

9.22.9. Clearance of Combustible Material

9.22.9.1. Clearance to the Fireplace Opening

(1) *Combustible* material shall not be placed on or near the face of a fireplace within 150 mm (5⁷/₈ in) of the fireplace opening, except that where the *combustible* material projects more than 38 mm (1¹/₂ in) out from the face of the fireplace above the opening, such material shall be at least 300 mm (11³/₄ in) above the top of the opening.

9.22.9.2. Metal Exposed to the Interior

(1) Metal exposed to the interior of a fireplace such as the damper control mechanism shall have at least a 50 mm (2 in) clearance from any *combustible* material on the face of the fireplace where such metal penetrates through the face of the fireplace.

9.22.9.3. Clearance to Combustible Framing

(1) Not less than a 100 mm (4 in) clearance shall be provided between the back and sides of a solid fuel-burning fireplace and *combustible* framing, except that a 50 mm (2 in) clearance is permitted where the fireplace is located in an exterior wall.

(2) Not less than a 50 mm (2 in) clearance shall be provided between the back and sides of the smoke chamber of a solid fuel-burning fireplace and *combustible* framing, except that a 25 mm (1 in) clearance is permitted where the fireplace is located in an exterior wall.

9.22.9.4. Heat Circulating Duct Openings

(1) The clearance of *combustible* material above heat circulating duct openings from those openings shall be not less than,

- (a) 300 mm (11³/₄ in) where the *combustible* material projects not less than 38 mm (1¹/₂ in) from the face, and
- (b) 150 mm (5⁷/₈ in) where the projection is less than 38 mm (1¹/₂ in).

9.22.10. Fireplace Inserts and Hearth-Mounted Stoves

9.22.10.1. Appliance Standard

(1) Fireplace inserts and hearth mounted *stoves* vented through the throat of a fireplace shall conform to ULC-S628, "Fireplace Inserts".

9.22.10.2. Installation

(1) The installation of fireplace inserts and hearth mounted *stoves* vented through the throat of a fireplace shall conform to CAN/CSA-B365, "Installation Code for Solid-Fuel Burning Appliances and Equipment".

(2) Fireplace inserts and hearth mounted *stoves* vented through the throat of a fireplace described in Sentence (1) may be installed in existing fireplaces only if a minimum thickness of 190 mm (7¹/₂ in) of solid masonry is provided between the smoke chamber and any existing *combustible* materials, unless the insert is listed for lesser clearances.

(3) A fireplace insert installed in a masonry fireplace shall have,

- (a) a *listed* metal *chimney* liner installed from the insert collar to the top of the *chimney*, or
- (b) a direct sealed connection to the *chimney flue* where such provision is part of an insert conforming to Sentence 9.22.10.1.(1).

Section 9.23. Wood-Frame Construction

9.23.1. Application

9.23.1.1. Limitations (See Appendix A.)

- (1) This Section applies where wall, floor and roof planes are generally comprised of lumber frames of small repetitive structural members, or engineered components, and where,
 - (a) roof and wall planes are clad, sheathed or braced on at least one side,
 - (b) the small repetitive structural members are spaced not more than 600 mm (23⁵/₈ in) o.c.,
 - (c) the walls do not serve as *foundations*,
 - (d) the specified *live load* on supported subfloors and floor framing does not exceed 2.4 kPa (50 psf), and
 - (e) the span of any structural member does not exceed 12.20 m (40 ft).
- (2) Where the conditions in Sentence (1) are exceeded for wood construction, the design of the framing and fastening shall conform to Subsection 4.3.1.

9.23.2. General

9.23.2.1. Strength and Rigidity

- (1) All members shall be so framed, anchored, fastened, tied and braced to provide the necessary strength and rigidity.

9.23.2.2. Protection from Decay

- (1) Ends of wood joists, beams and other members framing into masonry or concrete shall be treated to prevent decay where the bottom of the member is at or below ground level, or a 12 mm (½ in) air space shall be provided at the end and sides of the member.
- (2) Air spaces required in Sentence (1) shall not be blocked by insulation, *vapour barriers* or airtight materials.

9.23.2.3. Protection from Dampness

- (1) Except as permitted in Sentence (2), wood framing members that are not pressure-treated with a wood preservative and which are supported on concrete in contact with the ground or *fill* shall be separated from the concrete by not less than 0.05 mm (0.002 in) polyethylene film or Type S roll roofing.
- (2) Dampproofing material referred to in Sentence (1) is not required where the wood member is at least 150 mm (5⁷/₈ in) above the ground.

