National Building Code of Canada 1995

Second Revisions and Errata

Issued by the Canadian Commission on Building and Fire Codes

November 1999

The attached pages identify second revisions and errata to the National Building Code of Canada 1995.

The revisions have been approved by the Canadian Commission on Building and Fire Codes. The revisions contained herein include updates from 01 July 1997 to 31 October 1999.

The errata are corrections or updates that have been identified and are included to facilitate the use of the Code.

Second revisions are identified by an *r2* in the margin; second errata are identified by an *e2*.

For your convenience, change pages have been provided for the majority of these new errata and revisions. Simply replace the current page in your document with the updated page provided. A table on the inside front cover lists all the new errata and revisions contained herein, including minor errata and revisions for which change pages have not been provided.

	Code Reference	Change
e2	1.1.4.1.(1)	Address for BNQ changed to: Bureau de normalisation du Québec, 333, rue Franquet, Ste-Foy (Québec) G1P 4C7
e2, r2	Table 2.7.3.2. (page 13)	Name of ANSI A208.1-1993 standard is: Particleboard
e2, r2	Table 2.7.3.2.	Change pages provided (pg. 17/18, 21/22, 25/26 and 27/28)
r2	5.3.1.2.(2)(d)	Change page provided
e2	5.3.1.2.(5)(b)	Change page provided
r2	5.3.1.3.(3)	Change page provided
e2	5.6.1.2.(1)(v)	Change page provided
e2	5.6.1.2.(3)(u)	Change page provided
e2	9.3.2.9.(1)	Change page provided
e2	9.3.2.9.(2)(b)	Change page provided
r2	9.4.2.4.(1)	Change page provided
e2	Table 9.5.3.1.	Code reference under table title should read: Forming Part of Sentences 9.5.3.1.(1) and (2)
r2	9.8.9.4.(2)	Change page provided
e2	9.9.2.2.(1)	Change page provided
r2	9.9.2.6.(1)	Change page provided
e2	9.9.7.1.(1)	Change page provided
e2	9.9.7.1.(2)	Change page provided
e2	9.10.14.12.	Article title should read: Alternate Approach to Exposing Building Face
e2	Table 9.12.2.2.	Note (3) should read: Good soil drainage to not less than the depth of frost penetration.
e2	9.20.6.1.(1) and 9.20.6.2.	Italicize *cavity wall(s)* throughout
e2	9.20.9.4.	Italicize *cavity wall(s)* throughout
e2	9.20.12.2.	Italicize *cavity wall(s)* throughout
e2	9.20.13.5. to 9.20.13.10.	Italicize *cavity wall(s)* throughout
e2	Table 9.23.3.5.	Change page provided
r2	9.23.4.3.(2)	Change page provided
r2	Table 9.23.4.3.	Change page provided
e2	9.23.13.11.(1)(a)	Change 0.5 kPa to: 0.35 kPa
r2	9.25.2.2.(1)(c)	Change page provided
r2	9.25.2.2.(4)	Change page provided
r2	9.25.2.5.(1)	Change page provided
r2	9.25.3.2.(1)	Change page provided
e2	Table 9.26.3.1.	Change page provided
e2	9.26.9.2.(1)	Change page provided
e2	9.26.10.	Change page provided
e2	9.26.10.8.	Change page provided
e2	Table 9.27.5.4.	Change page provided
e2	9.27.7.	Change page provided
e2	9.27.7.1.(2)	Change page provided
e2	Table 9.27.7.6.	Title should read: Exposure and Thickness of Wood Shingles and Shakes
e2	9.33.6.4.(6)	Reference should read: ...in accordance with Sentence 3.1.5.11.(2)
e2	A-2 (pg. 349)	Under "Certification," Warnock Hersey Professional Services (WHPS) is now: Intertek Testing Services NA Ltd. (ITS)
e2	Table A-2.7.3.2. (page 354)	Add A-9.10.21. to Code Reference column for CSA C22.1-94
e2	Table A-9.3.2.1.B.	Change page provided
r2	A-9.4.2.4.(1)	Change page provided
e2	A-9.15.1.3.(3)	Change page provided
e2	A-9.19.1.1.(1)	Change page provided
e2	Table A-9.25.1.2.B.	Change page provided
e2	A-9.25.3.2.	Change page provided
e2	Table D-1.1.2.	Change page provided
e2	D-1.1.5.	Change page provided
e2	D-3.1.5.(1)	Change page provided
e2	Index (page 554)	Listing for Group B occupancy should read: Group B occupancy (see Care or detention occupancy)

Table 2.7.3.2. (Continued)

	Issuing Agency	Document Number	Title of Document	Code Reference
e	CGSB	CAN/CGSB-37.3-M89	Application of Emulsified Asphalts for Dampproofing or Waterproofing	5.8.2.3.(1) 9.13.1.4.(1)
	CGSB	CAN/CGSB-37.4-M89	Fibrated, Cutback Asphalt, Lap Cement for Asphalt Roofing	5.6.1.2.(1) 9.26.2.1.(1)
	CGSB	CAN/CGSB-37.5-M89	Cutback Asphalt Plastic Cement	5.6.1.2.(1) 9.26.2.1.(1)
e	CGSB	37-GP-6Ma-1983	Asphalt, Cutback, Unfilled, for Dampproofing	5.8.2.2.(7) 5.8.2.2.(8) 9.13.2.1.(1)
	CGSB	CAN/CGSB-37.8-M88	Asphalt, Cutback, Filled, for Roof Coating	5.6.1.2.(1) 9.26.2.1.(1)
	CGSB	37-GP-9Ma-1983	Primer, Asphalt, Unfilled, for Asphalt Roofing, Dampproofing and Waterproofing	5.6.1.2.(1) 5.8.2.2.(6) 9.26.2.1.(1)
e	CGSB	37-GP-12Ma-1984	Application of Unfilled Cutback Asphalt for Dampproofing	5.8.2.3.(2) 9.13.1.4.(1)
	CGSB	CAN/CGSB-37.16-M89	Filled Cutback Asphalt for Dampproofing and Waterproofing	5.8.2.2.(6) 9.13.2.1.(1)
e	CGSB	37-GP-18Ma-1985	Tar, Cutback, Unfilled, for Dampproofing	5.8.2.2.(7) 5.8.2.2.(8) 9.13.2.1.(1)
	CGSB	37-GP-21M-1985	Tar, Cutback, Fibrated, for Roof Coating	5.6.1.2.(1) 9.26.2.1.(1)
e	CGSB	CAN/CGSB-37.22-M89	Application of Unfilled Cutback Tar Foundation Coating for Dampproofing	5.8.2.3.(2) 9.13.1.4.(1)
e	CGSB	37-GP-36M 1976	Application of Filled Cutback Asphalts for Dampproofing and Waterproofing	5.8.2.3.(1)
e	CGSB	37-GP-37M 1977	Application of Hot Asphalt for Dampproofing or Waterproofing	5.8.2.3.(1)
	CGSB	CAN/CGSB-37.50-M89	Hot Applied Rubberized Asphalt for Roofing and Waterproofing	5.6.1.2.(1) 5.8.2.2.(6) 9.26.2.1.(1)
e	CGSB	CAN/CGSB-37.51-M90	Application for Hot-Applied Rubberized Asphalt, for Roofing and Waterproofing	5.6.1.3.(1) 5.8.2.3.(1) 9.26.15.1.(1)
	CGSB	37-GP-52M-1984	Roofing and Waterproofing Membrane, Sheet Applied, Elastomeric	5.6.1.2.(1) 5.8.2.2.(6) 9.26.2.1.(1)
r	CGSB	CAN/CGSB-37.54-95	Polyvinyl Chloride Roofing and Waterproofing Membrane	5.6.1.2.(1) 5.8.2.2.(6) 9.26.2.1.(1)
	CGSB	37-GP-55M-1979	Application of Sheet Applied Flexible Polyvinyl Chloride Roofing Membrane	5.6.1.3.(1) 9.26.16.1.(1)

Table 2.7.3.2. (Continued)

	Issuing Agency	Document Number	Title of Document	Code Reference
r	CGSB	37-GP-56M-1985	Membrane, Modified, Bituminous, Prefabricated, and Reinforced for Roofing	5.6.1.2.(1) 5.8.2.2.(6) 9.26.2.1.(1)
	CGSB	37-GP-64M-1977	Mat Reinforcing, Fibrous Glass, for Membrane Waterproofing Systems and Built-Up Roofing	5.6.1.2.(1)
	CGSB	41-GP-6M-1983	Sheets, Thermosetting Polyester Plastics, Glass Fiber Reinforced	5.6.1.2.(1) 9.26.2.1.(1)
r	CGSB	CAN/CBSB-41.24-95	Rigid Vinyl Siding, Soffits and Fascia	5.6.1.2.(3) 9.27.13.1.(1)
	CGSB	51-GP-21M-1978	Thermal Insulation, Urethane and Isocyanurate, Unfaced	5.3.1.2.(2) Table 9.23.16.2.A. 9.25.2.2.(1)
r2				
	CGSB	CAN/CGSB-51.25-M87	Thermal Insulation, Phenolic, Faced	5.3.1.2.(2) Table 9.23.16.2.A. 9.25.2.2.(1)
	CGSB	CAN/CGSB-51.26-M86	Thermal Insulation, Urethane and Isocyanurate, Boards, Faced	5.3.1.2.(2) Table 9.23.16.2.A. 9.25.2.2.(1)
	CGSB	51-GP-27M-1979	Thermal Insulation, Polystyrene, Loose Fill	5.3.1.2.(2) 9.25.2.2.(1)
e	CGSB	CAN/CGSB-51.32-M77	Sheathing, Membrane, Breather Type	5.6.1.2.(1) 5.6.1.2.(3) 9.20.13.9.(1) 9.23.17.1.(1) 9.26.2.1.(1)
	CGSB	CAN/CGSB-51.33-M89	Vapour Barrier, Sheet, Excluding Polyethylene, for Use in Building Construction	5.5.1.2.(2) 9.25.4.2.(4)
r	CGSB	CAN/CGSB-51.34-M86 (Amended 1988)	Vapour Barrier, Polyethylene Sheet for Use in Building Construction	5.5.1.2.(2) 9.13.2.1.(1) 9.13.2.1.(2) 9.18.6.2.(1) 9.25.3.2.(2) 9.25.4.2.(3)
r2				
	CGSB	CAN/CGSB-51.60-M90	Cellulose Fibre Loose Fill Thermal Insulation	5.3.1.2.(2) 9.25.2.2.(1)
	CGSB	CAN/CGSB-63.14-M89	Plastic Skylights	5.4.1.2.(3) 5.4.1.2.(4) 5.6.1.2.(1) 5.6.1.2.(2) 9.7.7.1.(1) 9.7.7.2.(1)

Table 2.7.3.2. (Continued)

	Issuing Agency	Document Number	Title of Document	Code Reference
	CSA	CAN/CSA-A405-M87	Design and Construction of Masonry Chimneys and Fireplaces	9.21.3.5.(1) 9.22.1.4.(1) 9.22.5.2.(2)
	CSA	CAN3-A438-M84	Concrete Construction for Housing and Small Buildings	9.3.1.1.(1) 9.3.1.7.(1)
	CSA	CAN/CSA-A440-M90	Windows	5.4.1.2.(3) 5.4.1.2.(5) 5.4.1.2.(6) 5.6.1.2.(3) 5.6.1.2.(4) 5.6.1.2.(5) 9.7.2.1.(1) 9.7.6.1.(1)
e 2	CSA	A440.1-M1990	User Selection Guide to CAN/CSA-A440-M90 Windows	5.4.1.2.(5) 5.4.1.2.(6) 5.6.1.2.(4) 5.6.1.2.(5)
r	CSA	CAN/CSA-B44-94 (Supplement 1-B44S1-97)	Safety Code for Elevators	3.2.6.7.(2) 3.5.2.1.(1) 3.5.2.1.(2) 3.5.2.1.(3) 3.5.4.2.(1) 3.8.3.5.(1) Table 4.1.10.5.
r	CSA	B51-97	Boiler, Pressure Vessel, and Pressure Piping Code	6.2.1.5.(1) 9.31.6.3.(2) 9.33.5.2.(1)
r	CSA	B52-95	Mechanical Refrigeration Code	6.2.1.5.(1) 9.33.5.2.(1)
	CSA	CAN/CSA-B72-M87	Installation Code for Lightning Protection Systems	6.3.1.4.(1)
	CSA	B111-1974	Wire Nails, Spikes and Staples	9.23.3.1.(1) 9.26.2.2.(1) 9.29.5.6.(1)
	CSA	CAN/CSA-B139-M91	Installation Code for Oil Burning Equipment	6.2.1.5.(1) 8.2.2.11.(1) 9.31.6.3.(2) 9.33.5.2.(1)
r	CSA	B182.1-96	Plastic Drain and Sewer Pipe and Pipe Fittings	9.14.3.1.(1)
	CSA	B355-94	Lifts for Persons with Physical Disabilities	3.8.3.5.(2)
	CSA	CAN/CSA-B365-M91	Installation Code for Solid-Fuel-Burning Appliances and Equipment	6.2.1.5.(1) 9.21.1.3.(2) 9.22.10.2.(1) 9.31.6.3.(2) 9.33.5.2.(1) 9.33.5.3.(1)

Table 2.7.3.2. (Continued)

	Issuing Agency	Document Number	Title of Document	Code Reference
	CSA	C22.1-94	Canadian Electrical Code, Part I	3.6.1.2.(1) 3.6.2.1.(6) 3.6.2.8.(1) 6.2.1.5.(1) 8.2.2.9.(2) 9.31.6.3.(2) 9.33.5.2.(1) 9.34.1.1.(1)
r	CSA	C22.2 No. 0.3-96	Test Methods for Electrical Wires and Cables	3.1.4.3.(1) 3.1.5.17.(1) 3.6.4.3.(1)
	CSA	C22.2 No.113-M1984	Fans and Ventilators	9.32.3.9.(6)
	CSA	C22.2 No.141-M1985	Unit Equipment for Emergency Lighting	3.2.7.4.(2) 9.9.11.3.(6)
	CSA	C22.2 No. 211.0-M1984	General Requirements and Methods of Testing for Nonmetallic Conduit	3.1.5.19.(1)
	CSA	CAN/CSA-C260-M90	Rating the Performance of Residential Mechanical Ventilating Equipment	9.32.3.9.(1)
	CSA	CAN/CSA-C282-M89	Emergency Electrical Power Supply for Buildings	3.2.7.5.(1)
	CSA	CAN/CSA-C439-88	Standard Methods of Test for Rating the Performance of Heat Recovery Ventilators	9.32.3.9.(3)
	CSA	CAN/CSA-C445-M92	Design and Installation of Earth Energy Heat Pump Systems for Residential and Other Small Buildings	9.33.5.2.(1)
	CSA	CAN/CSA-F280-M90	Determining the Required Capacity of Residential Space Heating and Cooling Appliances	6.2.1.3.(1) 9.33.5.1.(1)
	CSA	CAN/CSA-F326-M91	Residential Mechanical Ventilation Systems	9.32.3.1.(1)
	CSA	CAN/CSA-G40.21-M92	Structural Quality Steels	4.2.3.8.(1) 9.23.4.3.(2)
	CSA	G401-93	Corrugated Steel Pipe Products	9.14.3.1.(1)
r	CSA	O80 Series-97	Wood Preservation	3.1.4.4.(1) 4.2.3.2.(1) 4.2.3.2.(2)
r	CSA	O80.1-97	Preservative Treatment of All Timber Products by Pressure Processes	9.3.2.9.(3)
r	CSA	O80.2-97	Preservative Treatment of Lumber, Timber, Bridge Ties, and Mine Ties by Pressure Processes	4.2.3.2.(1) 9.3.2.9.(3)
r	CSA	O80.3-97	Preservative Treatment of Piles by Pressure Processes	4.2.3.2.(1)
r	CSA	O80.9-97	Preservative Treatment of Plywood by Pressure Processes	9.3.2.9.(3)
r	CSA	O80.15-97	Preservative Treatment of Wood for Building Foundation Systems, Basements, and Crawl Spaces by Pressure Processes	4.2.3.2.(1) 9.3.2.9.(3)

Table 2.7.3.2. (Continued)

	Issuing Agency	Document Number	Title of Document	Code Reference
	CSA	O86.1-94	Engineering Design in Wood (Limit States Design)	Table 4.1.9.1.B. 4.3.1.1.(1)
	CSA	O115-M1982	Hardwood and Decorative Plywood	5.6.1.2.(3) 9.27.9.1.(1) 9.30.2.2.(1)
r	CSA	O118.1-97	Western Cedars, Shakes and Shingles	5.6.1.2.(1) 5.6.1.2.(3) 9.26.2.1.(1) 9.27.7.1.(1)
	CSA	O118.2-M1981	Eastern White Cedar Shingles	5.6.1.2.(1) 5.6.1.2.(3) 9.26.2.1.(1) 9.27.7.1.(1)
e	CSA	O121-M1978	Douglas Fir Plywood	5.6.1.2.(3) 9.23.14.2.(1) 9.23.15.1.(1) Table 9.23.16.2.A. 9.27.9.1.(1) 9.30.2.2.(1) Table A-14 Table A-16 Table A-18
	CSA	CAN/CSA-O122-M89	Structural Glued-Laminated Timber	Table A-11 Table A-20
	CSA	CAN/CSA-O132.2 Series-90	Wood Flush Doors	9.6.5.1.(1)
	CSA	CAN/CSA-O141-91	Softwood Lumber	3.1.4.6.(2) 9.3.2.6.(1)
e	CSA	O151- M1978	Canadian Softwood Plywood	5.6.1.2.(3) 9.23.14.2.(1) 9.23.15.1.(1) Table 9.23.16.2.A. 9.27.9.1.(1) 9.30.2.2.(1) Table A-14 Table A-16 Table A-18
	CSA	O153-M1980	Poplar Plywood	5.6.1.2.(3) 9.23.14.2.(1) 9.23.15.1.(1) Table 9.23.16.2.A. 9.27.9.1.(1) 9.30.2.2.(1)
e	CSA	CAN/CSA-O177-M89	Qualification Code for Manufacturers of Structural Glued-Laminated Timber	4.3.1.2.(1) Table A-11 Table A-20

Table 2.7.3.2. (Continued)

	Issuing Agency	Document Number	Title of Document	Code Reference
e	CSA	CAN/CSA-O325.0-92	Construction Sheathing	5.6.1.2.(3) 9.23.14.2.(1) Table 9.23.14.5.B. 9.23.15.1.(1) Table 9.23.15.6.B. Table 9.23.16.2.B. Table A-14 Table A-16 Table A-18
e	CSA	O437.0-93	OSB and Waferboard	5.6.1.2.(3) 9.23.14.2.(1) 9.23.14.4.(2) 9.23.15.1.(1) 9.23.15.2.(2) Table 9.23.16.2.A. 9.27.11.1.(1) 9.29.9.1.(2) 9.30.2.2.(1) Table A-14 Table A-16 Table A-18
	CSA	CAN/CSA-S16.1-94	Limit States Design of Steel Structures	Table 4.1.9.1.B. 4.3.4.1.(1)
	CSA	S136-94	Cold Formed Steel Structural Members	4.3.4.2.(1)
	CSA	CAN3-S157-M83	Strength Design in Aluminum	4.3.5.1.(1)
	CSA	S269.1-1975	Falsework for Construction Purposes	4.1.1.3.(3)
	CSA	CAN/CSA-S269.2-M87	Access Scaffolding for Construction Purposes	4.1.1.3.(3)
	CSA	CAN/CSA-S269.3-M92	Concrete Formwork	4.1.1.3.(3)
e	CSA	CAN3-S304-M84	Masonry Design for Buildings	4.3.2.1.(1) 9.21.4.5.(1)
e	CSA	S304.1-94	Masonry Design for Buildings (Limit States Design)	Table 4.1.9.1.B. 4.1.9.3.(5) 4.3.2.1.(1)
	CSA	S307-M1980	Load Test Procedure for Wood Roof Trusses for Houses and Small Buildings	9.23.13.11.(5)
	CSA	S350-M1980	Code of Practice for Safety in Demolition of Structures	8.1.1.3.(1)
	CSA	CAN3-S367-M81	Air-Supported Structures	4.4.1.1.(1)
	CSA	CAN/CSA-S406-92	Construction of Preserved Wood Foundations	9.15.1.3.(3) 9.16.5.1.(1)
	CSA	S413-94	Parking Structures	4.4.2.1.(1)
	CSA	CAN/CSA-Z32.4-M86	Essential Electrical Systems for Hospitals	3.2.7.6.(1)
	CSA	CAN/CSA-Z240.2.1-92	Structural Requirements for Mobile Homes	9.12.2.2.(6) 9.15.1.4.(1)

