of the insulation,
(b) lath and plaster, mechanically fastened to a supporting assembly independent of the insulation,
(c) masonry,
(d) concrete, or
(e) any thermal barrier that meets the requirements of classification B when tested in conformance with CAN4-S124-M, "Standard Method of Test for the Evaluation of Protective Coverings for Foamed Plastic" (see Appendix A).

(3) *Combustible* insulation having a *flame-spread rating* of more than 25 but not more than 500 on an exposed surface or any surface that would be exposed by cutting through the material in any direction, is permitted in the exterior walls of a *building* required to be of *noncombustible construction* provided the insulation is protected from adjacent space in the *building*, other than adjacent concealed spaces within *attic or roof spaces*, crawl spaces, and wall assemblies, by a thermal barrier as described in Sentence (2), except that in unsprinklered *buildings* more than 18 m high or in unsprinklered *buildings* regulated by the provisions of Subsection 3.2.6., the insulation is protected by a thermal barrier consisting of

(a) gypsum board not less than 12.7 mm thick, mechanically fastened to a supporting assembly independent of the insulation and with all joints either backed or taped and filled,
(b) lath and plaster, mechanically fastened to a supporting assembly independent of the insulation,
(c) masonry or concrete not less than 25 mm thick, or
(d) any thermal barrier that, when tested in conformance with CAN/ULC-S101-M, "Standard Methods of Fire Endurance Tests of Building Construction and Materials," will not develop an average temperature rise of more than 140°C or a maximum temperature rise at any point of more than 180°C on its unexposed face within 10 min.

(See also Sentence 3.2.3.7.(3).)

(4) *Combustible* insulation having a *flame-spread rating* of more than 25 but not more than 500 on any exposed surface or any surface that would be exposed by cutting through the material in any direction, is permitted in the interior walls of a *building* required to be of *noncombustible construction* provided the insulation is protected from adjacent space in the *building*, other than adjacent concealed spaces within *attic or roof spaces*, crawl spaces, and wall assemblies, by a thermal barrier as described in Sentence (2), except that in unsprinklered *buildings* more than 18 m high or in unsprinklered *buildings* regulated by the provisions of Subsection 3.2.6., the insulation is protected by a thermal barrier consisting of

(a) Type X gypsum board not less than 15.9 mm thick conforming to CSA A82.27-M, "Gypsum Board Products," mechanically fastened to a supporting assembly independent of the insulation and with all joints either backed or taped and filled,
(b) non-*loadbearing* masonry or concrete not less than 50 mm thick,
(c) *loadbearing* masonry or concrete not less than 75 mm thick, or
(d) any thermal barrier that, when tested in conformance with CAN/ULC-S101-M, "Standard Methods of Fire Endurance Tests of Building Construction and Materials," will not develop an average temperature rise of more than 140°C or a maximum temperature rise at any point of more than 180°C on its unexposed face within 20 min and will remain in place for not less than 40 min.

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

(6) Thermosetting foamed plastic insulation having a *flame-spread rating* of not more than 500 which forms part of a factory-assembled exterior wall panel that does not incorporate an air space is permitted to be used in a *building* required to be of *noncombustible construction* provided

(a) the foamed plastic is protected on both sides by sheet steel not less than 0.38 mm thick which will remain in place for not less than 10 min when the wall panel is tested in conformance with CAN/ULC-S101-M, "Standard Methods of Fire Endurance Tests of Building Construction and Materials,"
(b) the *flame-spread rating* of the wall panel, determined by subjecting a sample including an assembled joint to the appropriate test described in Subsection 3.1.12., is not more than the *flame-spread rating* permitted for the room or space which it bounds,
(c) the *building* does not contain a Group B or Group C *major occupancy*, and

(d) the *building* is not more than 18 m high, measured between *grade* and the floor level of the uppermost *storey*.

3.1.5.12. Combustible Elements in Partitions

r4 **(1)** Except as permitted by Sentence (2), solid lumber *partitions* not less than 38 mm thick and wood framing in *partitions*, located in *fire compartments* not more than 600 m^2 in area or in *sprinklered floor areas* are permitted to be used in a *building* required to be of *noncombustible construction* provided the *partitions*

(a) are not required *fire separations*, and

(b) are not located in Group B *occupancies*.

r4 **(2)** *Partitions* installed in a *building* of *noncombustible construction* are permitted to contain wood framing provided

(a) the *building* is not more than

(i) 3 *storeys* in *building height* if the *building* is not *sprinklered*, or

(ii) 6 *storeys* in *building height* if the *building* is *sprinklered*,

(b) the *partitions* are not located in an *institutional occupancy*, and

(c) the *partitions* are not installed as enclosures for *exits* or *vertical service spaces*.

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

3.1.5.14. Combustible Ducts

(1) Except as permitted by Sentence 3.5.4.3.(1), *combustible* ducts, including *plenums* and duct connectors, are permitted to be used in a *building* required to be of *noncombustible construction* provided such ducts and duct connectors

(a) are used only in horizontal runs, and

(b) are Class 1 conforming to Article 6.2.3.2.

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

3.1.5.15. Combustible Piping Materials

(1) Except as permitted in Clause 3.1.5.2.(1)(e) and Sentences (2) and (3), piping and tubing and associated adhesives are permitted to be used in a *building* required to be of *noncombustible construction* provided they r4

(a) have a *flame-spread rating* of not more than 25, except when concealed in a wall or a concrete floor slab, and

(b) when used in *buildings* described in Subsection 3.2.6., have a smoke developed classification of not more than 50, except when concealed in a wall or a concrete floor slab.

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

(3) Polypropylene pipes and fittings are permitted to be used for drain, waste and vent piping for the conveyance of highly corrosive materials and for piping used to distribute distilled or dialyzed water in laboratory and hospital facilities, provided r4

(a) they are installed in a *sprinklered building*,

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

(c) piping that penetrates a *fire separation* is sealed at the penetration by a fire stop system that, when subjected to the fire test method in CAN4-S115-M, "Standard Method of Fire Tests of Firestop Systems," has an FT rating not less than the *fire-resistance rating* of the *fire separation*.

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

3.1.5.17. Electrical Wires and Cables

(1) Except as permitted in Article 3.1.5.16., optical fibre cables and electrical wires and cables with *combustible* insulation, jackets or sheathes are permitted in a *building* required to be of *noncombustible construction* provided r4

(a) the wires and cables exhibit a vertical char of not more than 1.5 m when tested in conformance with the Vertical Flame Test – Cables in Cabletrough in Clause 4.11.4.

of CSA C22.2 No. 0.3, "Test Methods for Electrical Wires and Cables," or

(b) the wires and cables are located in

(i) totally enclosed *noncombustible* raceways (see A-3.1.4.3.(1)(b)(i) in Appendix A),

(ii) masonry walls,

(iii) concrete slabs,

(iv) a *service room* separated from the remainder of the *building* by a *fire separation* having not less than a 1 h *fire-resistance rating*, or

r4 (v) totally enclosed nonmetallic raceways conforming to Article 3.1.5.19.

(See Appendix A.)

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

r4 **3.1.5.19. Totally Enclosed Nonmetallic Raceways.** Totally enclosed nonmetallic raceways not more than 625 mm^2 in cross-sectional area are permitted to be used in a *building* required to be of *noncombustible construction* to enclose optical fibre cables and electrical wires and cables provided the totally enclosed nonmetallic raceway exhibits a vertical char of not more than 1.5 m when tested in conformance with the Vertical Flame Test (FT-4) – Conduit or Tubing on Cable Tray in Clause 6.16 of CSA C22.2 No. 211.0-M, "General Requirements and Methods of Testing for Nonmetallic Conduit."

3.1.6. Tents and Air-Supported Structures (See Appendix A.)

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

3.1.6.2. Restrictions

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

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

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

3.1.6.3. Clearance to Other Structures

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

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

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

(4) Tents not more than 120 m^2 in ground area, located on fair grounds or similar open spaces, need not be separated from one another provided such closer spacing does not create a hazard to the public.

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

3.1.6.5. Flame Resistance. Every tent and *air-supported structure* and all tarpaulins and decorative materials used in connection with such structures shall conform to CAN/ULC-S109-M, "Standard for Flame Tests of Flame-Resistant Fabrics and Films."

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

3.1.7. Fire-Resistance Ratings

3.1.7.1. Determination of Ratings

(1) Except as provided in Sentence (2) and Article 3.1.7.2., where a material, assembly of materials or a structural member is required to have a *fire-resistance rating*, the rating shall be determined on the basis of the results of tests conducted in conformance with CAN/ULC-S101-M, "Standard Methods of Fire Endurance Tests of Building Construction and Materials."

(2) A material, assembly of materials or a structural member is permitted to be assigned a *fire-resistance rating* on the basis of Chapter 2, "Fire Performance Ratings" of the Supplement to the NBC 1990.

3.1.7.2. Exception for Exterior Walls. The limitation on the rise of temperature on the unexposed surface of an assembly as required by the tests referred to in Sentence 3.1.7.1.(1) shall not apply to an exterior wall that has a *limiting distance* of 1.2 m or more provided correction is made for radiation from the unexposed surface in accordance with Article 3.2.3.12.

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

3.1.7.4. Exposure Conditions for Rating

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

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

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

3.1.7.5. Minimum Fire-Resistance Rating. The use of materials or assemblies of materials having a greater *fire-resistance rating* than required shall entail no obligation to exceed in whole or in

part the minimum *fire-resistance ratings* required by this Part.

3.1.7.6. Rating of Supporting Construction

(1) Except as provided in Sentence (2) and in r4 Articles 3.2.2.16. to 3.2.2.64. for mixed types of construction, all *loadbearing* walls, columns and arches in the *storey* immediately below a floor or roof assembly required to have a *fire-resistance rating* shall have a *fire-resistance rating* not less than that of the supported floor or roof assembly.

(2) *Loadbearing* walls, columns and arches supporting a *service room* or *service space* need not conform to Sentence (1).

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

3.1.8. Fire Separations and Closures

3.1.8.1. General Requirements

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

(a) except as permitted in Sentence (2), be constructed as a continuous element (see Appendix A), and

(b) where required in this Part, have a *fire-resistance rating* as specified. (See Appendix A.)

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

3.1.8.2. Combustible Construction Support.

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

3.1.8.3. Continuity of Fire Separations

(1) Except as provided in Sentence 3.5.4.2.(2), a *horizontal service space* or other concealed space located above a required vertical *fire separation*, including the walls of a vertical shaft, shall be divided at the *fire separation* by an equivalent *fire separation* within the *service space*, and the separation shall terminate so that a smoke-tight joint is provided at the point where it abuts on or intersects the floor and the roof slab or deck.

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

3.1.8.4. Determination of Ratings

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

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

Table 3.1.8.A.
Forming Part of Sentence 3.1.8.4.(2)

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

3.1.8.14. Wired Glass and Glass Block

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

(2) Wired glass assemblies permitted in Sentence (1) which are used in vertical *fire separations* need not be tested in conformance with Sentence 3.1.8.4.(1) provided that the wired glass is

(a) not less than 6 mm thick,
(b) reinforced by a steel wire mesh in the form of diamonds, squares or hexagons having dimensions of approximately 25 mm across the flats, using wire of not less than 0.45 mm diam, or approximately 13 mm across the flats, using wire of not less than 0.40 mm diam, the wire to be centrally embedded during manufacture and welded or intertwined at each intersection,
(c) set in fixed steel frames having a minimum metal thickness of 1.35 mm and providing a glazing stop of not less than 20 mm on each side of the glass, and
(d) limited in area so that
  (i) individual panes are not more than 0.84 m^2, with neither height nor width more than 1.4 m, and
  (ii) the area not structurally supported by mullions is not more than 7.5 m^2. (See Appendix A.)

(3) Where glass blocks are permitted in Sentence (1), they shall be installed in accordance with Subsection 4.3.2. and reinforced with steel reinforcement in each horizontal joint.

3.1.8.15. Temperature Rise Limit for Doors.

Except as provided in Article 3.1.8.17., the maximum temperature rise on the opaque portion of the unexposed side of a door used as a *closure* in a *fire separation*, when tested in conformance with Sentence 3.1.8.4.(1), shall conform to Table 3.1.8.B. when used in the locations shown in the Table.

3.1.8.16. Area Limits for Wired Glass or Glass Block.

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

3.1.8.17. Temperature Rise and Area Limits Waived

(1) The temperature rise limits and glass area limits required in Articles 3.1.8.15. and 3.1.8.16. are waived for *closures* between an *exit* enclosure and an enclosed vestibule or corridor provided

(a) the vestibule or corridor is separated from the remainder of the *floor area* by a *fire separation* having a *fire-resistance rating* of not less than 45 min,
(b) the separation in Clause (a) contains no wired glass or glass block within 3 m of the *closure* into the *exit* enclosure, and
(c) the vestibule or corridor contains no *occupancy*.

(See Appendix A.)

3.1.9. Building Services in Fire Separations and Fire Rated Assemblies

3.1.9.1. Fire Stopping of Service Penetrations

(1) Piping, tubing, ducts, *chimneys*, electrical wires and cables, totally enclosed *noncombustible* raceways, electrical outlet boxes and other similar *building* services that penetrate a membrane forming part of an assembly required to have a *fire-resistance rating*, or a *fire separation*, shall be

(a) tightly fitted, or
(b) sealed by a fire stop system that, when subjected to the fire test method in CAN4-S115-M, "Standard Method of Fire Tests of Firestop Systems," has an F rating not less than the *fire-protection rating* required for *closures* in the *fire separation*. (See A-9.10.9.6.(1) in Appendix A.) (See also Article 3.1.9.4. for penetrations involving *combustible* drain, waste and vent piping.)

(2) Piping, tubing, ducts, *chimneys*, electrical wires and cables, totally enclosed *noncombustible* raceways, electrical outlet boxes and other similar *building* services that penetrate a *firewall* or a horizontal *fire separation* that is required to have a *fire-*

Table 3.1.8.B.
r4 Forming Part of Articles 3.1.8.15. and 3.1.8.16.

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

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

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

3.1.9.3. Penetration by Wires, Cables and Outlet Boxes

(1) Electrical or similar wiring in totally enclosed *noncombustible* raceways is permitted to partly or wholly penetrate an assembly required to have a *fire-resistance rating* without being incorporated in the assembly at the time of testing as required in Article 3.1.9.2.

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

3.1.10.7. Combustible Projections

(1) *Combustible* material shall not extend across the end of a *firewall* but is permitted to extend across a roof above a *firewall* that is terminated in conformance with Sentence 3.1.10.3.(2).

(2) When *buildings* are separated by a *firewall*, *combustible* projections on the exterior of one *building*, such as balconies, platforms, canopies, eave projections and stairs, that extend outward beyond the end of the *firewall*, shall not be permitted within 2.4 m of *combustible* projections and window or door openings of the adjacent *building*. (See also Article 3.2.3.6.)

3.1.11. Fire Stops in Concealed Spaces

3.1.11.1. Separation of Concealed Spaces. Concealed spaces in interior wall, ceiling and crawl spaces shall be separated from concealed spaces in exterior walls and *attic or roof spaces* by fire stops conforming to Article 3.1.11.7.

3.1.11.2. Fire Stopping in Wall Assemblies

(1) Except as permitted in Sentence (2), fire stops conforming to Article 3.1.11.7. shall be provided to block off concealed spaces within a wall assembly

(a) at every floor level,

(b) at every ceiling level where the ceiling forms part of an assembly required to have a *fire-resistance rating*, and

(c) so that the maximum horizontal dimension is not more than 20 m and the maximum vertical dimension is not more than 3 m.

(2) Fire stops conforming to Sentence (1) are not required provided

(a) the wall space is filled with insulation,

(b) the exposed construction materials and any insulation within the wall space are *noncombustible*,

(c) the exposed construction materials and any insulation within the wall space have a *flame-spread rating* of not more than 25 on any exposed surface or on any surface that would be exposed by cutting through the material in any direction and fire stops are installed so that the vertical distance between them is not more than 10 m, or

(d) the insulated wall assembly contains not more than one concealed air space, and the horizontal thickness of that air space is not more than 25 mm. r4

3.1.11.3. Fire Stopping between Nailing and Supporting Elements

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

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

3.1.11.4. Fire Stopping between Vertical and Horizontal Spaces

(1) Fire stops conforming to Article 3.1.11.7. shall be provided

(a) at all interconnections between concealed vertical and horizontal spaces in interior coved ceilings, drop ceilings and soffits in which the exposed construction materials within the space have a *flame-spread rating* of more than 25, and

(b) at the end of each run and at each floor level in concealed spaces between stair stringers in which the exposed construction materials within the space have a *flame-spread rating* of more than 25.

3.1.11.5. Fire Stopping of Roof Spaces, Balconies and Canopies

(1) Every unsprinklered concealed space within a ceiling or roof assembly of *combustible construction*, including attic spaces, shall be separated by construction conforming to Article 3.1.11.7. into compartments not more than

(a) 600 m^2 in area with no dimension more than 60 m where the exposed construction materials within the space have a *flame-*

spread rating of not more than 25, and

(b) 300 m² in area with no dimension more than 20 m where the exposed construction materials within the space have a *flame-spread rating* of more than 25.

(2) Every concealed space in exterior cornices, mansard style roofs, balconies and canopies in which the exposed construction materials within the space have a *flame-spread rating* of more than 25 shall be separated by construction conforming to Article 3.1.11.7.

(a) at the points where such concealed spaces extend across the ends of required vertical *fire separations*, and

(b) so that the maximum dimension in any concealed space is not more than 20 m.

3.1.11.6. Fire Stopping of Crawl Spaces.

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

3.1.11.7. Fire Stop Materials

(1) Except as provided in Sentences (2) to (4), materials used to separate concealed spaces into compartments shall remain in place and prevent the passage of flames for a period of not less than 15 min when subjected to the standard fire exposure in CAN r /ULC-S101-M, "Standard Methods of Fire Endurance Tests of Building Construction and Materials."

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

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

(4) In *buildings* permitted to be of *combustible construction* and in *combustible* roof systems permitted r4 by Sentence 3.1.5.3.(2) and in raised platforms permitted by Article 3.1.5.8., materials used to separate concealed spaces into compartments are permitted to be

(a) solid lumber not less than 38 mm thick,

(b) phenolic bonded plywood, waferboard, or strandboard not less than 12.5 mm thick with joints supported, or

(c) 2 thicknesses of lumber each not less than 19 mm thick with joints staggered, where the width or height of the concealed space is such that more than one piece of lumber not less than 38 mm thick is necessary to block off the space.

(5) Openings through materials referred to in Sentences (1) to (4) shall be protected to maintain the integrity of the construction.

(6) Where materials referred to in Sentences (1) to (4) are penetrated by construction elements or by service equipment, fire stop materials shall be used to seal the penetration.

3.1.12. Flame-Spread Rating and Smoke Developed Classification

3.1.12.1. Determination of Ratings

(1) Except as provided in Sentences (2) and (3), the *flame-spread rating* and smoke developed classification of a material, assembly of materials or structural member shall be determined on the basis of not less than 3 tests conducted in conformance with CAN/ULC-S102-M, "Standard Method of Test for Surface Burning Characteristics of Building Materials and Assemblies."

(2) The *flame-spread rating* and smoke developed classification of a material or assembly of materials shall be determined on the basis of not less than 3 tests conducted in conformance with CAN/ULC-S102.2-M, "Standard Method of Test for Surface Burning Characteristics of Flooring, Floor Covering, and Miscellaneous Materials and Assemblies," where the material or assembly of materials

(a) is designed for use in a relatively horizontal position with only its top surface exposed to air,

(b) cannot be tested in conformance with Sentence (1) without the use of supporting material that is not representative of the intended installation, or

(c) is thermoplastic.

(3) A material, assembly of materials or a structural member is permitted to be assigned a *flame-spread rating* and smoke developed classification on the basis of Chapter 2, "Fire Performance Ratings" of the Supplement to the NBC 1990.

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

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

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

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

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

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

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

3.1.13.8. Noncombustible Construction

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

(a) the *flame-spread ratings* in Subsection 3.1.5. shall apply in addition to the requirements in this Subsection, and

(b) the *flame-spread ratings* for *exits* in this Subsection shall also apply to any surface in the *exit* that would be exposed by cutting through the material in any direction, except that this requirement does not apply to doors, *heavy timber construction* in *sprinklered buildings* and *fire-retardant treated wood*.

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

3.1.13.10. Exterior Exit Passageway. Where an exterior *exit* passageway provides the only *means of egress* from the rooms or *suites* it serves, the wall and ceiling finishes of that passageway, including the soffit beneath and the *guard* on the passageway, shall have a *flame-spread rating* of not more than 25, except that a *flame-spread rating* of not more than 150 is permitted for up to 10 per cent of the total wall area and for up to 10 per cent of the total ceiling area.