9.23.2.4. Lumber

- (1) Lumber shall conform to the appropriate requirements in Subsection 9.3.2.

9.23.2.5. Termite Protection

- (1) Where termites are known to exist, unless pressure-treated with a chemical that is toxic to such termites in accordance with Article 9.3.2.9., wood steps shall rest on a non-cellulosic base or apron extending at least 150 mm (5⁷/₈ in) above the ground.
- (2) Wood lattice or skirting around porches shall be separated from piers and *soil* by at least 50 mm (2 in).

9.23.3. Fasteners**9.23.3.1. Standards for Nails and Screws**

- (1) Unless otherwise indicated, nails specified in this Section shall be common steel wire nails or common spiral nails, conforming to CSA B111, "Wire Nails, Spikes and Staples".
- (2) Wood screws specified in this Section shall conform to ANSI/ASME B18.6.1., "Wood Screws (Inch Series)". (See Appendix A.)

9.23.3.2. Length of Nails

- (1) All nails shall be long enough so that not less than half their required length penetrates into the second member.

9.23.3.3. Prevention of Splitting

- (1) Splitting of wood members shall be minimized by staggering the nails in the direction of the grain and by keeping nails well in from the edges. (See Appendix A.)

9.23.3.4. Nailing of Framing

- (1) Except as provided in Sentence (2), nailing of framing shall conform to Table 9.23.3.4.

Table 9.23.3.4.
Nailing for Framing
Forming Part of Sentence 9.23.3.4.(1)

Construction Detail	Minimum Length of Nails, mm (in)	Minimum Number or Maximum Spacing of Nails
Floor joist to plate - toe nail	82 (3¼)	2
Wood or metal strapping to underside of floor joists	57 (2¼)	2
Cross bridging to joists	57 (2¼)	2 at each end
Double header or trimmer joists	76 (3)	300 mm (11¾ in) (o.c.)
Floor joist to stud (balloon construction)	76 (3)	2
Ledger strip to wood beam	82 (3¼)	2 per joist
Joist to joist splice (See also Table 9.23.13.8.)	76 (3)	2 at each end
Header joist end nailed to joists along perimeter	101 (4)	3
Tail joist to adjacent header joist (end nailed) around openings	82 (3¼)	5
	101 (4)	3
Each header joist to adjacent trimmer joist (end nailed) around openings	82 (3¼)	5
	101 (4)	3
Stud to wall plate (each end) toe nail or end nail	63 (2½)	4
	82 (3¼)	2
Doubled studs at openings, or studs at walls or wall intersections and corners	76 (3)	750 mm (30 in) (o.c.)
Column 1	2	3

Table 9.23.3.4. (Cont'd)
Nailing for Framing
 Forming Part of Sentence 9.23.3.4.(1)

Construction Detail	Minimum Length of Nails, mm (in)	Minimum Number or Maximum Spacing of Nails
Doubled top wall plates	76 (3)	600 mm (23 ⁵ / ₈ in) (o.c.)
Bottom wall plate or sole plate to joists or blocking (exterior walls) ⁽¹⁾	82 (3 ¹ / ₄)	400 mm (15 ⁷ / ₈ in) (o.c.)
Interior walls to framing or subflooring	82 (3 ¹ / ₄)	600 mm (23 ⁵ / ₈ in) (o.c.)
Horizontal member over openings in non-loadbearing walls - each end	82 (3 ¹ / ₄)	2
Lintels to studs	82 (3 ¹ / ₄)	2 at each end
Ceiling joist to plate - toe nail each end	82 (3 ¹ / ₄)	2
Roof rafter, roof truss or roof joist to plate - toe nail	82 (3 ¹ / ₄)	3
Rafter plate to each ceiling joist	101 (4)	2
Rafter to joist (with ridge supported)	76 (3)	3
Rafter to joist (with ridge unsupported)	76 (3)	See Table 9.23.13.8.
Gusset plate to each rafter at peak	57 (2 ¹ / ₄)	4
Rafter to ridge board - toe nail - end nail	82 (3 ¹ / ₄)	3
Collar tie to rafter - each end	76 (3)	3
Collar tie lateral support to each collar tie	57 (2 ¹ / ₄)	2
Jack rafter to hip or valley rafter	82 (3 ¹ / ₄)	2
Roof strut to rafter	76 (3)	3
Roof strut to loadbearing wall - toe nail	82 (3 ¹ / ₄)	2
38 mm x 140 mm (2 in by 6 in) or less plank decking to support	82 (3 ¹ / ₄)	2
Plank decking wider than 38 mm x 140 mm (2 in by 6 in) to support	82 (3 ¹ / ₄)	3
38 mm (2 in) edge laid plank decking to support (toe nail)	76 (3)	1
38 mm (2 in) edge laid plank to each other	76 (3)	450 mm (17 ³ / ₈ in) (o.c.)
Column 1	2	3