Table 2.7.3.2. (Continued)

	Issuing Agency	Document Number	Title of Document	Code Reference
	CSA	Z240.10.1-94	Site Preparation, Foundation, and Anchorage of Mobile Homes	9.15.1.4.(1) 9.23.6.3.(1)
	CSA	CAN/CSA-Z305.1-92	Nonflammable Medical Gas Piping Systems	3.7.5.1.(1)
	CSA	CAN/CSA-Z317.2-M91	Special Requirements for Heating, Ventilation, and Air Conditioning (HVAC) Systems in Health Care Facilities	6.2.1.1.(1)
	EPA	EPA 402-R-92-003	Protocols for Radon and Radon Decay Product Measurements in Homes	9.13.8.2.(7)
e	HC	H49-58	Exposure Guidelines for Residential Indoor Air Quality (1989)	9.13.8.2.(10)
	ISO	8201: 1987	Acoustics – Audible emergency evacuation signal	3.2.4.19.(2)
r	NFPA	13-1996	Installation of Sprinkler Systems	3.2.4.8.(2) 3.2.4.16.(1) 3.2.5.13.(1) 3.3.2.12.(3)
r	NFPA	13D-1996	Installation of Sprinkler Systems in One- and Two-Family Dwellings and Manufactured Homes	3.2.5.13.(3)
r	NFPA	13R-1996	Installation of Sprinkler Systems in Residential Occupancies up to and including Four Stories in Height	3.2.5.13.(2)
r	NFPA	14-1996	Installation of Standpipe and Hose Systems	3.2.5.9.(1) 3.2.5.10.(1)
r	NFPA	20-1996	Installation of Centrifugal Fire Pumps	3.2.5.19.(1)
	NFPA	71-1989	Installation, Maintenance and Use of Signaling Systems for Central Station Service	3.2.4.7.(4)
	NFPA	72-1990	Installation, Maintenance and Use of Protective Signaling Systems	3.2.4.7.(4)
r	NFPA	80-1995	Fire Doors and Fire Windows	3.1.8.5.(2) 3.1.8.10.(2) 3.1.8.12.(2) 3.1.8.12.(3) 3.1.8.14.(1) 9.10.13.1.(1) 9.10.13.2.(3)
	NFPA	82-1994	Incinerators, Waste and Linen Handling Systems and Equipment	6.2.6.1.(1) 9.10.10.5.(2)
e 2	NFPA	96-1994	Ventilation Control and Fire Protection of Commercial Cooking Operations	6.2.2.6.(1)
r	NFPA	211-1996	Chimneys, Fireplaces, Vents, and Solid Fuel-Burning Appliances	6.3.1.2.(2) 6.3.1.3.(1)
r	NFPA	214-1996	Water-Cooling Towers	6.2.3.15.(4)
	NLGA		Standard Grading Rules for Canadian Lumber (1994)	9.3.2.1.(1)
r	SMACNA		HVAC Duct Construction Standards – Metal and Flexible (1985) 2nd Edition - 1995	6.2.4.2.(1) 9.33.6.5.(2)
e 2	TC		Airport Regulations of the Aeronautics Act	4.1.6.12.(1)
r 2	TPIC		Truss Design Procedures and Specifications for Light Metal Plate Connected Wood Trusses (1996)	9.23.13.11.(6)

Table 2.7.3.2. (Continued)

	Issuing Agency	Document Number	Title of Document	Code Reference
	ULC	CAN/ULC-S101-M89	Fire Endurance Tests of Building Construction and Materials	3.1.5.11.(3) 3.1.5.11.(4) 3.1.5.11.(6) 3.1.7.1.(1) 3.1.11.7.(1) 3.2.3.7.(7) 3.2.6.5.(6)
	ULC	CAN/ULC-S102-M88	Test for Surface Burning Characteristics of Building Materials and Assemblies	3.1.12.1.(1)
	ULC	CAN/ULC-S102.2-M88	Test for Surface Burning Characteristics of Flooring, Floor Covering, and Miscellaneous Materials and Assemblies	3.1.12.1.(2) 3.1.13.4.(1)
	ULC	ULC S102.3-M1982	Fire Test of Light Diffusers and Lenses	3.1.13.4.(1)
e 2	ULC	CAN4-S104-M80	Fire Tests of Door Assemblies	3.1.8.4.(1) 3.2.6.5.(3)
	ULC	CAN4-S105-M85	Fire Door Frames Meeting the Performance Required by CAN4-S104	9.10.13.6.(1)
	ULC	CAN4-S106-M80	Fire Tests of Window and Glass Block Assemblies	3.1.8.4.(1)
	ULC	CAN/ULC-S107-M87	Fire Tests of Roof Coverings	3.1.15.1.(1)
	ULC	CAN/ULC-S109-M87	Flame Tests of Flame-Resistant Fabrics and Films	3.1.6.5.(1) 3.2.3.20.(1) 3.6.5.2.(2) 3.6.5.3.(1) 9.33.6.3.(1)
	ULC	CAN/ULC-S110-M86	Fire Tests for Air Ducts	3.6.5.1.(2) 3.6.5.1.(5) 9.33.6.2.(2) 9.33.6.2.(4)
r	ULC	ULC-S111-95	Fire Tests for Air Filter Units	6.2.3.14.(1) 9.33.6.15.(1)
e 2	ULC	CAN/ULC-S112-M90	Fire Test of Fire Damper Assemblies	3.1.8.4.(1)
	ULC	CAN4-S113-79	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	Test for Determination of Non-Combustibility in Building Materials	1.1.3.2.(1)
r	ULC	ULC-S115-95	Fire Tests for Fire Stop Systems	3.1.5.15.(3) 3.1.9.1.(1) 3.1.9.1.(2) 3.1.9.4.(4) 9.10.9.7.(3)
	ULC	CAN4-S124-M85	Test for the Evaluation of Protective Coverings for Foamed Plastic	3.1.5.11.(2)

Table 2.7.3.2. (Continued)

	Issuing Agency	Document Number	Title of Document	Code Reference
	ULC	CAN/ULC-S126-M86	Test for Fire Spread under Roof-Deck Assemblies	3.1.14.1.(1) 3.1.14.2.(1)
	ULC	CAN/ULC-S134-92	Fire Test of Exterior Wall Assemblies	3.1.5.5.(1)
	ULC	S505-1974	Fusible Links for Fire Protection Service	3.1.8.9.(1)
	ULC	CAN/ULC-S524-M91	Installation of Fire Alarm Systems	3.2.4.5.(1)
	ULC	CAN/ULC-S531-M87	Smoke Alarms	3.2.4.21.(1) 9.10.18.1.(1)
r	ULC	CAN/ULC-S537-97	Verification of Fire Alarm Systems	3.2.4.5.(2)
	ULC	CAN/ULC-S553-M86	Installation of Smoke Alarms	3.2.4.21.(7)
	ULC	CAN/ULC-S610-M87	Factory-Built Fireplaces	9.22.8.1.(1)
	ULC	ULC-S628-93	Fireplace Inserts	9.22.10.1.(1)
	ULC	CAN/ULC-S629-M87	650°C Factory-Built Chimneys	9.21.1.2.(1)
	ULC	CAN/ULC-S639-M87	Steel Liner Assemblies for Solid-Fuel Burning Masonry Fireplaces	9.22.2.3.(1)
r	ULC	CAN/ULC-S701-97	Thermal Insulation, Polystyrene, Boards and Pipe Covering	5.3.1.2.(2) Table 9.23.16.2.A. 9.25.2.2.(1)
r2				
r	ULC	CAN/ULC-S702-97	Thermal Insulation, Mineral Fibre, for Buildings	5.3.1.2.(2) Table 9.23.16.2.A. 9.25.2.2.(1)
r2	ULC	CAN/ULC-S705.1-98	Thermal Insulation–Spray-Applied Rigid Polyurethane Foam, Medium Density, Material Specification	5.3.1.2.(2) 9.25.2.2.(1)
r2	ULC	CAN/ULC-S705.2-98	Thermal Insulation–Spray-Applied Rigid Polyurethane Foam, Medium Density, Installer's Responsibilities–Specification	5.3.1.3.(3) 9.25.2.5.(1)
	ULC	ULC/ORD-C199P-M1988	Combustible Piping for Sprinkler Systems	3.2.5.14.(2)

Part 5
Environmental Separation
(See Appendix A.)

Section 5.1. General

5.1.1. Scope

5.1.1.1. Scope

1) The scope of this Part shall be as described in Section 2.1. (See Appendix A.)

5.1.2. Application

5.1.2.1. Separation of Environments

1) This Part applies to
a) the control of condensation in and on, and the transfer of heat, air and moisture through *building* elements and interfaces between *building* elements that separate
   i) interior space from exterior space,
   ii) interior space from the ground, and
   iii) environmentally dissimilar interior spaces, and
b) site conditions that may affect moisture loading on *building* elements that separate interior space from exterior space, and interior space from the ground.

(See Appendix A.)

5.1.3. Definitions

5.1.3.1. Defined Words

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

5.1.4. Environmental Separation Requirements

5.1.4.1. Resistance to Environmental Loads

1) *Building* components and assemblies that separate dissimilar environments shall
a) be designed to have sufficient capacity and integrity to resist or accommodate all environmental loads and effects of those loads that may be reasonably expected, having regard to
   i) the intended use of the *building*, and
   ii) the environment to which the components and assemblies are subject, and
b) satisfy the requirements of this Part.

5.1.4.2. Resistance to Deterioration
(See Appendix A.)

1) Except as provided in Sentence (2), materials that comprise *building* components and assemblies that separate dissimilar environments shall be:
a) compatible with adjoining materials, and
b) resistant to any mechanisms of deterioration which would be reasonably expected, given the nature, function and exposure of the materials.

2) Material compatibility and deterioration resistance are not required where it can be shown that incompatibility or uncontrolled deterioration will not adversely affect any of
a) the health or safety of *building* users,
b) the intended use of the *building*, or
c) the operation of *building* services.

5.1.5. Other Requirements

5.1.5.1. Requirements in Other Parts of the Code

1) Acoustical, structural and fire safety requirements of other Parts of this Code shall apply.

Section 5.2. Loads and Procedures

5.2.1. Environmental Loads

5.2.1.1. Exterior Environmental Loads

1) Except as provided in Sentences (2) and (3), climatic loads shall be determined according to Section 2.2.

2) Except as provided in Sentence (3), below ground exterior environmental loads not described

in Section 2.2. shall be determined from existing geological and hydrological data or from site tests.

3) Where local design and construction practice has shown *soil* temperature analysis to be unnecessary, *soil* temperatures need not be determined. (See Appendix A.)

5.2.1.2. Interior Environmental Loads

1) Interior environmental loads shall be derived from the intended use of the space. (See Appendix A.)

5.2.2. Procedures

5.2.2.1. Calculations

1) Heat, air and moisture transfer calculations shall conform to good practice such as described in the ASHRAE Handbooks.

2) For the purposes of any analysis conducted to indicate conformance to the thermal resistance levels required in Article 5.3.1.2., *soil* temperatures shall be determined based on annual average *soil* temperature, seasonal amplitude of variation and attenuation of variation with depth.

3) Wind load calculations shall conform to Subsection 4.1.8.

Section 5.3. Heat Transfer

(See Appendix A.)

5.3.1. Thermal Resistance of Assemblies

5.3.1.1. Required Resistance to Heat Transfer

(See Appendix A.)

1) Except as provided in Sentence (2), where a *building* component or assembly will be subjected to an intended temperature differential, the component or assembly shall include materials to resist heat transfer in accordance with the remainder of this Subsection.

2) The installation of materials to resist heat transfer in accordance with the remainder of this Subsection is not required where it can be shown that uncontrolled heat transfer will not adversely affect any of

a) the health or safety of *building* users,
b) the intended use of the *building*, or
c) the operation of *building* services.

5.3.1.2. Properties to Resist Heat Transfer

(See Appendix A.)

1) Materials and components installed to provide the required resistance to heat transfer shall provide sufficient resistance, for the interior and exterior design temperatures,

a) to minimize surface condensation on the warm side of the component or assembly,
b) in conjunction with other materials and components in the assembly, to minimize condensation within the component or assembly, and
c) in conjunction with systems installed for space conditioning, to meet the interior design thermal conditions for the intended *occupancy*.

2) Except as provided in Sentence (3), where materials or components are installed to provide the required resistance to heat transfer and are covered in the scope of the standards listed below, the materials and components shall conform to the requirements of the respective standards:

a) CAN/CGSB-12.8-M, "Insulating Glass Units,"
b) CAN/ULC-S701, "Thermal Insulation, Polystyrene, Boards and Pipe Covering," *r*
c) CGSB 51-GP-21M, "Thermal Insulation, Urethane and Isocyanurate, Unfaced,"
d) CAN/ULC-S705.1, "Thermal Insulation–Spray Applied Rigid Polyurethane Foam, Medium Density, Material Specification," *r2*
e) CAN/CGSB-51.25-M, "Thermal Insulation, Phenolic, Faced,"
f) CAN/CGSB-51.26-M, "Thermal Insulation, Urethane and Isocyanurate, Boards, Faced,"
g) CGSB 51-GP-27M, "Thermal Insulation, Polystyrene, Loose Fill,"
h) CAN/CGSB-51.60-M, "Cellulose Fibre Loose Fill Thermal Insulation,"
i) CAN/CGSB-82.1-M, "Sliding Doors,"
j) CAN/CGSB-82.5-M, "Insulated Steel Doors,"
k) CAN/ULC-S702, "Thermal Insulation, Mineral Fibre, for Buildings," or *r*
l) CAN/CSA-A247-M, "Insulating Fibreboard."

(See Appendix A.)

3) The requirements for *flame-spread ratings* contained in the standards listed in Sentence (2) need be applied only as required in Part 3.

4) Except as provided in Sentence (5), all metal-framed glazed assemblies separating interior *conditioned space* from interior unconditioned space or exterior space shall incorporate a thermal break to minimize condensation.

5) Metal framed glazed assemblies need not comply with Sentence (4) where these assemblies are
a) storm windows or doors, or
b) windows or doors that are required to have a *fire-protection rating*.
(See Appendix A.)

e 2

5.3.1.3. Location and Installation of Materials Providing Thermal Resistance

1) Where a material required by Article 5.3.1.1. is intersected by a *building* assembly, penetrated by a high conductance component or interrupted by expansion, control or construction joints, and where condensation is likely to occur at these intersections, penetrations or interruptions, sufficient thermal resistance shall be provided so as to minimize condensation at these locations.

2) Materials providing required thermal resistance shall have sufficient inherent resistance to air flow or be positioned in the assembly so as to prevent convective air flow through and around the material. (See Appendix A.)

3) Spray-in-place polyurethane insulation shall be installed in accordance with the requirements of CAN/ULC-S705.2, "Thermal Insulation–Spray-Applied Rigid Polyurethane Foam, Medium Density, Installer's Responsibilities–Specification."

r 2

Section 5.4. Air Leakage

5.4.1. Air Barrier Systems

5.4.1.1. Required Resistance to Air Leakage

(See Appendix A.)

1) Except as provided in Sentence (2), where a *building* component or assembly separates interior *conditioned space* from exterior space, interior space from the ground, or environmentally dissimilar interior spaces, the component or assembly shall contain an *air barrier system*.

2) An *air barrier system* is not required where it can be shown that uncontrolled air leakage will not adversely affect any of
a) the health or safety of *building* users,
b) the intended use of the *building*, or
c) the operation of *building* services.

5.4.1.2. Air Barrier System Properties

1) Except as provided in Sentence (2), sheet and panel type materials intended to provide the principal resistance to air leakage shall have an air leakage characteristic not greater than 0.02 L/(s • m^2) measured at an air pressure difference of 75 Pa. (See Appendix A.)

2) The air leakage limit specified in Sentence (1) is permitted to be increased where it can be shown that the higher rate of leakage will not adversely affect any of
a) the health or safety of the *building* users,
b) the intended use of the *building*, or
c) the operation of *building* services.
(See Appendix A.)

3) Except as provided in Sentence (6), where components of the *air barrier system* are covered in the scope of the standards listed below, the components shall conform to the requirements of the respective standards:
a) CAN/CGSB-63.14-M, "Plastic Skylights,"
b) CAN/CGSB-82.1-M, "Sliding Doors,"
c) CAN/CGSB-82.5-M, "Insulated Steel Doors," or
d) CAN/CSA-A440-M, "Windows."
(See Appendix A.)

4) Skylights not covered in the scope of CAN/CGSB-63.14-M, "Plastic Skylights," shall conform to the performance requirements of that standard.

5) Except as provided in Sentence (6), windows and sliding doors covered in the scope of CAN/CGSB-82.1-M, "Sliding Doors," or CAN/CSA-A440-M, "Windows," and installed as components in an *air barrier system* shall conform at least to the airtightness requirements in CSA A440.1-M, "User Selection Guide to CAN/CSA-A440-M90 Windows."

6) Where a wired glass assembly is installed as a component in an *air barrier system* in a required *fire separation*, the assembly need not conform to CAN/CSA-A440-M, "Windows," or CSA A440.1-M, "User Selection Guide to CAN/CSA-A440-M90 Windows." (See Appendix A.)

7) The *air barrier system* shall be continuous
a) across construction, control and expansion joints,
b) across junctions between different *building* assemblies, and
c) around penetrations through the *building* assembly.

8) An *air barrier system* installed in an assembly subject to wind load, and other elements of the separator that will be subject to wind load, shall transfer that load to the structure.

9) Except as provided in Sentence (11), an *air barrier system* installed in an assembly subject to wind load shall be designed and constructed to resist 100% of the specified wind load as determined according to Subsection 4.1.8. for cladding.

r

10) Except as provided in Sentence (11), deflections of the *air barrier system* and other elements

of the separator that will be subject to wind load shall not adversely affect non-structural elements at 1.5 times the specified wind load.

11) Where it can be shown by test or analysis that an *air barrier system* installed in an assembly will be subject to less than 100% of the specified wind load,

a) the *air barrier system* is permitted to be designed and constructed to resist the lesser load, and
b) deflections of the *air barrier system* and other elements of the separator that will be subject to wind load shall not adversely affect non-structural elements at 1.5 times the lesser load.

Section 5.5. Vapour Diffusion

5.5.1. Vapour Barriers

5.5.1.1. Required Vapour Barrier

1) Except as provided in Sentence (2), where a *building* component or assembly will be subjected to a temperature differential and a differential in water vapour pressure, the component or assembly shall include a *vapour barrier*.

2) A *vapour barrier* is not required where it can be shown that uncontrolled vapour diffusion will not adversely affect any of

a) the health or safety of *building* users,
b) the intended use of the *building*, or
c) the operation of *building* services.

5.5.1.2. Vapour Barrier Properties and Installation

(See A-5.3.1.2 in Appendix A.)

1) The *vapour barrier* shall have sufficiently low permeance and shall be positioned in the *building* component or assembly so as to

a) minimize moisture transfer by diffusion, to surfaces within the assembly that would be cold enough to cause condensation at the design temperature and humidity conditions, or
b) reduce moisture transfer by diffusion, to surfaces within the assembly that would be cold enough to cause condensation at the design temperature and humidity conditions, to a rate that will not allow sufficient accumulation of moisture to cause deterioration or otherwise adversely affect any of
   i) the health or safety of *building* users,
   ii) the intended use of the *building*, or
   iii) the operation of *building* services.

(See Appendix A.)

2) Where materials installed to provide the required resistance to vapour diffusion are covered in the scope of the standards listed below, the materials shall conform to the requirements of the respective standards:

a) CAN/CGSB-51.33-M, "Vapour Barrier, Sheet, Excluding Polyethylene, for Use in Building Construction," or
b) CAN/CGSB-51.34-M, "Vapour Barrier, Polyethylene Sheet for Use in Building Construction."

(See Appendix A.)

3) Coatings applied to gypsum wallboard to provide required resistance to vapour diffusion shall be shown to conform with the requirements of Sentence (1) when tested in accordance with CAN/CGSB-1.501-M, "Method for Permeance of Coated Wallboard."

4) Coatings applied to materials other than gypsum wallboard to provide required resistance to vapour diffusion shall be shown to conform with the requirements of Sentence (1) when tested in accordance with ASTM E 96, "Water Vapor Transmission of Materials," by the desiccant method (dry cup).

Section 5.6. Precipitation

5.6.1. Protection from Precipitation

5.6.1.1. Required Protection from Precipitation

(See Appendix A.)