3.1.14. Roof Assemblies

3.1.14.1. Fire-Retardant Treated Wood Roof Systems

(1) Where a *fire-retardant treated wood* roof system is used to comply with the requirements of Subsection 3.2.2., the roof deck assembly shall meet the conditions of acceptance of CAN/ULC-S126-M, "Standard Method of Test for Fire Spread Under Roof-Deck Assemblies."

(2) Supports for the roof deck assembly referred to in Sentence (1) shall consist of

(a) *fire-retardant treated wood*,

(b) *heavy timber construction*,

(c) *noncombustible construction*, or

(d) a combination thereof.

3.1.14.2. Metal Roof Deck Assemblies

(1) Except as permitted in Sentence (2), a metal roof deck assembly shall meet the conditions of acceptance of CAN/ULC S126-M, "Standard Method of Test for Fire Spread Under Roof-Deck Assemblies" if

(a) it supports a *combustible* material above the deck that could propagate a fire beneath the roof deck assembly, and

(b) the deck is used to comply with the requirements for *noncombustible construction* in Sentences 3.2.2.16.(2), 3.2.2.17.(2), 3.2.2.21.(2), 3.2.2.25.(2), 3.2.2.31.(2), 3.2.2.40.(2), 3.2.2.42.(2), 3.2.2.43.(2), 3.2.2.45.(2), 3.2.2.54.(2), 3.2.2.59.(2), 3.2.2.60.(2) or 3.2.2.61.(2). r4

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

(a) the *combustible* material above the roof deck is protected by a thermal barrier

conforming to Clause 3.1.5.11.(2)(e) that is located
  (i) on its underside, or
  (ii) beneath the roof deck,
(b) the *building* is *sprinklered* in accordance with Sentence 3.2.2.12.(1), or
(c) the roof assembly has a *fire-resistance rating* of not less than 45 min.

3.1.15. Roof Covering

3.1.15.1. Roof Covering Classification.

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

3.1.16. Occupant Load

3.1.16.1. Occupant Load Determination

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

(2) Where a *floor area* or part thereof has been designed for an *occupant load* other than that determined from Table 3.1.16.A., a permanent sign indicating that *occupant load* shall be posted in a conspicuous location.

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

(4) Where a room or group of rooms is intended for 2 or more *occupancies* at different times, the value to be used from Table 3.1.16.A. shall be the value which gives the greatest number of persons for the *occupancies* concerned.

Table 3.1.16.A
Forming Part of Article 3.1.16.1

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

Note to Table 3.1.16.A.:
[1] See A-3.3.1.4.(1) in Appendix A.

Section 3.2 Size and Occupancy Requirements for Fire Safety

3.2.1. General

3.2.1.1. Exceptions to Building Height in Storeys

(1) Roof-top enclosures provided for elevator machinery, stairways and *service rooms*, used for no purpose other than for service to the *building*, shall not be considered as a *storey* in calculating the *building height*.

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

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

(a) the aggregate area of the *mezzanine* floor is not more than 40 per cent of the area of the *storey* in which it is located,

(b) it is used as an open *floor area* except as provided in Sentence 3.3.2.11.(2), and

(c) the space above the *mezzanine* floor and the space above the floor beneath it has no visual obstructions more than 1 070 mm above such floors.

(See Appendix A.)

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

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

(6) When a *mezzanine* is required to be considered as a *storey* in determining *building height*, its floor assembly shall be constructed in conformance with the *fire separation* requirements for floor assemblies in Articles 3.2.2.16. to 3.2.2.64. r4

(7) A *service space* in which facilities are included to permit a person to enter and to undertake maintenance and other operations pertaining to *building* services from within the *service space* need not be considered a *storey* if it conforms to Articles 3.2.5.15. and 3.3.1.22., and Sentences 3.2.4.19.(2), 3.2.7.3.(2), 3.3.1.3.(7), 3.4.2.4.(3) and 3.4.4.4.(8). (See Appendix A.)

3.2.1.2. Storage Garage Considered as a Separate Building.

Where a *basement* is used primarily as a *storage garage*, the *basement* is permitted to be considered as a separate *building* for the purposes of Subsection 3.2.2. provided the floor above the *basement* and the exterior walls of the *basement* above the adjoining ground level are constructed as *fire separations* of masonry or concrete having a *fire-resistance rating* of not less than 2 h.

3.2.1.3. Roof Considered as a Wall.

For the purposes of this Section any part of a roof that is pitched at an angle of 60° or more to the horizontal and adjoins a space intended for *occupancy* within a *building* shall be considered as part of an external wall of the *building*.

3.2.1.4. Floor Assembly over Basement

(1) A floor assembly immediately above a *basement* shall be constructed as a *fire separation* having a *fire-resistance rating* conforming to the requirements for floor assemblies in Articles 3.2.2.16. to 3.2.2.64., but not less than 45 min. r4

(2) All *loadbearing* walls, columns and arches supporting a floor assembly immediately above a *basement* shall have a *fire-resistance rating* not less than that required in Sentence (1) for the floor assembly.

3.2.1.5. Fire Containment in Basements

(1) Except as provided in Sentences (2) and 3.2.2.11.(2), *basements* shall be *sprinklered* or shall be subdivided into *fire compartments* not more than 600 m^2 in area by a *fire separation* having a *fire-resistance rating* not less than that required for the floor assembly immediately above the *basement*.

(2) An *open-air storey* need not conform to Sentence (1).

3.2.2. Building Size and Construction Relative to Occupancy

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

3.2.2.2. Special and Unusual Structures. Structures which cannot be identified with the descriptions of *buildings* in Articles 3.2.2.16. to 3.2.2.64. shall be protected against fire spread and collapse in conformance with good fire protection engineering practice, such as described in the NFPA Fire Protection Handbook, Sixteenth Edition. (See A-3, A-3.2.2.2. and A-3.2.5.13.(1) in Appendix A.) r4

3.2.2.3. Exceptions to Structural Fire Protection

(1) Fire protection is not required for

(a) steel lintels over openings not more than 2 m wide in *loadbearing* walls and not more than 3 m wide in non-*loadbearing* walls,

(b) steel lintels over openings greater than those in Clause (a) provided such lintels are supported at intervals of not more than 2 m by structural members with the required *fire-resistance rating*,

(c) the bottom flanges of shelf angles and plates that are not a part of the structural frame,

(d) steel members for framework around elevator shaft doorways, steel for the support of elevator and dumbwaiter guides, counterweights and other such equipment, when entirely enclosed in a shaft and not a part of the structural frame of a *building*,

(e) steel members of stairways, including escalators, which are not a part of the structural frame of a *building*,

(f) steel members of porches, exterior balconies, exterior stairways, fire escapes, cornices, marquees and other similar appurtenances provided they are outside an exterior wall of a *building*, and

(g) *loadbearing* steel or concrete members wholly or partially outside of a *building* face in *buildings* not more than 4 *storeys* in *building height* and classified as Group A, B, C, D or F, Division 3 *major occupancy* provided such members are not less than 1 m away from any *unprotected opening* in an exterior wall, or shielded from heat radiation in the event of a fire within a *building* by construction that will provide the same degree of protection that would be necessary if the member was located inside the *building*, with the protection extending on either side of the member a distance equal to the projection of the member from the face of the wall. (See also Sentence 3.2.3.8.(2).)

3.2.2.4. Lesser Restrictions. When the *building height* or the *building area* could be regulated by more than one of Articles 3.2.2.16. to 3.2.2.64. for the same *occupancy* classification of the *building*, the least restrictive Article is permitted to be used. r4

3.2.2.5. Crawl Spaces

(1) For the purposes of Articles 3.2.1.4. and 3.2.1.5., a crawl space shall be considered as a *basement* when it is more than 1.8 m high between the lowest part of the floor assembly and the ground or other surface below or is used

(a) for any *occupancy*,

(b) for the passage of *flue pipes*, or

(c) as a *plenum* in *combustible construction*.

(2) A floor assembly immediately above a crawl space is not required to be constructed as a *fire separation* and is not required to have a *fire-resistance rating* provided the crawl space is not considered as a *basement* in Sentence (1).

3.2.2.6. Streets

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

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

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

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

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

3.2.2.7. Exterior Balconies. Exterior balconies shall be constructed in accordance with the type of construction required in Articles 3.2.2.16. to
r4 3.2.2.64., as applicable to the *occupancy* classification of the *building*.

3.2.2.8. Exterior Passageways. Elevated exterior passageways used as part of a *means of egress* shall conform to the requirements in Articles 3.2.2.16.
r4 to 3.2.2.64. for *mezzanines*.

3.2.2.9. Occupancy on Roof. Where a portion of a roof supports an *occupancy*, that portion shall be constructed in conformance with the *fire separation* requirements for floor assemblies in
r4 Articles 3.2.2.16. to 3.2.2.64.

3.2.2.10. Roof-Top Enclosures

(1) Roof-top enclosures provided for elevator machinery and *service rooms*, used for no purpose other than for service to the *building*, shall be constructed in accordance with the type of construction
r4 required in Articles 3.2.2.16. to 3.2.2.64., except that where such enclosure is not more than 1 *storey*, it is not required to have a *fire-resistance rating*.

(2) Roof-top enclosures for stairways including *exit* stairways shall be constructed in
r4 conformance with Articles 3.2.2.16. to 3.2.2.64., except that such enclosures need not have a *fire-resistance rating* nor be constructed as a *fire separation*.

3.2.2.11. Storeys below Ground

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

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

(a) except as provided in Sentence (3), *basements* shall be *sprinklered*,
(b) floor assemblies below such ground level shall be constructed as a
  (i) *fire separation* with a *fire-resistance rating* of not less than 3 h where the *basements* are occupied by Group E or Group F, Division 1 or 2 *occupancies*, and
  (ii) *fire separation* with a *fire-resistance rating* of not less than 2 h where the *basements* are not occupied by Group E or Group F, Division 1 or 2 *occupancies*, and
(c) all *loadbearing* walls, columns and arches shall have a *fire-resistance rating* not less than that required for the construction that they support.

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

(a) it contains only *residential occupancies*, and
(b) not less than one unobstructed access opening conforming to Sentence 3.2.5.1.(2) is installed on that *storey* for each 15 m of wall length in not less than one wall required to face a *street* in Subsection 3.2.2.

3.2.2.12. Sprinklers in Lieu of Roof Assembly Rating

(1) The requirements in Articles 3.2.2.16. to 3.2.2.64. for roof assemblies to have a *fire-resistance* r4
rating are permitted to be waived provided

(a) the *building* is *sprinklered*,
(b) the sprinkler system in Clause (a) is electrically supervised in conformance with Sentence 3.2.4.16.(5), and
(c) the operation of the sprinkler system in Clause (a) will cause a signal to be transmitted to the fire department in conformance with Sentence 3.2.4.7.(3).

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

3.2.2.13. Heavy Timber Roof Permitted.
For the purposes of Articles 3.2.2.16. to 3.2.2.64., roof r4
assemblies in *buildings* up to 2 *storeys* in *building*

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

3.2.2.14. Ratings Waived for Arena Type Building Roof

(1) The requirements for a roof assembly to have a *fire-resistance rating* are permitted to be waived for gymnasia, swimming pools, arenas, and rinks if no part of the roof assembly is less than 6 m above the main floor or balcony and the roof carries no loads other than normal roof loads, including permanent access walks, and ventilating, sound and lighting equipment, except that the restriction concerning minimum distance shall not apply to

(a) an inclined and stepped floor ascending from the main floor which is used for seating purposes only, or
(b) a balcony used for seating purposes only.

3.2.2.15. Buildings Containing Impeded Egress Zones

(1) A *building*, containing an *impeded egress zone* and not more than 1 *storey* in *building height*, conforming to the appropriate requirements of Articles 3.2.2.16. to 3.2.2.64., is not required to conform to the requirements for a Group B, Division 1 *major occupancy* provided

r4

(a) the *building* is *sprinklered*,
(b) the *building* does not include
  (i) a *contained use area*
  (ii) sleeping accommodation,
  (iii) a *high hazard industrial occupancy*, or
  (iv) a *mercantile occupancy*,
(c) the *building area* is not more than 6 400 m^2 if the *building* includes a *medium hazard industrial occupancy*,
(d) the *impeded egress zone* does not extend beyond the boundaries of the *fire compartment* in which it is located, and
(e) the *occupant load* of the *impeded egress zone* is not more than 100.

3.2.2.16. Assembly Buildings, Division 1, 1 Storey

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

(a) is not more than 1 *storey* in *building height*,
(b) has no part of the auditorium floor more than 5 m above or below *grade*,
(c) has no *occupancy* above or below the auditorium other than one which serves it or is dependent on it, and
(d) is one in which the *occupant load* of the auditorium floor is not more than 300 persons.

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

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

(See also Article 3.2.2.17.)

3.2.2.17. Assembly Buildings, Division 1, 1 Storey

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

(a) is not more than 1 *storey* in *building height*,
(b) has less than 40 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

(ii) if *sprinklered*, the *building area* is not more than twice the area limits of Subclause (i) (see Article 3.2.2.12. for supervised sprinkler systems), and

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

r4 3.2.2.41. Business and Personal Services Buildings, 4 Storeys, Sprinklered

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

(a) is 4 *storeys* in *building height*,

(b) is *sprinklered*, and

(c) has a *building area* not more than

(i) 2 400 m^2 if facing one *street*

(ii) 3 000 m^2 if facing 2 *streets*, or

(iii) 3 600 m^2 if facing 3 *streets*.

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

(a) floor assemblies shall be *fire separations* with a *fire-resistance rating* of not less than 1 h,

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

(c) roof assemblies shall have a *fire-resistance rating* of not less than 1 h, and

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

r4 3.2.2.42. Business and Personal Services Buildings, up to 6 Storeys

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

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

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

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

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

(a) floor assemblies shall be *fire separations* with a *fire-resistance rating* of not less than 1 h,

Table 3.2.2.K.
Forming Part of Sentence 3.2.2.42.(1) r4

No. of *Storeys*	Unsprinklered Maximum Area, m^2		
	Facing 1 *Street*	Facing 2 *Streets*	Facing 3 *Streets*
1	unlimited	unlimited	unlimited
2	7 200	unlimited	unlimited
3	4 800	6 000	7 200
4	3 600	4 500	5 400
5	2 800	3 600	4 320
6	2 400	3 000	3 600
Column 1	2	3	4

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

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

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

3.2.2.43. Business and Personal Services Buildings, Any Height, Any Area r4

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

(a) is not limited in *building height*, and

(b) is not limited in *building area*.

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

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

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

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

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

3.2.2.44. Mercantile Buildings, 1 and 2 Storeys

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

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

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

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

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

No. of *Storeys*	Unsprinklered Maximum Area, m²		
	Facing 1 *Street*	Facing 2 *Streets*	Facing 3 *Streets*
1	1 000	1 250	1 500
2	600	750	900
Column 1	2	3	4

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

(a) floor assemblies shall be *fire separations* with a *fire-resistance rating* of not less than 45 min, and

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

3.2.2.45. Mercantile Buildings, up to 3 Storeys

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

(a) is not more than 3 *storeys* in *building height*, and

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

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

(a) floor assemblies shall be *fire separations* with a *fire-resistance rating* of not less than 45 min,

(b) *mezzanines* shall have, if of *combustible construction*, a *fire-resistance rating* of not less than 45 min,

Table 3.2.2.M.
Forming Part of Sentence 3.2.2.45.(1)

No. of *Storeys*	Unsprinklered Maximum Area, m²		
	Facing 1 *Street*	Facing 2 *Streets*	Facing 3 *Streets*
1	1 500	1 500	1 500
2	1 200	1 500	1 500
3	800	1 000	1 200
	Sprinklered Maximum Area, m²		
1	4 800	6 000	7 200
2	2 400	3 000	3 600
3	1 600	2 000	2 400
Column 1	2	3	4

(c) roof assemblies shall have a *fire-resistance rating* of not less than 45 min, except that in *buildings* not more than 1 *storey* in *building height*, the *fire-resistance rating* is permitted to be waived provided the roof assembly is of *noncombustible construction* or is constructed as a *fire-retardant treated wood* roof system conforming to Article 3.1.14.1., and

(i) if unsprinklered, the *building area* is not more than 1 500 m², and

(ii) if *sprinklered*, the *building area* is not more than
2 400 m² if facing 1 *street*,
3 000 m² if facing 2 *streets*, or
3 600 m² if facing 3 *streets*
(see Article 3.2.2.12. for supervised sprinkler systems), and

(d) all *loadbearing* walls, columns and arches supporting an assembly required to have a *fire-resistance rating* shall have a *fire-resistance rating* of not less than 45 min or shall be of *noncombustible construction*, except that such members and assemblies supporting a *fire separation* shall have a *fire-resistance rating* not less than that required for the supported assembly.

3.2.2.46. Mercantile Buildings, 4 Storeys, Sprinklered

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

(a) is 4 *storeys* in *building height*,
(b) is *sprinklered*, and
(c) has a *building area* not more than
  (i) 1 200 m^2 if facing one *street*,
  (ii) 1 500 m^2 if facing 2 *streets*, or
  (iii) 1 800 m^2 if facing 3 *streets*.

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

(a) floor assemblies shall be *fire separations* with a *fire-resistance rating* of not less than 1 h,
(b) *mezzanines* shall have a *fire-resistance rating* of not less than 1 h,
(c) roof assemblies shall have a *fire-resistance rating* of not less than 1 h, and
(d) all *loadbearing* walls, columns and arches shall have a *fire-resistance rating* not less than that required for the supported assembly.

3.2.2.47. Mercantile Buildings, up to 6 Storeys

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

(a) if unsprinklered, is not more than 3 *storeys* in *building height* and has a *building area* not more than 1 500 m^2, and
(b) if *sprinklered*, is not more than 6 *storeys* in *building height* and has a *building area* not more than the value in Table 3.2.2.N.

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

(a) floor assemblies shall be *fire separations* with a *fire-resistance rating* of not less than 2 h,
(b) *mezzanines* shall have a *fire-resistance rating* of not less than 1 h,
(c) roof assemblies shall have a *fire-resistance rating* of not less than 1 h, and
(d) all *loadbearing* walls, columns and arches shall have a *fire-resistance rating* not less

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

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

than that required for the supported assembly.

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

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

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

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

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

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

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

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

Table 3.2.2.O.
Forming Part of Sentence 3.2.2.49.(1)

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

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

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

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

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

(a) is not more than 3 *storeys* in *building height*,
(b) is *sprinklered*, and
(c) has a *building area* not more than the value in Table 3.2.2.P.

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

(a) floor assemblies shall be *fire separations* with a *fire-resistance rating* of not less than 45 min, and
(b) all *loadbearing* walls, columns and arches shall have a *fire-resistance rating* not less than that required for the supported assembly.

Table 3.2.2.P.
r4 Forming Part of Sentence 3.2.2.50.(1)

No. of *Storeys*	*Sprinklered* Maximum Area, m²		
	Facing 1 *Street*	Facing 2 *Streets*	Facing 3 *Streets*
1	2 400	3 000	3 600
2	1 200	1 500	1 800
3	800	1 000	1 200
Column 1	2	3	4

r4 3.2.2.51. Industrial Buildings, Division 1, up to 4 Storeys

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

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

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

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

Table 3.2.2.Q.
r4 Forming Part of Sentence 3.2.2.51.(1)

No. of *Storeys*	Unsprinklered Maximum Area, m²		
	Facing 1 *Street*	Facing 2 *Streets*	Facing 3 *Streets*
1	2 400	3 000	3 600
2	1 200	1 500	1 800
3	800	1 000	1 200
4	600	750	900
Column 1	2	3	4

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

3.2.2.52. Industrial Buildings, Division 1, up to 4 Storeys, Sprinklered r4

(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*, and
(c) has a *building area* not more than the value in Table 3.2.2.R.