Notes to Table 9.23.3.4.:

(1) See Sentence 9.23.3.4.(2)

- (2) Where the bottom wall plate or sole plate of an exterior wall is not nailed to joists or blocking in conformance with Table 9.23.3.4., the exterior wall may be fastened to the floor framing by,
- (a) having plywood, OSB or waferboard sheathing extend down over floor framing and fastened to the floor framing by nails or staples conforming to Article 9.23.3.5., or
 - (b) tying the wall framing to the floor framing by 50 mm (2 in) wide galvanized-metal strips,
 - (i) not less than 0.41 mm (0.016 in) in thickness,
 - (ii) spaced not more than 1 200 mm (3 ft 11 in) apart, and
 - (iii) fastened at each end with at least two 63 mm (2¹/₂ in) nails.

9.23.3.5. Fastening for Sheathing or Subflooring

- (1) Fastening of sheathing and subflooring shall conform to Table 9.23.3.5.

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 (in)				Minimum Number or Maximum Spacing of Fasteners
	Common or Spiral Nails	Ring Thread Nails or Screws	Roofing Nails	Staples	
Board lumber 184 mm (7¼ in) or less wide	51 (2)	45 (1¾)	N/A	51 (2)	2 per support
Board Lumber more than 184 mm (7¼ in) wide	51 (2)	45 (1¾)	N/A	51 (2)	3 per support
Fibreboard sheathing up to 13 mm (½ in) thick	N/A	N/A	44 (1¾)	28 (1½)	150 mm (5⅞ in) (o.c.) along edges and 300 mm (11¼ in) (o.c.) along intermediate supports
Gypsum sheathing up to 13 mm (½ in) thick	N/A	N/A	44 (1¾)	N/A	
Plywood, OSB or waferboard up to 10 mm (¾ in) thick	51 (2)	45 (1¾)	N/A	38 (1½)	
Plywood, OSB or waferboard from 10 mm (¾ in) to 20 mm (13/16 in) thick	51 (2)	45 (1¾)	N/A	51 (2)	
Plywood, OSB or waferboard over 20 mm (13/16 in) thick	57 (2¼)	51 (2)	N/A	N/A	
Column 1	2	3	4	5	6

(2) Staples shall not be less than 1.6 mm (1/16 in) in diameter or thickness, with not less than a 9.5 mm (¾ in) crown driven with the crown parallel to framing.

(3) Roofing nails for the attachment of fibreboard or gypsum sheathing shall not be less than 3.2 mm (1/8 in) in diameter with a minimum head diameter of 11.1 mm (7/16 in).

(4) Flooring screws shall not be less than 3.2 mm (1/8 in) in diameter.

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,

- the floors serve residential areas as described in Table 4.1.5.3., or
- the uniformly distributed *live load* on the floors do not exceed that specified for residential areas as described in Table 4.1.5.3.

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

- serve other than residential areas, or
- 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) and Article 9.23.13.10., the 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.

(2) Spans for floor joists which 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.

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

9.23.4.3. Steel Beams

(1) The spans for steel beams with laterally supported top flanges shall conform to Table 9.23.4.3. for floors and Tables A-20 to A-29 for roofs and floors. (See Appendix A.)

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
Column 1	2	3	4	5	6	7	8

Notes to Table 9.23.4.3.:

(1) 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, "Structural Quality Steel".

- (3) A beam may be considered to be laterally supported if,
- (a) the wood joists bear on its top flange at intervals of 600 mm (23⁵/₈ in) or less over its entire length,
 - (b) the load being applied to this beam is transmitted through the joists, and
 - (c) 19 mm by 38 mm (1 in by 2 in) wood strips in contact with the top flange are nailed on both sides of the beam to the bottom of the joist supported.