1) Except as provided in Sentence (2), where a *building* component or assembly is exposed to precipitation, the component or assembly shall

a) minimize ingress of precipitation into the component or assembly, and
b) prevent ingress of precipitation into interior space.

2) Protection from ingress of precipitation is not required where it can be shown that such ingress will not adversely affect any of

a) the health or safety of *building* users,
b) the intended use of the *building*, or
c) the operation of *building* services.

5.6.1.2. Protective Material and Component Properties

1) Where materials or components applied to sloped or horizontal assemblies are installed to

provide required protection from precipitation and are covered in the scope of the standards listed below, the materials or components shall conform to the requirements of the respective standards:

a) ASTM D 2178, "Asphalt Glass Felt Used in Roofing and Waterproofing,"
b) CAN/CGSB-37.4-M, "Fibrated, Cutback Asphalt, Lap Cement for Asphalt Roofing,"
c) CAN/CGSB-37.5-M, "Cutback Asphalt Plastic Cement,"
d) CAN/CGSB-37.8-M, "Asphalt, Cutback, Filled, for Roof Coating,"
e) CGSB 37-GP-9Ma, "Primer, Asphalt, Unfilled, for Asphalt Roofing, Dampproofing and Waterproofing,"
f) CGSB 37-GP-21M, "Tar, Cutback, Fibrated, for Roof Coating,"
g) CAN/CGSB-37.50-M, "Hot Applied Rubberized Asphalt for Roofing and Waterproofing,"
h) CGSB 37-GP-52M, "Roofing and Waterproofing Membrane, Sheet Applied, Elastomeric,"
r i) CAN/CGSB-37.54, "Polyvinyl Chloride Roofing and Waterproofing Membrane,"
j) CGSB 37-GP-56M, "Membrane, Modified, Bituminous, Prefabricated, and Reinforced for Roofing,"
k) CGSB 37-GP-64M, "Mat Reinforcing, Fibrous Glass, for Membrane Waterproofing Systems and Built-Up Roofing,"
l) CGSB 41-GP-6M, "Sheets, Thermosetting Polyester Plastics, Glass Fiber Reinforced,"
m) CAN/CGSB-51.32-M, "Sheathing, Membrane, Breather Type,"
n) CAN/CGSB-63.14-M, "Plastic Skylights,"
o) CSA A123.1-M, "Asphalt Shingles Surfaced with Mineral Granules,"
p) CSA A123.2-M, "Asphalt Coated Roofing Sheets,"
q) CSA A123.3-M, "Asphalt or Tar Saturated Roofing Felt,"
r) CSA A123.4-M, "Bitumen for Use in Construction of Built-Up Roof Coverings and Dampproofing and Waterproofing Systems,"
s) CAN/CSA-A123.5-M, "Asphalt Shingles Made from Glass Felt and Surfaced with Mineral Granules,"
t) CSA A123.17, "Asphalt-Saturated Felted Glass-Fibre Mat for Use in Construction of Built-Up Roofs,"
u) CAN/CSA-A220.0-M, "Performance of Concrete Roof Tiles,"
r v) CSA O118.1, "Western Cedars, Shakes and Shingles," with shakes not less than No. 1 or Handsplit grade and shingles not less than No. 2 grade, or
e 2 w) CSA-O118.2-M, "Eastern White Cedar Shingles," not less than B grade.

(See Appendix A.)

2) Skylights that are not covered in the scope of CAN/CGSB-63.14-M, "Plastic Skylights," shall conform to the performance requirements of that standard.

3) Except as provided in Sentence (5), where materials or components applied to vertical assemblies are installed to provide required protection from precipitation and are covered in the scope of the standards listed below, the materials or components shall conform to the requirements of the respective standards:

a) ASTM C 212, "Structural Clay Facing Tile,"
b) CAN/CGSB-11.3-M, "Hardboard," types 1, 2 or 5 when not factory finished,
c) CAN/CGSB-11.5-M, "Hardboard, Precoated, Factory Finished, for Exterior Cladding,"
d) CAN/CGSB-34.4-M, "Siding, Asbestos-Cement, Shingles and Clapboards,"
e) CAN/CGSB-34.5-M, "Sheets, Asbestos-Cement, Corrugated,"
f) CAN/CGSB-34.14-M, "Sheets, Asbestos-Cement, Decorative,"
g) CAN/CGSB-34.16-M, "Sheets, Asbestos-Cement, Flat, Fully Compressed,"
h) CAN/CGSB-34.17-M, "Sheets, Asbestos-Cement, Flat, Semicompressed,"
i) CAN/CGSB-34.21-M, "Panels, Sandwich, Asbestos-Cement with Insulating Cores,"
j) CAN/CGSB-41.24, "Rigid Vinyl Siding, Soffits and Fascia," r
k) CAN/CGSB-51.32-M, "Sheathing, Membrane, Breather Type," r
l) CAN/CGSB-82.1-M, "Sliding Doors," r
m) CAN/CGSB-82.5-M, "Insulated Steel Doors," r
n) CAN/CGSB-93.1-M, "Sheet, Aluminum Alloy, Prefinished, Residential," r
o) CAN/CGSB-93.2-M, "Prefinished Aluminum Siding, Soffits and Fascia, for Residential Use," r
p) CAN/CGSB-93.3-M, "Prefinished Galvanized and Aluminum-Zinc Alloy Steel Sheet for Residential Use," r
q) CAN/CGSB-93.4, "Galvanized and Aluminum-Zinc Alloy Coated Steel Siding, Soffits and Fascia, Prefinished, Residential," r
r) CSA A371, "Masonry Construction for Buildings," Section 4, r
s) CAN/CSA-A440-M, "Windows," r
t) CSA O115-M, "Hardwood and Decorative Plywood," r
u) CSA O118.1, "Western Cedars, Shakes and Shingles," with shakes not less than No. 1 or Handsplit grade and shingles not less than No. 2 grade, except that No. 3 grade may be used for undercoursing, r e 2

r v) CSA O118.2-M, "Eastern White Cedar Shingles," not less than B (clear) grade, except that C grade may be used for undercoursing,
r w) CSA O121-M, "Douglas Fir Plywood,"
r x) CSA O151-M, "Canadian Softwood Plywood,"
r y) CSA O153-M, "Poplar Plywood,"
r z) CAN/CSA-O325.0, "Construction Sheathing," or
r aa) CSA O437.0, "OSB and Waferboard."
(See Appendix A.)

4) Except as provided in Sentence (5), windows and sliding doors exposed to the exterior and covered in the scope of CAN/CSA-A440-M, "Windows," or CAN/CGSB-82.1-M, "Sliding Doors," shall conform at least to the water tightness requirements in CSA A440.1-M, "User Selection Guide to CAN/CSA-A440-M90 Windows."

5) Where a wired glass assembly in a required *fire separation* is exposed to the exterior, the assembly need not conform to CAN/CSA-A440-M, "Windows," or CSA A440.1-M, "User Selection Guide to CAN/CSA-A440-M90 Windows." (See Appendix A.)

5.6.1.3. Installation of Protective Materials

1) Where a material applied to a sloped or horizontal assembly is installed to provide required protection from precipitation and its installation is covered in the scope of one of the standards listed below, installation shall conform to the requirements of the respective standard:

a) CAN/CGSB-37.51-M, "Application of Hot-Applied Rubberized Asphalt for Roofing and Waterproofing,"
b) CGSB 37-GP-55M, "Application of Sheet Applied Flexible Polyvinyl Chloride Roofing Membrane,"
c) CAN3-A123.51-M, "Asphalt Shingle Application on Roof Slopes 1:3 and Steeper," or
d) CAN3-A123.52-M, "Asphalt Shingle Application on Roof Slopes 1:6 to Less Than 1:3."

2) Protective materials applied to sloped or horizontal assemblies shall be installed to resist wind-uplift loads determined according to Subsection 4.1.8.

3) Where masonry applied to vertical assemblies is installed to provide required protection from precipitation, installation shall conform to the requirements of CSA A371, "Masonry Construction for Buildings."

4) Where protective materials applied to assemblies are installed to provide required protection from precipitation, the materials shall be installed to shed precipitation or otherwise minimize its entry into the assembly and prevent its penetration through the assembly.

5.6.2. Sealing, Drainage, Accumulation and Disposal

5.6.2.1. Sealing and Drainage

(See Appendix A.)

1) Except as provided in Sentence (2), materials, components, assemblies, joints in materials, junctions between components and junctions between assemblies exposed to precipitation shall be

a) sealed to prevent ingress of precipitation, or
b) drained to direct precipitation to the exterior.

2) Sealing or drainage are not required where it can be shown that the omission of sealing and drainage will not adversely affect any of

a) the health or safety of *building* users,
b) the intended use of the *building*, or
c) the operation of *building* services.

5.6.2.2. Accumulation and Disposal

1) Where water, snow or ice can accumulate on a *building*, provision shall be made to minimize the likelihood of hazardous conditions arising from such accumulation.

2) Where precipitation can accumulate on sloped or horizontal assemblies, provision shall be made for drainage conforming with the relevant provincial, territorial or municipal regulations or, in the absence of such regulations, with Article 4.10.4. of the National Plumbing Code of Canada 1995.

3) Where downspouts are provided and are not connected to a sewer, provisions shall be made to

a) divert the water from the *building*, and
b) prevent *soil* erosion.

4) Junctions between vertical assemblies, and sloped or horizontal assemblies, shall be designed and constructed to minimize the flow of water from the sloped or horizontal assembly onto the vertical assembly.

Table 9.3.2.1.
Minimum Lumber Grades for Specific End Uses
Forming Part of Sentence 9.3.2.1.(1)

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	—

Notes to Table 9.3.2.1.:
(1) See Appendix A.

9.3.2.9. Termite and Decay Protection

1) In localities where termites are known to occur, the clearance between structural wood elements and the finished ground level directly below them shall be not less than 450 mm, unless the structural wood elements are pressure treated with a chemical that is toxic to termites. *e 2*

2) Structural wood elements shall be pressure treated with a preservative to resist decay where

a) the structural wood elements are in contact with the ground, or
b) the vertical clearance between structural wood elements and the finished ground level is less than 150 mm. (See also Articles 9.23.2.2. and 9.23.2.3.) *e 2*

3) Where wood is required by this Article to be treated to resist termites or decay, such treatment shall be in accordance with the requirements of

a) CSA O80.1, "Preservative Treatment of All Timber Products by Pressure Processes," *r*
b) CSA O80.2, "Preservative Treatment of Lumber, Timber, Bridge Ties, and Mine Ties by Pressure Processes," *r*
c) CSA O80.9, "Preservative Treatment of Plywood by Pressure Processes," or *r*
d) CSA O80.15, "Preservative Treatment of Wood for Building Foundation Systems, Basements, and Crawl Spaces by Pressure Processes." *r*

9.3.3. Metal

9.3.3.1. Sheet Metal Thickness

1) Minimum thicknesses for sheet metal material given in this Part refer to the actual minimum thicknesses measured at any point of the material, and in the case of galvanized steel, include the thickness of the coating unless otherwise indicated.

9.3.3.2. Galvanized Sheet Metal

1) Where galvanized sheet metal is intended for use in locations exposed to the weather or as a flashing material, it shall have a zinc coating not less than the G90 coating designation in

r a) ASTM A 653/A 653M, "Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process," or

r b) ASTM A 924/A 924M, "Steel Sheet, Metallic-Coated by the Hot-Dip Process."

Section 9.4. Structural Requirements

(See Appendix A.)

9.4.1. General

9.4.1.1. Structural Design

1) Except as provided in Sentence (2), Sentence 9.23.4.2.(2) and Subsections 9.4.2. to 9.4.4., structural members and their connections shall be designed in conformance with Part 4.

2) Where structural members and their connections conform to the requirements listed elsewhere in this Part, it shall be deemed that the structural design requirements have been met.

9.4.1.2. Post, Beam and Plank Construction

1) Except for columns described in Section 9.17. and beams described in Subsection 9.23.4., post, beam and plank construction with the *loadbearing* framing members spaced more than 600 mm apart shall be designed in conformance with Subsection 4.3.1.

9.4.2. Specified Loads

9.4.2.1. Application

1) This Subsection applies to wood frame assemblies with clear spans not exceeding 12.20 m and members spaced not more than 600 mm apart.

9.4.2.2. Specified Snow Loads

1) Except as provided in Sentences (2) and (3), specified snow loads shall be not less than those calculated using the following formula:

$$S = C_b \bullet S_s + S_r$$

where

S = the specified snow load,

C_b = the basic snow load roof factor, which is 0.5 where the entire width of a roof does not exceed 4.3 m and 0.6 for all other roofs,

S_s = the ground snow load in kPa, determined according to Subsection 2.2.1., and

S_r = the associated rain load in kPa, determined according to Subsection 2.2.1.

2) In no case shall the specified snow load be less than 1 kPa.

3) Bow string, arch or semi-circular roof trusses having an unsupported span greater than 6 m shall be designed in conformance with the snow load requirements in Subsection 4.1.7.

9.4.2.3. Balconies

1) Residential balconies not used as passageways shall be designed to carry the specified roof snow load or 1.9 kPa, whichever is greater.

9.4.2.4. Attics

1) Residential attics having limited accessibility to preclude storage of equipment or material shall be designed for a total specified load of not less than 0.35 kPa, where the total specified load is the sum of the specified *dead load* plus the specified live ceiling load. (See Appendix A.) r2 r2

9.4.3. Deflections

9.4.3.1. Deflections

1) The maximum deflection of structural members shall conform to Table 9.4.3.1.

2) *Dead loads* need not be considered in computing deflections referred to in Sentence (1).

9.8.8. Guards

(See Appendix A regarding loads on guards.)

9.8.8.1. Required Guards

(See Appendix A.)

1) Every surface to which access is provided for other than maintenance purposes, including but not limited to exterior landings, porches, balconies, *mezzanines*, galleries, and raised *walkways*, shall be protected by a *guard* on each side that is not protected by a wall and where there is a difference in elevation to adjacent surfaces of more than 600 mm.

2) Every exterior stair with more than 6 risers and every ramp shall be protected with *guards* on all open sides where the difference in elevation between the adjacent ground level and the stair or ramp exceeds 600 mm.

3) When an interior stair has more than 2 risers, the sides of the stair and the landing or floor level around the stairwell shall be

a) enclosed by walls, or
b) protected by *guards*.

9.8.8.2. Height of Guards

(See Appendix A.)

1) Except as provided in Sentences (2) to (4), all *guards*, including those for balconies, shall be not less than 1 070 mm high.

2) *Guards* for porches, decks, landings and balconies are permitted to be a minimum of 900 mm high where

a) the walking surface of the porch, deck, landing or balcony served by the *guard* is not more than 1 800 mm above the finished ground level, and
b) the porch, deck, landing or balcony serves not more than one *dwelling unit*.

3) Except as provided in Sentence (4), *guards* for stairs shall be not less than 900 mm high measured vertically from a line drawn through the outside edges of the stair nosings, and 1 070 mm high at landings.

4) All required *guards* within *dwelling units* shall be not less than 900 mm high.

9.8.8.3. Guards for Floors and Ramps in Garages

1) Except for floors of garages referred to in Section 9.35., a continuous curb not less than 150 mm in height and a *guard* not less than 1 070 mm above the floor level shall be provided at every opening through a garage floor and around the perimeter of such floor and ramps where the exterior walls are omitted and where the top of the floor is 600 mm or more above an adjacent ground or floor level.

9.8.8.4. Openings in Guards

1) Except as provided in Sentence (2), openings through any *guard* that is required by Article 9.8.8.1. shall be of a size that will prevent the passage of a spherical object having a diameter of 100 mm unless it can be shown that the location and size of openings that exceed this limit do not represent a hazard. (See A-9.8.8.4.(1) and (2) in Appendix A.)

2) Openings through any *guard* that is required by Article 9.8.8.1. and that is installed in a *building* of *industrial occupancy* shall be of a size that will prevent the passage of a spherical object having a diameter of 200 mm unless it can be shown that the location and size of openings that exceed this limit do not represent a hazard. (See A-9.8.8.4.(1) and (2) in Appendix A.)

3) Unless it can be shown that the location and size of openings that do not comply with the following limits do not represent a hazard, openings through any *guard* that is not required by Article 9.8.8.1. and that serves a *building* of other than *industrial occupancy*, shall be of a size that: *e*

a) will prevent the passage of a spherical object having a diameter of 100 mm, or
b) will permit the passage of a spherical object having a diameter of 200 mm.

(See Appendix A.)

9.8.8.5. Design to Prevent Climbing

(See Appendix A.)

1) *Guards* required by Article 9.8.8.1. and serving *buildings* of *residential occupancy* shall be designed so that no member, attachment or opening located between 100 mm and 900 mm above the floor or walking surface protected by the *guard* will facilitate climbing.

9.8.8.6. Glass in Guards

1) Glass in *guards* shall be

a) safety glass of the laminated or tempered type conforming to CAN/CGSB-12.1-M, "Tempered or Laminated Safety Glass," or
b) wired glass conforming to CAN/CGSB-12.11-M, "Wired Safety Glass."

9.8.9. Construction

9.8.9.1. Exterior Concrete Stairs

1) Exterior concrete stairs with more than 2 risers and 2 treads shall be

a) supported on unit masonry or concrete walls or piers not less than 150 mm in cross section, or

b) cantilevered from the main *foundation* wall.

2) Stairs described in Sentence (1), when cantilevered from the *foundation* wall, shall be constructed and installed in conformance with Subsection 9.8.10.

3) The depth below ground level for *foundations* for exterior steps shall conform to the requirements in Section 9.12.

9.8.9.2. Exterior Wood Steps

1) Exterior wood steps shall not be in direct contact with the ground unless suitably treated with a wood preservative.

9.8.9.3. Wooden Stair Stringers

1) Wooden stair stringers shall

a) have a minimum effective depth of 90 mm and an over-all depth of not less than 235 mm,
b) be supported and secured top and bottom,
c) be not less than 25 mm actual thickness if supported along their length and 38 mm actual thickness if unsupported along their length, and
d) except as permitted in Sentence (2), be spaced not more than 900 mm o.c. for stairs serving not more than one *dwelling unit* and 600 mm o.c. in other stairs.

2) For stairs serving not more than one *dwelling unit* where risers support the front portion of the tread, the space between stringers shall be not more than 1 200 mm.

9.8.9.4. Treads

1) Stair treads of lumber, plywood or O-2 grade OSB within *dwelling units* shall be not less than 25 mm actual thickness, except that if open risers are used and the distance between stringers exceeds 750 mm, the treads shall be not less than 38 mm actual thickness.

r2 **2)** Stair treads of plywood or OSB, not continuously supported by the riser, shall have their face grain or direction of face orientation at right angles to the stringers.

9.8.9.5. Finish for Treads and Landings

1) The finish for treads and landings of interior stairs in *dwelling units*, other than stairs to unfinished *basements*, shall consist of hardwood, vertical grain softwood, resilient flooring or other material providing equivalent performance.

2) Treads and landings of interior and exterior stairs and ramps, other than those within *dwelling units*, shall have a slip-resistant finish or be provided with slip-resistant strips that extend not more than 1 mm above the surface.

9.8.10. Cantilevered Precast Concrete Steps

9.8.10.1. Design

1) Exterior concrete steps and their anchorage system that are cantilevered from a *foundation* wall shall be designed and installed to support the loads to which they may be subjected.

9.8.10.2. Anchorage

1) Cantilevered concrete steps referred to in Article 9.8.10.1. shall be anchored to concrete *foundation* walls not less than 200 mm thick.

9.8.10.3. Prevention of Damage Due to Frost

1) Suitable precautions shall be taken during backfilling and grading operations to ensure that subsequent freezing of the *soil* will not cause uplift forces on the underside of cantilevered concrete steps to the extent that the steps or the walls to which they are attached will be damaged.

Section 9.9. Means of Egress

9.9.1. Scope

9.9.1.1. Application

1) Stairways, handrails and *guards* in a *means of egress* shall conform to the requirements in Section 9.8. as well as to the requirements in this Section.

9.9.1.2. Fire Protection

1) *Flame-spread ratings*, *fire-resistance ratings* and *fire-protection ratings* shall conform to Section 9.10.

9.9.1.3. Occupant Load

1) Except for *dwelling units*, the *occupant load* of a *floor area* or part of a *floor area* shall be the number of persons for which such areas are designed, but not fewer than that determined from Table 3.1.16.1., unless it can be shown that the area will be occupied by fewer persons.