Table 3.2.2.R.
Forming Part of Sentence 3.2.2.52.(1) r4

No. of *Storeys*	*Sprinklered* Maximum Area, m²		
	Facing 1 *Street*	Facing 2 *Streets*	Facing 3 *Streets*
1	6 000	7 500	9 000
2	3 000	3 750	4 500
3	2 000	2 500	3 000
4	1 500	1 875	2 250
Column 1	2	3	4

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

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

r4 3.2.2.53. Industrial Buildings, Division 2, 1 and 2 Storeys

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

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

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

Table 3.2.2.S.
r4 Forming Part of Sentence 3.2.2.53.(1)

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

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

(a) floor assemblies shall be *fire separations* and, if of *combustible construction*, shall have a *fire-resistance rating* of not less than 45 min, and

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

r4 3.2.2.54. Industrial Buildings, Division 2, up to 4 Storeys

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

(a) is not more than 4 *storeys* in *building height*,

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

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

Table 3.2.2.T.
Forming Part of Sentence 3.2.2.54.(1) r4

No. of *Storeys*	Unsprinklered Maximum Area, m^2		
	Facing 1 *Street*	Facing 2 *Streets*	Facing 3 *Streets*
1	3 200	4 000	4 800
2	1 600	2 000	2 400
3	1 070	1 340	1 600
4	800	1 000	1 200
Column 1	2	3	4

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

(a) floor assemblies shall be *fire separations* with a *fire-resistance rating* of not less than 45 min,

(b) *mezzanines* shall have, if of *combustible construction*, a *fire-resistance rating* of not less than 45 min,

(c) roof assemblies shall have, if of *combustible construction*, a *fire-resistance rating* of not less than 45 min, except that in *buildings* not more than 1 *storey* in *building height*, the *fire-resistance rating* is permitted to be waived provided that the roof assembly is constructed as a *fire-retardant treated wood* roof system conforming to Article 3.1.14.1., and

(i) if unsprinklered, the *building area* is not more than
1 600 m^2 if facing 1 *street*,
2 000 m^2 if facing 2 *streets*, or
2 400 m^2 if facing 3 *streets*, and

(ii) if *sprinklered*, the *building area* is not more than twice the area limits of Subclause (i) (see Article 3.2.2.12. for supervised sprinkler systems), and

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

supporting a *fire separation* shall have a *fire-resistance rating* not less than that required for the supported assembly.

r4 (See also Article 3.2.2.55.)

r4 3.2.2.55. Industrial Buildings, Division 2, up to 4 Storeys

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

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

r4 **Table 3.2.2.U.**
Forming Part of Sentence 3.2.2.55.(1)

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

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

(a) floor assemblies shall be *fire separations* with a *fire-resistance rating* of not less than 1 h,
(b) *mezzanines* shall have a *fire-resistance rating* of not less than 1 h,
(c) roof assemblies shall have a *fire-resistance rating* of not less than 1 h, and
(d) all *loadbearing* walls, columns and arches shall have a *fire-resistance rating* not less than that required for the supported assembly.

r4 (See also Article 3.2.2.54.)

r4 3.2.2.56. Industrial Buildings, Division 2, up to 6 Storeys

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

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

Table 3.2.2.V.
Forming Part of Sentence 3.2.2.56.(1) r4

No. of *Storeys*	Unsprinklered Maximum Area, m^2		
	Facing 1 *Street*	Facing 2 *Streets*	Facing 3 *Streets*
1	9 000	11 250	13 500
2	4 500	5 625	6 750
3	3 000	3 750	4 500
4	2 250	2 812	3 375
5	1 800	2 250	2 700
6	1 500	1 875	2 250
Column 1	2	3	4

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

(a) floor assemblies shall be *fire separations* with a *fire-resistance rating* of not less than 2 h,
(b) *mezzanines* shall have a *fire-resistance rating* of not less than 1 h,
(c) roof assemblies shall have a *fire-resistance rating* of not less than 1 h, and
(d) all *loadbearing* walls, columns and arches shall have a *fire-resistance rating* not less than that required for the supported assembly.

3.2.2.57. Industrial Buildings, Division 2, Any Height, Any Area, Sprinklered r4

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

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

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

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

r4 3.2.2.58. Industrial Buildings, Division 3, 1 and 2 Storeys

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

(2) The building shall be of *combustible* or *noncombustible construction* used either singly or in combination, and
(a) floor assemblies shall be *fire separations* and, if of *combustible construction*, shall have a *fire-resistance rating* of not less than 45 min, and

Table 3.2.2.W.
r4 Forming Part of Sentence 3.2.2.58.(1)

No. of *Storeys*	Unsprinklered Maximum Area, m²		
	Facing 1 *Street*	Facing 2 *Streets*	Facing 3 *Streets*
1	1 600	2 000	2 400
2	800	1 000	1 200
	Sprinklered Maximum Area, m²		
1	4 800	6 000	7 200
2	1 600	2 000	2 400
Column 1	2	3	4

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

3.2.2.59. Industrial Buildings, Division 3, up to 4 Storeys r4

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

Table 3.2.2.X.
Forming Part of Sentence 3.2.2.59.(1) r4

No. of *Storeys*	Unsprinklered Maximum Area, m²		
	Facing 1 *Street*	Facing 2 *Streets*	Facing 3 *Streets*
1	4 800	6 000	7 200
2	2 400	3 000	3 600
3	1 600	2 000	2 400
4	1 200	1 500	1 800
Column 1	2	3	4

(2) The *building* shall be of *combustible* or *noncombustible construction* used either singly or in combination, and
(a) floor assemblies shall be *fire separations* and, if of *combustible construction*, shall have a *fire-resistance rating* of not less than 45 min,
(b) *mezzanines* shall have, if of *combustible construction*, a *fire-resistance rating* of not less than 45 min,
(c) roof assemblies shall have, if of *combustible construction*, a *fire-resistance rating* of not less than 45 min, except that in *buildings* not more than 1 *storey* in *building height*, the *fire-resistance rating* is permitted to be

waived provided that the roof assembly is constructed as a *fire-retardant treated wood* roof system conforming to Article 3.1.14.1., and

(i) if unsprinklered, the *building area* is not more than
2 400 m² if facing 1 *street*,
3 000 m² if facing 2 *streets*, or
3 600 m² if facing 3 *streets*, and

(ii) if sprinklered, the *building area* is not more than twice the area limits of Subclause (i) (see Article 3.2.2.12. for supervised sprinkler systems), and

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

r4 3.2.2.60. Industrial Buildings, Division 3, 1 Storey

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

(a) is not more than 1 *storey* in *building height*, and

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

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

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

Table 3.2.2.Y.
r4 Forming Part of Sentence 3.2.2.60.(1)

No. of *Storeys*	Unsprinklered Maximum Area, m²		
	Facing 1 *Street*	Facing 2 *Streets*	Facing 3 *Streets*
1	5 600	7 000	8 400
Column 1	2	3	4

3.2.2.61. Industrial Buildings, Division 3, 1 Storey, Any Area, Low Fire Load Occupancy r4

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

(a) is not more than 1 *storey* in *building height*,

(b) is used solely for low fire load *occupancies* such as

(i) power generating plants, or

(ii) plants for the manufacture or storage of *noncombustible* materials such as asbestos, brick, cement, concrete or steel, and

(c) is not limited in *building area*.

(2) The *building* shall be of *noncombustible construction*.

3.2.2.62. Industrial Buildings, Division 3, Storage Garages up to 22 m High r4

(1) A *building* used as a *storage garage* with all *storeys* constructed as *open-air storeys* and having no other *occupancy* above it is permitted to have its floor, wall, ceiling and roof assemblies constructed without a *fire-resistance rating* provided the *building* is

(a) of *noncombustible construction*,

(b) not more than 22 m high, measured between *grade* and the ceiling level of the top *storey*,

(c) not more than 10 000 m² in *building area*, and

(d) designed so that every portion of each *floor area* is within 60 m of an exterior wall opening.

3.2.2.63. Industrial Buildings, Division 3, up to 6 Storeys r4

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

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

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

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

Table 3.2.2.Z.
r4 Forming Part of Sentence 3.2.2.63.(1)

No. of *Storeys*	Unsprinklered Maximum Area, m^2		
	Facing 1 *Street*	Facing 2 *Streets*	Facing 3 *Streets*
1	unlimited	unlimited	unlimited
2	7 200	9 000	10 800
3	4 800	6 000	7 200
4	3 600	4 500	5 400
5	2 880	3 600	4 320
6	2 400	3 000	3 600
Column 1	2	3	4

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

(a) floor assemblies shall be *fire separations* with a *fire-resistance rating* of not less than 1 h,
(b) *mezzanines* shall have a *fire-resistance rating* of not less than 1 h,
(c) roof assemblies shall have a *fire-resistance rating* of not less than 1 h, and
(d) all *loadbearing* walls, columns and arches shall have a *fire-resistance rating* not less than that required for the supported assembly.

r4 3.2.2.64. Industrial Buildings, Division 3, Any Height, Any Area

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

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

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

(a) floor assemblies shall be *fire separations* with a *fire-resistance rating* of not less than 2 h, except that such floor assemblies are permitted to be reduced to *fire separations* with a *fire-resistance rating* of not less than 1 h in a *storage garage* with all *storeys* constructed as *open-air storeys*,
(b) *mezzanines* shall have a *fire-resistance rating* of not less than 1 h,
(c) roof assemblies shall have a *fire-resistance rating* of not less than 1 h, and
(d) all *loadbearing* walls, columns and arches shall have a *fire-resistance rating* not less than that required for the supported assembly.

3.2.3. Spatial Separation and Exposure Protection of Buildings

3.2.3.1. Limiting Distance and Area of Unprotected Openings

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

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

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

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

(5) Where fire fighting facilities cannot reach the *building* within 10 min of the alarm being received, the *limiting distance* shall be doubled.

Table 3.2.3.A.
Forming Part of Subsection 3.2.3.

Exposing Building Face		Area of Unprotected Opening for Groups A, B, C, D and F, Division 3 Occupancies, Per Cent																										
Max. Area, m²	Ratio (L/H or H/L) [1]	Limiting Distance, m																										
		0	1.2	1.5	2.0	2.5	3	4	5	6	7	8	9	10	11	12	13	14	16	18	20	25	30	35	40	45	50
10	Less than 3 : 1	0	8	10	18	29	46	91	100																		
	3 : 1 to 10 : 1	0	8	12	21	33	50	96	100																		
	Over 10 : 1	0	11	18	32	48	68	100																			
15	Less than 3 : 1	0	7	9	14	22	33	63	100																		
	3 : 1 to 10 : 1	0	8	10	17	25	37	67	100																		
	Over 10 : 1	0	10	15	26	39	53	87	100																		
20	Less than 3 : 1	0	7	9	12	18	26	49	81	100																	
	3 : 1 to 10 : 1	0	8	10	15	21	30	53	85	100																	
	Over 10 : 1	0	9	14	23	33	45	72	100																		
25	Less than 3 : 1	0	7	8	11	16	23	41	66	98	100																
	3 : 1 to 10 : 1	0	8	9	13	19	26	45	70	100																	
	Over 10 : 1	0	9	13	21	30	39	62	90	100																	
30	Less than 3 : 1	0	7	8	11	15	20	35	56	83	100																
	3 : 1 to 10 : 1	0	7	9	12	17	23	39	61	88	100																
	Over 10 : 1	0	8	12	19	27	36	56	79	100																	
40	Less than 3 : 1	0	7	8	10	13	17	28	44	64	89	100															
	3 : 1 to 10 : 1	0	7	8	11	15	20	32	48	69	93	100															
	Over 10 : 1	0	8	11	17	24	31	47	66	88	100																
50	Less than 3 : 1	0	7	8	9	12	15	24	37	53	72	96	100														
	3 : 1 to 10 : 1	0	7	8	10	14	18	28	41	57	77	100															
	Over 10 : 1	0	8	10	15	21	28	41	57	76	97	100															
60	Less than 3 : 1	0	7	8	9	11	14	21	32	45	62	81	100														
	3 : 1 to 10 : 1	0	7	8	10	13	16	25	36	49	66	85	100														
	Over 10 : 1	0	8	10	14	20	25	38	51	67	85	100															
80	Less than 3 : 1	0	7	7	8	10	12	18	26	36	48	62	79	98	100												
	3 : 1 to 10 : 1	0	7	8	9	11	14	21	29	40	52	67	84	100													
	Over 10 : 1	0	8	9	13	17	22	32	44	56	70	86	100														
100	Less than 3 : 1	0	7	7	8	9	11	16	22	30	40	51	65	80	97	100											
	3 : 1 to 10 : 1	0	7	8	9	11	13	18	25	34	44	56	69	84	100												
	Over 10 : 1	0	7	9	12	16	20	29	39	49	61	74	89	100													
150	Less than 3 : 1	0	7	7	8	9	10	13	17	22	29	37	46	56	67	79	93	100									
	3 : 1 to 10 : 1	0	7	7	8	10	11	15	20	26	33	41	50	60	71	84	97	100									
	Over 10 : 1	0	7	8	11	13	17	24	31	39	48	57	68	79	91	100											
250	Less than 3 : 1	0	7	7	7	8	9	10	13	16	20	25	30	36	43	51	59	68	87	100							
	3 : 1 to 10 : 1	0	7	7	8	9	10	12	15	19	24	28	34	40	47	55	63	72	92	100							
	Over 10 : 1	0	7	8	9	11	14	19	24	30	36	43	50	57	65	73	82	92	100								
350	Less than 3 : 1	0	7	7	7	8	8	9	11	14	16	20	24	28	33	38	44	50	64	81	99	100					
	3 : 1 to 10 : 1	0	7	7	8	8	9	11	13	16	19	23	27	32	37	42	48	55	69	85	100						
	Over 10 : 1	0	7	8	9	10	12	16	21	25	30	36	41	47	53	59	66	73	88	100							
500	Less than 3 : 1	0	7	7	7	7	8	9	10	12	14	16	19	22	25	29	33	37	47	59	71	100					
	3 : 1 to 10 : 1	0	7	7	7	8	8	10	12	14	16	19	22	25	29	33	37	41	52	63	76	100					
	Over 10 : 1	0	7	7	8	9	11	14	18	22	25	30	34	38	43	48	53	58	70	82	96	100					
1 000	Less than 3 : 1	0	7	7	7	7	7	8	9	9	10	12	13	14	16	18	20	22	27	33	39	58	82	100			
	3 : 1 to 10 : 1	0	7	7	7	7	8	9	10	11	12	14	15	17	19	21	23	26	31	37	43	63	86	100			
	Over 10 : 1	0	7	7	8	8	9	11	13	16	19	21	24	27	30	33	36	39	46	53	60	82	100				
2 000	Less than 3 : 1	0	7	7	7	7	7	7	8	8	9	9	10	11	12	13	14	15	17	20	23	33	44	58	74	93	100
	3 : 1 to 10 : 1	0	7	7	7	7	7	8	8	9	10	11	12	13	14	15	16	17	20	23	27	37	49	63	79	97	100
	Over 10 : 1	0	7	7	7	8	8	9	11	12	14	16	18	19	21	23	25	27	32	36	40	53	66	82	99	100	

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

r in conformance with CAN/ULC-S101-M, "Standard Methods of Fire Endurance Tests of Building Construction and Materials."

3.2.3.8. Protection of Structural Members

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

(2) Structural members in Sentence (1) that are less than 3 m from the property line or centreline of a public thoroughfare shall be protected from exterior fire by fire protection having a *fire-resistance rating* not less than that required for their protection from inside fires in conformance with Articles r4 3.2.2.16. to 3.2.2.64., or by fire protection having a *fire-resistance rating* of not less than 1 h, whichever is the greater.

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

3.2.3.9. Unlimited Unprotected Openings

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

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

3.2.3.10. Low Fire Load, 1 Storey Building

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

(a) is not more than 1 *storey* in *building height*,
(b) is used for low fire load *occupancies* such r4 as described in Sentence 3.2.2.61.(1), and
(c) is located so that the *limiting distance* is not less than 3 m.

3.2.3.11. Increased Openings Permitted

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

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

3.2.3.12. Equivalent Opening Factor.

Where the surface temperature on the unexposed surface of a wall assembly exceeds the limitation of a standard fire test as permitted in Article 3.1.7.2., an allowance shall be made for the radiation from the hot unexposed wall surface by adding an equivalent area of *unprotected opening* to the area of actual openings as follows:

$$A_C = A + (A_F \times F_{EO})$$

where

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

A = actual area of *unprotected openings*,

A_F = area of exterior surface of the *exposing building face* exclusive of openings on which the temperature limitation of the standard test is exceeded, and

F_{EO} = an equivalent opening factor derived from the following expression:

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

where

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

T_e = 892°C for a *fire-resistance rating* of not less than 45 min, 927°C for a *fire-resistance rating* of not less than 1 h, and 1 010°C for a *fire-resistance rating* of not less than 2 h.

3.2.3.13. Protection of Exit Facilities

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

(a) less than 10 m below openings in the exterior walls of the *exit*, or

(b) less than 2 m above openings in the exterior walls of the *exit*.

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

(a) less than 10 m below the *exit* stair or ramp, or

(b) less than 5 m above the *exit* stair or ramp.

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

3.2.3.14. Wall Exposed to Another Wall

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

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

where

D = the greater required *limiting distance* for the *exposing building faces* of the 2 *fire compartments*, and

θ = the angle made by the intersecting planes of the *exposing building faces* of the 2 *fire compartments* (in the case where the exterior walls are parallel and face each other, θ = 0°). (See Appendix A.)

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

3.2.3.15. Wall Exposed to Adjoining Roof.

Except as permitted in Sentence 3.2.3.20.(4), where a wall in a *building* is exposed to a fire hazard from an adjoining roof of a separate unsprinklered *fire compartment* in the same *building*, and the exposed wall contains windows within 3 *storeys* vertically and 5 m horizontally of such roof, the roof shall contain no skylights within 5 m of the exposed wall.

3.2.3.16. Protection of Soffits

(1) Where there is a common *attic or roof space* above more than 2 *suites* of *residential occupancy* or above more than 2 patients' sleeping rooms, and the common *attic or roof space* projects beyond the exterior wall of the *building*, the soffit and any opening in the soffit or other surface of the projection located within 2.5 m of a window or door opening shall be protected by

(a) *noncombustible* material not less than 0.38 mm thick and having a melting point not below 650°C,

(b) plywood not less than 11 mm thick ,

(c) strandboard or waferboard not less than 12.5 mm thick, or

(d) lumber not less than 11 mm thick.

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

(3) Where an eave overhang is completely separated from the remainder of the *attic or roof space* by fire stopping, the requirements in Sentence (1) do not apply.

3.2.3.17. Apron, Canopy or Spandrel Protection for Vertically Separated Openings.

Where any *storey* of a *building* classified as a Group E or Group F, Division 1 or 2 *major occupancy* is required to be separated from the *storey* above or below by a *fire separation*, every opening in an exterior wall located vertically above another opening shall be separated by apron or spandrel walls not less than 1 m high or by a canopy not less than 1 m wide at each floor level and the apron, spandrel or canopy shall have a *fire-resistance rating* not less than that of the construction required for the floor assembly but need not be more than 1 h, except as required elsewhere in this Subsection.

3.2.3.18. Roof Coverings

(1) Except as provided in Sentence (2), every *building* shall have a Class A, B or C roof covering as described in Subsection 3.1.15.

(2) Roof coverings are not required to have a Class A, B or C rating for

(a) tents and *air-supported structures*, and

(b) *buildings* of Group A, Division 2 *occupancy* not more than 2 *storeys* in *building height* and not more than 1 000 m^2 in *building area* provided the roof covering is underlaid with *noncombustible* material.

3.2.3.19. Covered Vehicular Passageway

(1) A covered vehicular passageway shall

(a) be of *noncombustible construction* when constructed below *grade*, and

(b) be separated from every *building* or part of a *building* adjoining it by a *fire separation* having a *fire-resistance rating* of not less than 1.5 h where it is designed as a receiving or shipping area.

3.2.3.20. Walkway between Buildings

(1) Except as provided in Sentence 3.2.3.21.(2), where *buildings* are connected by a *walkway*, each *building* shall be separated from the *walkway* by a *fire separation* with a *fire-resistance rating* of not less than 45 min.

(2) Except as provided in Sentence (3), a *walkway* connected to a *building* required to be of *noncombustible construction* shall also be of *noncombustible construction*.

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

(a) not less than 50 per cent of the area of any enclosing perimeter walls is open to the outdoors, and

(b) the *walkway* is at ground level.

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

3.2.3.21. Underground Walkway

(1) An underground *walkway* shall not be designed or used for any purpose other than pedestrian travel unless such other purpose is acceptable to the *authority having jurisdiction* and any space in the *walkway* containing an *occupancy* is *sprinklered*.

(2) *Buildings* connected by an underground *walkway* shall be separated from the *walkway* by a *fire separation* with a *fire-resistance rating* of not less than 1 h.

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

(4) Smoke barrier doors shall be installed in underground *walkways* at intervals of not more than 100 m, or the travel distance from the door of an adjacent room or space to the nearest *exit* shall be not more than one and a half times the least allowable travel distance for any of the adjacent *occupancies* as prescribed in Sentence 3.4.2.5.(1).

3.2.4. Fire Alarm and Detection Systems

(See Appendix A.)

3.2.4.1. Determination of Requirement for a Fire Alarm System

(1) Except as provided in Sentences (2) to (4), a fire alarm system shall be installed when the *occupant load* in Table 3.2.4.A. for any *major occupancy* is exceeded, and in *buildings* containing

(a) a *contained use area*,

(b) an *impeded egress zone*,

(c) an *interconnected floor space* required to conform to Articles 3.2.8.3. to 3.2.8.9.,

(d) more than 3 *storeys*, including *storeys* below *grade*,
(e) a total *occupant load* of more than 300, other than in open air seating areas,
(f) an *occupant load* of more than 150 above or below the *first storey*, other than in open air seating areas, or
(g) a child care facility, including a day care facility, with an *occupant load* of more than 40.

Table 3.2.4.A.