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 (1¹/₂ to 2 in) thick,
 - (b) is normal weight,
 - (c) is placed directly on the subflooring, and
 - (d) has not less than 20 MPa (2900 psi) compressive strength after 28 days.
- (3) Where a floor is required to support a concrete topping not more than 51 mm (2 in) thick, the beam spans shown in Tables A-8 to A-11 shall be multiplied by 0.8 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 9.26., 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-16.

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 (2 in) 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 deeper than one-third the joist depth, unless the depth of the member is increased by the size of the notch.

9.23.5.3. Wall Studs

- (1) Wall studs shall not be notched, drilled or otherwise damaged so that the undamaged portion of the stud is less than two-thirds the depth of the stud if the stud is *loadbearing* or 40 mm (1⁹/₁₆ in) if the stud is *non-loadbearing*, unless the weakened studs are suitably reinforced.

9.23.5.4. Top Plates

- (1) Top plates in walls shall not be notched, drilled or otherwise weakened to reduce the undamaged width to less than 50 mm (2 in) unless the weakened plates are suitably reinforced.

9.23.5.5. Roof Trusses

(1) Roof truss members shall not be notched, drilled or otherwise weakened unless such notching or drilling is allowed for in the design of the truss.

9.23.6. Anchorage

9.23.6.1. Anchorage of Building Frames

(1) *Building* frames shall be anchored to the *foundation* unless a structural analysis of wind and earth pressures shows anchorage is not required.

(2) Except as provided in Article 9.23.6.3., anchorage shall be provided by embedding the ends of the first floor joists in concrete, or fastening the sill plate to the *foundation* with not less than 12.7 mm (½ in) diam anchor bolts spaced not more than 2 400 mm (7 ft 10 in) o.c.

(3) Anchor bolts referred to in Sentence (2) shall be fastened to the sill plate with nuts and washers and shall be embedded not less than 100 mm (4 in) in the *foundation* and so designed that they may be tightened without withdrawing them from the *foundation*.

9.23.6.2. Anchorage of Columns and Posts

(1) Except as provided in Sentences (2) and (3), exterior columns and posts shall be anchored to resist uplift and lateral movement.

(2) Except as provided in Sentence (3), where columns or posts support balconies, decks, verandas and other exterior platforms, and the columns or posts extend not more than 600 mm (23⅞ in) above finished ground level, the supported joists or beams shall be,

- (a) anchored to a *foundation* to resist uplift and lateral movement, or
- (b) directly anchored to the ground to resist uplift.

(3) Anchorage is not required for platforms described in Sentence (2) that,

- (a) are not more than 1 storey,
- (b) are not more than 55 m² (592 ft²) in area,
- (c) do not support a roof, and
- (d) are not attached to another structure, unless it can be demonstrated that differential movement will not adversely affect the performance of that structure.

9.23.6.3. Anchorage of Smaller Buildings

(1) *Buildings* not more than 4.3 m (14 ft 1 in) wide and not more than 1 *storey* in *building height* are permitted to be anchored in conformance with the requirements of CAN/CSA-Z240.10.1, "Site Preparation, Foundation and Anchorage of Mobile Homes".

9.23.7. Sill Plates

9.23.7.1. Size of Sill Plates

(1) Where sill plates provide bearing for the floor system they shall be not less than 38 mm by 89 mm (2 in by 4 in) material.

9.23.7.2. Levelling of Sill Plates

- (1) Sill plates shall be,
 - (a) levelled by setting them on a full bed of mortar, or
 - (b) laid directly on the *foundation* where the top of the *foundation* is level.
- (2) The joint between the sill plate for exterior walls and the *foundation* shall be sealed in accordance with Subsection 9.25.3.

9.23.8. Beams to Support Floors

9.23.8.1. Bearing for Beams

- (1) Beams shall have even and level bearing and shall have not less than 89 mm (3½ in) length of bearing at end supports, except as required in notes to Tables A-8 to A-11.

9.23.8.2. Priming of Steel Beams

- (1) Exterior steel beams susceptible to corrosion shall be shop primed with rust-inhibitive paint.