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

9.9.2. General

9.9.2.1. Egress from Roof Area, Podiums, Terraces, Platforms and Contained Open Spaces

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

2) Where a roof is intended for an *occupant load* of more than 60 persons, at least 2 separate *means of egress* shall be provided from the roof to stairs designed in conformance with the requirements for *exit* stairs and located remote from each other.

3) Where a podium, terrace, platform or contained open space is provided, egress requirements shall conform to the appropriate requirements for rooms or *suites* in Article 9.9.7.3.

9.9.2.2. Types of Exits

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1) Except as otherwise provided in this Section, an *exit* from any *floor area* shall be one of the following used singly or in combination:

a) an exterior doorway,
b) an exterior passageway,
c) an exterior ramp,
d) an exterior stairway,
e) a fire escape (as described in Subsection 3.4.7.),
f) a *horizontal exit*,
g) an interior passageway,
h) an interior ramp, or
i) an interior stairway.

9.9.2.3. Fire Escapes

1) Fire escapes may be used as *exits* on existing *buildings* provided they are designed and installed in conformance with Subsection 3.4.7.

2) Fire escapes shall not be installed on any new *building*.

9.9.2.4. Elevators, Slide Escapes and Windows

1) Elevators, slide escapes or windows shall not be considered as part of a required *means of egress*.

9.9.2.5. Purpose of Exits

1) An *exit* shall be designed for no purpose other than for exiting except that an *exit* may also serve as an access to a *floor area*.

9.9.2.6. Horizontal Exits

1) Where a *horizontal exit* is used, it shall conform to Sentence 3.4.1.6.(1) and Article 3.4.6.9.

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9.9.3. Dimensions of Means of Egress

9.9.3.1. Application

1) This Subsection applies to every *means of egress* except *exits* that serve not more than one *dwelling unit* and *access to exits* within *dwelling units*.

9.9.3.2. Exit Width

1) Except for doors and corridors, the width of every *exit* facility shall be not less than 900 mm. (See Article 9.9.6.4. for doors and Subsection 9.8.3. for stairs.)

9.9.3.3. Width of Corridors

1) The width of every *public corridor*, corridor used by the public, and *exit* corridor shall be not less than 1 100 mm. (See also Subsection 9.9.5. for obstructions in corridors.)

9.9.3.4. Headroom Clearance

1) Except for stairways, doorways and *storage garages*, the minimum headroom clearance in *exits* and *access to exits* shall be 2.1 m. (See Articles 9.8.3.4. and 9.8.4.4. for stairways and Subsection 9.9.6. for doorways.)

2) The clear height of every *storey* in a *storage garage* shall be not less than 2 m.

9.9.4. Fire Protection of Exits

9.9.4.1. Application

1) Except as provided in Article 9.9.4.4., this Subsection applies to the fire protection of all *exits* except *exits* serving not more than one *dwelling unit*.

9.9.4.2. Fire Separations for Exits

1) Except as provided in Sentence (5) and Article 9.9.8.5., every *exit* other than an exterior doorway shall be separated from each adjacent *floor area* or from another *exit* by a *fire separation* having a *fire-resistance rating* not less than that required for the floor assembly above the *floor area*. (See Article 9.10.9.10.)

2) Where there is no floor assembly above, the *fire-resistance rating* required in Sentence (1) shall not be less than that required by Subsection 9.10.8. for the floor assembly below, but in no case shall the *fire-resistance rating* be less than 45 min.

3) A *fire separation* common to 2 *exits* shall be smoke-tight and not be pierced by doorways, duct work, piping or any other opening that may affect the continuity of the separation.

4) A *fire separation* that separates an *exit* from the remainder of the *building* shall have no

openings except those for electrical wiring, *noncombustible* conduit and *noncombustible* piping that serve only the *exit*, and for standpipes, sprinkler piping, *exit* doorways and wired glass and glass block permitted in Article 9.9.4.3.

5) The requirements in Sentence (1) do not apply to an exterior *exit* passageway provided the passageway has not less than 50% of its exterior sides open to the outdoors and is served by an *exit* stair at each end of the passageway.

9.9.4.3. Wired Glass or Glass Block

(See A-3.1.8.17.(1) in Appendix A.)

1) This Article applies to wired glass in doors, and wired glass or glass block in sidelights, where these are installed in *fire separations* between *exit* enclosures and *floor areas*.

2) Except as provided in Sentence (3), the combined area of glazing in doors and sidelights shall not exceed 0.8 m^2.

3) Where an *exit* enclosure connects with a *floor area* through an enclosed vestibule or corridor separated from the *floor area* by *fire separations* having not less than a 45 min *fire-resistance rating*, the glazed areas described in Sentence (1) need not be limited as required in Sentence (2).

9.9.4.4. Openings Near Unenclosed Exit Stairs and Ramps

1) Where an unenclosed exterior *exit* stair or ramp provides the only *means of egress* from a *suite*, and is exposed to fire from openings in the exterior walls of another *fire compartment*, the openings in the exterior walls of the *building* shall be protected with wired glass in fixed steel frames or glass block conforming to Articles 9.10.13.5. and 9.10.13.7. when the openings in the exterior walls of the *building* are within 3 m horizontally and less than 10 m below or less than 5 m above the *exit* stair or ramp.

9.9.4.5. Openings in Exterior Walls of Exits

1) Either openings in exterior walls of an *exit* or openings in adjacent exterior walls of the *building* the *exit* serves shall be protected with wired glass in fixed steel frames or glass block installed in accordance with Articles 9.10.13.5. and 9.10.13.7., where

a) the *exit* enclosure has exterior walls that intersect the exterior walls of the *building* at an angle of less than 135° measured on the outside of the *building*, and
b) the openings in the exterior walls of the *building* are within 3 m horizontally and less than 2 m above the openings in the exterior walls of the *exit*.

(See Appendix A.)

9.9.4.6. Openings Near Exit Doors

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 Articles 9.10.13.5. and 9.10.13.7.

9.9.4.7. Stairways in 2 Storey, Group D or E Buildings

1) Where a *suite* of Group D or E *occupancy* is located partly on the *first storey* and partly on the second *storey*, stairways serving the second *storey* of that *suite* need not be constructed as *exit* stairs provided,

a) the *building* is not greater than 2 *storeys* in *building height*,
b) the *suite* is separated from other *occupancies* by at least a 45 min *fire separation*,
c) the area occupied by the *suite* is not greater than 100 m^2 per *storey*,
d) the maximum travel distance from any point in the *suite* to an exterior *exit* is not greater than 25 m,
e) the floor assemblies have a *fire-resistance rating* of not less than 45 min or are of *noncombustible construction*, and
f) the *basement* and *first storey* are separated by a *fire separation* having a *fire-resistance rating* of not less than 45 min.

9.9.5. Obstructions and Hazards in Means of Egress

9.9.5.1. Application

1) This Subsection applies to obstructions and hazards in every *means of egress* except those within a *dwelling unit* or serving not more than one *dwelling unit*.

9.9.5.2. Occupancies in Public Corridors

1) Where a *public corridor* or a corridor used by the public contains an *occupancy*, such *occupancy* shall not reduce the unobstructed width of the corridor to less than the required width of the corridor.

9.9.5.3. Obstructions in Public Corridors

1) Except as permitted in Sentence (2), obstructions located within 1 980 mm of the floor shall not project horizontally more than 100 mm into *exit* passageways, corridors used by the public or *public corridors* in a manner that would create a hazard for visually impaired persons travelling adjacent to walls.

2) The horizontal projection of an obstruction referred to in Sentence (1) is permitted to exceed 100 mm where the obstruction extends to less than 680 mm above the floor. (See A-3.3.1.9.(4) in Appendix A.)

9.9.5.4. Obstructions in Exits

1) Except as permitted in Subsection 9.9.6. and Article 9.8.7.6., no fixture, turnstile or construction shall project within the required width of an *exit*.

9.9.5.5. Obstructions in Means of Egress

1) No obstructions such as posts or turnstiles shall be placed so as to restrict the width of a required *means of egress* from a *floor area* or part of a *floor area* to less than 750 mm unless an alternate unobstructed *means of egress* is provided adjacent to and plainly visible from the restricted egress.

2) Except as provided in Sentence (3), no obstructions, such as counter gates, that do not meet the requirements for *exit* doors, shall be placed in a required *means of egress* from a *floor area* or part of a *floor area* unless an alternate unobstructed *means of egress* is provided adjacent to and plainly visible from the restricted egress.

3) Obstructions, such as counter gates, that do not satisfy Sentence (2), are permitted to be placed in a required *means of egress* from a part of a *floor area* in *mercantile occupancies* and *business and personal services occupancies*, provided that the part of the *floor area* served by the obstructed *means of egress* is not generally accessible to the public.

9.9.5.6. Mirrors or Draperies

1) No mirror shall be placed in or adjacent to any *exit* so as to confuse the direction of *exit*, and no mirror or draperies shall be placed on or over *exit* doors.

9.9.5.7. Fuel-Fired Appliances

1) Fuel-fired *appliances* shall not be installed in an *exit* or corridor serving as an *access to exit*.

9.9.5.8. Service Rooms

1) *Service rooms* containing equipment subject to possible explosion, such as *boilers* designed to operate at a pressure in excess of 100 kPa, and certain types of refrigerating and transformer equipment, shall not be located under required *exits*.

9.9.5.9. Ancillary Rooms

1) Ancillary rooms such as storage rooms, washrooms, toilet rooms, laundry rooms and *service rooms* shall not open directly into an *exit*.

9.9.6. Doors in a Means of Egress

9.9.6.1. Application

1) This Subsection applies to all doors in a *means of egress* except doors within *dwelling units* and exterior doors serving not more than one *dwelling unit* unless otherwise stated herein.

9.9.6.2. Obstructions by Doors

1) *Exit* doors shall not decrease the required *exit* width by more than 100 mm in *exit* corridors, and not more than 50 mm for other *exit* facilities.

2) Doors in their swing shall not reduce the width of the path of travel to less than

a) the required *exit* width in *exit* corridors and passageways, and
b) 750 mm on *exit* stairs or landings.

9.9.6.3. Headroom Obstructions

1) No door closer or other device shall be installed in an *exit* in such a manner as to reduce the headroom clearance to less than 1 980 mm.

9.9.6.4. Door Sizes

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

a) be not less than 2 030 mm high,
b) be not less than 810 mm wide where there is only one door leaf, and
c) have no single leaf less than 610 mm wide in any multiple leaf door.

9.9.6.5. Direction of Door Swing

1) Except as provided in Sentence 3.3.1.11.(1), every door that opens onto a corridor or other facility that provides *access to exit* from a room or *suite* having an *occupant load* of more than 60 persons, and every door that is located within a corridor that is required to be separated from the remainder of the *floor area* by a *fire separation,* shall swing on a vertical axis in the direction of *exit* travel and shall not open onto a step.

2) Except as permitted in Sentence (5) and in Sentence 3.4.6.13.(1), every required *exit* door, shall swing on its vertical axis.

3) Except as provided in Sentences (4) and (5), every required *exit* door shall open in the direction of *exit* travel.

4) An *exit* door serving not more than one *dwelling unit* is permitted to swing inward.

5) *Exit* doors serving a *storage garage* serving not more than one *dwelling unit*, or doors serving other accessory *buildings* where there is no danger to life safety, need not conform to Sentences (2) or (3).

9.9.6.6. Nearness of Doors to Stairs

1) Except as provided in Sentence (2), the distance between a stair riser and the leading edge of a door during its swing shall be not less than 300 mm.

2) Where there is a danger of blockage from ice or snow, an *exit* door may open onto not more than one step provided the riser of such step does not exceed 150 mm.

9.9.6.7. Revolving Doors

1) Revolving doors used as *exits* shall conform to Article 3.4.6.14.

9.9.6.8. Door Opening Mechanism

1) Except as provided in Sentence 3.4.6.15.(4) for electromagnetic locking systems, *exit* doors and doors to *suites*, including exterior doors to *dwelling units*, shall be openable from the inside without requiring keys, special devices or specialized knowledge of the door opening mechanism.

9.9.6.9. Automatic Locking Prohibited

1) Except for hotels and motels, a door opening onto a *public corridor* that provides *access to exit* from *suites* shall be designed not to lock automatically when such doors are equipped with automatic self-closing devices. (See A-3.3.4.5. in Appendix A.)

9.9.6.10. Effort Required to Open

1) Every *exit* door shall be designed and installed so that when the latch is released the door will open in the direction of *exit* travel under a force of not more than 90 N applied at the knob or other latch releasing device. (See Sentence 3.8.3.3.(7) for door opening forces in a *barrier-free* path of travel.)

9.9.7. Access to Exits

9.9.7.1. Means of Egress from Suites

e 2 **1)** Except as required in Sentence 9.9.9.3.(1), each *suite* in a *floor area* occupied by more than one *suite* shall have

a) an exterior *exit* doorway,

b) a doorway to a *public corridor*, or

e 2 c) a doorway to an exterior passageway.

e 2 **2)** Except as provided in Sentences 9.9.7.2.(1) and 9.9.8.2.(2), from the point where a doorway described in Clauses (1)(b) or (c) enters the *public corridor* or exterior passageway, it shall be possible to go in opposite directions to each of 2 separate *exits*.

9.9.7.2. Dead-End Corridors

1) Except for a dead-end corridor that is entirely within a *suite* and except as permitted in Sentence 9.9.9.2.(1), a dead-end corridor is permitted provided it is not more than 6 m long.

9.9.7.3. Number and Spacing of Egress Doors

1) Except for *dwelling units*, at least 2 egress doors shall be provided when the area of a room or *suite*, or the distance measured from any point within the room or *suite* to the nearest egress door, exceeds the values in Table 9.9.7.3.

2) Doors required in Sentence (1) shall be spaced so that in the event that one door is made inaccessible by a fire within such room or *suite*, the other door will provide safe egress.

Table 9.9.7.3.
Maximum Areas and Travel Distances for Rooms and Suites with a Single Egress Door
Forming Part of Sentence 9.9.7.3.(1)

Occupancy of Room, *Suite* or *Floor Area*	Maximum Area of Room, *Suite* or *Floor Area*, m^2	Maximum Distance to Egress Door, m
Group C (except *dwelling units*)	100	15
Group D	200	25
Group E	150	15
Group F, Division 2	150	10
Group F, Division 3	200	15

9.9.7.4. Independent Access to Exit

1) Required *access to exit* from *suites* shall not be through any other *dwelling unit*, *service room* or other *occupancy*.

9.9.7.5. Travel Distance within Rooms and Suites

1) Except for *dwelling units*, the travel distance from any point within the room or *suite* to the nearest egress door shall not exceed the maximum travel distance in Article 9.9.8.2.

9.9.8. Exits from Floor Areas

9.9.8.1. Measurement of Travel Distance

1) Except as provided in Sentences (2) and (3), for the purposes of this Subsection, travel distance means the distance from any point in the *floor area* to an *exit* measured along the path of *exit* travel.

Table 9.23.3.5.
Fasteners for Sheathing and Subflooring
Forming Part of Sentence 9.23.3.5.(1)

Element	Minimum Length of Fasteners, mm				Minimum Number or Maximum Spacing of Fasteners
	Common or Spiral Nails	Ring Thread Nails or Screws	Roofing Nails	Staples	
Board lumber 184 mm or less wide	51	45	N/A	51	2 per support
Board lumber more than 184 mm wide	51	45	N/A	51	3 per support
Fibreboard sheathing up to 13 mm thick	N/A	N/A	44	28	150 mm (o.c.) along edges and 300 mm (o.c.) along intermediate supports *e 2*
Gypsum sheathing up to 13 mm thick	N/A	N/A	44	N/A	
Plywood, OSB or waferboard up to 10 mm thick	51	45	N/A	38	
Plywood, OSB or waferboard from 10 mm to 20 mm thick	51	45	N/A	51	
Plywood, OSB or waferboard over 20 mm thick	57	51	N/A	N/A	

9.23.4. Maximum Spans

9.23.4.1. Application

1) Spans provided in this Subsection for joists, beams and lintels supporting floors shall apply only where

a) the floors serve residential areas as described in Table 4.1.6.3., or
b) the uniformly distributed *live load* on the floors does not exceed that specified for residential areas as described in Table 4.1.6.3.

2) Spans for joists, beams and lintels supporting floors shall be determined according to Subsection 4.1.3. where the supported floors

a) serve other than residential areas, or
b) support a uniform *live load* in excess of that specified for residential areas.

9.23.4.2. Spans for Joists, Rafters and Beams

(See Appendix A.)

1) Except as required in Sentence (2), spans for wood joists and rafters shall conform to the spans shown in Tables A-1 to A-7 for the uniform *live loads* shown in the tables. (See Article 9.4.2.2.)

2) Spans for floor joists that are not selected from Tables A-1 and A-2 and that are required to be designed for the same loading conditions, shall not exceed the design requirements for uniform loading and vibration criteria. (See Appendix A.)

3) Spans for built-up wood and glued-laminated timber floor beams shall conform to the spans in Tables A-8 to A-11. (See Article 9.4.2.2.)

4) Spans for roof ridge beams shall conform to the spans in Table A-12 for the uniform snow load shown. (See Articles 9.4.2.2. and 9.23.13.8.)

9.23.4.3. Steel Beams

1) The spans for steel floor beams with laterally supported top flanges shall conform to Table 9.23.4.3. (See Appendix A.)

2) Beams described in Sentence (1) shall at least meet the requirements for Grade 350 W steel in CAN/CSA-G40.21-M, "Structural Quality Steels." *r2*

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Table 9.23.4.3.
Maximum Spans for Steel Beams Supporting Floors in Dwelling Units(1)
Forming Part of Sentence 9.23.4.3.(1)

Section	Supported Joist Length, m (Half the sum of joist spans on both sides of the beam)						
	2.4	3.0	3.6	4.2	4.8	5.4	6.0
	One *Storey* Supported						
W150 x 22	5.5	5.2	4.9	4.8	4.6	4.5	4.3
W200 x 21	6.5	6.2	5.9	5.7	5.4	5.1	4.9
W200 x 27	7.3	6.9	6.6	6.3	6.1	5.9	5.8
W200 x 31	7.8	7.4	7.1	6.8	6.6	6.4	6.2
W250 x 24	8.1	7.6	7.3	7.0	6.6	6.2	5.9
W250 x 33	9.2	8.7	8.3	8.0	7.7	7.5	7.3
W250 x 39	10.0	9.4	9.0	8.6	8.4	8.1	7.9
W310 x 31	10.4	9.8	9.4	8.9	8.4	8.0	7.6
W310 x 39	11.4	10.7	10.2	9.8	9.5	9.2	9.0
	Two *Storeys* Supported						
W150 x 22	4.9	4.4	4.1	3.8	3.5	3.4	3.2
W200 x 21	5.6	5.1	4.6	4.3	4.1	3.8	3.7
W200 x 27	6.4	6.1	5.6	5.3	4.9	4.7	4.4
W200 x 31	6.9	6.5	6.2	5.8	5.4	5.1	4.9
W250 x 24	6.8	6.1	5.6	5.2	4.9	4.6	4.4
W250 x 33	8.2	7.7	7.0	6.5	6.1	5.8	5.5
W250 x 39	8.8	8.3	7.8	7.2	6.8	6.4	6.1
W310 x 31	8.7	7.8	7.2	6.7	6.2	5.9	5.6
W310 x 39	10.0	9.3	8.5	7.9	7.4	7.0	6.7

Notes to Table 9.23.4.3.:
(1) See Appendix A.

9.23.4.4. Concrete Topping

(See Appendix A.)

1) Except as permitted in Sentence (2), where a floor is required to support a concrete topping, the joist spans shown in Table A-1 or the spacing of the members shall be reduced to allow for the loads due to the topping.

2) Where a floor is required to support a concrete topping, joist spans are permitted to be selected from Table A-2 provided the concrete

a) is 38 to 51 mm thick,
b) is normal weight,
c) is placed directly on the subflooring, and
d) has not less than 20 MPa compressive strength after 28 days.

3) Where a floor is required to support a concrete topping, the beam spans shown in Tables A-8 to A-11 or the supported length of the floor joists shall be reduced to allow for the loads due to the topping.

9.23.4.5. Heavy Roofing Materials

1) Where a roof is required to support an additional uniform *dead load* from roofing materials such as concrete roofing tile, or materials other than as specified in Section 9.27., such as clay roofing tiles, the additional load shall be allowed for by reducing

a) the spans for roof joists and rafters in Tables A-4 to A-7, or the spacing of the members, and
b) the spans for ridge beams and lintels in Tables A-12 to A-20. (See A-9.23.4.2. in Appendix A.)