Forming Part of Sentence 3.2.4.1.(1)

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

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

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

(4) A fire alarm system is not required in a *storage garage* conforming to Article 3.2.2.62. provided there are no other *occupancies* in the *building*.

3.2.4.2. Continuity of Fire Alarm System

(1) Where there are openings through a *firewall*, other than those for piping, tubing, wiring and totally enclosed *noncombustible* raceways, the requirements in this Subsection shall apply to the *floor areas* on both sides of the *firewall* as if they were in the same *building*.

(2) Except as provided in Sentence (4), where a *building* contains more than one *major occupancy* and a fire alarm system is required, a single system shall serve all *occupancies*.

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

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

(5) The permission in Sentence (4) to consider separated portions of a *building* as separate *buildings* does not apply to *service rooms* and storage rooms.

3.2.4.3. Types of Fire Alarm Systems

(1) Fire alarm systems shall be
(a) single stage systems in Group F, Division 1 *occupancies*,
(b) 2 stage systems in Group B *occupancies* other than those described in Clause (c),
(c) single or 2 stage systems in *buildings* 3 *storeys* or less in *building height* used for children's custodial homes, convalescent homes or orphanages, and
(d) single or 2 stage systems in all other cases.

3.2.4.4. Description of Fire Alarm Systems

(1) A single stage fire alarm system shall, upon the operation of any manual pull station or *fire detector*, cause an *alarm signal* to sound on all audible signal appliances in the system. (See Appendix A.)

(2) A 2 stage fire alarm system shall

3.2.5.1. Access to Above Grade Storeys

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

(2) An opening for access required in Sentence (1) shall be not less than 1 100 mm high by 550 mm wide, with a sill height of not more than 900 mm above the inside floor.

(3) Access panels above the *first storey* shall be readily openable from both inside and outside, or the opening shall be glazed with plain glass.

3.2.5.2. Access to Basements

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

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

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

3.2.5.4. Roof Access. On *buildings* more than 3 *storeys* in *building height* where the slope of the roof is less than 1 in 4, all main roof areas shall be provided with direct access from the *floor areas* immediately below, either by a stairway or by a hatch not less than 550 mm by 900 mm with a suitable fixed ladder.

3.2.5.5. Access Routes

(1) Every *building* which is more than 3 *storeys* in *building height* or more than 600 m^2 in *building area* shall be provided with access routes for fire department vehicles

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

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

3.2.5.6. Location of Access Routes

(1) Access routes required by Article 3.2.5.5. shall be located so that the principal entrance and every access opening required by Articles 3.2.5.1. and 3.2.5.2. are located not less than 3 m and not more than 15 m from the closest portion of the access route required for fire department use, measured horizontally from the face of the *building*.

(2) Access routes shall be provided to every *building* so that

(a) for *buildings* provided with a fire department connection, a fire department pumper vehicle can be located adjacent to the hydrants described in Article 3.2.5.16.,

(b) for *buildings* not provided with a fire department connection, a fire department pumper vehicle can be located so that the length of the access route from a hydrant to the vehicle plus the unobstructed path of travel for the fire fighter from the vehicle to the *building* is not more than 90 m, and

(c) the unobstructed path of travel for the fire fighter from the vehicle to the *building* is not more than 45 m.

(3) The unobstructed paths of travel for the fire fighter required by Sentence (2) from the vehicle to the *building* shall be measured from the vehicle to the fire department connection provided for the *building*, except that where no such connection is provided, the paths of travel shall be measured to the principal entrance of the *building*.

(4) Where a portion of a *building* is completely cut off from the remainder of the *building* so that there is no access to the remainder of the *building*, the access routes required by Sentence (2) shall be located so that the unobstructed path of travel from the vehicle to one entrance of each such portion is not more than 45 m.

3.2.5.7. Access Route Design

(1) A portion of a roadway or yard provided as a required access route for fire department use shall

(a) have a clear width of not less than 6 m, unless it can be shown that lesser widths are satisfactory,
(b) have a centreline radius of not less than 12 m,
(c) have an overhead clearance of not less than 5 m,
(d) have a change of gradient of not more than 1 in 12.5 over a minimum distance of 15 m,
(e) be designed to support the expected loads imposed by fire fighting equipment and be surfaced with concrete, asphalt or other material designed to permit accessibility under all climatic conditions,
(f) have turnaround facilities for any dead-end portion of the access route more than 90 m, and
(g) be connected with a public thoroughfare.

(See Appendix A.)

3.2.5.8. Water Supply. An adequate water supply for fire fighting shall be provided for every *building*.

3.2.5.9. Standpipe and Hose Systems

(1) Except as provided in Sentence 3.2.5.10.(4), a standpipe and hose system shall be installed in every *building* that is

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

3.2.5.10. Standpipe and Hose System Design

(1) Except as provided in Sentences (2) to (6) and Articles 3.2.5.11. and 3.2.5.12., where standpipe and hose systems are required, the design, construction, installation and testing of such standpipe and hose systems shall be in conformance with NFPA 14, "Installation of Standpipe and Hose Systems."

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

Occupancy Classification	*Building Area*, m²		
	1 *storey*	2 *storeys*	3 *storeys*
A	2 500	2 000	1 500
B (except hospitals)	2 000	1 500	1 000
Hospitals	500	500	500
C	2 000	1 500	1 000
D	4 000	3 000	2 000
F, Division 1	1 000	1 000	1 000
F, Division 2	2 000	1 500	1 000
F, Division 3	3 000	2 000	1 000
Column 1	2	3	4

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

(3) Where more than one standpipe is provided, the total water supply need not be more than 30 L/s.

(4) A standpipe need not be installed in a *storage garage* conforming to Article 3.2.2.62. provided the *building* is not more than 15 m high. r4

(5) Where a standpipe and hose system is required, 64 mm diam hose connections shall be provided, except that in *buildings* 25 m or less in height, measured between *grade* and the ceiling level of the top *storey* and having a *building area* of 4 000 m² or less, the hose connections are permitted to be 38 mm diam.

(6) The residual water pressure at the design flow rate at the topmost outlet of a standpipe and hose system that is required to be installed in a *building* is permitted to be less than 450 kPa provided that

(a) the *building* is *sprinklered* in conformance with the requirements of Sentence 3.2.5.13.(1),
(b) the water supply at the base of the sprinkler riser is capable of meeting the design flow rate and pressure demand of the sprinkler system, including the inside and outside hose allowance, and

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

3.2.5.11. Hose Stations and Cabinets

(1) Required hose stations shall be located in or near *exits*, and where a pressurized vestibule is provided adjacent to *exit* stairs, the hose station shall be located within the pressurized vestibule.

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

(3) Every hose cabinet shall be located so that its door, when fully opened, will not obstruct the required width of a *means of egress*.

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

(5) Fire hose stations in a Group B, Division 1 *major occupancy* are permitted to be located in secure areas, or in lockable cabinets provided that

(a) identical keys for all cabinets are located at all guard stations, or

(b) electrical remote release devices are provided and are connected to an emergency power supply.

3.2.5.12. Trouble Signal Annunciation for Valves.

In *buildings* where a fire alarm system is required to have an annunciator by Sentence 3.2.4.8.(1), except for hose valves, all valves controlling water supplies in a standpipe and hose system shall be equipped with an electrically supervised switch for transmitting a trouble signal to the annunciator in the event of movement of the valve handle.

3.2.5.13. Automatic Sprinkler Systems

r4 **(1)** Except as provided in Sentences (2), (3), (4) and (5), where a sprinkler system is required, it shall be designed, constructed, installed and tested in conformance with NFPA 13, "Installation of Sprinkler Systems." (See Appendix A.)

r4 **(2)** Instead of the requirements of Sentence (1), NFPA 13R, "Standard for the Installation of Sprinkler Systems in Residential Occupancies up to Four Stories in Height" is permitted to be used for the design, construction, installation and testing of a sprinkler system installed in a *building* of *residential occupancy* conforming to one of Articles 3.2.2.34., 3.2.2.35. or 3.2.2.36.

(3) Instead of the requirements of Sentence (1), NFPA 13D, "Standard for the Installation of Sprinkler Systems in One- and Two-Family Dwellings and Mobile Homes" is permitted to be used for the design, construction, installation and testing of a sprinkler system installed in a *building* of *residential occupancy* that contains not more than 2 *dwelling units*.

(4) Where a *building* contains fewer than 9 sprinklers, the water supply for such sprinklers is permitted to be supplied from the domestic water system for the *building* provided the required flow for the sprinklers can be met by the domestic system. r4

(5) Where a water supply serves both a sprinkler system and a system serving other equipment, control valves shall be provided so that either system can be shut off independently. r4

(6) Open grid and translucent ceilings located below sprinkler systems shall be installed in conformance with NFPA 13, "Installation of Sprinkler Systems," paragraphs 4-4.14 and 4-4.15. r4

3.2.5.14. Combustible Sprinkler Piping

(1) *Combustible* sprinkler piping shall be used only for wet systems in *residential occupancies* and other light hazard *occupancies*. (See Appendix A.)

(2) *Combustible* sprinkler piping shall meet the requirements of ULC C199P-M, "Combustible Piping for Sprinkler Systems."

(3) *Combustible* sprinkler piping shall be separated from the area served by the sprinkler system and from any other *fire compartment* by ceilings, walls, or soffits consisting of, as a minimum, lath and plaster, gypsum board not less than 9.5 mm thick, plywood not less than 13 mm thick, or a suspended membrane ceiling with lay-in panels or tiles and steel suspension grids, with the lay-in panels or tiles having a mass of at least 1.7 kg/m^2.

(4) Where *combustible* sprinkler piping is located above a ceiling, an opening through the ceiling that is not protected in conformance with

Sentence (3) shall be located so that the distance between the edge of the opening and the nearest sprinkler is not more than 300 mm.

3.2.5.15. Sprinklered Service Space

(1) An automatic sprinkler system shall be installed in a *service space* referred to in Sentence 3.2.1.1.(7) if flooring for access within the *service space* is other than catwalks.

(2) The sprinkler system required by Sentence (1) shall be equipped with waterflow detecting devices with each device serving not more than one *storey*.

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

(a) initiate an *alert signal* or an *alarm signal*, and

(b) indicate separately on the fire alarm system annunciator the actuation of each device.

3.2.5.16. Fire Department Connections

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

(2) Fire department connections for sprinkler systems shall be located so that the distance from a fire department connection to a hydrant is not more than 45 m and is unobstructed.

3.2.5.17. Portable Fire Extinguishers

(1) Portable extinguishers shall be provided and installed in accordance with the appropriate provincial, territorial or municipal regulations or, in the absence of such regulations, the National Fire Code of Canada 1990.

(2) In a Group B, Division 1 *major occupancy*, portable fire extinguishers are permitted to be located in secure areas, or in lockable cabinets provided that

(a) identical keys for all cabinets are located at all guard stations, or

(b) electrical remote devices are provided and are connected to an emergency power supply.

3.2.5.18. Protection from Freezing.

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

3.2.6. Additional Requirements for High Buildings

(See Appendix A.)

3.2.6.1. Application

(1) This Subsection applies to

(a) every *building* of Group A, D, E or F *major occupancy* classification that is more than

(i) 36 m high, measured between *grade* and the floor level of the top *storey*, or

(ii) 18 m high, measured between *grade* and the floor level of the top *storey*, and in which the cumulative or total *occupant load* on or above any *storey* above *grade*, other than the *first storey*, divided by 1.8 times the width in metres of all *exit* stairs at that *storey*, exceeds 300,

(b) every *building* containing a Group B *major occupancy* in which the floor level of the highest *storey* of that *major occupancy* is more than 18 m above *grade* or every *building* containing a *floor area* or part of a *floor area* located above the third *storey* designed or intended as a Group B, Division 2 *occupancy*, and

(c) every *building* containing a Group C *major occupancy* whose floor level is more than 18 m above *grade*.

3.2.6.2. Limits to Smoke Movement

(1) Every *building* shall be designed to limit the danger to occupants and fire fighters from exposure to smoke in a *building* fire, as provided in Sentences (2) to (4) and Articles 3.2.6.3. to 3.2.6.7.

(2) Except as provided in Articles 3.2.6.4. to 3.2.6.6., every *building* shall be designed so that during a period of 2 h after the start of a fire all *floor areas* that are above the lowest *exit storey* will not contain more than 1 per cent by volume of contaminated air from the fire floor, assuming an outdoor

temperature equal to the January design temperature on a 2.5 per cent basis determined in conformance with Subsection 2.2.1. (See Appendix A.)

(3) Except as provided in Articles 3.2.6.4. and 3.2.6.6., every *building* shall be designed so that during a fire the limit described in Sentence (2) on the movement of contaminated air into other *floor areas* is not exceeded in

(a) each *exit* stair serving *storeys* above the lowest *exit level*, and

(b) each *exit* stair serving *storeys* below the lowest *exit level*.

(See Appendix A.)

(4) Except as provided in Articles 3.2.6.4. and 3.2.6.6., every *building* shall be designed so that during a fire the limit described in Sentence (2) on the movement of contaminated air into other *floor areas* is

(3) A single *exit* is permitted from a *dwelling unit* provided the *exit* is an exterior doorway not more than 1.5 m above adjacent ground level and

(a) it is not necessary to travel up or down more than 1 *storey* to reach the *exit* door, or

(b) the uppermost floor level opens to a balcony not more than 6 m above adjacent ground level.

(4) An egress door from either the uppermost *storey* or the lowest *storey* in a *dwelling unit*, as required in Sentence (2), need not be provided where that *storey* is served by a stairway that

(a) leads to a public *access to exit*,

(b) has no direct access to any other *storey* in the *dwelling unit*, and

(c) is separated from the other *storeys* in the *dwelling unit* by a *fire separation* having a *fire-resistance rating* of not less than 45 min.

(5) In *buildings* of *residential occupancy* not more than 3 *storeys* in *building height*, a doorway from a *dwelling unit* is permitted to open directly into an *exit* stairway provided such *dwelling unit* has a second and separate *means of egress*.

(6) A doorway from a *dwelling unit* is permitted to open onto an interior corridor served by a single *exit*, or an exterior balcony served by a single *exit* stairway, or an exterior passageway served by a single *exit* stairway provided each *dwelling unit* has a second and separate *means of egress*.

3.3.4.5. Automatic Locking Prohibition. Except for hotels and motels, a door opening onto a *public corridor* which provides *access to exit* from a *suite* shall be designed not to lock automatically. (See Appendix A.)

3.3.4.6. Sound Transmission. *Dwelling units* shall be designed and constructed to restrict sound transmission in conformance with Article 9.11.2.1.

3.3.4.7. Guards for Residential Occupancies. *Guards* around balconies in *buildings* of *residential occupancy* shall be designed so that no member, attachment or opening located between 100 mm and 900 mm above the balcony will facilitate climbing.

3.3.4.8. Stairs, Handrails and Guards for Dwelling Units. Stairs, handrails and *guards* within *dwelling units* shall conform to the appropriate requirements in Section 9.8.

3.3.5. Industrial Occupancy

3.3.5.1. Scope. This Subsection applies to *floor areas* or parts thereof used or intended for use as *industrial occupancies*.

3.3.5.2. Fire Extinguishing Systems. In addition to other requirements in this Code for the installation of automatic fire extinguishing systems, in a Group F, Division 1 *major occupancy*, an appropriate automatic fire extinguishing system shall be installed in every *floor area* to provide protection if required by provincial, territorial or municipal regulations or, in the absence of regulations, if required by the National Fire Code of Canada 1990.

3.3.5.3. Basements

(1) *Basements* shall not be used for the storage, manufacture or handling of volatile solids, liquids or gases that generate explosive air-vapour mixtures or for processes that involve explosive dusts.

(2) Entrances and *exits* to *basements* and rooms containing *building* services in a *building* where the storage, manufacture or handling of volatile materials can generate explosive air-vapour mixtures or where processes that produce explosive dusts can occur shall be separate from the remainder of the *building*.

(3) *Basements* and rooms referred to in Sentence (2) shall be separated from the remainder of the *building* with a vapour-tight separation.

3.3.5.4. Cutting and Welding. Where a room in other than a Group F *major occupancy* is used for cutting and welding operations, it shall be separated from the remainder of the *building* by a *fire separation* having a *fire-resistance rating* of not less than 1 h, except that this requirement does not apply to a room that is protected by an automatic fire extinguishing system.

3.3.5.5. Repair and Storage Garages

(1) Where access is provided from a *storage garage* to a stair tower or elevator serving *occupancies* above the level of the *storage garage*, such access shall be through a vestibule conforming to Sentence 3.3.5.8.(3).

(2) Treads and landings in interior stairs that extend to the roof of a *storage garage* shall be designed to be free of accumulations of ice and snow.

(3) Mechanical *storage garages* of not more than 4 *storeys* in *building height*, where no persons other than parking attendants are permitted above the *street* floor level, need not have a *fire separation* between the *exits* and the remainder of the *building*.

(4) Every garage shall be provided with natural or mechanical ventilation in conformance with the requirements of Subsection 6.2.2. to prevent excessive accumulation of carbon monoxide, exhaust fumes or flammable and toxic vapours.

(5) The clear height in a *storage garage* shall be not less than 2 m.

(6) A continuous curb not less than 150 mm high and a *guard* not less than 1 070 mm high shall be provided at every garage floor opening and around the perimeter of every floor where the exterior walls are omitted.

(7) Only 2 *exits* located remote from each other need be provided in *storage garages* conforming
R4 to Article 3.2.2.62. provided persons other than parking attendants are not permitted above the *street* floor level.

(8) Except for *open-air storeys*, every *storey* of a *storage garage* or *repair garage* located below *grade* shall be *sprinklered*.

3.3.5.6. Repair Garage Separation. A *repair garage* or a *repair garage* and any ancillary spaces serving it, including waiting rooms, reception rooms, tool and parts storage areas and supervisory office space, shall be separated from other *occupancies* by a *fire separation* having a *fire-resistance rating* of not less than 2 h.

3.3.5.7. Storage Garage Separation. A *storage garage* shall be separated from other *occupancies* by a *fire separation* with a *fire-resistance rating* of not less than 1.5 h.

3.3.5.8. Vestibules

(1) Where access is provided through a *fire separation* between a *storage garage* and a Group A, Division 1 or Group B *occupancy*, such access shall be through a vestibule conforming to Sentence (3).

(2) In *buildings* more than 3 *storeys* in *building height*, where access is provided through a *fire separation* between a *storage garage* and a Group A, Division 2, 3 or 4, or a Group C *occupancy*, such access shall be through a vestibule conforming to Sentence (3).

(3) Where access is provided through a vestibule, as required in Sentences (1), (2) and 3.3.5.5.(1), the vestibule shall

(a) be not less than 1.8 m long,

(b) be naturally ventilated to outside air by a vent that has an unobstructed area of not less than 0.1 m^2 for each door that opens into the vestibule but not less than 0.4 m^2, or be mechanically ventilated at a rate of 14 m^3/h for each square metre of vestibule floor surface area, and

(c) have the openings between the vestibule and an adjoining *occupancy* provided with self-closing doors having no hold-open devices.

3.3.5.9. Dispensing of Fuel

(1) Facilities for the dispensing of fuel having a *flash point* below 37.8°C shall not be installed above any space intended for *occupancy*.

(2) Facilities for the dispensing of fuel having a *flash point* below 37.8°C shall not be installed in any *building*, except that this requirement does not apply to a canopy which is open on not less than 75 per cent of its perimeter.

Section 3.4 Requirements for Exits

3.4.1. General Requirements

3.4.1.1. Scope. *Exit* facilities complying with this Section shall be provided from every *floor area* which is intended for *occupancy*. (See Appendix A.)

3.4.1.2. Separation of Exits

(1) Except as permitted by the requirements of Sentence (2), where more than one *exit* is required from a *floor area*, each *exit* shall be separate from every other *exit* leading from that *floor area*.

(4) Every *vertical service space* that does not extend to the bottom of a *building* shall be enclosed at the lowest level with construction having a *fire-resistance rating* not less than that required for the *service space* walls.

(5) Vents from *vertical service spaces* not extending to the roof shall be enclosed within the *building* with construction having a *fire-resistance rating* not less than that required for the *service space* walls.

(6) Only openings that are necessary for the use of the *vertical service space* shall be permitted in the *service space* enclosure.

3.5.3.2. Foamed Plastic Protection.

Foamed plastic insulation in *vertical service spaces* shall be protected in conformance with Article 3.1.5.11.

3.5.3.3. Linen and Refuse Chutes

(1) Every linen or refuse chute shall

(a) be impervious to moisture,
(b) have a smooth internal surface,
(c) be corrosion-resistant,
(d) be constructed of *noncombustible* material, and
(e) be located in a shaft in which there are no services other than *noncombustible* drain, waste and vent piping or *noncombustible* water piping.