9.23.8.3. Built-up Wood Beams (See Appendix A.)

- (1) Where a beam is made up of individual pieces of lumber that are nailed together, the individual members shall be 38 mm (1½ in) or greater in thickness and installed on edge.
- (2) Except as permitted in Sentence (3), where individual members of a built-up beam are butted together to form a joint, the joint shall occur over a support.
- (3) Where a beam is continuous over more than 1 span, individual members are permitted to be butted together to form a joint at or within 150 mm (5⅞ in) of the end quarter points of the clear spans, provided the quarter points are not those closest to the ends of the beam.
- (4) Members joined at quarter points shall be continuous over adjacent supports.
- (5) Joints in individual members of a beam that are located at or near the end quarter points shall not occur in adjacent members at the same quarter point and shall not reduce the effective beam width by more than half.
- (6) Not more than 1 butt joint shall occur in any individual member of a built-up beam within any one span.
- (7) Except as provided in Sentence (8), where 38 mm (1½ in) members are laid on edge to form a built-up beam, individual members shall be nailed together with a double row of nails not less than 89 mm (3½ in) in length, spaced not more than 450 mm (17¾ in) apart in each row with the end nails located 100 mm (4 in) to 150 mm (5⅞ in) from the end of each piece.
- (8) Where 38 mm (1½ in) members in built-up wood beams are not nailed together as provided in Sentence (7), they shall be bolted together with not less than 12.7 mm (½ in) diam bolts equipped with washers and spaced not more than 1 200 mm (3 ft 11 in) o.c., with the end bolts located not more than 600 mm (23⅝ in) from the ends of the members.

9.23.9. Floor Joists

9.23.9.1. End Bearing for Joists

- (1) Except when supported on ribbon boards, floor joists shall have not less than 38 mm (1½ in) length of end bearing.

- (2) Ribbon boards referred to in Sentence (1) shall be not less than 19 mm by 89 mm (1 in by 4 in) lumber let into the studs.

9.23.9.2. Joists Supported by Beams

- (1) Floor joists may be supported on the tops of beams or may be framed into the sides of beams.
- (2) When framed into the side of a wood beam, joists referred to in Sentence (1) shall be supported on,
- (a) joist hangers or other acceptable mechanical connectors, or
 - (b) not less than 38 mm by 64 mm (2 in by 3 in) ledger strips nailed to the side of the beam, except that 38 mm by 38 mm (2 in by 2 in) ledger strips may be used provided each joist is nailed to the beam by at least four 89 mm (3½ in) nails, in addition to the nailing for the ledger strip required in Table 9.23.3.4.
- (3) When framed into the side of a steel beam, joists referred to in Sentence (1) shall be supported on the bottom flange of the beam or on not less than 38 mm by 38 mm (2 in by 2 in) lumber bolted to the web with not less than 6.3 mm (¼ in) diam bolts spaced not more than 600 mm (23¾ in) apart.
- (4) Joists referred to in Sentence (3) shall be spliced above the beam with not less than 38 mm by 38 mm (2 in by 2 in) lumber at least 600 mm (23¾ in) long to support the flooring.
- (5) Not less than a 12 mm (½ in) space shall be provided between the splice required in Sentence (4) and the beam to allow for shrinkage of the wood joists.

9.23.9.3. Restraint of Joist Bottoms

- (1) Except as provided in Sentence 9.23.9.4.(1), bottoms of floor joists shall be restrained from twisting at each end by toe-nailing to the supports, end-nailing to the header joists or by providing continuous strapping, blocking between the joists or cross-bridging near the supports.

9.23.9.4. Strapping and Bridging in Tables A-1 and A-2

- (1) Except as permitted by Sentence (5), where strapping is specified in Table A-1, it shall be,
- (a) not less than 19 mm by 64 mm (1 in by 3 in), nailed to the underside of floor joists,
 - (b) located not more than 2 100 mm (6 ft 11 in) from each support or other rows of strapping, and
 - (c) fastened at each end to a sill or header.
- (2) Where bridging is specified in Table A-1, it shall consist of not less than 19 mm by 64 mm (1 in by 3 in) or 38 mm by 38 mm (2 in by 2 in) cross bridging located not more than 2 100 mm (6 ft 11 in) from each support or other rows of bridging.
- (3) Where bridging and strapping are specified in Tables A-1,
- (a) bridging shall,
 - (i) comply with Sentence (2), or
 - (ii) consist of 38 mm (1½ in) solid blocking located not more than 2 100 mm (6 ft 11 in) from each support or other rows of bridging and securely fastened between the joists, and
 - (b) except as provided in Sentence (5), strapping shall comply with Sentence (1) and be installed under the bridging.
- (4) Bridging specified in Table A-2 shall consist of,
- (a) bridging as described in Sentence (2), or
 - (b) 38 mm (1½ in) solid blocking located not more than 2 100 mm (6 ft 11 in) from each support or other rows of bridging and securely fastened between the joists.