9.23.5. Notching and Drilling

9.23.5.1. Holes Drilled in Framing Members

1) Holes drilled in roof, floor or ceiling framing members shall be not larger than one-quarter the depth of the member and shall be located not less than 50 mm from the edges, unless the depth of the member is increased by the size of the hole.

9.23.5.2. Notching of Framing Members

1) Floor, roof and ceiling framing members are permitted to be notched provided the notch is located on the top of the member within half the joist depth from the edge of bearing and is not

ends of the studs, securely fastened to the full length studs at the sides of the opening.

9.24.3.2. Fire-Rated Walls

1) Steel studs used in walls required to have a *fire-resistance rating* shall be installed so that there is not less than a 12 mm clearance between the top of the stud and the top of the runner to allow for expansion in the event of fire.

2) Except as provided in Article 9.24.3.6., studs in walls referred to in Sentence (1) shall not be attached to the runners in a manner that will prevent such expansion.

3) Framing above doors with steel door frames in non-*loadbearing fire separations* required to have a *fire-resistance rating* shall consist of 2 runners on the flat fastened back to back. (See Appendix A.)

4) The upper runner required in Sentence (3) shall be bent at each end to extend upwards not less than 150 mm and fastened to the adjacent studs.

5) A gypsum board filler piece, the width and length of the runner, shall be provided between the door frame referred to in Sentence (3) and the adjacent runner.

9.24.3.3. Orientation of Studs

1) Steel studs shall be installed with webs at right angles to the wall face and, except at openings, shall be continuous for the full wall height.

9.24.3.4. Support for Cladding Materials

1) Corners and intersections of walls shall be constructed to provide support for the cladding materials.

9.24.3.5. Framing around Openings

1) Studs shall be doubled on each side of every opening where such openings involve more than one stud space, and shall be tripled where the openings in exterior walls exceed 2.4 m in width.

2) Studs described in Sentence (1) shall be fastened together by screws, crimping or welding to act as a single structural unit in resisting transverse loads.

9.24.3.6. Attachment of Studs to Runners

1) Studs shall be attached to runners by screws, crimping or welding around wall openings and elsewhere where necessary to keep the studs in alignment during construction.

2) Where clearance for expansion is required in Article 9.24.3.2., attachment required in Sentence (1) shall be applied between studs and bottom runners only.

9.24.3.7. Openings for Fire Dampers

1) Openings for *fire dampers* in non-*loadbearing fire separations* required to have a *fire-resistance rating* shall be framed with double studs on each side of the opening.

2) The sill and header for openings described in Sentence (1) shall consist of a runner track with right angle bends made on each end so as to extend 300 mm above the header or below the sill and fastened to the studs.

3) The openings described in Sentence (1) shall be lined with a layer of gypsum board not less than 12.7 mm thick fastened to stud and runner webs.

Section 9.25. Heat Transfer, Air Leakage and Condensation Control

9.25.1. Scope

9.25.1.1. Application

1) This Section applies to thermal insulation and measures to control heat transfer, air leakage and condensation.

2) Insulation and sealing of heating and ventilating ducts shall conform to Sections 9.32. and 9.33.

9.25.1.2. General

(See Appendix A.)

1) Except as provided in Sentence (2), any sheet or panel type material with an air leakage characteristic less than 0.1 L/(s•m^2) at 75 Pa and water vapour permeance less than 60 ng/(Pa•s•m^2) and incorporated in a *building* assembly required by Article 9.25.2.1. to be insulated shall be installed

a) on the warm face of the assembly,
b) at a location where the ratio between the total thermal resistance of all materials outboard of its innermost impermeable surface and the total thermal resistance of all materials inboard of that surface is not less than required in Table 9.25.1.2., or
c) outboard of an air space that is vented to the outdoors and, for walls, drained.

Table 9.25.1.2.
Ratio of Outboard to Inboard Thermal Resistance
Forming Part of Article 9.25.1.2.

Heating Degree Days of *Building* Location[1], Celsius degree-days	Minimum Ratio, Total Thermal Resistance Outboard of Material's Inner Surface to Total Thermal Resistance Inboard of Material's Inner Surface
up to 4999	0.20
5000 to 5999	0.30
6000 to 6999	0.35
7000 to 7999	0.40
8000 to 8999	0.50
9000 to 9999	0.55
10000 to 10999	0.60
11000 to 11999	0.65
12000 or higher	0.75

Notes to Table 9.25.1.2.:
(1) See Sentence 2.2.1.1.(1)

2) Wood-based sheathing materials installed so that, in each framing space, at least one of the gaps required by Article 9.23.15.3. and Sentence 9.23.16.5.(1) does not occur over framing need not comply with Sentence (1).

9.25.2. Thermal Insulation

9.25.2.1. Required Insulation

1) All walls, ceilings and floors separating heated space from unheated space, the exterior air or the exterior *soil* shall be provided with sufficient thermal insulation to prevent moisture condensation on their room side during the winter and to ensure comfortable conditions for the occupants. (See A-9.1.1.1. in Appendix A.)

9.25.2.2. Insulation Materials

1) Except as required in Sentence (2), thermal insulation shall conform to the requirements of

r a) CAN/ULC-S701, "Thermal Insulation, Polystyrene, Boards and Pipe Covering,"
b) CGSB 51-GP-21M, "Thermal Insulation, Urethane and Isocyanurate, Unfaced,"
r2 c) CAN/ULC-S705.1, "Thermal Insulation–Spray-Applied Rigid Polyurethane Foam, Medium Density, Material Specification,"
d) CAN/CGSB-51.25-M, "Thermal Insulation, Phenolic, Faced,"
e) CAN/CGSB-51.26-M, "Thermal Insulation, Urethane and Isocyanurate, Boards, Faced,"
f) CGSB 51-GP-27M, "Thermal Insulation, Polystyrene, Loose Fill,"
g) CAN/CGSB-51.60-M, "Cellulose Fibre Loose Fill Thermal Insulation."
h) CAN/ULC-S702, "Thermal Insulation, Mineral Fibre, for Buildings," or r
i) CAN/CSA-A247-M, "Insulating Fibreboard."

2) The *flame-spread ratings* requirements contained in the standards listed in Sentence (1) shall not apply. (See Appendix A.)

3) Insulation in contact with the ground shall be inert to the action of *soil* and water and shall be such that its insulative properties are not significantly reduced by moisture.

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9.25.2.3. Installation of Thermal Insulation

1) Insulation shall be installed so that there is a reasonably uniform insulating value over the entire face of the insulated area.

2) Insulation shall be applied to the full width and length of the space between furring or framing.

3) Except where the insulation provides the principal resistance to air leakage, thermal insulation shall be installed so that at least one face is in full and continuous contact with an element with low air permeance. (See Appendix A.)

4) Insulation on the interior of *foundation* walls enclosing a crawl space shall be applied so that there is not less than 50 mm clearance above the crawl space floor, if the insulation is of a type that may be damaged by water.

5) Insulation around concrete slabs-on-ground shall be located so that heat from the *building* is not restricted from reaching the ground beneath the perimeter, where exterior walls are not supported by footings extending below frost level.

6) Where insulation is exposed to the weather and subject to mechanical damage, it shall be protected with not less than

a) 6 mm asbestos-cement board,
b) 6 mm preservative-treated plywood, or
c) 12 mm cement parging on wire lath applied to the exposed face and edge.

7) Insulation located in areas where it may be subject to mechanical damage shall be protected by a covering such as gypsum board, plywood, particleboard, OSB, waferboard or hardboard.

8) Insulation in factory-built *buildings* shall be installed so that it will not become dislodged during transportation.

9.25.2.4. Installation of Loose-Fill Insulation

1) Except as provided in Sentences (2) to (6), loose-fill insulation shall be used on horizontal surfaces only.

2) Loose-fill insulation is permitted to be installed in attic spaces over ceilings sloped not more than 2.5 in 12.

3) Loose-fill insulation is permitted to be used in wood frame walls of existing *buildings*. (See Appendix A.)

4) Blown-in insulation is permitted to be installed in above-ground wood frame walls of new *buildings* provided

a) the density of the installed insulation is sufficient to preclude settlement,
b) the material is installed behind a membrane that permits visual inspection prior to installation of the interior finish,
c) the material is installed in a manner that will not interfere with the installation of the interior finish, and
d) no water is added to the insulation, unless it can be shown that the added water will not adversely affect other materials in the assembly.

5) Water repellent loose-fill insulation is permitted to be used between the outer and inner wythes of masonry *cavity walls*. (See Appendix A.)

6) Where soffit venting is used, measures shall be taken

a) to prevent loose-fill insulation from blocking the soffit vents and to maintain an open path for circulation of air from the vents into the *attic or roof space*, and
b) to minimize air flow into the insulation near the soffit vents to maintain the thermal performance of the material. (See Article 9.19.1.3.)

9.25.2.5. Installation of Spray-Applied Polyurethane

r2 **1)** Spray-applied polyurethane insulation shall be installed in accordance with CAN/ULC-S705.2, "Thermal Insulation–Spray-Applied Rigid Polyurethane Foam, Medium Density, Installer's Responsibilities–Specification."

9.25.3. Air Barrier Systems

9.25.3.1. Required Barrier to Air Leakage

1) Thermally insulated wall, ceiling and floor assemblies shall be constructed so as to include an *air barrier system* that will provide a continuous barrier to air leakage

a) from the interior of the *building* into wall, floor, *attic or roof spaces*, sufficient to prevent excessive moisture condensation in such spaces during the winter, and
b) from the exterior inward sufficient to prevent moisture condensation on the room side during winter and to ensure comfortable conditions for the occupants.

(See Appendix A.)

9.25.3.2. Air Barrier System Properties

(See Appendix A.)

1) *Air barrier systems* shall possess the characteristics necessary to provide an effective barrier to air infiltration and exfiltration under differential air pressure due to stack effect, mechanical systems or wind. *e 2*

2) Where polyethylene sheet is used to provide airtightness in the *air barrier system*, it shall conform to CAN/CGSB-51.34-M, "Vapour Barrier, Polyethylene Sheet for Use in Building Construction."

9.25.3.3. Continuity of the Air Barrier System

1) Where the *air barrier system* consists of an air-impermeable panel-type material, all joints shall be sealed to prevent air leakage.

2) Where the *air barrier system* consists of flexible sheet material, all joints shall be

a) sealed, or
b) lapped not less than 100 mm and clamped, such as between framing members, furring or blocking and rigid panels.

3) Where an interior wall meets an exterior wall, ceiling, floor or roof required to be provided with air barrier protection, the *air barrier system* shall extend across the intersection.

4) Where an interior wall projects through a ceiling or extends to become an exterior wall, spaces in the wall shall be blocked to provide continuity across those spaces with the *air barrier system* in the abutting walls or ceiling.

5) Where an interior floor projects through an exterior wall or extends to become an exterior floor, continuity of the *air barrier system* shall be maintained from the abutting walls across the floor assembly.

6) Penetrations of the *air barrier system*, such as those created by the installation of doors, windows, electrical wiring, electrical boxes, piping or ductwork, shall be sealed to maintain the integrity of the *air barrier system* over the entire surface.

7) Access hatches installed through assemblies constructed with an *air barrier system* shall be weatherstripped around their perimeters to prevent air leakage.

8) Clearances between *chimneys* or *gas vents* and the surrounding construction that would permit air leakage from within the *building* into a wall or *attic or roof space* shall be sealed by *noncombustible* material to prevent such leakage.

9.25.4. Vapour Barriers

9.25.4.1. Required Barrier to Vapour Diffusion

1) Thermally insulated wall, ceiling and floor assemblies shall be constructed with a *vapour barrier* so as to provide a barrier to diffusion of water vapour from the interior into wall spaces, floor spaces or *attic or roof spaces*.

9.25.4.2. Vapour Barrier Materials

1) Except as required in Sentence (2), *vapour barriers* shall have an initial permeance not greater than 45 ng/(Pa•s•m^2).

2) When used where a high resistance to vapour movement is required, such as in wall constructions that incorporate exterior cladding or sheathing having a low water vapour permeance, *vapour barriers* shall have a permeance not greater than 15 ng/(Pa•s•m^2). (See Appendix A.)

3) Where polyethylene is installed as the *vapour barrier* required in Sentence (2), it shall conform to CAN/CGSB-51.34-M, "Vapour Barrier, Polyethylene Sheet for Use in Building Construction."

4) Membrane-type *vapour barriers* other than polyethylene shall conform to the requirements of CAN/CGSB-51.33-M, "Vapour Barrier, Sheet, Excluding Polyethylene, for Use in Building Construction."

5) Where a coating is applied to gypsum board to function as the *vapour barrier*, the permeance of the coating shall be determined in accordance with CAN/CGSB-1.501-M, "Method for Permeance of Coated Wallboard."

9.25.4.3. Installation of Vapour Barriers

1) *Vapour barriers* shall be installed to protect the entire surfaces of thermally insulated wall, ceiling and floor assemblies.

2) *Vapour barriers* shall be installed sufficiently close to the warm side of insulation to prevent condensation at design conditions. (See Appendix A.)

Section 9.26. Roofing

9.26.1. General

9.26.1.1. Purpose of Roofing

1) Roofs shall be protected with roofing, including flashing, installed to shed rain effectively and prevent water due to ice damming from entering the roof.

9.26.1.2. Alternate Installation Methods

1) Methods described in CAN3-A123.51-M, "Asphalt Shingle Application on Roof Slopes 1:3 and Steeper," or CAN3-A123.52-M, "Asphalt Shingle Application on Roof Slopes 1:6 to Less Than 1:3," are permitted to be used for asphalt shingle applications not described in this Section.

9.26.2. Roofing Materials

9.26.2.1. Material Standards

1) Roofing materials shall conform to

a) CAN/CGSB-37.4-M, "Fibrated, Cutback Asphalt, Lap Cement for Asphalt Roofing,"
b) CAN/CGSB-37.5-M, "Cutback Asphalt Plastic Cement,"
c) CAN/CGSB-37.8-M, "Asphalt, Cutback, Filled, for Roof Coating,"
d) CGSB 37-GP-9Ma, "Primer, Asphalt, Unfilled, for Asphalt Roofing, Dampproofing and Waterproofing,"
e) CGSB 37-GP-21M, "Tar, Cutback, Fibrated, for Roof Coating,"
f) CAN/CGSB-37.50-M, "Hot Applied Rubberized Asphalt for Roofing and Waterproofing,"
g) CGSB 37-GP-52M, "Roofing and Waterproofing Membrane, Sheet Applied, Elastomeric,"
h) CAN/CGSB-37.54, "Polyvinyl Chloride Roofing and Waterproofing Membrane,"
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) CAN/CGSB-51.32-M, "Sheathing, Membrane, Breather Type,"
l) CSA A123.1-M, "Asphalt Shingles Surfaced with Mineral Granules,"
m) CSA A123.2-M, "Asphalt Coated Roofing Sheets,"
n) CSA A123.3-M, "Asphalt or Tar Saturated Roofing Felt,"

o) CSA A123.4-M, "Bitumen for Use in Construction of Built-Up Roof Coverings and Dampproofing and Waterproofing Systems,"
p) CAN/CSA-A123.5-M, "Asphalt Shingles Made from Glass Felt and Surfaced with Mineral Granules,"
q) CSA A123.17, "Asphalt-Saturated Felted Glass-Fibre Mat for Use in Construction of Built-Up Roofs,"
r) CAN/CSA-A220.0-M, "Performance of Concrete Roof Tiles,"
s) CSA O118.1, "Western Cedars, Shakes and Shingles," or
t) CSA O118.2-M, "Eastern White Cedar Shingles."

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 as provided in Sentence 9.26.7.4.(2).

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 9.26.3.1.

Table 9.26.3.1.
Roofing Types and Slope Limits
Forming Part of Sentence 9.26.3.1.(1)

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
e 2 Cedar Shakes	1 in 3	no limit

Table 9.26.3.1. (Continued)

Type of Roofing	Minimum Slope	Maximum Slope
Asbestos-Cement Corrugated Sheets	1 in 4	no limit
Corrugated Metal Roofing	1 in 4	no limit
e 2 Sheet Metal Shingles	1 in 4[1]	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

Notes to Table 9.26.3.1.:
(1) See Sentences 9.26.3.1.(2) and (3).

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

1) Sheet metal flashing shall consist of not less than
a) 1.73 mm thick sheet lead,
b) 0.33 mm thick galvanized steel,
c) 0.46 mm thick copper,
d) 0.46 mm thick zinc, or
e) 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 at least
a) one layer of sheet metal not less than 600 mm wide, or
b) 2 layers of roll roofing.

4) The bottom layer of roofing required in Sentence (3) shall consist of at least 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 at least Type M mineral surface roll roofing (mineral surface up), 914 mm wide, centred in the valley, applied over a 100 mm wide strip of cement along each edge of the bottom layer, and fastened with a sufficient number of nails to hold it in place until the shingles are applied.

9.26.4.3. Intersection of Shingle Roofs and Masonry

1) The intersection of shingle roofs and masonry walls or *chimneys* shall be protected with flashing.

2) Counter flashing required in Sentence (1) shall be embedded not less than 25 mm in the masonry and shall extend not less than 150 mm down the masonry and lap the lower flashing not less than 100 mm.

3) Flashing along the slopes of a roof described in Sentence (1) shall be stepped so that there is not less than a 75 mm head lap in both the lower flashing and counter flashing.

4) Where the roof described in Sentence (1) slopes upwards from the masonry, the flashing shall extend up the roof slope to a point equal in height to the flashing on the masonry, but not less than 1.5 times the shingle exposure.

9.26.4.4. Intersection of Shingle Roofs and Walls other than Masonry

1) The intersection of shingle roofs and walls clad with other than masonry shall be protected with flashing.

2) Flashing required in Sentence (1) shall be installed so that it extends up the wall not less than 75 mm behind the sheathing paper, and extends not less than 75 mm horizontally.

3) Along the slope of the roof, the flashing required in Sentence (1) shall be stepped with not less than a 75 mm head lap.

9.26.4.5. Intersection of Built-Up Roofs and Masonry

1) The intersection of built-up roofs with masonry walls or *chimneys* shall have a cant strip at

9.26.8.5. Hips and Ridges

1) Shingles on hips and ridges shall be not less than 300 mm wide applied to provide triple coverage.

2) Shingles referred to in Sentence (1) shall be cemented to the roof shingles and to each other with a coat of cement 25 mm from the edges of the shingles and fastened with nails or staples located 40 mm above the butt of the overlying shingle and 50 mm from each edge.

9.26.8.6. Flashing

1) Flashing shall conform to Subsection 9.26.4.

9.26.8.7. Fastening

1) Shingles shall be fastened in accordance with Article 9.26.7.4.

9.26.9. Wood Roof Shingles

9.26.9.1. Decking

1) Decking for wood shingled roofs may be continuous or spaced.

9.26.9.2. Grade

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1) Western cedar shingles shall be not less than No. 2 grade.

2) Eastern white cedar shingles shall be not less than B (clear) grade.

9.26.9.3. Size

1) Wood shingles shall be not less than 400 mm long and not less than 75 mm or more than 350 mm wide.

9.26.9.4. Spacing and Joints

1) Shingles shall be spaced approximately 6 mm apart and offset at the joints in adjacent courses not less than 40 mm so that joints in alternate courses are staggered.

9.26.9.5. Fastening

1) Shingles shall be fastened with 2 nails or staples located approximately 20 mm from the sides of the shingle and 40 mm above the exposure line.

9.26.9.6. Exposure

1) The exposure of wood roof shingles shall conform to Table 9.26.9.6.

Table 9.26.9.6.
Exposure of Wood Roof Shingles
Forming Part of Sentence 9.26.9.6.(1)

Roof Slope	Maximum Exposure, mm					
	No.1 or A Grade Length of Shingle, mm			No. 2 or B Grade Length of Shingle, mm		
	400	450	600	400	450	600
< 1 in 3	100	115	165	90	100	140
≥ 1 in 3	125	140	190	100	115	165

9.26.9.7. Flashing

1) Flashing shall conform to Subsection 9.26.4.

9.26.9.8. Eave Protection

1) Eave protection shall conform to Subsection 9.26.5.

9.26.10. Cedar Roof Shakes

e 2

9.26.10.1. Size and Thickness

1) Shakes shall be not less than 450 mm long and not less than 100 mm nor more than 350 mm wide with a butt thickness of not more than 32 mm and not less than 9 mm.

9.26.10.2. Underlay

1) Where eave protection is not provided, an underlay conforming to the requirements in Article 9.26.6.1. for wood shingles shall be laid as a strip not less than 900 mm wide along the eaves.