(2) Every shaft containing a linen or refuse chute shall have a *fire-resistance rating* conforming to Sentence 3.5.3.1.(1), but not less than

(a) 1 h where the chute outlet for the discharge room is protected by an automatic, self-latching *closure* held open by a fusible link, or
(b) 2 h where no *closure* is provided at the chute outlet into the discharge room.

(3) Every interior linen or refuse chute shall extend not less than 1 m above the roof and shall be vented above the roof with a vent which

(a) has an unobstructed area not less than the cross-sectional area of the chute, and
(b) is equipped with a cover that will open automatically or that can be opened manually in the event of a fire in the chute.

(4) Intake openings for linen or refuse chutes shall

(a) have an area not more than 60 per cent of the cross-sectional area of the chute, and
(b) be fitted with *closures* designed to close automatically and latch after use.

(5) Intake openings for linen or refuse chutes shall be located in rooms or compartments that

(a) have no dimension less than 750 mm,
(b) are separated from the remainder of the *building* by a *fire separation* with a *fire-resistance rating* of not less than 45 min,
(c) are designed for no other purpose, and
(d) do not open directly into an *exit*.

(6) Sprinklers shall be installed at the top of each linen and refuse chute, at alternate floor levels and in the room or bin into which the chute discharges.

(7) The room into which a linen chute discharges shall be separated from the remainder of the *building* by a *fire separation* with a *fire-resistance rating* of not less than 1 h.

(8) Every refuse chute shall be equipped at the top with spray equipment for washing-down purposes.

(9) A refuse chute shall discharge only into a room or bin separated from the remainder of the *building* by a *fire separation* with a *fire-resistance rating* of not less than 2 h.

(10) The room or bin into which a refuse chute discharges shall be of sufficient size to contain the refuse between normal intervals of emptying, be impervious to moisture and be equipped with a water connection and floor drain for washing-down purposes.

(11) Rooms into which refuse chutes discharge shall contain no service equipment that is not related to refuse handling and disposal.

3.5.3.4. Exhaust Duct Negative Pressure.

When a *vertical service space* contains an exhaust duct that serves more than one *fire compartment*, the duct shall have a fan located at or near the exhaust outlet to ensure that the duct is under negative pressure, and such individual *fire compartments* shall not have individual fans that exhaust directly into the duct in the *vertical service space*.

3.5.4. Horizontal Service Spaces and Service Facilities

3.5.4.1. Scope. This applies to *horizontal service spaces* and service facilities, including ceiling spaces, duct spaces, crawl spaces and *attic or roof spaces*.

3.5.4.2. Fire Separations for Horizontal Service Spaces

(1) A *horizontal service space* that penetrates a required vertical *fire separation* shall be separated from the remainder of the *building* it serves in conformance with Sentence (2).

(2) Where a *horizontal service space* or other concealed space is located above a required vertical *fire separation* other than a vertical shaft, such space need not be divided at the *fire separation* as required in Article 3.1.8.3. provided the construction between such space and the space below is constructed as a *fire separation* at least equivalent to that required for the vertical *fire separation*, except that where the vertical *fire separation* is not required to have a *fire-resistance rating* of more than 45 min, the *fire-resistance rating* is permitted to be not less than 30 min. (See Appendix A.)

3.5.4.3. Plenum Requirements

(1) The concealed space between the ceiling and floor or ceiling and roof used as a *plenum* need not conform to Sentence 3.1.5.14.(1) and Article 6.2.3.2. provided

(a) all materials within the ceiling space have a *flame-spread rating* of not more than 25 and a smoke developed classification of not more than 50, except for

(i) tubing for pneumatic controls,

(ii) optical fibre cables and electrical wires and cables that exhibit a vertical char of not more than 1.5 m when tested in conformance with the Vertical Flame Test – Cables in Cabletrough in Clause 4.11.4. of CSA C22.2 No. 0.3-M, "Test Methods for Electrical Wires and Cables," r4

(iii) optical fibre cables and electrical wires and cables that are located in totally enclosed *noncombustible* raceways (see A-3.1.4.3.(1)(b)(i) in Appendix A), and r4

(iv) totally enclosed nonmetallic raceways conforming to Article 3.1.5.19., and r4

(b) the supports for the ceiling membrane are of *noncombustible* material having a melting point not below 760°C.

(2) When the concealed space referred to in Sentence (1) is used as a return-air *plenum* and incorporates a ceiling membrane that forms part of the required *fire-resistance rating* of the assembly, every opening through the membrane shall be protected by a *fire stop flap* which shall

(a) stop the flow of air into the concealed space in the event of a fire,

(b) be supported in a manner that will maintain the integrity of the ceiling membrane for the duration of time required to provide the required *fire-resistance rating*, and

(c) conform to the appropriate requirements of Chapter 2, "Fire Performance Ratings" of the Supplement to the NBC 1990.

3.5.4.4. Attic or Roof Space Access. Every *attic or roof space* more than 600 mm high shall be provided with access from the floor immediately below by a hatchway not less than 550 mm by 900 mm or by a stairway.

3.5.4.5. Horizontal Service Space Access. *Horizontal service spaces* consisting of ceiling and duct spaces which are more than 1 200 mm high and 600 mm wide shall have access doors not less than 600 mm in both horizontal and vertical dimensions, or shall have inspection doors not less than 300 mm in both horizontal and vertical dimensions placed so that the entire interior of the duct or space can be viewed.

3.5.4.6. Crawl Space Access. Every crawl space shall have at least one access opening not less than 550 mm by 900 mm.

3.5.5. Elevators, Dumbwaiters and Escalators

3.5.5.1. Elevator, Dumbwaiter and Escalator Standards

(1) The design, construction, installation and *alteration* of every elevator, dumbwaiter and escalator shall conform to appropriate provincial, territorial, or municipal requirements or, in the absence of such

8.2.2.5. Standpipe Systems. Where a *building* being demolished floor by floor is equipped with a standpipe system, such system, together with fire department connections and valves, shall be maintained in operable condition on all *storeys* below that being demolished except the *storey* immediately below it. (See Appendix A.)

8.2.2.6. Cutting and Welding Operations

(1) Cutting and welding operations shall e conform to Section 5.18 of the National Fire Code of Canada 1990.

(2) Areas on a demolition site where cutting and welding operations have taken place shall be kept under supervision for not less than 1 h after the operations have been completed.

8.2.2.7. Egress Provision. Not less than one stairway shall be maintained in usable condition at all times.

8.2.2.8. Fire Warning. A system to alert site personnel of fire in a *building* being demolished shall be provided, and the system shall be capable of being heard in all areas of the *building*.

8.2.2.9. Building Service Shut-Off

(1) Except as provided in Sentence (2), and except for water supplies for fire fighting, *building* services shall be shut off and gas and fuel lines shall be capped in a *building* being demolished.

(2) Temporary electrical installations shall be installed in conformance with the requirements of the appropriate provincial, territorial or municipal legislation or, in the absence of such legislation, to the requirements of CSA C22.1, "Canadian Electrical Code, Part I."

8.2.2.10. Clearance to Combustible Materials

(1) Internal combustion engines shall be located so that the exhaust discharges not less than 500 mm from *combustible* materials.

(2) Where exhaust from internal combustion engines is piped outdoors, a clearance of not less than 150 mm shall be maintained between the exhaust pipe and *combustible* material.

8.2.2.11. Fuel Supply Installation

(1) Fuel supplies for heating equipment and internal-combustion engines shall conform to

(a) CAN/CGA-B149.2-M, "Propane Installation Code,"
(b) CSA-B139, "Installation Code for Oil Burning Equipment," or
(c) CAN/CGA-B149.1-M, "Natural Gas Installation Code."

8.2.2.12. Tank, Piping and Machinery Reservoir Safety

(1) Tanks, piping and machinery reservoirs containing *combustible liquids* or *flammable liquids* or which are likely to contain flammable vapours shall be drained and, except as required in Sentence (2), removed prior to demolition of the *building*.

(2) Where it is impracticable to remove tanks, piping or machinery reservoirs from the *building* prior to demolition, such equipment shall be conspicuously identified and removed as soon as conditions permit.

(3) Tanks, piping and machinery reservoirs in Sentences (1) and (2) which contained *combustible liquids*, *flammable liquids* or flammable gases shall be purged with inert materials prior to demolition to prevent an explosion. (See Appendix A.)

8.2.2.13. Fire Separations in Partly Occupied Building. Where part of a *building* continues to be occupied during demolition, the occupied part shall be separated from that being demolished by a *fire separation* having a *fire-resistance rating* of not less than 1 h.

8.2.2.14. Watch

(1) A watch, with tours at intervals of not more than 1 h apart, shall be provided throughout demolition sites when there are occupants in the portion of the *building* not being demolished.

(2) Facilities shall be provided to enable the watcher to communicate with the fire department.

8.2.2.15. Smoking Restrictions. Smoking shall be permitted only in conformance with Subsection 2.4.3. of the National Fire Code of Canada 1990.

8.2.3. Fire Safety at Construction Sites

8.2.3.1. Application to Construction Sites. This Subsection applies to all *buildings* and portions of *buildings* under construction and includes *alterations*. (See Appendix A.)

8.2.3.2. Fire Safety Plan. Prior to construction, a fire safety plan conforming to Section 2.15 of the National Fire Code of Canada 1990 shall be prepared for the construction site.

8.2.3.3. Access for Fire Fighting

(1) Unobstructed access to fire protection equipment, such as hydrants, fire department connections and portable extinguishers, shall be maintained at all times.

(2) Where practicable, access routes to the construction site shall be provided for fire department vehicles. (See A-8.2.2.3.(2) in Appendix A.)

(3) Where a construction site is fenced so as to prevent general entry, provision shall be made for access by fire department equipment and personnel.

8.2.3.4. Portable Extinguishers

(1) Portable extinguishers shall be installed and maintained in conformance with Part 6 of the National Fire Code of Canada 1990.

(2) In addition to the requirements of Sentence (1), portable extinguishers shall be provided

(a) adjacent to cutting or welding operations,
(b) in areas where combustibles are stored,
(c) near or on any internal-combustion engines,
(d) adjacent to areas where *flammable liquids* or gases are stored or handled,
(e) adjacent to temporary oil or gas fired equipment, and
(f) adjacent to bitumen heating equipment.

(3) The minimum rating for extinguishers in Sentences (1) and (2) shall be

(a) 2-A:10-BC on moveable equipment, and
(b) 4-A:40-BC in all other locations.

8.2.3.5. Standpipe Systems. Where a standpipe and hose system is to be installed in a *building*, such system shall be installed progressively in conformance with Subsection 3.2.5.

8.2.3.6. Cutting and Welding Operations. Cutting and welding operations shall conform to Section 5.18 of the National Fire Code of Canada 1990. *e*

8.2.3.7. Egress Provisions. In areas of the *building* in which construction operations are taking place, at least one *exit* shall be accessible and usable at all times.

8.2.3.8. Fire Warning. A suitable means of alerting site personnel to a fire shall be provided, and this system shall be capable of being heard in all areas of the *building*.

8.2.3.9. Clearance to Combustible Materials

(1) Clearances between *combustible* material and internal combustion engines shall conform to Article 8.2.2.10.

(2) The clearance between *combustible* materials and temporary heating equipment, including *flues*, shall be in conformance with Part 6 or in conformance with the minimum clearances shown on certified heating equipment.

8.2.3.10. Combustible Liquid and Flammable Liquid Storage

(1) *Combustible liquids* and *flammable liquids* shall be stored and used in conformance with Part 4 of the National Fire Code of Canada 1990.

(2) Bitumen heating equipment shall be provided with metal covers.

(3) Bitumen heating equipment shall be under constant supervision when in operation.

(4) Mops used for spreading bitumen shall be kept outside the *building* in a safe location.

8.2.3.11. Watch

(1) Except where the *building* is provided with a fire alarm system or similar equipment acceptable to the *authority having jurisdiction*, a watch, with tours at intervals of not more than 1 h apart shall be provided when a portion of a *building* is occupied while construction operations are taking place.

(2) In *buildings* which are occupied prior to completion of construction, provision shall be made for the watcher to sound the alarm and notify the fire department.

Part 9
Housing and Small Buildings

Section 9.1 General

9.1.1. Scope

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

Section 9.2 Definitions

9.2.1. General

9.2.1.1. Words in italics are defined in Part 1.

Section 9.3 Materials, Systems and Equipment

9.3.1. Concrete

9.3.1.1. Concrete. Concrete shall be designed, mixed, placed, cured and tested in accordance with CAN3-A438, "Concrete Construction for Housing and Small Buildings."

9.3.1.2. Cement. Cement shall meet the requirements of CAN3-A5, "Portland Cements."

9.3.1.3. Concrete in Contact with Sulphate Soil

(1) Concrete in contact with sulphate *soil* deleterious to normal cement shall conform to the requirements in Section 16 of CAN/CSA-A23.1, "Concrete Materials and Methods of Concrete Construction." r

(2) Sulphate-resisting cement shall be used for concrete referred to in Sentence (1).

9.3.1.4. Aggregates. Aggregates shall consist of sand, gravel, crushed rock, crushed air-cooled blast furnace slag, expanded shale or expanded clay conforming to CAN/CSA-A23.1, "Concrete Materials and Methods of Concrete Construction" and shall be clean, well-graded and free of injurious amounts of organic and other deleterious material. r

9.3.1.5. Water. Water shall be clean and free of injurious amounts of oil, organic matter, sediment or any other deleterious material.

9.3.1.6. Compressive Strength. Unless specifically required elsewhere in this Part, the compressive strength of unreinforced concrete shall be not less than 15 MPa after 28 days. (See also Articles 9.3.1.7., 9.12.4.1., 9.15.4.1. and 9.18.6.1.)

9.3.1.7. Concrete for Garage and Carport Floors and Exterior Steps. When concrete is used for garage and carport floors and exterior steps, it shall have a minimum compressive strength of 20 MPa after 28 days and shall have air entrainment of 5 to 8 per cent.

9.3.1.8. Concrete Mixes

(1) The concrete mixes described in Table 9.3.1.A. shall be considered acceptable if the slump does not exceed 100 mm when measured according to the slump test described in CAN/CSA-A23.2-M, "Methods of Test for Concrete." r

(2) Aggregate for mixes referred to in Sentence (1) shall not exceed 50 mm in size.

9.3.1.9. Admixtures. Admixtures shall conform to CAN3-A266.1, "Air Entraining Admixtures for Concrete" or CAN3-A266.2, "Chemical Admixtures for Concrete," as applicable.

Table 9.3.1.A.
Forming Part of Sentence 9.3.1.8.(1)

Concrete Mixes (by volume)			
Concrete Strength, MPa	Cement, parts	Sand, parts	Coarse Aggregate, parts
15	1	2	4
	1	—	6, pit run gravel
20	1	1.75	3, up to 40 mm in size
	1	—	4.75 pit run gravel
Column 1	2	3	4

9.3.1.10. Reinforced Concrete. Reinforced concrete shall be designed to conform to the requirements of Part 4.

9.3.1.11. Cold Weather Requirements

(1) When the air temperature is below 5°C, concrete shall be kept at a temperature of not less than 10°C or more than 25°C while being mixed and placed, and maintained at a temperature of not less than 10°C for 72 h after placing.

(2) No frozen material or ice shall be used in concrete described in Sentence (1).

9.3.2. Lumber and Wood Products

9.3.2.1. Grade Marking. Lumber for joists, rafters, trusses and beams and for the uses listed in Table 9.3.2.A. shall be identified by a grade stamp to indicate its grade as determined by the NLGA "Standard Grading Rules for Canadian Lumber." (See Appendix A.)

Table 9.3.2.A.
Forming Part of Article 9.3.2.1.

Minimum Lumber Grades for Specific End Uses				
Use	Boards [1]			Framing
	Paragraph in the NLGA grading rules under which boards are graded			
	All Species		Eastern White Pine & Red Pine	All Species
	Para 113	Para 114	Para 118	
Stud wall framing (loadbearing members)	—	—	—	Stud, Standard, No. 2
Stud wall framing (non-loadbearing members)	—	—	—	Stud, Utility, No. 3
Plank frame construction (loadbearing members)	No. 3 Common	—	No. 3 Common	No. 2
Plank frame construction (non-loadbearing members)	No. 5 Common	—	No. 5 Common	Economy, No. 3
Posts and beams less than 114 mm in thickness	—	—	—	Standard, No. 2
Posts and beams not less than 114 mm in thickness	—	—	—	Standard
Roof sheathing	No. 3 Common	Standard	No. 4 Common	—
Subflooring	No. 3 Common	Standard	No. 3 Common	—
Wall sheathing when required as a nailing base	No. 4 Common	Utility	No. 4 Common	—
Wall sheathing not required as a nailing base	No. 5 Common	Economy	No. 5 Common	—
Column 1	2	3	4	5

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Note to Table 9.3.2.A.:
[1] See Appendix A.

Table 9.10.14.A.
Forming Part of Article 9.10.14.1.

Maximum Percentage of Unprotected Openings in Exterior Walls													
Occupancy Classification of *Building*	Maximum Area of *Exposing Building Face*, m²	*Limiting distance*, m											
		Less than 1.2	1.2	1.5	2.0	4.0	6.0	8.0	10.0	12.0	16.0	20.0	25.0
Residential, business and personal services, and *low hazard industrial*	30	0	7	9	12	39	88	100	—	—	—	—	—
	40	0	7	8	11	32	69	100	—	—	—	—	—
	50	0	7	8	10	28	57	100	—	—	—	—	—
	100	0	7	8	9	18	34	56	84	100	—	—	—
	Over 100	0	7	7	8	12	19	28	40	55	92	100	—
Mercantile and *medium hazard industrial*	30	0	4	4	6	20	44	80	100	—	—	—	—
	40	0	4	4	6	16	34	61	97	100	—	—	—
	50	0	4	4	5	14	29	50	79	100	—	—	—
	100	0	4	4	4	9	17	28	42	60	100	—	—
	Over 100	0	4	4	4	6	10	14	20	27	46	70	100
Column 1	2	3	4	5	6	7	8	9	10	11	12	13	14

equipped to meet the needs of the community, the *limiting distance* determined from Article 9.10.14.1. or required in Articles 9.10.14.12., 9.10.14.14. and 9.10.14.16., shall be doubled.

9.10.14.4. Alternate Method of Determining Limiting Distance. The *limiting distance* shown in Table 9.10.14.A. may be reduced provided it is not less than the square root of the aggregate area of *unprotected openings* in an *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.*

9.10.14.5. Openings in Walls Having a Limiting Distance Less Than 1.2 m. Openings in a wall having a *limiting distance* of less than 1.2 m shall be protected by *closures,* of other than wired glass or glass block, whose *fire protection rating* is in conformance with the *fire-resistance rating* required for the wall. (See Table 9.10.13.A.)

9.10.14.6. Allowance for Sprinklers and Wired Glass or Glass Block. The maximum area of *unprotected openings* may be doubled where the *building* is *sprinklered,* or where the *unprotected openings* are glazed with wired glass in steel frames or glass blocks as described in Articles 9.10.13.5. and 9.10.13.7. (See A-3.2.3.11. in Appendix A.)

9.10.14.7. Exterior Wall Construction for Irregular-Shaped Buildings. For the purpose of using Table 9.10.14.B to determine the required type of construction, cladding and *fire-resistance rating* for an exterior wall, the *exposing building face* shall be taken as the projection of the exterior wall onto a vertical plane located so that no portion of the *exposing building face* of the *building* is between the vertical plane and the line to which the *limiting distance* is measured and, for these purposes, the permitted area of *unprotected openings* shall be determined from Table 9.10.14.A. or Article 9.10.14.4., using the *limiting distance* measured from this *exposing building face.* (See A-3.2.3.1.(4) in Appendix A.)

9.10.14.8. Percentage of Unprotected Openings for Irregular-Shaped Buildings. For the purpose of using Table 9.10.14.A. to determine the actual percentage of *unprotected openings* permitted in an exterior wall, the location of the *exposing building face* is permitted to be taken at a vertical plane located so that there are no *unprotected openings* between the vertical plane and the line to which the *limiting distance* is measured. (See A-3.2.3.1.(4) in Appendix A.)

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

9.10.14.10. Open-Air Storage Garages. When a *storage garage* has all *storeys* constructed as *open-air storeys*, the *exposing building face* of such garage is permitted to have unlimited *unprotected openings* provided the *storage garage* has a *limiting distance* of not less than 3 m.

9.10.14.11. Construction of Exposing Building Face

(1) Except as permitted in Sentence (2) and Articles 9.10.14.12. to 9.10.14.16., each *exposing building face* and any exterior wall located above an *exposing building face* that encloses an *attic or roof space* shall be constructed in conformance with Table 9.10.14.B. and Subsection 9.10.8. *r4*

(2) Combustible cladding conforming to Sentence 9.10.14.12.(3) is permitted on *buildings* where *r4*

(a) the limiting distance is not less than 0.6 m, and

(b) the exposing face is constructed with no unprotected openings.