- (5) Strapping described in Sentence (1) and Clause (3)(b) is not required where,
 - (a) furring strips complying with Table 9.29.3.1. are fastened directly to the joists, or
 - (b) a panel-type ceiling finish complying with Subsection 9.29.5., 9.29.6., 9.29.7., 9.29.8., or 9.29.9. is attached directly to the joists.

- (6) Where a ceiling attached to wood furring is specified in Table A-2,
 - (a) the ceiling finish shall consist of gypsum board, plywood or OSB not less than 12.7 mm (½ in) thick, and
 - (b) the furring shall be,
 - (i) 19 mm by 89 mm (1 in by 4 in) wood furring spaced at not more than 600 mm (23⅞ in) o.c., or
 - (ii) 19 mm by 64 mm (1 in by 3 in) wood furring spaced at not more than 400 mm (15¾ in) o.c.

9.23.9.5. Header Joists

- (1) Header joists around floor openings shall be doubled when they exceed 1 200 mm (3 ft 11 in) in length.
- (2) The size of header joists exceeding 3.2 m (10 ft 6 in) in length shall be determined by calculations.

9.23.9.6. Trimmer Joists

- (1) Trimmer joists around floor openings shall be doubled when the length of the header joist exceeds 800 mm (2 ft 7 in).
- (2) When the header joist exceeds 2 000 mm (6 ft 7 in) in length the size of the trimmer joists shall be determined by calculations.

9.23.9.7. Support of Tail and Header Joists

- (1) When tail joists and header joists are supported by the floor framing, they shall be supported by suitable joist hangers or nailing in accordance with Table 9.23.3.4.

9.23.9.8. Support of Walls

- (1) *Non-loadbearing* walls parallel to the floor joists shall be supported by joists beneath the wall or on blocking between the joists.
- (2) Blocking referred to in Sentence (1) for the support of *non-loadbearing* walls shall be not less than 38 mm by 89 mm (2 in by 4 in) lumber, spaced not more than 1 200 mm (3 ft 11 in) apart.
- (3) *Non-loadbearing* interior walls at right angles to the floor joists are not restricted as to location.
- (4) *Loadbearing* interior walls parallel to floor joists shall be supported by beams or walls of sufficient strength to transfer safely the design loads to vertical supports.
- (5) *Loadbearing* interior walls at right angles to floor joists shall be located not more than 900 mm (2 ft 11 in) from the joist support when the wall does not support a floor, and not more than 600 mm (23⅞ in) from the joist support when the wall supports one or more floors, unless the joist size is designed to support such loads.

9.23.9.9. Cantilevered Floor Joists

- (1) Floor joists supporting roof loads shall not be cantilevered more than 400 mm (15¾ in) beyond their supports where 38 mm by 184 mm (2 in by 8 in) joists are used and not more than 600 mm (23⅞ in) beyond their supports where 38 mm by 235 mm (2 in by 10 in) or larger joists are used.
- (2) The cantilevered portions referred to in Sentence (1) shall not support floor loads from other *storeys* unless calculations are provided to show that the design resistances of the cantilevered joists are not exceeded.

- (3) Where cantilevered floor joists described in Sentences (1) and (2) are at right angles to the main floor joists, the tail joists in the cantilevered portion shall,
- (a) extend inward away from the cantilever support a distance equal to not less than 6 times the length of the cantilever, and
 - (b) shall be end nailed to an interior doubled header joist in conformance with Table 9.23.3.4.