2) A strip of material similar to that described in Sentence (1) not less than 450 mm wide shall be interlaid between each course of shakes with the bottom edge of the strip positioned above the butt line at a distance equal to double the exposure of the shakes.

3) Interlaid strips referred to in Sentence (2) shall be lapped not less than 150 mm at hips and ridges in a manner that will prevent water from reaching the roof sheathing.

9.26.10.3. Spacing and Joints

1) Shakes shall be spaced 6 mm to 9 mm apart and the joints in any one course shall be separated not less than 40 mm from joints in adjacent courses.

9.26.10.4. Fastening

1) Shakes shall be fastened with nails located approximately 20 mm from the sides of the shakes and 40 mm above the exposure line.

9.26.10.5. Exposure

1) The exposure of wood shakes shall not exceed

a) 190 mm for shakes not less than 450 mm long, and

b) 250 mm for shakes not less than 600 mm long.

9.26.10.6. Flashing

1) Flashing shall conform to Subsection 9.26.4.

9.26.10.7. Eave Protection

1) Eave protection shall conform to Subsection 9.26.5.

e 2

9.26.10.8. Grade

1) Shakes shall be not less than No. 1 or Handsplit grade.

9.26.11. Built-Up Roofs

9.26.11.1. Quantity of Materials

1) The quantities of bituminous materials used on built-up roofs shall conform to Table 9.26.11.1.

Table 9.26.11.1.
Quantities of Bitumen for Built-up Roofs
Forming Part of Sentence 9.26.11.1.(1)

Type of Roof	Amount of Bitumen per Square Metre of Roof Surface	
	Mopping Coats between Layers	Flood Coat
Asphalt and aggregate	1 kg	3 kg
Coal-tar and aggregate	1.2 kg	3.6 kg
Cold process roofing	0.75 L cold process cement	2 L cold process top coating

9.26.11.2. Coal-Tar and Asphalt Products

1) Coal-tar products and asphalt products shall not be used together in built-up roof construction.

9.26.11.3. Roof Felts

1) Bitumen roofing felts shall be at least No. 15 felt.

9.26.11.4. Aggregate Surfacing

1) Aggregate used for surfacing built-up roofs shall be clean, dry and durable and shall consist of particles of gravel, crushed stone or air-cooled blast *furnace* slag having a size of from 6 mm to 15 mm.

2) The minimum amount of aggregate surfacing per square metre of roof surface shall be 15 kg gravel or crushed stone or 10 kg crushed slag.

9.26.11.5. Flashing

1) Flashing shall conform to Subsection 9.26.4.

9.26.11.6. Number of Layers

1) Built-up roofing shall consist of not less than 3 mopped-down layers of roofing felt flood coated with bitumen.

9.26.11.7. Installation of Layers

1) In hot process applications each layer of bitumen-saturated felt shall be laid while the bitumen is hot, with each layer overlapping the previous one.

2) The full width under each lap referred to in Sentence (1) shall be coated with bitumen so that in no place does felt touch felt.

3) Felt shall be laid free of wrinkles and shall be rolled directly into the hot bitumen and broomed forward and outward from the centre to ensure complete adhesion.

9.26.11.8. Roofing over Wood-Based Sheathing

1) Except as permitted in Sentence (2), built-up roofing applied over wood, plywood, OSB or waferboard roof sheathing shall be laid over an additional base layer of felt laid dry over the entire roof deck with not less than a 50 mm headlap and a 50 mm sidelap between each sheet.

2) Where plywood, OSB or waferboard roof sheathing is used, the dry layer of felt required in Sentence (1) may be omitted when the joints are taped and the sheathing is primed with asphalt.

9.26.11.9. Attachment to Decking

1) Roofing shall be securely attached to the decking or where insulation is applied above the deck, the insulation shall be securely attached to the deck before the first layer of felt is fastened to the insulation.

9.26.11.10. Cant Strips

1) Except as permitted in Sentence (4), a cant strip shall be provided at the edges of roofs.

2) At least 2 plies of the roofing membrane shall be carried over the top of the cant strip.

3) Flashing shall extend over the top of the cant strip and be shaped to form a drip.

4) The cant strip required in Sentence (1) need not be provided where a gravel stop is installed at the edge of roofs.

a) 14.3 mm lumber,
b) 7.5 mm plywood, or
c) 7.5 mm OSB or waferboard.

4) Asbestos-cement shingles are permitted to be attached to the sheathing only when the sheathing consists of not less than
a) 14.3 mm lumber,
b) 9.5 mm plywood, or
c) 9.5 mm OSB or waferboard.

5) Where wood shingles or shakes are applied to sheathing which is not suitable for attaching the shingles or shakes, the shingles or shakes are permitted to be attached to a wood lath not less than 38 mm by 9.5 mm thick securely nailed to the framing and applied as described in Article 9.27.7.5.

6) Where asbestos-cement shingles are applied to sheathing that is not suitable for attaching the shingles, the shingles are permitted to be fastened to a wood lath not less than 89 mm by 9.5 mm thick securely nailed to the framing.

7) Lath referred to in Sentence (6) shall be applied so that it overlaps the preceding shingle course by not less than 20 mm.

9.27.5.2. Blocking

1) Blocking for the attachment of cladding shall be not less than 38 mm by 38 mm lumber securely nailed to the framing and spaced not more than 600 mm o.c.

9.27.5.3. Furring

1) Except as permitted in Sentences 9.27.5.1.(5) and (6), furring for the attachment of cladding shall be not less than 19 mm by 38 mm lumber when applied over sheathing.

2) When applied without sheathing, furring referred to in Sentence (1) shall be not less than
a) 19 mm by 64 mm lumber on supports spaced not more than 400 mm o.c., or
b) 19 mm by 89 mm lumber on supports spaced not more than 600 mm o.c.

3) Furring referred to in Sentence (1) shall be
a) securely fastened to the framing, and
b) spaced not more than 600 mm o.c.

9.27.5.4. Size and Spacing of Fasteners

1) Nail or staple size and spacing for the attachment of cladding and trim shall conform to Table 9.27.5.4.

Table 9.27.5.4.
Attachment of Cladding
Forming Part of Sentence 9.27.5.4.(1)

Type of Cladding	Minimum Nail or Staple Length, mm	Minimum Number of Nails or Staples	Maximum Nail or Staple Spacing
Wood trim	51	—	600 mm (o.c.)
Lumber siding or horizontal siding made from sheet material	51	—	600 mm (o.c.)
Metal cladding	38	—	600 mm (o.c.) (nailed to framing) 400 mm (o.c.) (nailed to sheathing only)
e 2 Wood shakes			
up to 200 mm in width	51	2	—
over 200 mm in width	51	3	—
e 2 Wood shingles			
200 mm in width	32	2	—
over 200 mm in width	32	3	—
Asbestos-cement shingles	32	2	—
Panel or sheet type cladding			
up to 7 mm thick	38	—	150 mm (o.c.) along edges
more than 7 mm thick	51	—	300 mm (o.c.) along intermediate supports

9.27.5.5. Fastener Materials

1) Nails or staples for the attachment of cladding and wood trim shall be corrosion-resistant and shall be compatible with the cladding material.

9.27.5.6. Expansion and Contraction

1) Fasteners for metal or vinyl cladding shall be positioned to permit expansion and contraction of the cladding.

9.27.5.7. Penetration of Fasteners

1) Fasteners for shakes and shingles shall penetrate through the nail-holding base or not less than 19 mm into the framing.

2) Fasteners for cladding other than that described in Sentence (1) shall penetrate through the nail-holding base or not less than 25 mm into the framing.

9.27.6. Lumber Siding

9.27.6.1. Materials

1) Lumber siding shall be sound, free of knot holes, loose knots, through checks or splits.

9.27.6.2. Thickness and Width

1) Drop, rustic, novelty, lapped board and vertical wood siding shall be not less than 14.3 mm thick and not more than 286 mm wide.

2) Bevel siding shall be
a) not less than 5 mm thick at the top, and
b) not less than
   i) 12 mm thick at the butt for siding 184 mm or less in width, and
   ii) 14.3 mm thick at the butt for siding wider than 184 mm.

3) Bevel siding shall be not more than 286 mm wide.

9.27.6.3. Joints

1) Lumber siding shall prevent water from entering at the joints by the use of lapped or matched joints or by vertical wood battens.

2) Siding shall overlap not less than 1 mm per 16 mm width of lumber, but not less than
a) 9.5 mm for matched siding,
b) 25 mm for lapped bevel siding, or
c) 12 mm for vertical battens.

e 2 **9.27.7. Wood Shingles and Shakes**

9.27.7.1. Materials

1) Shingles and shakes shall conform to
a) CSA O118.1, "Western Cedars, Shakes and Shingles," or
b) CSA O118.2-M, "Eastern White Cedar Shingles."

2) Western cedar shakes shall be not less than No. 1 or Handsplit grade, and western cedar shingles not less than No. 2 grade, except that No. 3 grade may be used for undercoursing. *e 2*

3) Eastern white cedar shingles shall be at least B (clear) grade, except that C grade may be used for the lower course of double course applications.

9.27.7.2. Width

1) Shingles and shakes shall be not less than 65 mm or more than 350 mm wide.

9.27.7.3. Fasteners

1) Shingles or shakes shall be fastened with nails or staples located approximately 20 mm from each edge and not less than 25 mm above the exposure line for single-course applications, or approximately 50 mm above the butt for double-course applications.

9.27.7.4. Offsetting of Joints

1) In single-course application, joints in succeeding courses shall be offset not less than 40 mm so that joints in any 2 of 3 consecutive courses are staggered.

2) In double-course application, joints in the outer course shall be offset from joints in the under-course by not less than 40 mm, and joints in succeeding courses shall be offset not less than 40 mm.

9.27.7.5. Fastening to Lath

1) When lath is used with double-course application [see Sentence 9.27.5.1.(5)], it shall be spaced according to the exposure and securely fastened to the framing.

2) The butts of the under-course of the application referred to in Sentence (1) shall rest on the top edge of the lath.

3) The outer course of the application referred to in Sentence (1) shall be fastened to the lath with nails of sufficient length to penetrate through the lath.

4) The butts of the shingles or shakes shall be so located that they project not less than 12 mm below the bottom edge of the lath referred to in Sentence (1).

5) If wood lath is not used, the butts of the under-course shingles or shakes of the application

Table A-9.3.2.1.B. (Continued)

Facsimiles of Grade Mark	Association or Agency
	MacDonald Inspection Division of Intertek Testing Services NA Ltd. 211 Schoolhouse Street Coquitlam, British Columbia V3K 4X9 *e 2*
	Maritime Lumber Bureau P.O. Box 459 Amherst, Nova Scotia B4H 4A1
	Newfoundland Lumber Producers Association P.O. Box 8 Glovertown, Newfoundland A0G 2L0
	Northern Forest Products Association 400-1488 Fourth Avenue Prince George, British Columbia V2L 4Y2
	N.W.T. Forest Industries Association Box 1033 Hay River, Northwest Territories X0E 0R0
	Ontario Lumber Manufacturers' Association 55 University Avenue, Suite 1105, Box 8 Toronto, Ontario M5J 2H7

Table A-9.3.2.1.B. (Continued)

Facsimiles of Grade Mark	Association or Agency
NLGA RULE NO 1 S-DRY 00 S — P — F	Pacific Lumber Inspection Bureau P.O. Box 7235 Bellevue, Washington 98008-1235 USA British Columbia Division: P.O. Box 19118 Fourth Avenue Postal Outlet Vancouver, British Columbia V6C 4R8
S.P.F. 1 000 S - GRN	Quebec Lumber Manufacturers' Association Association des manufacturiers de bois de sciage du Québec 5055, boul. Hamel ouest, bureau 200 Québec (Québec) G2E 2G6

A-9.3.2.8.(1) Non-Standard Lumber. The NLGA "Standard Grading Rules for Canadian Lumber" permit lumber to be dressed to sizes below the standard sizes (38 × 89, 38 × 140, 38 × 184, etc.) provided the grade stamp shows the reduced size. This Sentence permits the use of the span tables for such lumber, provided the size indicated on the stamp is not less than 95% of the corresponding standard size. Allowable spans in the tables must be reduced a full 5% even if the undersize is less than the 5% permitted.

A-9.4. Structural Requirements. Section 9.4. establishes the principle that the design of structural members of Part 9 buildings must either be based on the specific requirements in Part 9, such as the span tables, or be in accordance with Part 4. Usually a combination of the two approaches is used. For example, even if the snow load on a wood roof truss is based on Subsection 9.4.2., the joints must be designed in accordance with Part 4.

The only explicit treatment of structural loads in Section 9.4. is for gravity loads; wind and earthquake loads are dealt with implicitly in the body of Part 9 and are not used as inputs to any of the span tables. There may therefore be a tendency to assume that wind and earthquake loads do not need to be considered in the design of Part 9 buildings. In most cases this is true: the majority of low rise, wood frame buildings have a great deal of structural redundancy and continuity and have more than enough capacity to resist lateral loads due to wind and earthquake.

For example, in a traditional house configuration, even if there are large openings in the exterior walls for picture windows and sliding doors, the many interior partitions act as shear walls and provide adequate lateral stability. This may not be the case for some newer house designs.

However, this does not apply to all building configurations or details that might be found in Part 9 buildings. For example, a mercantile building might be long and narrow with almost entirely windowed walls on the ends and few structurally attached interior partitions. In such a case, wind and earthquake loads would have to be considered in the design of the long structural walls and their foundations.

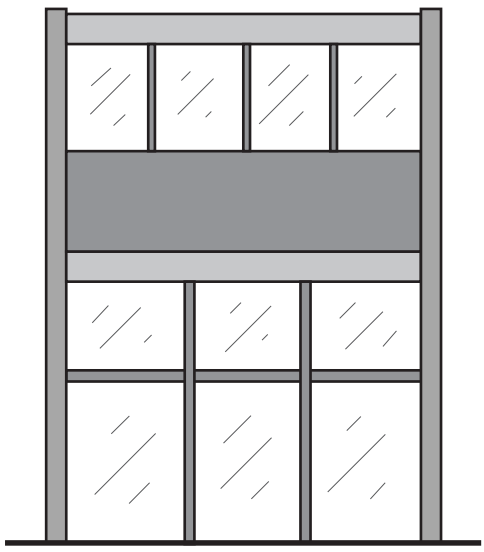


Figure A-9.4.A.
Mercantile building with little resistance to lateral loading

Another example is the practice, in some parts of the country, of building houses on crawl spaces with perimeter walls consisting of short, wood frame "knee" or "pony" walls and with no lateral bracing or interior partitions in the crawl space. The only structural continuity in the foundation-to-knee-wall and knee-wall-to-floor joints comes from nailing and this is inadequate to resist lateral loads from significant earthquakes.

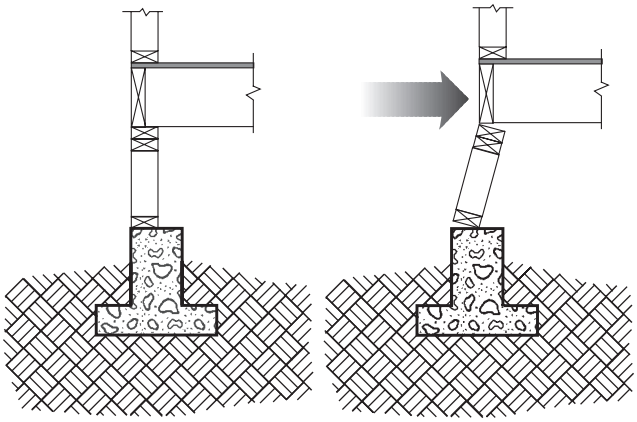


Figure A-9.4.B.
Crawl space knee-wall with little resistance to lateral loading

Thus Part 9 buildings are not exempt from having to comply with the wind and earthquake loading requirements of Part 4. In many cases, these considerations can safely be ignored but, in certain configurations, the building's resistance to wind and earthquake loads must be carefully considered.

See also A-9.23.10.2.

r2 **A-9.4.2.4.(1) Specified Loads for Attics with Limited Accessibility.** Typical residential roofs are framed with roof trusses and the ceiling is insulated.

Residential trusses are placed at 600 mm on centre with web members joining top and bottom chords. Lateral web bracing is installed perpendicular to the span of the trusses. As a result, there is limited room for movement inside the attic space or for storage of material. Access hatches are generally built to the minimum acceptable dimensions of 500 mm by 700 mm, further limiting the size of material that can be moved into the attic.

With exposed insulation in the attic, access is not recommended unless protective clothing and breathing apparatus are worn.

Thus the attic space is recognized as uninhabitable and loading can be based on actual dead load. In emergency situations or for the purpose of inspection, it is possible for a person to access the attic without over-stressing the truss or causing damaging deflections.

A-Table 9.4.4.1. 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-Table 9.6.6.1. Glass in Doors. Maximum areas in Table 9.6.6.1. 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 9.6.6.2.(3).

A-9.6.6.3.(1) 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 to be used for walk-in closets.

A-9.6.6.6.(1) Double Glazing for Glass Doors and Glass in Doors. Where a door consists of a large area of glass held in a frame, for example, sliding patio doors, the glass is considered to be glass in a door and would be required to be double glazed. Only where a door is solid glass and has no frame would the glass not be required to be double glazed.

A-9.6.8.1. Forced Entry Via 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. Figure A-9.6.8.1. 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-S332, *r*

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.

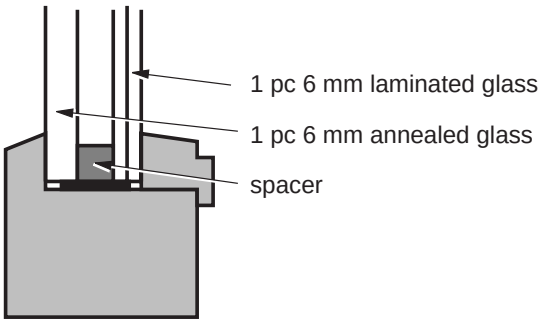


Figure A-9.6.8.1.
Combined laminated/annealed glazing

A-9.6.8.5.(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 strike-plates that are specially designed to provide equal or greater protection.

A-9.6.8.7.(1) Hinged Doors. Methods of satisfying this Sentence 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-9.6.8.10.(1) Resistance of Doors to Forced Entry. This Sentence designates standard ASTM F 476, "Test Methods for Security of Swinging Door Assemblies" as an alternate to compliance with the prescriptive requirements for doors and hardware. The annex to the standard provides four security classifications, with acceptance criteria, depending on the type of building and the crime rate of the area in which it is located. The NBC has only specified Grade 10, the minimum level. The annex suggests the following guidelines be followed when selecting security levels for door assemblies:

Grade 10: This is the minimum security level and is quite adequate for single-family residential buildings located in stable, low-crime areas.

Grade 20: This is the low–medium security level and is designed to provide security for residential buildings located in average crime-rate areas and for apartments in both low and average crime-rate areas.

Grade 30: This is the medium–high security level and is designed to provide security for residential buildings located in higher than average crime-rate areas or for small commercial buildings in average or low crime-rate areas.

Grade 40: This is the high security level and is designed for small commercial buildings located in high crime-rate areas. This level could also be used for residential buildings having an exceptionally high incidence of semi-skilled burglary attacks.

All these grades satisfy the Code and can be considered for use where a higher level of security is desired or warranted.

A-9.7.1.3.(1) Bedroom Window Height. Sentence 9.7.1.3.(1) requires every bedroom that does not have an exterior door to have at least one window that is large enough and easy enough to open that it can be used as an exit in case of a fire that prevents use of the normal building exits. However, the Article does not set a maximum sill height for such a window; it is therefore possible to install a window or skylight which satisfies the requirements of the Article but defeats the Article's intent by virtue of being so high that it cannot be reached for exit purposes. It is recommended that the sills of windows intended for use as emergency exits be not higher than 1.5 m above the floor. Sometimes it is difficult to avoid having the sill higher than this; e.g. skylights, windows in basement bedrooms. In these cases, it is recommended that access to the window be improved by some means such as built-in furniture installed below the window.