9.10.14.12. Exposing Building Face of Houses

(1) Except as required in Article 9.10.14.3., and as provided in Sentence (3), in *buildings* containing only *dwelling units* in which there is no *dwelling unit* above another *dwelling unit*, the requirements of *r4*

Table 9.10.14.B.
Forming Part of Article 9.10.14.11.

Minimum Construction Requirements for Exposing Building Faces				
Occupancy Classification of *Building*	Maximum Percentage of *Unprotected Openings* Permitted, per cent	Minimum Required *Fire-Resistance Rating*	Type of Construction Required	Type of Cladding Required
Residential, business and personal services, and *low hazard industrial*	0 – 10	1 h	*Noncombustible*	*Noncombustible*
	11 – 25	1 h	*Combustible* or *noncombustible*	*Noncombustible*
	26 – 100	45 min	*Combustible* or *noncombustible*	*Combustible* or *noncombustible*
Mercantile, and *medium hazard industrial*	0 – 10	2 h	*Noncombustible*	*Noncombustible*
	11 – 25	2 h	*Combustible* or *noncombustible*	*Noncombustible*
	26 – 100	1 h	*Combustible* or *noncombustible*	*Combustible* or *noncombustible*
Column 1	2	3	4	5

Article 9.10.14.11. do not apply provided that the *exposing building face* has a *fire-resistance rating* of not less than 45 min where the *limiting distance* is less than 1.2 m, and when the *limiting distance* is less than 0.6 m, the *exposing building face* is clad with *noncombustible* material.

(2) Window openings in the *exposing building face* referred to in Sentence (1) shall not be permitted if the *limiting distance* is less than 1.2 m and shall be limited in conformance with the requirements for *unprotected openings* in Article 9.10.14.1. where the *limiting distance* is 1.2 m or greater.

r4 **(3)** Cladding on the *exposing building face* described in Sentence (1) may be vinyl when the *limiting distance* is less than 0.6 m, provided the cladding

(a) conforms to Subsection 9.27.13.,
(b) is installed directly over 12.7 mm gypsum sheathing,
(c) has a *flame spread rating* not greater than 25, when tested in accordance with Sentence 3.1.12.1.(2), and
(d) does not exceed 2 mm in thickness, exclusive of fasteners, joints and local reinforcements.

9.10.14.13. Combustible Projections.

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

9.10.14.14. Detached Garage Serving One Dwelling Unit

(1) Except as required in Article 9.10.14.3., the *exposing building face* of a detached garage that serves one *dwelling unit* only shall have a *fire-resistance rating* of not less than 45 min, except that no *fire-resistance rating* is required where the *limiting distance* is 0.6 m or greater.

(2) The *exterior cladding* of detached garages described in Sentence (1) is not required to be *noncombustible* regardless of the *limiting distance*.

(3) The percentage of window openings permitted in the *exposing building face* of detached garages described in Sentence (1) shall conform to the requirements for *unprotected openings* in Article 9.10.14.1.

(4) Where a detached garage serves only one *dwelling unit* and is located on the same property as that *dwelling unit*, then the requirements for *limiting distance* shall not apply between the garage and the *dwelling unit*.

9.10.14.15. Heavy Timber and Steel Columns.

Heavy timber and steel columns need not conform to the requirements of Article 9.10.14.11. provided the *limiting distance* is not less than 3 m.

9.10.14.16. Low Fire Load Occupancies.

Except as required in Article 9.10.14.3., in *buildings* of 1 *storey* in *building height* of *noncombustible construction* classified as *low hazard industrial occupancy* which are used only for low *fire load occupancies* such as power generating plants or plants for the manufacture or storage of *noncombustible* materials, non-*loadbearing* wall components need not have a minimum *fire-resistance rating* provided the *limiting distance* is 3 m or more.

9.10.15. Fire Stops

9.10.15.1. Required Fire Stops in Concealed Spaces

(1) Concealed spaces in interior walls, ceilings and crawl spaces shall be separated by fire stops from concealed spaces in exterior walls and *attic or roof spaces*.

(2) Fire stops shall be provided at all interconnections between concealed vertical and horizontal spaces in interior coved ceilings, drop ceilings and soffits where the exposed construction materials within the concealed spaces have a surface *flame-spread rating* greater than 25.

(3) Fire stops shall be provided at the top and bottom of each run of stairs where they pass through a floor containing concealed space in which the exposed construction materials within the space have a surface *flame-spread rating* greater than 25.

(4) In unsprinklered *buildings* of *combustible construction*, every concealed space created by a ceiling, roof space or unoccupied attic space shall be

separated by fire stops into compartments of not more than 300 m^2 in area where such space contains exposed construction materials having a surface *flame-spread rating* greater than 25.

(5) No dimension of the concealed space described in Sentence (4) shall exceed 20 m.

(6) Concealed spaces in mansard or gambrel style roofs, exterior cornices, balconies and canopies of *combustible construction* in which the exposed construction materials within the space have a surface *flame-spread rating* exceeding 25 shall have vertical fire stops at intervals of not more than 20 m and at points where such concealed spaces extend across the ends of required vertical *fire separations*.

9.10.15.2. Required Fire Stops in Wall Assemblies

(1) Except as permitted in Sentences (2) and (3), fire stops shall be provided to block off concealed spaces within wall assemblies, including spaces created by furring, at each floor level, and at each ceiling level where the ceiling contributes to part of the required *fire-resistance rating*, and at other locations within the wall, so that the distance between fire stops does not exceed 20 m horizontally and 3 m vertically.

(2) Fire stops required in Sentence (1) are not required provided the exposed construction materials within the wall space, including insulation, but not including wiring, piping or similar services, have a *flame-spread rating* of not more than 25.

(3) Fire stops required in Sentence (1) are not required provided the wall space is filled with insulation.

9.10.15.3. Fire Stop Materials. Fire stops shall be constructed of not less than 0.38 mm sheet steel, 6 mm asbestos board, 12.7 mm gypsum wallboard, 12.5 mm plywood, waferboard or strandboard, with joints having continuous support, 2 layers of 19 mm lumber with joints staggered, 38 mm lumber or materials conforming to Sentence 3.1.11.7.(1).

9.10.15.4. Penetration of Fire Stops. Where fire stops are pierced by pipes, ducts or other elements, the effectiveness of the fire stops shall be maintained around such elements.

9.10.16. Flame Spread Limits

9.10.16.1. Flame Spread Rating of Interior Surfaces

(1) Except as otherwise provided in this Subsection, the exposed surface of every interior wall and ceiling, including skylights and glazing, shall have a surface *flame-spread rating* of not more than 150.

(2) Except as permitted in Sentence (3), doors need not conform to Sentence (1) provided they have a surface *flame-spread rating* of not more than 200.

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

9.10.16.2. Ceilings in Exits or Public Corridors. At least 90 per cent of the exposed surface of every ceiling in an *exit* or unsprinklered ceiling in a *public corridor* shall have a surface *flame-spread rating* of not more than 25. (See Article 9.10.16.6.)

9.10.16.3. Walls in Exits

(1) Except as provided in Sentence (2), at least 90 per cent of the exposed surfaces of every wall in an *exit* shall have a surface *flame-spread rating* of not more than 25. (See Article 9.10.16.6.)

(2) At least 75 per cent of the wall surface of a lobby used as an *exit* in Article 9.9.8.5. shall have a surface *flame-spread rating* of not more than 25. (See Article 9.10.16.6.)

9.10.16.4. Exterior Exit Passageways. Where an exterior *exit* passageway provides the only *means of egress* from the rooms or *suites* it serves, the wall and ceiling finishes of that passageway, including the soffit beneath and the *guard* on the passageway, shall have a surface *flame-spread rating* of not more than 25, except that up to 10 per cent of the total wall area and 10 per cent of the total ceiling area is permitted to have a surface *flame-spread rating* of not more than 150.

9.10.16.5. Walls in Public Corridors. At least 90 per cent of the total wall surface in any unsprinklered *public corridor* shall have a surface *flame-spread rating* of not more than 75, or at least 90 per cent of the upper half of such walls shall have a

surface *flame-spread rating* of not more than 25. (See Article 9.10.16.6.)

9.10.16.6. Calculation of Wall and Ceiling Areas. *Combustible* doors, skylights, glazing and *combustible* light diffusers and lenses shall not be considered in the calculation of wall and ceiling areas in this Subsection.

9.10.16.7. Corridors Containing an Occupancy. Where a *public corridor* or a corridor used by the public contains an *occupancy*, the interior finish materials used on the walls or ceiling of such *occupancy*, shall have a surface *flame-spread rating* in conformance with that required for *public corridors*.

9.10.16.8. Light Diffusers and Lenses. Light diffusers and lenses having *flame-spread ratings*

9.23.9.4. Strapping and Bridging in Tables A1 and A2

(1) Except as permitted in Sentence (2), where strapping only is specified in Tables A-1 and A-2, it shall be

(a) not less than 19 mm by 64 mm, nailed to the underside of floor joists,
(b) located not more than 2 100 mm from each support or other rows of strapping, and
(c) fastened at each end to a sill or header.

(2) Strapping is not required if furring strips or a panel-type ceiling finish is attached directly to the joists.

(3) Where bridging is specified in Tables A-1 and A-2, it shall consist of not less than 19 mm by 64 mm or 38 mm by 38 mm cross bridging located not more than 2 100 mm from each support or other rows of bridging.

(4) Where bridging plus strapping is specified in Tables A-1 and A-2, it shall consist of

(a) bridging as described in Sentence (3), together with wood strapping as described in Sentence (1), or
(b) 38-mm solid blocking located not more than 2 100 mm from each support or other rows of bridging and securely fastened between the joists, together with wood strapping as defined in Sentence (1).

(See A-9.23.4.1.(2) in Appendix A.)

9.23.9.5. Header Joists

(1) Header joists around floor openings shall be doubled when they exceed 1.2 m in length.

(2) The size of header joists exceeding 3.2 m in length shall be determined by calculations.

9.23.9.6. Trimmer Joists

(1) Trimmer joists around floor openings shall be doubled when the length of the header joist exceeds 800 mm.

(2) When the header joist exceeds 2 m in length the size of the trimmer joists shall be determined by calculations.

9.23.9.7. Support of Tail and Header Joists.

When tail joists and header joists are supported by the floor framing, they shall be supported by suitable joist hangers or nailing.

9.23.9.8. Support of Walls

(1) Non-*loadbearing* walls parallel to the floor joists shall be supported by joists beneath the wall or on blocking between the joists.

(2) Blocking referred to in Sentence (1) for the support of non-*loadbearing* walls shall be not less than 38 mm by 89 mm lumber, spaced not more than 1.2 m apart.

(3) Non-*loadbearing* interior walls at right angles to the floor joists are not restricted as to location.

(4) *Loadbearing* interior walls parallel to floor joists shall be supported by beams or walls of sufficient strength to transfer safely the design loads to the vertical supports.

(5) *Loadbearing* interior walls at right angles to floor joists shall be located not more than 900 mm from the joist support when the wall does not support a floor, and not more than 600 mm from the joist support when the wall supports one or more floors, unless the joist size is designed to support such loads.

9.23.9.9. Cantilevered Floor Joists

(1) Floor joists supporting roof loads shall not be cantilevered more than 400 mm beyond their supports where 38 mm by 184 mm joists are used and not more than 600 mm beyond their supports where 38 mm by 235 mm or larger joists are used.

(2) The cantilevered portions referred to in Sentence (1) shall not support floor loads from other *storeys* unless calculations are provided to show that the allowable design stresses of the cantilevered joists are not exceeded.

(3) Where cantilevered floor joists described in Sentences (1) and (2) are at right angles to the main floor joists, the tail joists in the cantilevered portion shall extend inward away from the cantilever support a distance equal to not less than 6 times the length of the cantilever, and shall be end nailed to an interior doubled header joist in conformance with Table 9.23.3.A. e

9.23.10. Wall Studs

9.23.10.1. Stud Size and Spacing. The size and spacing of studs shall conform to Table 9.23.10.A.

Table 9.23.10.A.
Forming Part of Article 9.23.10.1.

Size and Spacing of Studs				
Type of Wall	Supported Loads (including *dead loads*)	Minimum Stud Size, mm	Maximum Stud Spacing, mm	Maximum Unsupported Height, m
Interior	No load	38 × 38 38 × 89 flat (1)	400 400	2.4 3.6
	Attic not accessible by a stairway	38 × 64 38 × 64 flat (1) 38 × 89 38 × 89 flat (1)	600 400 600 400	3.0 2.4 3.6 2.4
	Attic accessible by a stairway plus one floor Roof load plus one floor Attic not accessible by stairway plus 2 floors	38 × 89	400	3.6
	Roof load Attic accessible by a stairway Attic not accessible by a stairway plus one floor	38 × 89 38 × 64	600 400	3.6 2.4
	Attic accessible by a stairway plus 2 floors, or roof load plus 2 floors	38 × 89 64 × 89 38 × 140	300 400 400	3.6 3.6 4.2
	Attic accessible by a stairway plus 3 floors, or roof load plus 3 floors	38 × 140	300	4.2
Exterior	Roof with or without attic storage	38 × 64 38 × 89	400 600	2.4 3.0
	Roof with or without attic storage plus one floor	38 × 89 38 × 140	400 600	3.0 3.0
	Roof with or without attic storage plus 2 floors	38 × 89 64 × 89 38 × 140	300 400 400	3.0 3.0 3.6
	Roof with or without attic storage plus 3 floors	38 × 140	300	1.8
Column 1	2	3	4	5

Note to Table 9.23.10.A.:
(1) See Article 9.23.10.2.

9.23.13.6. Hip and Valley Rafters. Hip and valley rafters shall be not less than 50 mm greater in depth than the common rafters and not less than 38 mm thick, actual dimension.

9.23.13.7. Intermediate Support for Rafters and Joists

(1) Ceiling joists and collar ties of not less than 38 mm by 89 mm lumber may be assumed to provide intermediate support to reduce the span for rafters and joists where the roof slope is 1 in 3 or greater.

(2) Collar ties referred to in Sentence (1) more than 2.4 m long shall be laterally supported near their centres by not less than 19 mm by 89 mm continuous members at right angles to the collar ties.

(3) Dwarf walls and struts are permitted to be used to provide intermediate support to reduce the span for rafters and joists.

(4) When struts are used to provide intermediate support they shall be not less than 38 mm by 89 mm material extending from each rafter to a *loadbearing* wall at an angle of not less than 45° to the horizontal.

(5) When dwarf walls are used for rafter support, they shall be framed in the same manner as *loadbearing* walls and securely fastened top and bottom to the roof and ceiling framing to prevent over-all movement.

(6) Solid blocking shall be installed between floor joists beneath dwarf walls referred to in Sentence (5) that enclose finished rooms.

9.23.13.8. Ridge Support

(1) Except as provided in Sentence (3), the ridge of the roof shall be supported by a *loadbearing* wall extending from the ridge to suitable bearing or by a ridge beam of not less than 38 mm by 140 mm material.

(2) Ridge beams referred to in Sentence (1) shall be supported at intervals not exceeding 1.2 m by not less than 38 mm by 89 mm members extending vertically from the ridge to suitable bearing.

(3) When the roof slope is 1 in 3 or more, ridge support may be omitted provided the lower ends of the rafters are adequately tied to prevent outward movement.

(4) Ties required in Sentence (3) are permitted to consist of tie rods or ceiling joists forming a continuous tie for opposing rafters and nailed in accordance with Table 9.23.13.A.

(5) Ceiling joists referred to in Sentence (4) shall be fastened together with at least one more nail per joist splice than required for the rafter to joist connection shown in Table 9.23.13.A.

(6) Members referred to in Sentence (5) may be fastened together either directly or through a gusset plate.

9.23.13.9. Restraint of Joist Bottoms. Roof joists supporting a finished ceiling, other than plywood, waferboard or strandboard, shall be restrained from twisting along the bottom edges by means of furring, blocking, cross bridging or strapping conforming to Article 9.23.9.3. *e*

9.23.13.10. Ceiling Joists Supporting Roof Load

(1) Except as permitted in Sentence (2), ceiling joists supporting part of the roof load from the rafters shall be not less than 25 mm greater in depth than required for ceiling joists not supporting part of the roof load.

(2) When the roof slope is 1 in 4 or less, the ceiling joist sizes referred to in Sentence (1) shall be determined from the span tables for roof joists.

9.23.13.11. Wood Roof Trusses

(1) Except for roof trusses constructed of Poplar, Eastern White Pine, Western White Pine, Red Pine, Western Red Cedar and Eastern White Cedar, the member sizes for Howe or Fink type wood roof trusses spaced not more than 600 mm o.c. which are to be supported at or near their ends may be determined in conformance with Tables A-10 and A-11 provided such trusses conform to the requirements of Sentences (3) to (7). (See Appendix A.)

(2) The joint connections used in trusses described in Sentence (1) shall be designed in conformance with the requirements in Subsection 4.3.1.

(3) Where a roof truss described in Sentence (1) supports a ceiling, and the unsupported length of the bottom chord between the truss panel points exceeds 3.05 m, the bottom chord shall be not less than 38 mm by 114 mm in size.

Table 9.23.13.A.
Forming Part of Sentences 9.23.13.8.(4) and (5)

Rafter-to-Joist Nailing
(Minimum Number of Nails not less than 76 mm Long)
(Unsupported Ridge)

Roof Slope	Spacing, mm	Rafter Tied to Every Joist						Rafter Tied to Joist every 1.2 m					
		Building Width up to 8 m			*Building* Width up to 9.8 m			*Building* Width up to 8 m			*Building* Width up to 9.8 m		
		Roof Snow Load, kPa											
		1.0 or less	1.5	2.0 or more	1.0 or less	1.5	2.0 or more	1.0 or less	1.5	2.0 or more	1.0 or less	1.5	2.0 or more
1 in 3	400	4	5	6	5	7	8	11	—	—	—	—	—
	600	6	8	9	8	—	—	11	—	—	—	—	—
1 in 2.4	400	4	4	5	5	6	7	7	10	—	9	—	—
	600	5	7	8	7	9	11	7	10	—	—	—	—
1 in 2	400	4	4	4	4	4	5	6	8	9	8	—	—
	600	4	5	6	5	7	8	6	8	9	8	—	—
1 in 1.71	400	4	4	4	4	4	4	5	7	8	7	9	11
	600	4	4	5	5	6	7	5	7	8	7	9	11
1 in 1.33	400	4	4	4	4	4	4	4	5	6	5	6	7
	600	4	4	4	4	4	5	4	5	6	5	6	7
1 in 1	400	4	4	4	4	4	4	4	4	4	4	4	5
	600	4	4	4	4	4	4	4	4	4	4	4	5
Column 1	2	3	4	5	6	7	8	9	10	11	12	13	14

(4) Where the unsupported length of the bottom chord described in Sentence (3) exceeds 3.66 m between the panel points, the bottom chord shall be not less than 38 mm by 140 mm in size.

(5) Where the length of compression web members in roof trusses described in Sentence (1) exceeds 1.83 m, such web members shall be provided with continuous bracing to prevent buckling.

(6) Bracing required in Sentence (5) shall consist of not less than 19 mm by 89 mm lumber nailed at right angles to the web members near their centres with at least two 63 mm nails for each member.

(7) Web members referred to in Sentence (5) shall be not less than 38 mm by 89 mm lumber of at least No. 2 grade.

(8) Roof trusses that are not designed in conformance with Sentence (1) shall

(a) be capable of supporting a total ceiling load (*dead load* plus *live load*) of 0.5 kPa plus two and two-thirds times the design roof load for 24 h, and

(b) not exceed the deflections shown in Table 9.23.13.B. when loaded with the ceiling load plus one and one-third times the design roof snow load for 1 h.

(9) Testing for lumber roof trusses referred to in Sentence (8) shall be in conformance with CSA S307, "Load Test Procedure for Wood Roof Trusses for Houses and Small Buildings," except that the unsymmetrical loading requirement in Clause 7.7 of that standard shall not apply.

r RubberizedAsphalt for Roofing and Waterproofing,"
(g) CGSB 37-GP-52M, "Roofing and Waterproofing Membrane, Sheet Applied, Elastomeric,"
(h) CGSB 37-GP-54M, "Roofing and Waterproofing Membrane, Sheet Applied, Flexible, Polyvinyl Chloride,"
(i) CGSB 37-GP-56M, "Membrane, Modified, Bituminous, Prefabricated, and Reinforced for Roofing,"
(j) CGSB 41-GP-6M, "Sheets, Thermosetting Polyester Plastics, Glass Fiber Reinforced,"
(k) CAN2-51.32, "Sheathing, Membrane, Breather Type,"
(l) CSA A123.1, "Asphalt Shingles Surfaced with Mineral Granules,"
(m) CSA A123.2, "Asphalt Coated Roofing Sheets,"
(n) CSA A123.3, "Asphalt or Tar Saturated Roofing Felt,"
(o) CSA A123.4, "Bitumen for Use in Construction of Built-Up Roof Coverings and Dampproofing and Waterproofing Systems,"
(p) CSA A123.17, "Asphalt-Saturated Felted Glass-Fibre Mat for Use in Construction of Built-Up Roofs,"
(q) CSA-O118.1, "Western Red Cedar Shingles, and Shakes," or
r4 (r) CAN/CSA A123.5-M, "Asphalt Shingles Made from Glass Felt and Surfaced with Mineral Granules."