9.23.10. Wall Studs

9.23.10.1. Stud Size and Spacing

- (1) Except as provided in Sentence (2), the size and spacing of studs shall conform to Table 9.23.10.1.
 - (2) Studs for walls not listed in Table 9.23.10.1. and supporting roof loads shall conform to Table A-30 to A-33, provided,
 - (a) the studs are clad with not less than 9.5 mm ($\frac{3}{8}$ in) thick plywood, OSB or waferboard sheathing on the exterior face, and not less than 12.5 mm ($\frac{1}{2}$ in) gypsum board on the interior face,
 - (b) solid bridging is provided at not more than 1 200 mm (3 ft 11 in) on centre,
 - (c) the studs are fastened to the top and bottom plates with no fewer than three 82 mm ($3\frac{1}{4}$ in) toe-nails,
 - (d) the double top plates are fastened together with not less than 76 mm (3 in) nails spaced not more than 200 mm ($7\frac{7}{8}$ in) on centre,
 - (e) roof framing members spaced not more than 600 mm ($23\frac{5}{8}$ in) are fastened to the top plates with no fewer than four 82 mm ($3\frac{1}{4}$ in) toe-nails, and
 - (f) the bottom plate is fastened to the floor joists, blocking or rim joist with not less than 82 mm ($3\frac{1}{4}$ in) nails spaced not more than 200 mm ($7\frac{7}{8}$ in) on centre.
- (See Appendix A.)

Table 9.23.10.1.
Size and Spacing of Studs
 Forming Part of Sentence 9.23.10.1.(1)

Type of Wall	Supported Loads (including <i>dead loads</i>)	Minimum Stud Size, mm (in)	Maximum Stud Spacing, mm (in)	Maximum Unsupported Height, m (ft-in)
	No load	38 x 38 (2" x 2")	400 (16)	2.4 (7'-10")
		38 x 89 (2" x 4") flat ⁽¹⁾	400 (16)	3.6 (11'-10")
	Attic not accessible by a stairway	38 x 64 (2" x 3")	600 (24)	3.0 (9'-10")
		38 x 64 (2" x 3") flat ⁽¹⁾	400 (16)	2.4 (7'-10")
		38 x 89 (2" x 4")	600 (24)	3.6 (11'-10")
		38 x 89 (2" x 4") flat ⁽¹⁾	400 (16)	2.4 (7'-10")
Interior	Attic accessible by a stairway plus one floor Roof load plus one floor Attic not accessible by stairway plus 2 floors	38 x 89 (2" x 4")	400 (16)	3.6 (11'-10")
	Roof load,			
	Attic accessible by a stairway	38 x 64 (2" x 3")	400 (16)	2.4 (7'-10")
	Attic not accessible by a stairway plus one floor	38 x 89 (2" x 4")	600 (24)	3.6 (11'-10")
	Attic accessible by a stairway plus 2 floors Roof load plus 2 floors	38 x 89 (2" x 4")	300 (12)	3.6 (11'-10")
		64 x 89 (3" x 4")	400 (16)	3.6 (11'-10")
		38 x 140 (2" x 6")	400 (16)	4.2 (13'-9")
	Attic accessible by a stairway plus 3 floors Roof load plus 3 floors	38 x 140 (2" x 6")	300 (12)	4.2 (13'-9")
Exterior	Roof with or without attic storage	38 x 64 (2" x 3")	400 (16)	2.4 (7'-10")
		38 x 89 (2" x 4")	600 (24)	3.0 (9'-10")
	Roof with or without attic storage plus one floor	38 x 89 (2" x 4")	400 (16)	3.0 (9'-10")
		38 x 140 (2" x 6")	600 (24)	3.0 (9'-10")
	Roof with or without attic storage plus 2 floors	38 x 89 (2" x 4")	300 (12)	3.0 (9'-10")
		64 x 89 (3" x 4")	400 (16)	3.0 (9'-10")
		38 x 140 (2" x 6")	400 (16)	3.6 (11'-10")
	Roof with or without attic storage plus 3 floors	38 x 140 (2" x 6")	300 (12)	1.8 (5'-11")
Column 1	2	3	4	5

Notes to Table 9.23.10.1.:

(1) See Article 9.23.10.3.

9.23.10.2. Bracing and Lateral Support (See Appendix A.)

- (1) Except as provided in Sentence (2), each exterior wall in each *storey* shall be braced with at least one diagonal brace conforming to Sentence (3).
- (2) Bracing is not required where the walls,
- (a) have an interior finish conforming to the requirements of Section 9.29., or
 - (b) where the walls are,
 - (i) clad with panel-type siding,
 - (ii) diagonally sheathed with lumber, or
 - (iii) sheathed with plywood, OSB, waferboard, gypsum or fibreboard sheathing.