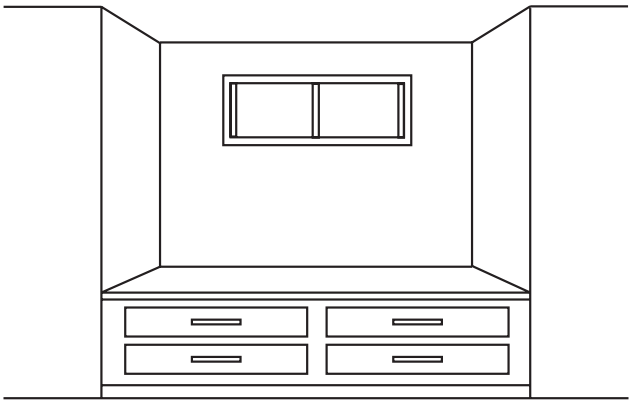


Figure A-9.7.1.3.A.
Built-in furniture to improve access to a window

A-9.7.1.3.(2) Bedroom Window Opening Areas and Dimensions. Although the minimum opening dimensions required for height and width are 380 mm, a window opening that is 380 mm by 380 mm would not comply with the minimum area requirements. (See Figure A-9.7.1.3.B.)

Sub-floor depressurization systems have been found to be very effective for controlling soil gas entry into houses. At least in areas which are prone to higher than normal radon levels, or other ground pollutants, this practice is recommended.

Article 9.13.8.2. provides for depressurization as an alternative to the installation of polyethylene below floor slabs. Using this option, a vent pipe for use with a sub-floor depressurization system is installed through the floor but is only connected if soil gas levels are found to be excessive.

Radon testing must be performed on the house and copies of the results provided to the home owner and the authority having jurisdiction. Since the radon level in a house can vary significantly during the year, the test should be of sufficient duration to provide a reasonable indication of the concentration. The minimum period for testing should be three months or as recommended by the authority having jurisdiction. The preferred testing location is centrally in the basement or the main floor for houses without basements.

The current Canadian Action Level for radon, as specified by Health Canada, is 800 Bq/m^3 (see H49-58, "Exposure Guidelines for Residential Indoor Air Quality"). If the results of the test indicate a concentration exceeding the Canadian Action Level, the rest of the sub-slab depressurization system must be installed. (It may be noted that Canadian and U.S. action levels are likely to differ.)

Installation of the sub-slab depressurization system requires that the pipe cast through the slab to the sub-slab space be uncapped and connected to a ventilation system exhausting to the outside. Exhaust pipes passing through unheated spaces should be insulated. The exhaust fan should be located outside the occupied space where noise will not be a nuisance. It is also best to locate the fan as close to the final outlet end of the ventilation system as possible so that the pressurized portion of the system downstream of the fan will not be located in or adjacent to the living space. If the pressurized portion of the system were to pass through the living space, then any leak in the system would have the potential to spill high concentration soil gas into the living space, thus exacerbating the situation the system was intended to correct. The fan should be of a type suitable for the application and capable of continuous operation.

Since radon concentration of the vent gases can become quite high, soil gases collected by the sub-slab depressurization system should be vented at the roof level. Therefore, it may be desirable to take some simple steps to facilitate future installation of the system. This could include locating the slab vent pipe below a suitable interior partition, through which the vertical riser could be run, and pre-drilling the partition top and bottom plates, particularly those not accessible from a basement or attic.

The house should be re-tested for radon after completion of the depressurization system.

A-9.14.2.1.(2) Insulation Applied to the Exterior of Foundation Walls. In addition to the prevention of heat loss, some types of mineral fibre insulation, such as rigid glass fibre, are installed on the exterior of basement walls for the purpose of moisture control. This is sometimes used instead of crushed rock as a drainage layer between the basement wall and the surrounding soil in order to facilitate the drainage of soil moisture. Water drained by this drainage layer must be carried away from the foundation by the footing drains or the granular drainage layer in order to prevent it from developing hydro-static pressure against the wall. Provision must be made to permit the drainage of this water either by extending the insulation or crushed rock to the drain or by the installation of granular material connecting the two. The installation of such drainage layer does not eliminate the need for normal waterproofing or damproofing of walls as specified in Section 9.13.

A-9.15.1.3.(3) Preserved Wood Foundations – Design Assumptions. Tabular data and figures in CAN/CSA-S406, "Construction of Preserved Wood Foundations," are based upon the general principles provided in CSA O86.1, "Engineering Design in Wood (Limit States Design)," with the following assumptions: *e*

- soil bearing capacity: 75 kPa or more,
- clear spans for floors: 5 000 mm or less,
- floor loadings: 1.9 kPa for first floor and suspended floor, and 1.4 kPa for second storey floor,
- foundation wall heights: 2 400 mm for slab floor, 3 000 mm for suspended wood floor, *e 2*
- top of granular layer to top of suspended wood floor: 600 mm,
- lateral load from soil pressure: equivalent to fluid pressure of 4.7 kPa per metre of depth,
- ground snow load: 3 kPa,
- basic snow load coefficient: 0.6,
- roof loads are carried to the exterior wall,
- dead loads:

roof	0.50 kPa,
floor	0.47 kPa,
wall (with siding)	0.32 kPa,
wall (with masonry veneer)	1.94 kPa,
foundation wall	0.27 kPa,
partitions	0.20 kPa.

A-9.15.3.3.(4) Footing Sizes. The footing sizes in Table 9.15.3.3. are based on typical construction consisting of a roof, not more than 3 storeys, and centre bearing walls or beams. For this reason, Sentence (1) stipulates a maximum supported joist span of 4.9 m.

It has become common to use flat wood trusses or wood I-joists to span greater distances in floors of small buildings. Where these spans exceed 4.9 m, minimum footing sizes may be based on the following method:

(a) Determine for each storey the span of joists that will be supported on a given footing. Sum these lengths (sum_1).
(b) Determine the product of the number of storeys times 4.9 m (sum_2).
(c) Determine the ratio of sum_1 to sum_2.
(d) Multiply this ratio by the minimum footing sizes in Table 9.15.3.3. to get the required minimum footing size.

Example: A 2-storey house is built using wood I-joists spanning 6 m.

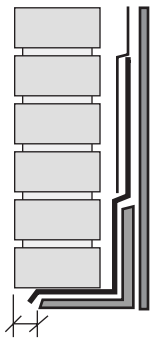
(a) $sum_1 = 6 + 6 = 12$ m
(b) $sum_2 = 4.9 \times 2 = 9.8$ m
(c) ratio $sum_1/sum_2 = 12/9.8 = 1.22$
(d) required minimum footing size = 1.22 x 350 mm (minimum footing size provided in Table 9.15.3.3.) = 427 mm.

A-9.18.7.1.(4) Protection of Ground Cover in Warm Air Plenums. The purpose of the requirement is to protect combustible ground cover from smoldering cigarette butts that may drop through air registers. The protective material should extend beyond the opening of the register and have up-turned edges, as a butt may be deflected sideways as it falls.

e 2 **A-9.19.1.1.(1) Venting of Attic or Roof Spaces.** Controlling the flow of moisture by air
e leakage and vapour diffusion into attic or roof spaces is necessary to limit moisture-induced deterioration. Given that imperfections normally exist in the vapour barriers and air barrier systems, recent
e research indicates that venting of attic or roof spaces is generally still required. The exception provided in Article 9.19.1.1. recognizes that some specialized ceiling-roof assemblies, such as those used in some factory-built buildings, have, over time, demonstrated that their construction is sufficiently tight to prevent excessive moisture accumulation. In these cases, ventilation would not be required.

A-9.20.1.2. Seismic Zones. Information on seismic zones for various localities can be found in Appendix C, Climatic Information for Building Design in Canada.

A-9.20.8.5. Distance from Edge of Masonry to Edge of Supporting Members



30 mm maximum for hollow units not less than 90 mm wide
12 mm maximum for hollow units less than 90 mm wide
1/3 of veneer width for solid units

Figure A-9.20.8.5.
Maximum projection of masonry beyond its support

A-9.20.12.2.(2) Corbelling of Masonry Foundation Walls

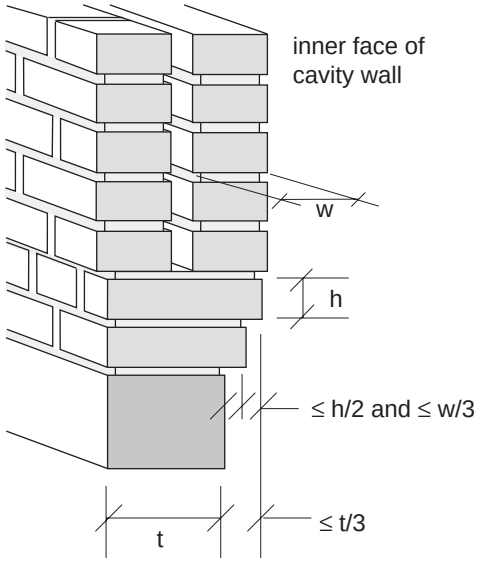


Figure A-9.20.12.2.
Maximum corbel dimensions

A-9.20.13.9.(3) Dampproofing of Masonry Walls. The reason for installing sheathing paper behind masonry walls is to prevent rainwater from reaching the interior finish if it should leak past the masonry. The sheathing paper intercepts the rainwater and leads it to the bottom of the wall where the flashing directs it to the exterior via weep holes. If the insulation is a type that effectively resists the penetration of water, and is installed so that water will not collect behind it, then there is no need for

Table A-9.25.1.2.A.
Minimum Thicknesses of Low Permeance Insulating Sheathing

Celsius Heating Degree-days	Min. RSI Ratio	38 x 89 Framing					38 x 140 Framing				
		Min. Outboard Thermal Resistance, RSI	Min. Sheathing Thickness, mm				Min. Outboard Thermal Resistance, RSI	Min. Sheathing Thickness, mm			
			Sheathing Thermal Resistance, RSI/mm					Sheathing Thermal Resistance, RSI/mm			
			0.0300	0.0325	0.0350	0.0400		0.0300	0.0325	0.0350	0.0400
≤ 4999	0.20	0.46	10	10	9	8	0.72	19	17	16	14
5000 to 5999	0.30	0.69	18	17	16	14	1.07	31	28	26	23
6000 to 6999	0.35	0.81	22	20	19	16	1.25	37	34	32	28
7000 to 7999	0.40	0.92	26	24	22	19	1.43	43	39	37	32
8000 to 8999	0.50	1.16	34	31	29	25	1.79	55	50	47	41
9000 to 9999	0.55	1.27	37	34	32	28	1.97	61	56	52	45
10000 to 10999	0.60	1.39	41	38	35	31	2.15	67	61	57	50
11000 to 11999	0.65	1.50	45	42	39	34	2.33	73	67	62	54
≥ 12000	0.75	1.73	53	49	45	40	2.69	85	78	72	63

The air leakage characteristics and water vapour permeance values for a number of common materials are given in Table A-9.25.1.2.B. These values are provided on a generic basis; specific materials may have values differing somewhat from those in the table.

Table A-9.25.1.2.B.
Air and Vapour Permeance Values(1)

Material	Air Leakage Characteristic, L/(s • m^2) at 75 Pa	Water Vapour Permeance, ng/(Pa • s • m^2)
Sheathing (low insulation value)		
12.7-mm foil-backed gypsum board	negligible	negligible
6.4-mm plywood	0.0084	23 – 74
12.7-mm gypsum board sheathing	0.0091	1373
11-mm oriented strandboard	0.0108	44
11-mm fibreboard sheathing	0.8285	772 – 2465
17-mm wood sheathing	high – depends on no. of joints	982

Table A-9.25.1.2.B. (Continued)

Material	Air Leakage Characteristic, L/(s • m^2) at 75 Pa	Water Vapour Permeance, ng/(Pa • s • m^2)
Insulation		
25-mm foil-faced urethane	negligible	negligible
25-mm extruded polystyrene	negligible	23 – 92
25-mm urethane foam	negligible	69
25-mm phenolic foam	negligible	133
25-mm expanded polystyrene (Type 2)	0.0214	86 – 160
fibrous insulations	very high	very high
Membrane materials		
metal	negligible	negligible
0.15-mm polyethylene	negligible	1.6 – 5.8
breather type sheathing membrane	0.2706	170 – 1400
spun bonded polyolefin film	0.9593	3646

Notes to Table A-9.25.1.2.B.:

(1) Air leakage and vapour permeance values derived from:

- Bombaru, D., Jutras, R. and Patenaude, A. Air Permeance of Building Materials. Summary Report prepared by AIR-INS Inc. for Canada Mortgage and Housing Corporation, Ottawa, 1988. Values indicate properties of tested materials only. Values for specific products may vary significantly. *e 2*
- The Details of Air Barrier Systems for Houses. Ontario New Home Warranty Program, Toronto, 1993.

A-9.25.2.2.(2) Flame-Spread Ratings of Insulating Materials. Part 9 has no requirements for flame-spread ratings of insulation materials since these are seldom exposed in parts of buildings where fires are likely to start. Certain of the insulating material standards referenced in Sentence 9.25.2.2.(1) do include flame-spread rating criteria. These are included either because the industry producing the product wishes to demonstrate that their product does not constitute a fire hazard or because the product is regulated by authorities other than building authorities (e.g., Hazardous Products Act). However, the Code cannot apply such requirements to some materials and not to others. Hence, these flame-spread rating requirements are excepted in referencing these standards.

A-9.25.2.3.(3) Position of Insulation. For thermal insulation to be effective, it must not be short-circuited by convective air flow through or around the material. If low density fibrous insulation is installed with an air space on both sides of the insulation, the temperature differential between the warm and cold sides will drive convective air flow around the insulation. If foam plastic insulation is spot adhered to a back-up wall or adhered in a grid pattern to an air permeable substrate, and is not sealed at the joints and around the perimeter, air spaces between the insulation and the substrate will interconnect with spaces behind the cladding. Any temperature or air pressure differential across the insulation will again lead to short circuiting of the insulation by air flow. Thermal insulation must therefore be installed in full and continuous contact with the air barrier or another continuous component with low air permeance. (See Appendix note A-9.25.3.2. for examples of low-air-permeance materials.)

A-9.25.2.4.(3) Loose-Fill Insulation in Existing Wood Frame Walls. The addition of insulation into exterior walls of existing wood frame buildings increases the likelihood of damage to framing and cladding components as a result of moisture accumulation. Many older homes were constructed with little or no regard for protection from vapour transmission or air leakage from the interior. Adding thermal insulation will substantially reduce the temperature of the siding or sheathing in winter months, possibly leading to condensation of moisture at this location.

Defects in exterior cladding, flashing and caulking could result in rain entering the wall cavity. This moisture, if retained by the added insulation, could initiate the process of decay.

Steps should be taken therefore, to minimize these effects prior to the retrofit of any insulation. Any openings in walls that could permit leakage of interior heated air into the wall cavity should be sealed. The inside surface should be coated with a low-permeability paint to reduce moisture transfer by diffusion. Finally, the exterior siding, flashing and caulking should be checked and repaired if necessary to prevent rain penetration.

A-9.25.2.4.(5) Loose-Fill Insulation in Masonry Walls. Typical masonry cavity wall construction techniques do not lend themselves to the prevention of entry of rainwater into the wall space. For this reason, loose-fill insulation used in

such space must be of the water repellent type. A test for water-repellency of loose-fill insulation suitable for installation in masonry cavity walls can be found in ASTM C 516, "Vermiculite Loose Fill Thermal Insulation."

A-9.25.3.1.(1) Air Barrier Systems for Control of Condensation. The majority of moisture problems resulting from condensation of water vapour in walls and ceiling/attic spaces are caused by the leakage of moist interior heated air into these spaces rather than by the diffusion of water vapour through the building envelope.

Protection against such air leakage must be provided by a system of air-impermeable materials joined with leak-free joints. Generally, air leakage protection can be provided by the use of air-impermeable sheet materials, such as gypsum board or polyethylene of sufficient thickness, when installed with appropriate structural support. However, the integrity of the airtight elements in the air barrier system can be compromised at the joints and here special care must be taken in design and construction to achieve an effective air barrier system.

Although Section 9.25. refers separately to vapour barriers and airtight elements in the air barrier system, these functions in a wall or ceiling assembly of conventional wood frame construction are often combined as a single membrane that acts as a barrier against moisture diffusion and the movement of interior air into insulated wall or roof cavities. Openings cut through this membrane, such as for electrical boxes, provide opportunities for air leakage into concealed spaces, and special measures must be taken to make such openings as airtight as possible. Attention must also be paid to less obvious leakage paths, such as holes for electric wiring, plumbing installations, wall-ceiling and wall-floor intersections, and gaps created by shrinkage of framing members.

In any case, air leakage must be controlled to a level where the occurrence of condensation will be sufficiently rare, or the quantities accumulated sufficiently small, and drying sufficiently rapid, to avoid material deterioration and the growth of mould and fungi.

Generally the location in a building assembly of the airtight element of the air barrier system is not critical; it can restrict air leakage whether it is located near the outer surface of the assembly, near the inner surface or at some intermediate location. However, if a material chosen to act as an airtight element in the air barrier system also has the characteristics of a vapour barrier (i.e. low permeability to water vapour), its location must be chosen more carefully in order to avoid moisture problems. [See Appendix notes A-9.25.1.2. and A-9.25.4.2.(2).]

In some constructions, an airtight element in the air barrier system is the interior finish, such as gypsum board, which is sealed to framing members and adjacent components by gaskets, caulking, tape or other methods to complete the air barrier system. In such cases, special care in sealing joints in a separate vapour barrier is not critical. This approach often uses no separate vapour barrier but relies on appropriate paint coatings to give the interior finish sufficient resistance to water vapour diffusion that it can provide the required vapour diffusion protection.

The wording in Section 9.25. allows for such innovative techniques, as well as the more traditional approach of using a continuous sheet, such as polyethylene, to act as an "air/vapour barrier."

Further information is available in "Moisture Problems in Houses," by A.T. Hansen, Canadian Building Digest 231, available from the Institute for Research in Construction, National Research Council of Canada, Ottawa K1A 0R6.

A-9.25.3.2. Air Barrier System Properties. Materials that have been tested and are considered to have low air permeance include:

- 2 mm smooth surface roofing membrane
- 2.7 mm modified bituminous torch-on membranes
- 1.3 mm modified bituminous self-adhesive membranes
- 12.7 mm gypsum board
- 12.7 mm cement board
- 8 mm plywood
- 12.7 mm particle board
- 11 mm waferboard
- 3.2 mm tempered hardboard
- 38 mm extruded polystyrene
- 25.4 mm foil back urethane insulation
- 24 mm phenolic insulation board
- aluminum foil
- polyethylene sheet
- reinforced non-perforated polyolefin.

Characteristics of specific products may vary significantly. *e 2*

A-9.25.4.2.(2) Increased Vapour Diffusion Resistance. Sentence 9.25.4.2.(2) indicates that where other elements in the building assembly have low vapour permeance, the vapour permeance of the element identified as the vapour barrier must be further reduced. As discussed in Appendix note A-9.25.1.2., the location or installation of elements with low air permeance and low vapour permeance requires special consideration to avoid moisture related deterioration. The following provides additional information on a variety of elements in the building assembly that may have low vapour permeance and thereby either perform as the vapour barrier or whose presence may demand more stringent requirements for the element identified as the vapour barrier.

Cladding

Different cladding materials have different vapour permeances and different susceptibilities to moisture deterioration. They are also installed in different manners which are more or less able to release moisture that may accumulate on the inner surface. Where low permeance cladding materials such as metal or vinyl siding, materials with a permeance less than 60 ng/(Pa • s • m^2), are installed with tight joints and without a vented air space, as may be the case with lock-seam metal siding the vapour barrier must provide greater control of vapour diffusion. Sentence 9.25.4.2.(2) specifies a maximum permeance of 15 ng/(Pa • s • m^2). Assemblies clad with standard residential vinyl or metal siding would not require additional protection as the joints are not so tight as to prevent the dissipation of moisture.

Low permeance cladding cannot itself serve as the vapour barrier as it will often fall to a temperature below that where saturation would occur.

Sheathing

Like cladding, sheathing materials have different vapour permeances and different susceptibilities to moisture deterioration. Again, where sheathing with a permeance less than 60 ng/(Pa • s • m^2), such as plywood, is installed, the permeance of the vapour barrier should not exceed 15 ng/(Pa • s • m^2).

Low permeance sheathing may serve as the vapour barrier if it can be shown that the interior surface of the sheathing will not fall below the temperature where saturation will occur. This may be the case where insulating sheathing is used. (See A-9.25.1.2.)

Thermal Insulation

Where low permeance foamed plastic is the sole thermal insulation in the building assembly, the inner surface of this element will be close to the interior temperature. In this case, no additional vapour barrier is needed to control condensation within the assembly. Where low permeance thermal insulation is installed on the outside of an insulated frame wall, however, the inner surface of the plastic insulation may fall below the temperature at which saturation will occur. In this case, a separate element must be installed to provide the necessary vapour diffusion protection. (See A-9.25.1.2.)