9.26.2.2. Nails

(1) Nails used for roofing shall be corrosion-resistant roofing or shingle nails conforming to CSA B111, "Wire Nails, Spikes and Staples."

(2) Nails shall have sufficient length to penetrate through, or 12 mm into, roof sheathing.

(3) Nails used with asphalt roofing shall have a head diameter of not less than 9.5 mm and a shank thickness of not less than 2.95 mm.

(4) Nails used with wood shingles or shakes shall have a head diameter of not less than 4.8 mm and a shank thickness of not less than 2.0 mm and shall be stainless steel, aluminum or hot-dipped galvanized. (See Appendix A.)

9.26.2.3. Staples

(1) Staples used to apply asphalt or wood shingles shall be corrosion-resistant and shall be driven with the crown parallel to the eaves.

(2) Staples used with asphalt shingles shall be not less than 19 mm long, 1.6 mm diam or thickness, with not less than a 25 mm crown, except that an 11 mm crown may be used if the number of staples specified in Article 9.26.7.4. is increased by one-third.

(3) Staples used with wood shingles shall be not less than 29 mm long, 1.6 mm diam or thickness, with not less than a 9.5 mm crown and shall be stainless steel or aluminum. (See A-9.26.2.2.(4) in Appendix A.)

9.26.3. Roof Slope

9.26.3.1. Slope

(1) Except as provided in Sentences (2) and (3), the roof slopes on which roof coverings may be applied shall conform to Table 9.26.3.A.

(2) Asphalt and gravel or coal tar and gravel roofs may be constructed with lower slopes than required in Sentence (1) when effective drainage is provided by roof drains located at the lowest points on the roofs.

(3) Sheet metal roof cladding systems specifically designed for low-slope applications are permitted to be installed with lower slopes than required in Sentence (1).

9.26.4. Flashing at Intersections

9.26.4.1. Materials. Sheet metal flashing shall consist of not less than 1.73 mm thick sheet lead, 0.33 mm thick galvanized steel, 0.46 mm thick copper, 0.46 mm thick zinc or 0.48 mm thick aluminum.

9.26.4.2. Valley Flashing

(1) Where sloping surfaces of shingled roofs intersect to form a valley, the valley shall be flashed.

(2) Closed valleys shall not be used with rigid shingles on slopes of less than 1 in 1.2.

(3) Open valleys shall be flashed with not less than one layer of sheet metal not less than 600 mm wide, or 2 layers of roll roofing.

Table 9.26.3.A.
Forming Part of Sentence 9.26.3.1.(1)

Roofing Types and Slope Limits of Roofs		
Type of Roofing	Minimum Slope	Maximum Slope
Built-up Roofing		
Asphalt base (gravelled)	1 in 50 [1]	1 in 4
Asphalt base (without gravel)	1 in 25	1 in 2
Coal-tar base (gravelled)	1 in 50 [1]	1 in 25
Cold process	1 in 25	1 in 1.33
Asphalt Shingles		
Normal application	1 in 3	no limit
Low slope application	1 in 6	no limit
Roll Roofing		
Smooth and mineral surfaced	1 in 4	no limit
480 mm wide selvage asphalt roofing	1 in 6	no limit
Cold application felt	1 in 50	1 in 1.33
Wood Shingles	1 in 4	no limit
Handsplit Shakes	1 in 3	no limit
Asbestos-Cement Corrugated Sheets	1 in 4	no limit
Corrugated Metal Roofing	1 in 4	no limit
Sheet Metal Shingles	1 in 4	no limit
Slate Shingles	1 in 2	no limit
Clay Tile	1 in 2	no limit
Glass Fibre Reinforced Polyester Roofing Panels	1 in 4	no limit
Column 1	2	3

Note to Table 9.26.3.A.:
[1] See Sentences 9.26.3.1.(2) and (3).

(4) The bottom layer of roofing required in Sentence (3) shall consist of not less than Type S smooth roll roofing or Type M mineral surface roll roofing (mineral surface down) not less than 457 mm wide, centred in the valley and fastened with nails spaced not more than 450 mm o.c. located 25 mm away from the edges.

(5) The top layer of roofing required in Sentence (3) shall consist of not less than Type M mineral surface roll roofing (mineral surface up), 914 mm wide, centred in the valley, applied over a 100 mm wide strip of cement along each edge of the bottom layer, and fastened with a sufficient number of nails to hold it in place until the shingles are applied.

9.26.4.3. Intersection of Shingle Roofs and Masonry

(1) The intersection of shingle roofs and masonry walls or *chimneys* shall be protected with flashing.

(2) Counter flashing required in Sentence (1) shall be embedded not less than 25 mm in the masonry and shall extend not less than 150 mm down the masonry and lap the lower flashing not less than 100 mm.

Table A–4 (Continued)

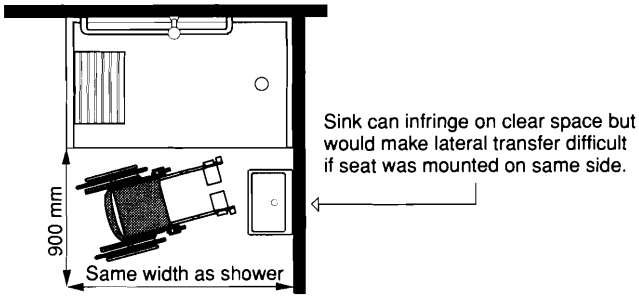
Roof Joists – (Design Roof Snow Loads 1.0 and 1.5 kPa)								
Commercial Designation	Grade	Member Size, mm	1.0 kPa Joist Spacing			1.5 kPa Joist Spacing		
			300 mm	400 mm	600 mm	300 mm	400 mm	600 mm
			m	m	m	m	m	m
Spruce – Pine – Fir (includes Spruce (all species except Coast Sitka Spruce), Jack Pine, Lodgepole Pine, Balsam Fir and Alpine Fir)	Select Structural	38 × 89	2.55	2.32	2.03	2.23	2.03	1.77
		38 × 140	4.02	3.65	3.19	3.51	3.19	2.79
		38 × 184	5.28	4.80	4.19	4.61	4.19	3.66
		38 × 235	6.74	6.13	5.35	5.89	5.35	4.68
		38 × 286	8.21	7.46	6.52	7.17	6.52	5.69
	No. 1 and No. 2	38 × 89	2.47	2.24	1.96	2.16	1.96	1.71
		38 × 140	3.89	3.53	3.08	3.40	3.08	2.69
		38 × 184	5.11	4.64	4.05	4.46	4.05	3.54
		38 × 235	6.52	5.93	5.18	5.70	5.18	4.52
		38 × 286	7.94	7.21	6.30	6.94	6.30	5.50
	No. 3	38 × 89	2.43	2.20	1.93	2.12	1.93	1.68
		38 × 140	3.82	3.47	3.03	3.33	3.03	2.65
		38 × 184	5.02	4.56	3.77	4.38	3.97	3.24
		38 × 235	6.41	5.65	4.61	5.60	4.86	3.97
		38 × 286	7.57	6.56	5.35	6.51	5.64	4.60
	Construction	38 × 89	2.43	2.20	1.93	2.12	1.93	1.68
	Standard	38 × 89	2.33	2.12	1.85	2.04	1.85	1.62
Northern Species (includes any Canadian softwood covered by the NLGA Standard Grading Rules)	Select Structural	38 × 89	2.28	2.07	1.81	1.99	1.81	1.58
		38 × 140	3.59	3.26	2.85	3.14	2.85	2.49
		38 × 184	4.72	4.29	3.75	4.12	3.75	3.27
		38 × 235	6.03	5.48	4.79	5.27	4.79	4.18
		38 × 286	7.34	6.67	5.82	6.41	5.82	5.09
	No. 1 and No. 2	38 × 89	2.23	2.03	1.77	1.95	1.77	1.55
		38 × 140	3.51	3.19	2.79	3.07	2.79	2.43
		38 × 184	4.61	4.19	3.66	4.03	3.66	3.20
		38 × 235	5.89	5.35	4.68	5.15	4.68	4.09
		38 × 286	7.17	6.52	5.58	6.26	5.69	4.80
	No. 3	38 × 89	2.18	1.98	1.73	1.90	1.73	1.50
		38 × 140	3.42	3.05	2.49	2.99	2.62	2.14
		38 × 184	4.28	3.71	3.03	3.68	3.19	2.60
		38 × 235	5.23	4.53	3.70	4.50	3.90	3.18
		38 × 286	6.07	5.26	4.29	5.22	4.52	3.69
	Construction	38 × 89	2.18	1.98	1.73	1.90	1.73	1.51
	Standard	38 × 89	2.12	1.93	1.68	1.85	1.68	1.47

Table A–5

Forming Part of Sentence 9.23.4.1.(1)

Roof Joists – (Design Roof Snow Loads 2.0 and 2.5 kPa)

Commercial Designation	Grade	Member Size, mm	2.0 kPa Joist Spacing			2.5 kPa Joist Spacing		
			300 mm	400 mm	600 mm	300 mm	400 mm	600 mm
			m	m	m	m	m	m
Douglas Fir – Larch (includes Douglas Fir and Western Larch)	Select Structural	38 × 89	2.15	1.95	1.71	1.99	1.81	1.58
		38 × 140	3.38	3.07	2.68	3.14	2.85	2.49
		38 × 184	4.44	4.04	3.53	4.12	3.75	3.27
		38 × 235	5.67	5.15	4.50	5.27	4.79	4.18
		38 × 286	6.91	6.27	5.48	6.41	5.82	5.09
	No. 1 and No. 2	38 × 89	2.06	1.87	1.63	1.91	1.74	1.52
		38 × 140	3.24	2.94	2.57	3.01	2.73	2.39
		38 × 184	4.26	3.87	3.38	3.95	3.59	3.14
		38 × 235	5.44	4.94	4.22	5.05	4.59	3.84
		38 × 286	6.62	6.00	4.90	6.14	5.46	4.46
	No. 3	38 × 89	1.91	1.65	1.35	1.74	1.50	1.23
		38 × 140	2.72	2.36	1.92	2.48	2.15	1.75
		38 × 184	3.31	2.87	2.34	3.01	2.61	2.13
		38 × 235	4.05	3.51	2.86	3.69	3.19	2.61
		38 × 286	4.70	4.07	3.32	4.28	3.70	3.03
	Construction	38 × 89	1.99	1.81	1.58	1.85	1.68	1.47
	Standard	38 × 89	1.93	1.75	1.53	1.79	1.62	1.42
Hemlock – Fir (includes Western Hemlock and Amabilis Fir)	Select Structural	38 × 89	2.12	1.93	1.68	1.97	1.79	1.56
		38 × 140	3.33	3.03	2.65	3.10	2.81	2.46
		38 × 184	4.38	3.98	3.48	4.07	3.70	3.23
		38 × 235	5.60	5.09	4.44	5.20	4.72	4.12
		38 × 286	6.81	6.19	5.41	6.32	5.75	5.02
	No. 1 and No. 2	38 × 89	2.06	1.87	1.63	1.91	1.74	1.52
		38 × 140	3.24	2.94	2.57	3.01	2.73	2.39
		38 × 184	4.26	3.87	3.38	3.95	3.59	3.14
		38 × 235	5.44	4.94	4.32	5.05	4.59	4.01
		38 × 286	6.62	6.01	5.25	6.14	5.58	4.68
	No. 3	38 × 89	1.99	1.81	1.58	1.85	1.68	1.47
		38 × 140	3.14	2.85	2.37	2.91	2.65	2.16
		38 × 184	4.09	3.54	2.89	3.72	3.22	2.63
		38 × 235	5.00	4.33	3.53	4.55	3.94	3.22
		38 × 286	5.80	5.02	4.10	5.28	4.57	3.73
	Construction	38 × 89	1.99	1.81	1.58	1.85	1.68	1.47
	Standard	38 × 89	1.93	1.75	1.53	1.79	1.62	1.42



A-3.7.3.12.(1)(b)

A-3.7.3.12.(1)(f) Grab Bars. Only one grab bar is required, to be installed on the wall next to the seat; a grab bar behind the seat prevents the user from leaning back against the wall, while one located on the wall opposite the seat cannot be reached from the seated position. The seat itself may be used in conjunction with the bar for transfer.

A-3.7.3.14. Telephone Counters. Built-in shelves or counters for public telephones must be designed to accommodate persons using telecommunication devices for the deaf (TDD). These devices require a level surface at least 350 mm deep by 250 mm wide with no obstruction above that space within 250 mm. If a wall-hung telephone or other obstruction extends to less than 250 mm from the shelf or counter, an equivalent clear space must be provided on either side of each telephone. At least one telephone should be equipped with a volume control on a receiver that generates a magnetic field compatible with the T-switch of a hearing aid. The lower portion of the shelf or counter is intended for persons using a wheelchair; therefore all parts of the operating mechanism of the telephone above this portion should be within reach of a wheelchair user. The telephone should also be equipped with a volume control and be compatible with a hearing aid. Where only one telephone is provided, it must satisfy all the requirements set out in this Article.

A-4.1.1.2.(2) Structural Designer. Part 4 has been written on the assumption that structural design will be carried out by a professional who is qualified for such design under appropriate provincial or territorial legislation. Sentence 4.1.1.2.(2) is not intended to imply that a professional may not also be required in the application of requirements in other Parts of the NBC.

A-4.1.1.3.(1). Structural Integrity. The requirements of Part 4 of the National Building Code, including the CSA design standards, generally provide a satisfactory level of structural integrity. Additional considerations may, however, be required for building systems made of components of different materials, whose interconnection is not covered by existing CSA design standards, buildings outside the scope of existing CSA design standards, and buildings exposed to severe accidental loads such as vehicle impact or explosion. Further guidance can be found in the Commentary on Structural Integrity in Chapter 4 of the Supplement to the NBC 1990.

A-4.1.1.5.(1) Deflections. Information on deflections can be found in the Commentary on Serviceability Criteria for Deflections and Vibrations in Chapter 4 of the Supplement to the NBC 1990.

A-4.1.1.5.(5) Lateral Deflection of Tall Buildings. The limitation of 1/500 drift per storey may be exceeded if it can be established that the drift as calculated will not result in damage to non-structural elements. Information on lateral deflection of tall buildings may be found in the Commentary on Wind Loads in Chapter 4 of the Supplement to the NBC 1990.

A-4.1.1.6.(1) Floor Vibration. Information on floor vibration can be found in the Commentary on Serviceability Criteria for Deflections and Vibrations in Chapter 4 of the Supplement to the NBC 1990.

A-4.1.1.6.(2) Lateral Vibrations and Acceleration Under Dynamic Wind Loads. Information on lateral vibrations and accelerations under dynamic wind loads can be found in the Commentary on Wind Loads in Chapter 4 of the Supplement to the NBC 1990.

A-4.1.2.1.(1) Temperature Changes. Information on effects due to temperature changes can be found in the Commentary on Effects of Deformations in Building Components in Chapter 4 of the Supplement to the NBC 1990.

A-4.1.3.3. Load Combinations. Information on load combinations can be found in the Commen-

tary on Load Combinations in Chapter 4 of the Supplement to the NBC 1990.

A-4.1.4. Limit States Design. Information on limit states design can be found in the Commentary on Limit States Design in Chapter 4 of the Supplement to the NBC 1990.

A-4.1.6.A. Floor Areas That Could Be Used As Viewing Areas. Some interior balconies, mezzanines, corridors, lobbies and aisles that are not intended to be used for the assembly of people as viewing areas are sometimes used as such and, consequently, are subject to loadings much higher than those for the occupancies they serve. Floor areas which may be subject to such higher loads must, therefore, be designed for a loading of 4.8 kPa.

A-4.1.6.9 Tributary Area. Information on tributary area can be found in the Commentary on Tributary Area in Chapter 4 of the Supplement of the NBC 1990.

A-4.1.6.B. Loads Due to Concentrations. Special study is required to determine concentrated loads for the design of floors and areas used by vehicles exceeding 9 000 kg gross weight and driveways and sidewalks over areaways and basements. Where appropriate the designer should refer to CAN3-S6, "Design of Highway Bridges."

A-4.1.7.1.(1)-(7) Coefficients for Snow Loads on Roofs. Information on coefficients for snow loads on roofs can be found in the Commentary on Snow Loads in Chapter 4 of the Supplement to the NBC 1990.

A-4.1.7.2.(2) Full and Partial Loading Under Snow Loads. Information on full and partial snow loading on roofs can be found in the Commentary on Snow Loads in Chapter 4 of the Supplement to the NBC 1990.

A-4.1.7.3.(1) Rain Loads. Information on rain loads can be found in the Commentary on Rain Loads in Chapter 4 of the Supplement to the NBC 1990.

A-4.1.8.1.(1), (2) Pressure Coefficient for Wind Loads. Information on pressure coefficients can be found in the Commentary on Wind Loads in Chapter 4 of the Supplement to the NBC 1990.

A-4.1.8.1.(5)(c) Dynamic Approach for Wind Loads. Information on a dynamic approach can be found in the Commentary on Wind Loads in Chapter 4 of the Supplement to the NBC 1990.

A-4.1.8.1.(6)(a) Gust Factors for Calculation of Internal Pressures. Information on gust factors for the calculation of internal pressures can be found in Commentary on Wind Loads in Chapter 4 of the Supplement to the NBC 1990.

A-4.1.8.1.(6)(d) and 4.1.8.2.(1)(b) Dynamic Approach to the Action of Wind Gusts. Information on a dynamic approach to the action of wind gusts can be found in the Commentary on Wind Loads in Chapter 4 of the Supplement to the NBC 1990.

A-4.1.8.3.(1) Full and Partial Loading under Wind Loads. Information on full and partial loading under wind loads can be found in the Commentary on Wind Loads in Chapter 4 of the Supplement to the NBC 1990.

A-4.1.9.1.(3) Direction of Forces. Information on the direction of earthquake forces can be found in the Commentary on Effects of Earthquakes in Chapter 4 of the Supplement to the NBC 1990.

A-4.1.9.1.(8) and A-4.1.9.B. Force Modification Factor, R. Explanatory notes on the various cases can be found in the Commentary on Effects of Earthquakes in Chapter 4 of the Supplement to the NBC 1990.

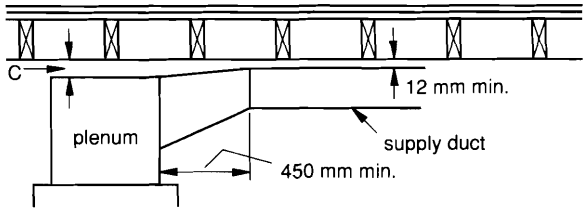
A-4.1.9.1.(11) and A-4.1.9.C. Foundation Factor. The foundation factor, F, accounts for the effects of soil conditions on the intensity of shaking of structures. The foundation soils are assumed to maintain their integrity. For all types of foundations, including deep ones, the possibility of ground failure due to excessive settlements in loose sands, liquefaction of saturated sands, fault displacements and loss of strength of sensitive clays should be considered by a person competent in this field of work.

A-4.1.9.1.(13)(b) Dynamic Analysis for Vertical Distribution of Lateral Seismic Forces. Information on a dynamic approach for the vertical distribution of the lateral seismic force, V,

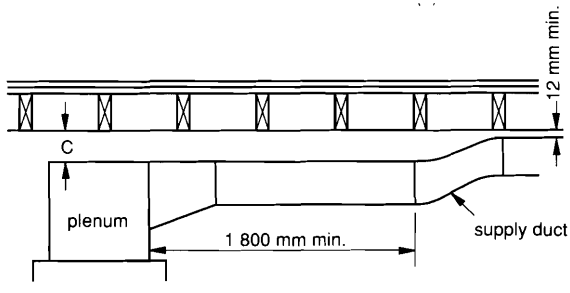
NFPA 69, Explosion Prevention Systems,
NFPA 81, Fur Storage, Fumigation and Cleaning,
NFPA 85F, The Installation and Operation of Pulverized Fuel Systems,
NFPA 86, Ovens and Furnaces, Design, Location and Equipment,
NFPA 88A, Parking Structures,
NFPA 88B, Repair Garages,
NFPA 91, Installation of Blower and Exhaust Systems for Dust, Stock and Vapor Removal or Conveying,
NFPA 96, Installation of Equipment for the Removal of Smoke and Grease-Laden Vapors from Commercial Cooking Equipment,
NFPA 204M, Guide for Smoke and Heat Venting,
NFPA 303, Marinas and Boatyards,
NFPA 307, Marine Terminals, Piers and Wharfs,
NFPA 321, Basic Classification of Flammable and Combustible Liquids,
NFPA 325M, Fire Hazard Properties of Flammable Liquids, Gases and Volatile Solids,
NFPA 395, Storage of Flammable and Combustible Liquids on Farms and Isolated Construction Projects,
NFPA 409, Aircraft Hangars,
NFPA 416, Construction and Protection of Airport Terminal Buildings,
NFPA 480, Magnesium, Storage, Handling,
NFPA 481, Production, Processing, Handling and Storage of Titanium,
NFPA 482, Production, Processing, Handling and Storage of Zirconium,
NFPA 490, Storage of Ammonium Nitrate,
NFPA 650, Pneumatic Conveying Systems,
NFPA 651, Manufacture of Aluminum or Magnesium Powder,
NFPA 654, Prevention of Fire and Dust Explosions in the Chemical, Dye, Pharmaceutical, and Plastics Industries,
NFPA 655, Prevention of Sulfur Fires and Explosions, and
NFPA 664, Prevention of Fires and Explosions in Wood Processing and Woodworking Facilities.

A-6.2.3.12. Make-Up Air for Exhaust Systems. When make-up air is introduced into a building in cold weather, it should be preheated when the comfort of people in the air path is a consideration.

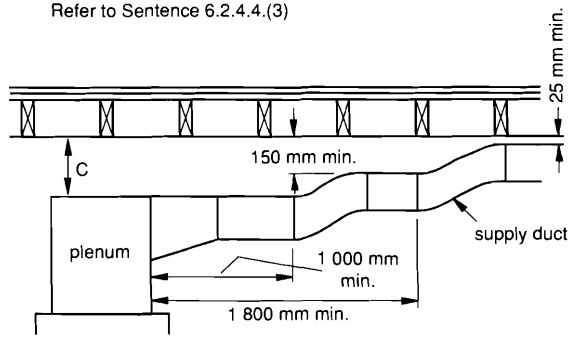
A-6.2.4.4. Clearances for Warm-Air Supply Ducts.



(a) Applicable to forced-air furnaces where permissible clearance C above plenum is 75 mm or less. Refer to Sentence 6.2.4.4. (2)



(b) Applicable to forced-air furnaces where permissible clearance C above plenum is more than 75 mm but not more than 150 mm. Refer to Sentence 6.2.4.4.(3)



(c) Applicable to forced-air furnaces where permissible clearance C above plenum is more than 150 mm. Refer to Sentence 6.2.4.4.(4)

A-6.2.4.4.

A-6.2.4.5.(2) Warm Air Supply Outlets. If the heating system is designed to also distribute ventilation air, high inside wall or ceiling outlets with diffusers designed for such applications, may be used. *e*

A-6.2.9.2.(6) Temperature of Exposed Piping. Normally piping carrying steam or high-temperature hot water at pressures above atmospheric (corresponding temperature 100°C or above) will be insulated to reduce heat losses as an economy measure. Above a temperature of approximately 70°C, however, a bare pipe can cause a burn to human flesh coming in contact with the pipe. If pipes above this temperature are normally out of reach of all persons other than maintenance personnel or are properly guarded, it would be expected that no insulation would be needed for public safety.

A-8.1.2.1. Application. The use of streets or public property and vehicular traffic during construction or demolition is normally controlled by regulations of authorities other than the building department (i.e. police department).

A-8.2.2.1.(1) Demolition during Renovation. When renovation is taking place, only the portion of the building undergoing demolition is covered by this Subsection. The requirements for the portion undergoing construction are covered by Subsection 8.2.3.

A-8.2.2.1.(2) Demolition. In certain buildings which do not pose an exposure hazard to other buildings, or in which there is little fire hazard to staff, such as in small buildings, the degree of application of this Subsection may be minimal. The degree of application should be determined in advance in conjunction with the authority having jurisdiction.

A-8.2.2.3.(2) Access for Fire Fighting. Fire fighting in storeys above the first requires prompt vertical movement by fire department personnel. Provision should be made for the use of elevators, hoists or lifts to assist such personnel in reaching upper storeys of the building.

A-8.2.2.5. Standpipe System. During freezing conditions, the standpipe may be drained to prevent damage to the equipment. It is not anticipated that hose will be available in the building being demolished, but that it will be brought to the relevant floor by the responding fire department.

A-8.2.2.12.(3) Purging of Tank. Guidance on methods of rendering inert tanks, piping and machinery reservoirs is available in NFPA 327, "Standard Procedures for Cleaning or Safeguarding Small Tanks and Containers." *e*

A-8.2.3.1. Construction Sites. Construction sites can range from a large multi-storey building to small single-storey residences and may include additions or renovations to an existing building. The degree to which this Subsection should apply to each site should be determined in advance, as part of the fire safety plan for the construction site, taking into consideration such issues as the size of the project and condition of the site.

A-9.3.2.1. Grade Marking of Lumber. Lumber is generally grouped for marketing into the species combinations contained in the following table. The maximum allowable spans for those combinations are listed in the span tables for joists, rafters and beams. Some species of lumber are also marketed individually. Since the allowable span for the northern species combination is based on the weakest species in the combination, the use of the span for this combination is permitted for any individual species not included in the Spruce-Pine-Fir, Douglas Fir-Larch, Hem-Fir combinations.

Facsimiles of typical grade marks of lumber associations and grading agencies accredited by the Canadian Lumber Standards (CLS) Accreditation Board to grade mark lumber in Canada are shown in the following table. Accreditation by the CLS Accreditation Board applies to the inspection, grading and grade marking of lumber, including mill supervisory service, in accordance with CSA Standard 0141, "Softwood Lumber."

The grade mark of a CLS accredited agency on a piece of lumber indicates its assigned grade, species or species combination, moisture condition at the time of surfacing, the responsible grader or mill of origin and the CLS accredited agency under whose supervision the grading and marking was done.

Canadian lumber is graded to the NLGA Standard Grading Rules for Canadian Lumber, published by the National Lumber Grades Authority. The NLGA rules specify standard grade names and grade name

Facsimiles of Grade Mark	Association or Agency
NFLD. LUMBER NLA NORTH SPECIES STUD S-GRN MILL 9	Newfoundland Lumber Producers Association P.O. Box 8 Glovertown, Newfoundland A0G 2L0
O.L.M.A.® 01-1 CONST. S-DRY SPRUCE - PINE - FIR	Ontario Lumber Manufacturers Association 55 University Avenue, Ste. 325 Toronto, Ontario M5J 2H7
S-P-F S-GRN 2 ® 031	L'association des manufacturiers des bois de sciage du Québec Quebec Lumber Manufacturers Association 5055, boul. Hamel ouest, bureau 200 Québec, Québec G2E 2G6
RIB® NLGA RULE No 1 S-GRN 00 HEM-FIR-N	Pacific Lumber Inspection Bureau 1110 – 355 Burrard Street Vancouver, British Columbia V6C 2G8
ILMA® S-DRY 1 00 S-P-F	Interior Lumber Manufacturers Association 203 – 2350 Hunter Road Kelowna, British Columbia V1X 6C1
0 0 No 1 S-DRY D FIR (N) NLGA RULE	MacDonald Inspection c/o Warnock Hersey Professional Services Ltd. 211 School House Street Coquitlam, British Columbia V3K 4X9
NWT 10 CONST S-P-F S-GRN	Northwest Territories Forest Industries Association 6301 Silverthorne Road P.O. Box 346 Sardis, British Columbia V2R 2N1

A-9.4.4.A. Classification of Soils. Sand or gravel may be classified by means of a picket test in which a 38 mm by 38 mm picket bevelled at the end at 45° to a point is pushed into the soil. Such material is classified as "dense or compact" if a man of average weight cannot push the picket more than 200 mm into the soil and "loose" if the picket penetrates 200 mm or more.

Clay and silt may be classified as "stiff" if it is difficult to indent by thumb pressure, "firm" if it can be indented by moderate thumb pressure, "soft" if it can be easily penetrated by thumb pressure, where this test is carried out on undisturbed soil in the wall of a test pit.

A-9.6.5.A. Glass in Doors. Maximum areas in Table 9.6.5.A. for other than fully tempered glazing are cut off at 1.50 m^2, as this would be the practical limit after which safety glass would be required by Sentence 9.6.5.2.(3).

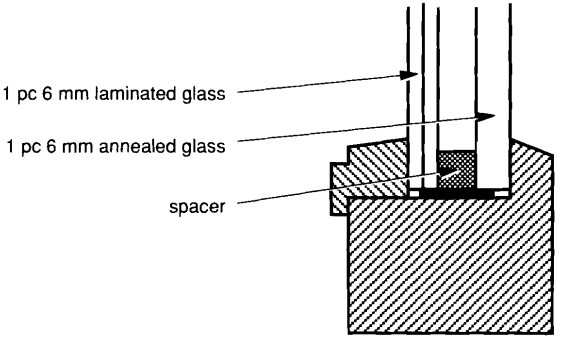
A-9.6.5.3. Mirrored Glass Doors. Standard CAN/CGSB-82.6-M covers mirrored glass doors for use on reach-in closets. It specifies that such doors are not intended to be used for walk-in closets. e

A-9.6.6.1. Glazing in Doors and Sidelights. There is no mandatory requirement that special glass be used in doors or sidelights, primarily because of cost. It is, however, a common method of forced entry to break glass in doors and sidelights to gain access to door hardware and unlock the door from the inside. Although insulated glass provides increased resistance over single glazing, the highest resistance is provided by laminated glass. Tempered glass, while stronger against static loads, is prone to shattering under high, concentrated impact loads.

Laminated glass is more expensive than annealed glass and must be used in greater thicknesses. The sketch shows an insulated sidelight made of one pane of laminated glass and one pane of annealed glass. This method reduces the cost premium that would result if both panes were laminated.

Consideration should be given to using laminated glazing in doors and accompanying sidelights regulated by Article 9.6.6.1., in windows located within 900 mm of locks in such doors, and in basement windows.

Underwriters' Laboratories of Canada have produced a document ULC Subject C972-1974, "Guide for the Investigation of Burglary Resisting Glazing Material," which provides a test procedure to evaluate the resistance of glazing to attacks by thieves. While it is principally intended for plate glass show windows, it may be of value for residential purposes.



Combined laminated/annealed glazing

A-9.6.6.1.

A-9.6.6.5.(1) Door Fasteners. The purpose of the requirement for 30 mm screw penetration into solid wood is to prevent the door from being dislodged from the jamb due to impact forces. It is not the intent to prohibit other types of hinges or strikeplates that are specially designed to provide equal or greater protection. e

A-9.6.6.7. Hinged Doors. Methods of satisfying this Article include either using non-removable pin hinges or modifying standard hinges by screw fastening a metal pin in a screw hole in one half of the top and bottom hinges. When the door is closed, the projecting portion of the pin engages in the corresponding screw hole in the other half of the hinge and then, even if the hinge pin is taken out, the door cannot be removed.

A-9.6.6.10. Resistance of Doors to Forced Entry. This Article designates ASTM Standard F476, "Standard Test Methods for Security of Swinging Doors" as an alternate to compliance with the prescriptive requirements for doors and hardware. The annex to the standard provides four security classifications, with acceptance criteria, depending on

A-9.8.8.1. Loads on Guards. Guards should be constructed so as to be strong enough to provide protection from falling under normal use. Such guards may be accepted on the basis of experience or by structural design. Loading criteria for the structural design of guards can be found in Article 4.1.10.1.

A-9.10.1.4. Commercial Cooking Equipment. Part 6 refers to NFPA 96, "Standard for the Installation of Equipment for the Removal of Smoke and Grease-laden Vapours from Commercial Cooking Equipment," which in turn references "Commercial Cooking Equipment." However, the deciding factor as to whether or not NFPA 96 applies is the potential for production of grease-laden vapours and smoke, rather than the type of equipment used. While NFPA 96 does not apply to domestic equipment for normal residential family use, it should apply to domestic equipment used in commercial, industrial, institutional and similar cooking applications where the potential for the production of smoke and grease-laden vapours exceeds that for normal residential family use.

A-9.10.3.1. Fire and Sound Resistance of Building Assemblies. The following tables may be used to select building assemblies for compliance with Article 9.10.3.1. and Subsection 9.11.2. However, these tables are provided only for the convenience of Code users. Assemblies not listed in these tables are equally acceptable provided their fire and sound resistance can be demonstrated to meet the above-noted requirements on the basis of tests described in 9.10.3.1. and 9.11.1. or by using the data in Chapter 2 of the Supplement to the NBC 1990. *e*

Table A-9.10.3.A.

Fire and Sound Resistance of Walls

Type of Wall	No.	Description	Finish on Each Side[1]	Fire-Resistance Rating	Typical Sound Transmission Class[2]
Hollow concrete block (normal weight aggregate)	1	140-mm block	None[3]	1 h	48
	2	Same as 1	B	2 h	51
	3	Same as 1, with both surfaces fastened directly, or both on metal resilient channels, or both on metal resilient channels with absorptive material[4]	A	2 h	47
	4	Same as 1, with metal resilient channels and absorptive material on one side[4]	A	1.75 h	51
	5	Same as 1, with 38-mm x 38-mm wood strapping and absorptive material on both sides[4]	A	2 h	57
	6	190-mm block	None[3]	1.5 h	50
	7	190-mm block	B	2 h	50

Table A-9.10.3.A. (Cont'd)

Fire and Sound Resistance of Walls

Type of Wall	No.	Description	Finish on Each Side[1]	Fire-Resistance Rating	Typical Sound Transmission Class[2]
	8	Same as 6, with both surfaces fastened directly, or both on metal resilient channels, or both on metal resilient channels with absorptive material[4]	A	2.5 h	49
	9	Same as 6, with metal resilient channels and absorptive material on one side[4]	A	2.5 h	53
	10	Same as 6, with 38-mm x 38-mm wood strapping on at least one side	A[6]	2.5 h	53
	11	Same as 6, with 38-mm x 38-mm wood strapping and absorptive material on both sides[4]	A[6]	2.5 h	59
	12	Same as 6, with 50-mm metal Z-bars (or 38-mm x 38-mm wood strapping plus metal resilient channels) and absorptive material on both sides[4]	A	2.5 h	64
	13	Same as 6, with studs (65-mm steel or 38-mmx 64-mm wood) and absorptive material on both sides[4]	A[6]	2.5 h	70
	14	Same as 6, with metal resilient channels and absorptive material on one side	D (finish one side only)	2.5 h	55
Concrete	15	150 mm	None[3]	3 h	55
	16	200 mm	None[3]	4 h	58

e

The K factor is determined from the following relationship:

$\ln(K) = A - B \cdot \ln(S_i/S_{184}) + G$

where A = a constant, the value of which is determined from Table A,

B = a constant, the value of which is determined from Table B,

S_i = span which results in 2-mm deflection of the joist in question under 1 kN concentrated midpoint load,

S_{184} = span which results in 2-mm deflection of 38 x 184-mm joist of same species and grade as the joist in question under 1 kN concentrated midpoint load,

G = a constant, the value of which is determined from Table G.

For any joist size, species and grade, the value of K which results in a vibration controlled span of 3 m is the largest allowed value.

Note that, for a sawn lumber joist, the ratio S_i/S_{184} is equivalent to its depth (mm) divided by 184.

Due to rounding differences, the method, as presented here, might produce results slightly different from those produced by the computer program used to generate the span tables.

Table A

Subfloor Thickness, mm	Constant A								
	Strapping Only			Bridging Only			Strapping + Bridging		
	Joist Spacing, mm			Joist spacing, mm			Joist spacing, mm		
	300	400	600	300	400	600	300	400	600
12.5	0.28	0.24	0.19	0.36	0.30	0.24	0.40	0.33	0.27
15.5	0.30	0.25	0.20	0.37	0.31	0.25	0.42	0.35	0.28
19.5	0.36	0.30	0.24	0.45	0.37	0.30	0.50	0.42	0.33

Table B

Floor Description	Constant B
Basic floor – 15.5-mm plywood subfloor (or equivalent in Table 9.23.14.A.) – 400-mm joist spacing – no bridging	0.33
Basic floor with bridging	0.38
Basic floor with bridging and strapping	0.41

Table G

Floor Description	Constant G
Floors with nailed subfloor	0
Floor with field-glued subfloor, * vibration-controlled span greater than 3 m	0.10
Floor with field-glued subfloor, * vibration-controlled span 3 m or less	0.15

* Subfloor glued to floor joists with elastomeric adhesive complying with CGSB Standard 71-GP-26M, "Standard for Adhesives for Field-gluing Plywood to Lumber Framing for Floor Systems."

Additional background information on this method can be found in the following publications:

- Onysko, D.M. Serviceability Criteria for Residential Floors Based on a Field Study of Consumer Response. Project 03-50-10-008. Forintek Canada Corp., Ottawa, Canada 1985.
- Onysko, D.M. Performance Criteria for Residential Floors Based on Consumer Responses. 1988 International Conference on Timber Engineering, Seattle, September 19-22, Forest Products Research Society, Vol.1, 1988 pp. 736-745.
- Onysko, D.M. Performance and Acceptability of Wood Floors - Forintek Studies. Proceedings of Symposium/Workshop on Serviceability of Buildings, Ottawa, May 16-18, National Research Council of Canada, Ottawa, 1988.

A-9.23.4.2.(1) Maximum Spans for Steel Beams Supporting Floors in Dwellings. A beam may be considered to be laterally supported if wood joists bear on its top flange at intervals of 600 mm or less over its entire length, if all the load being applied to this beam is transmitted through the joists and if 19 mm by 38 mm wood strips in contact with the top flange are nailed on both sides of the beam to the bottom of the joists supported. Other additional methods of positive lateral support are acceptable.

For supported joist lengths intermediate between those in the table, straightline interpolation may be used in determining the maximum beam span.

A-9.23.4.A. Spans for Steel Beams. The spans are based on the following assumptions:

(1) Simply supported beam spans
(2) Laterally supported top flange
(3) Yield strength 300 MPa
(4) Deflection limit L/360
(5) Live load = 1.9 kPa/1st floor, 1.4 kPa/2nd floor
(6) Dead load 1.5 kPa.

A-9.23.4.5. Concrete Topping. Spans given in Tables A-1 and A-2 were based on an assumed dead load for conventional wood frame floor construction. The addition of 50 mm of concrete topping can impose an additional dead load of about 0.8 to 1.2 kPa, depending on the density of the concrete. The spacing of joists in the span tables can be adjusted to allow for the increased load in accordance with the following example: for a topping dead load of 0.80 kPa on floor joists for living quarters, live load plus dead load becomes 2.7 kPa. Use spans for 1.9 kPa and 600 mm spacing but space members 400 mm apart.

Spans for floor joists in living quarters are based on a live load of 1.9 kPa. Spans for floor joists in bedrooms are based on a live load of 1.4 kPa.

A-9.23.10.4. Fingerjoined Lumber. The NLGA "Standard Grading Rules for Canadian Lumber," referenced in 9.3.2.1. refers to two special product standards, SPS-1, "Fingerjoined Structural Lumber," and SPS-3, "Fingerjoined Stud Lumber – Vertical Use Only," produced by NLGA. Material identified as conforming to these standards is considered to meet the requirements in this Article for joining with a structural adhesive. Lumber fingerjoined in accordance with SPS-3 should be used as a vertical end-loaded member in compression only, where sustained bending or tension-loading conditions are not present, and where the moisture content of the wood will not exceed 19 per cent. Fingerjoined lumber may not be visually regraded or remanufactured into a higher stress grade even if the quality of the lumber containing fingerjoints would otherwise warrant such regrading.

A-9.23.13.11.(1) Span Tables for Wood Roof Trusses. In these Tables the term "Fink" truss refers to the common "W" type truss and the term "Howe" truss refers to the type which has a vertical member extending from its peak. Schematic drawings of the simplest version of each type are shown on the following page. Each type may have web members additional to those shown, in which case the distances between panel points can be decreased.

The span tables in this Appendix have been calculated for wood species equivalent in strength to Spruce-Pine-Fir, Douglas Fir-Larch or Hem-Fir. The spans are not appropriate for the weaker species, which are included in the northern species combination.

The spans are based on 600 mm o.c. truss spacing.

R

S

Conversion Factors		
To Convert	**To**	**Multiply by**
°C	°F	1.8 and add 32
kg	lb	2.205
kPa	lbf/in² (psi)	0.1450
kPa	lbf/ft²	20.88
L	gal (imp.)	0.2200
L/s	gal/min (gpm)	13.20
lx	ft-candle	0.09290
m	ft	3.281
m²	ft²	10.76
m³	ft³	35.31
mm	in.	0.03937
m³/h	ft³/min (cfm)	0.5886
m/s	ft/min	196.8
MJ	Btu	947.8
N	lbf	0.2248
ng/(Pa · s · m²)	perms	0.0174
Pa	Inches of water	0.004014
W	Btu/h	3.412