Air Barrier Systems

In residential construction, the airtight element in the air barrier system often provides the required resistance to vapour diffusion and thereby also serves as the vapour barrier. In this case, the combined air/vapour barrier must be positioned sufficiently close to the warm side of the assembly to remain above the dew point temperature of the indoor air.

Any moisture from the indoor air that diffuses through the inner layers of the assembly or is carried by air leakage through those layers is likely to be trapped at such an air barrier. This will not cause a problem if the air/vapour barrier is located where the temperature is above the dew point of the indoor air; the trapped water vapour will remain as vapour and no harm will be done. But if the air/vapour barrier is located where the temperature is below the dew point of the indoor air, the trapped water vapour will condense or freeze. If this temperature remains below the dew point for any length of time, significant moisture could accumulate. Moisture that remains in a building assembly into warmer weather can allow the growth of decay organisms. (See A-9.25.1.2.)

A-9.25.4.3.(2) Location of Vapour Barriers. Assemblies in which the vapour barrier is located partway through the insulation meet the intent of this Article provided it can be shown that the temperature of the vapour barrier will not fall below the dew point of the heated interior air.

A-9.26.2.2.(4) Fasteners for Treated Shingles. Where shingles or shakes have been chemically treated with a preservative or a fire retardant, the fastener should be of a material known to be compatible with the chemicals used in the treatment.

A-9.26.17.1.(1) Installation of Concrete Roof Tiles. Where concrete roof tiles are to be installed, the dead load imposed by this material should be considered in determining the minimum sizes and maximum spans of the supporting roof members.

A-9.27.10.2.(3) Grooves in Hardboard Cladding. Grooves deeper than that specified may be used in thicker cladding providing they do not reduce the thickness to less than the required thickness minus 1.5 mm. Thus for type 1 or 2 cladding, grooves must not reduce the thickness to less than 4.5 mm or 6 mm depending on method of support, or to less than 7.5 mm for type 5 material.

A-9.27.11.2.(2) Thickness of Grade O-2 OSB. In using Table 9.27.9.2. to determine the thickness of Grade O-2 OSB cladding, substitute "face orientation" for "face grain" in the column headings.

A-Table 9.28.4.3. Stucco Lath. Paper-backed welded wire lath may also be used on horizontal surfaces provided its characteristics are suitable for such application.

Appendix D
Fire-Performance Ratings

Section D-1 General

The contents of this Appendix have been prepared on the recommendations of the Standing Committee on Fire Performance Ratings, which was established by the Canadian Commission on Building and Fire Codes (CCBFC) for this purpose.

D-1.1. Introduction

D-1.1.1. Scope

1) This fire-performance information is presented in a form closely linked to the performance requirements and the minimum materials specifications of the National Building Code of Canada 1995.

2) The ratings have been assigned only after careful consideration of all available literature on assemblies of common building materials, where they are adequately identified by description. The assigned values based on this information will, in most instances, be conservative when compared to the ratings determined on the basis of actual tests on individual assemblies.

3) The fire-performance information set out in this Appendix applies to materials and assemblies of materials which comply in all essential details with the minimum structural design standards described in Part 4 of the National Building Code of Canada. Additional requirements, where appropriate, are described in other Sections of this Appendix.

4) Section D-2 of this Appendix assigns fire-resistance ratings for walls, floors, roofs, columns and beams related to CAN/ULC-S101-M, "Fire Endurance Tests of Building Construction and Materials," and describes methods for determining these ratings.

5) Section D-3 assigns flame-spread ratings and smoke developed classifications for surface materials related to CAN/ULC-S102-M, "Test for Surface Burning Characteristics of Building Materials and Assemblies," and CAN/ULC-S102.2-M, "Test for Surface Burning Characteristics of Flooring, Floor Covering, and Miscellaneous Materials and Assemblies."

6) Section D-4 describes noncombustibility in building materials when tested in accordance with CAN4-S114-M, "Test for Determination of Non-Combustibility in Building Materials."

7) Section D-5 contains requirements for the installation of fire doors and fire dampers in fire-rated stud wall assemblies and the installation of fire stop flaps in fire-rated membrane ceilings.

8) Section D-6 contains background information regarding fire test reports, obsolete materials and assemblies, assessment of archaic assemblies and the development of the component additive method.

D-1.1.2. Referenced Documents

1) Where documents are referenced in this Appendix, they shall be the editions designated in Table D-1.1.2.

This Appendix is included for explanatory purposes only and does not form part of the requirements. The bold face reference numbers that introduce each item do not relate to specific requirements in the Code.

Table D-1.1.2.
Documents Referenced in Appendix D Fire-Performance Ratings

	Issuing Agency	Document Number	Title of Document	Reference
r, e2	ANSI	A208.1-1993	Particleboard	Table D-3.1.1.A.
r	ASTM	C 36-97	Gypsum Wallboard	D-1.5.1. Table D-3.1.1.A.
r	ASTM	C 37-95	Gypsum Lath	D-1.5.1.
r	ASTM	C 330-97	Lightweight Aggregates for Structural Concrete	D-1.4.3.(2)
r	ASTM	C 442-95	Gypsum Backing Board and Coreboard	D-1.5.1. Table D-3.1.1.A.
r	ASTM	C 588-95a	Gypsum Base for Veneer Plaster	D-1.5.1. Table D-3.1.1.A.
r	ASTM	C 630/C 630M-96a	Water Resistant Gypsum Backing Board	D-1.5.1. Table D-3.1.1.A.
r, e2	ASTM	C 931/C 931M-95a	Exterior Gypsum Soffit Board	D-1.5.1. Table D-3.1.1.A.
r	ASTM	C 960-97	Predecorated Gypsum Board	D-1.5.1.
	CCBFC	NRCC 30629	Supplement to the National Building Code of Canada 1990	D-6.2. D-6.3. D-6.4.
	CGSB	4-GP-36M-1978	Carpet Underlay, Fibre Type	Table D-3.1.1.B.
	CGSB	CAN/CGSB-4.129-93	Carpets for Commercial Use	Table D-3.1.1.B.
	CGSB	CAN/CGSB-11.3-M87	Hardboard	Table D-3.1.1.A.
	CGSB	CAN/CGSB-34.16-M89	Sheets, Asbestos-Cement, Flat, Fully Compressed	Table D-3.1.1.A.
	CGSB	CAN/CGSB-51.60-M90	Cellulose Fibre Loose Fill Thermal Insulation	D-2.3.4.(5)
	CGSB	CAN/CGSB-92.2-M90	Trowel or Spray Applied Acoustical Material	D-2.3.4.(5)
r	CSA	A23.1-94	Concrete Materials and Methods of Concrete Construction	D-1.4.3.(1)
r	CSA	A23.3-94	Design of Concrete Structures	D-2.1.5. D-2.6.6. D-2.8.2.
e2				Table D-2.8.2.
	CSA	A82.5-M1978	Structural Clay Non-Load-Bearing Tile	Table D-2.6.1.A.
	CSA	A82.22-M1977	Gypsum Plasters	Table D-3.1.1.A.
	CSA	CAN/CSA-A82.27-M91	Gypsum Board	D-1.5.1. Table D-3.1.1.A.
	CSA	A82.30-M1980	Interior Furring, Lathing and Gypsum Plastering	D-1.7.2.(1) D-2.3.9.(1) Table D-2.5.1.
	CSA	A82.31-M1980	Gypsum Board Application	D-2.3.9.
	CSA	A126.1-M1984	Vinyl Asbestos and Vinyl Composition Floor Tile	Table D-3.1.1.B.
	CSA	A165.1-94	Concrete Masonry Units	Table D-2.1.1.

Table D-1.1.2. (Continued)

	Issuing Agency	Document Number	Title of Document	Reference
	CSA	CAN/CSA-A247-M86	Insulating Fibreboard	Table D-3.1.1.A.
	CSA	CAN/CSA-G312.3-M92	Metric Dimensions for Structural Steel Shapes and Hollow Structural Sections	D-2.6.6.
e	CSA	O86.1-94	Engineering Design in Wood (Limit States Design)	D-2.11.2.(1) D-2.11.2.(2)
	CSA	O121-M1978	Douglas Fir Plywood	Table D-3.1.1.A.
	CSA	CAN/CSA-O141-91	Softwood Lumber	D-2.3.6.(2) Table D-2.4.1.
	CSA	O151-M1978	Canadian Softwood Plywood	Table D-3.1.1.A.
	CSA	O153-M1980	Poplar Plywood	Table D-3.1.1.A.
e	CSA	O437.0-93	OSB and Waferboard	Table D-3.1.1.A.
	CSA	CAN/CSA-S16.1-94	Limit States Design of Steel Structures	D-2.6.6.
r	NFPA	80-1995	Fire Doors and Fire Windows	D-5.2.1.
	ULC	CAN/ULC-S101-M89	Fire Endurance Tests of Building Construction and Materials	D-1.1.1.(4) D-1.12.1. D-2.3.2.
	ULC	CAN/ULC-S102-M88	Test for Surface Burning Characteristics of Building Materials and Assemblies	D-1.1.1.(5)
	ULC	CAN/ULC-S102.2-M88	Test for Surface Burning Characteristics of Flooring, Floor Covering, and Miscellaneous Materials and Assemblies	D-1.1.1.(5) Table D-3.1.1.B.
	ULC	CAN4-S114-M80	Test for Determination of Non-Combustibility in Building Materials	D-1.1.1.(6) D-4.1.1. D-4.2.1.
	ULC	S505-1974	Fusible Links for Fire Protection Service	D-5.3.2.
r	ULC	CAN/ULC-S702-97	Thermal Insulation, Mineral Fibre, for Buildings	Table D-2.3.4.A. Table D-2.3.4.D. D-2.3.5. Table D-2.6.1.E. D-6.4.

D-1.1.3. Applicability of Ratings

The ratings shown in this document apply if more specific test values are not available. The construction of an assembly that is the subject of an individual test report must be followed in all essential details if the fire resistance rating reported is to be applied for use with this Code.

D-1.1.4. Higher Ratings

The authority having jurisdiction may allow higher fire-resistance ratings than those derived from this Appendix, where supporting evidence justifies a higher rating. Additional information is provided in summaries of published test information and the reports of fire tests carried out by the Institute for Research in Construction, National Research Council of Canada, included in Section D-6, Background Information.

D-1.1.5. Additional Information on Fire Rated Assemblies

Assemblies containing materials for which there is no nationally recognized standard are not included

in this Appendix. Many such assemblies have been
e 2 rated by Underwriters Laboratories (UL), Underwriters' Laboratories of Canada (ULC), or Intertek
e 2 Testing Services NA Ltd. (ITS). The UL "Fire Resistance Directory," Volume 1, can be obtained from UL, 333 Pfingsten Road, Northbrook, Illinois 60062 U.S.A. The ULC information is published in their "List of Equipment and Materials," Volume III, Fire Resistance. Copies of this document may be obtained from ULC, 7 Crouse Road, Scarborough, Ontario M1R 3A9. ITS' "Directory of Listed Products" can be obtained from ITS, 3210 American Drive, Mississauga, Ontario L4V 1B3.

D-1.2. Interpretation of Test Results

D-1.2.1. Limitations

1) The fire-performance ratings set out in this Appendix are based on those that would be obtained from the standard methods of test described in the Code. The test methods are essentially a means of comparing the performance of one building component or assembly with another in relation to its performance in fire.

2) Since it is not practicable to measure the fire resistance of constructions in situ, they must be evaluated under some agreed test conditions. A specified fire-resistance rating is not necessarily the actual time that the assembly would endure in situ in a building fire, but is that which the particular construction must meet under the specified methods of test.

3) Considerations arising from departures in use from the conditions established in the standard test methods may, in some circumstances, have to be taken into account by the designer and the authority having jurisdiction. Some of these conditions are covered at present by the provisions of the National Building Code.

4) For walls and partitions, the stud spacings previously specified as 16 or 24 inch have been converted to 400 and 600 mm, respectively, for consistency with other metric values; however, the use of equivalent imperial dimensions for stud spacing is permitted.

D-1.3. Concrete

D-1.3.1. Aggregates in Concrete

Low density aggregate concretes generally exhibit better fire performance than natural stone aggregate concretes. A series of tests on concrete masonry walls, combined with mathematical analysis of the test results, has allowed further distinctions between certain low density aggregates to be made.

D-1.4. Types of Concrete

D-1.4.1. Description

1) For purposes of this Appendix, concretes are described as Types S, N, L, L_1, L_2, L40S, $L_1$20S or $L_2$20S as described in (2) to (8).

2) Type S concrete is the type in which the coarse aggregate is granite, quartzite, siliceous gravel or other dense materials containing at least 30% quartz, chert or flint.

3) Type N concrete is the type in which the coarse aggregate is cinders, broken brick, blast furnace slag, limestone, calcareous gravel, trap rock, sandstone or similar dense material containing not more than 30% of quartz, chert or flint.

4) Type L concrete is the type in which all the aggregate is expanded slag, expanded clay, expanded shale or pumice.

5) Type L_1 concrete is the type in which all the aggregate is expanded shale.

6) Type L_2 concrete is the type in which all the aggregate is expanded slag, expanded clay or pumice.

7) Type L40S concrete is the type in which the fine portion of the aggregate is sand and low density aggregate in which the sand does not exceed 40% of the total volume of all aggregates in the concrete.

8) Type $L_1$20S and Type $L_2$20S concretes are the types in which the fine portion of the aggregate is sand and low density aggregate in which the sand does not exceed 20% of the total volume of all aggregates in the concrete.

D-1.4.2. Determination of Ratings

Where concretes are described as being of Type S, N, L, L_1 or L_2, the rating applies to the concrete containing the aggregate in the group that provides the least fire resistance. If the nature of an aggregate cannot be determined accurately enough to place it in one of the groups, the aggregate shall be considered as being in the group that requires a greater thickness of concrete for the required fire resistance.

D-1.4.3. Description of Aggregates

1) The descriptions of the aggregates in Type S and Type N concretes apply to the coarse aggregates only. Coarse aggregate for this purpose means that retained on a 5 mm sieve using the method of grading aggregates described in CSA A23.1, "Concrete Materials and Methods of Concrete Construction."

2) Increasing the proportion of sand as fine aggregate in low density concretes requires

Table D-3.1.1.B.
Flame-Spread Ratings and Smoke Developed Classifications for Combinations of Common Floor Finish Materials and Surface Coatings[1]

Materials	Applicable Standard	FSR/SDC[2]
Hardwood or softwood flooring either unfinished or finished with a spar or urethane varnish coating	None	300/300
Vinyl-asbestos flooring not more than 4.8 mm thick applied over plywood or lumber subfloor or direct to concrete	CSA A126.1-M	300/300
Wool carpet (woven), pile weight not less than 1120 g/m^2, applied with or without felt underlay[3]	CAN/CGSB-4.129-93	300/300
Nylon carpet, pile weight not less than 610 g/m^2 and not more than 800 g/m^2, applied with or without felt underlay[3]	CAN/CGSB-4.129-93	300/500
Nylon carpet, pile weight not less than 610 g/m^2 and not more than 1355 g/m^2, glued down to concrete	CAN/CGSB-4.129-93	300/500
Wool/nylon blend carpet (woven) with not more than 20% nylon and pile weight not less than 1120 g/m^2	CAN/CGSB-4.129-93	300/500
Nylon/wool blend carpet (woven) with not more than 50% wool, pile weight not less than 610 g/m^2 and not more than 800 g/m^2	CAN/CGSB-4.129-93	300/500
Polypropylene carpet, pile weight not less than 500 g/m^2 and not more than 1200 g/m^2, glued down to concrete	CAN/CGSB-4.129-93	300/500

Notes to Table D-3.1.1.B.:
(1) Tested on the floor of the tunnel in conformance with provisions of CAN/ULC-S102.2-M, "Test for Surface Burning Characteristics of Flooring, Floor Covering, and Miscellaneous Materials and Assemblies."
(2) Flame Spread Rating/Smoke Developed Classification.
(3) Type 1 or 2 underlay as described in CGSB 4-GP-36M, "Carpet Underlay, Fibre Type."

D-3.1.4. Effect of Surface Coatings

Thin surface coatings can modify flame-spread characteristics either upward or downward. Table D-3.1.1.A. includes a number of thin coatings that increase the flame-spread rating of the base material, so that these may be considered where more precise control over flame spread hazard is desired.

D-3.1.5. Proprietary Materials

1) Information on flame-spread rating of proprietary materials and fire-retardant treatments that cannot be described in sufficient detail to ensure reproducibility is available through the listing and labelling services of Underwriters' Laboratories *e 2* of Canada, Intertek Testing Services NA Ltd. (3210 American Drive, Mississauga, Ontario L4V 1B3), or other recognized testing laboratory.

2) A summary of flame spread test results published prior to 1965 has been prepared by the Institute for Research in Construction of the National Research Council of Canada (see Item (1) in D-6.1. Fire Test Reports).

D-3.1.6. Limitations and Conditions

1) The propagation of flame along a surface in the standard test involves some finite depth of the material or materials behind the surface, and this involvement extends to the depth to which temperature variations are to be found during the course of the test; for many commonly used lining materials, such as wood, the depth involved is about 25 mm.

2) For all the combustible materials described in Table D-3.1.1.A., a minimum dimension is shown, and this represents the thickness of the test samples on which the rating has been based; when used in greater thicknesses than that shown, these materials may have a slightly lower flame-spread rating, and thinner specimens may have higher flame-spread ratings.

3) No rating has been included for foamed plastic materials because it is not possible at this time to identify these products with sufficient accuracy on a generic basis. Materials of this type that melt when exposed to the test flame generally show an increase in flame-spread rating as the thickness of the test specimen increases.

D-3.1.7. Referenced Standards

In Tables D-3.1.1.A. and D-3.1.1.B., the standards applicable to the materials described are noted because the ratings depend on conformance with these specifications.

Section D-4 Noncombustibility

D-4.1. Test Method

D-4.1.1. Determination of Noncombustibility

1) Noncombustibility is required of certain components of buildings by the provisions of this Code, which specifies noncombustibility by reference to CAN4-S114-M, "Test for Determination of Non-Combustibility in Building Materials."

2) The test to which reference is made in (1) is severe, and it may be assumed that any building material containing even a small proportion of combustibles will itself be classified as combustible. The specimen, 38 mm by 51 mm, is exposed to a temperature of 750°C in a small furnace. The essential criteria for noncombustibility are that the specimen does not flame or contribute to temperature rise.

D-4.2. Materials Classified as Combustible

D-4.2.1. Combustible Materials

Most materials from animal or vegetable sources will be classed as combustible by CAN4-S114-M, "Test for Determination of Non-Combustibility in Building Materials," and wood, wood fibreboard, paper, felt made from animal or vegetable fibres, cork, plastics, asphalt and pitch would therefore be classed as combustible.

D-4.2.2. Composite Materials

Materials that consist of combustible and noncombustible elements in combination will in many cases also be classed as combustible, unless the proportion of combustibles is very small. Some mineral wool insulations with combustible binder, cinder concrete, cement and wood chips and wood-fibred gypsum plaster would also be classed as combustible.

D-4.2.3. Effect of Chemical Additives

The addition of a fire-retardant chemical is not sufficient to change a combustible product to a noncombustible product.

D-4.3. Materials Classified as Noncombustible

D-4.3.1. Typical Examples

Noncombustible materials include brick, ceramic tile, concrete made from Portland cement with noncombustible aggregate, asbestos cement, plaster made from gypsum with noncombustible aggregate, metals commonly used in buildings, glass, granite, sandstone, slate, limestone and marble.

Section D-5 Protection of Openings in Fire-Rated Assemblies

D-5.1. Scope

D-5.1.1. Installation Information

1) The information in D-5 specifies requirements for

(a) the installation of fire doors and fire dampers in gypsum-wallboard-protected stud wall assemblies, and

(b) fire stop flaps for installation in fire-rated membrane ceilings.

D-5.2. Installation of Fire Doors and Fire Dampers

D-5.2.1. References

1) Fire doors and fire dampers in gypsum-wallboard-protected steel stud non-loadbearing walls required to have a fire-resistance rating shall be installed in conformance with Section 9.24. of this Code and the applicable requirements of NFPA 80, "Fire Doors and Fire Windows."

2) Fire doors and fire dampers in gypsum-wallboard-protected wood stud walls required to have a fire-resistance rating shall be installed in conformance with Section 9.23. of this Code and the applicable requirements of NFPA 80, "Fire Doors and Fire Windows."

D-5.3. Fire Stop Flaps

D-5.3.1. Construction Requirements

Fire stop flaps shall be constructed of steel not less than 1.5 mm thick, covered on both sides with