- (3) Where bracing is required, it shall,
 - (a) consist of not less than 19 mm by 89 mm (1 in by 4 in) wood members,
 - (b) be applied to the studs at an angle of approximately 45° to the horizontal, and
 - (c) extend the full height of the wall on each storey.
- (4) Bracing described in Sentence (3) shall be nailed to each stud and wall plate by at least two 63 mm (2½ in) nails.
- (5) Where *loadbearing* interior walls are not finished in accordance with Sentence (2), blocking or strapping shall be fastened to the studs at mid-height to prevent sideways buckling.

9.23.10.3. Orientation of Studs

- (1) Except as permitted in Sentences (2) and (3), all studs shall be placed at right angles to the wall face.
- (2) Studs on the flat are permitted to be used in gable ends of roofs that contain only unfinished space or in non-*loadbearing* interior walls within the limits described in Article 9.23.10.1.
- (3) Wall studs that support only a load from an attic not accessible by a stairway are permitted to be placed on the flat within the limits permitted in Article 9.23.10.1. provided,
 - (a) the studs are clad on at least 1 side with plywood, OSB or waferboard sheathing fastened to the face of the studs with a structural adhesive, and
 - (b) the portion of the roof supported by the studs does not exceed 2 100 mm (6 ft 11 in) in width.

9.23.10.4. Continuity of Studs

- (1) Wall studs shall be continuous for the full storey height except at openings and shall not be spliced except by finger-jointing with a structural adhesive. (See Appendix A.)

9.23.10.5. Support for Cladding Materials

- (1) Corners and intersections shall be designed to provide adequate support for the vertical edges of interior finishes, sheathing and cladding materials, and in no instance shall exterior corners be framed with less than the equivalent of 2 studs.
- (2) Where the vertical edges of interior finishes at wall intersections are supported at vertical intervals by blocking or furring, the vertical distance between such supports shall not exceed the maximum distance between supports specified in Section 9.29.

9.23.10.6. Studs at Sides of Openings

- (1) Except as provided in Sentence (2), studs shall be doubled on each side of openings so that the inner studs extend from the lintel to the bottom wall plate and the outer studs extend from the top wall plates to the bottom wall plate.
 - (2) Single studs are permitted to be used on either side of openings,
 - (a) in non-*loadbearing* interior walls not required to have *fire-resistance ratings* provided the studs extend from the top wall plate to the bottom wall plate, or
 - (b) in *loadbearing* or non-*loadbearing* interior or exterior walls, provided,
 - (i) the opening is less than and within the required stud spacing, and
 - (ii) no two such openings of full stud space width are located in adjacent stud spaces.
- (See Appendix A.)

9.23.10.7. Stud Posts Built into Walls

- (1) Except as provided in Sentences (2) and (3), stud posts shall be designed in accordance with Part 4.
- (2) The number of studs in a wall directly below a girder truss or roof beam shall conform to Tables A-34 to A-37, provided,
 - (a) the studs are fastened together to form a post in accordance with Sentence 9.17.4.2.(2),
 - (b) the wall is not less than 1 200 mm (3 ft 11 in) long and sheathed on at least one side with plywood, OSB, waferboard or gypsum sheathing, and
 - (c) the wall sheathing is fastened to the stud post with at least one row of fasteners conforming to Article 9.23.3.5. and spaced not less than 150 mm (5⁷/₈ in) on centre.
(See Appendix A.)
- (3) The width of the stud post shall be not less than the width of the girder or beam that it supports.

9.23.11. Wall Plates**9.23.11.1. Size of Wall Plates**

- (1) Except as provided in Sentence (2), wall plates shall be,
 - (a) not less than 38 mm (1½ in) thick, and
 - (b) not less than the required width of the wall studs.
- (2) In non-*loadbearing* walls and in *loadbearing* walls where the studs are located directly over framing members, the bottom wall plate may be 19 mm (¾ in) thick.

9.23.11.2. Bottom Wall Plates

- (1) A bottom wall plate shall be provided in all cases.
- (2) The bottom plate in exterior walls shall not project more than one third the plate width over the support.

9.23.11.3. Top Plates

- (1) Except as permitted in Sentences (2) to (4), no fewer than 2 top plates shall be provided in *loadbearing* walls.
- (2) A single top plate is permitted to be used in a section of a *loadbearing* wall containing a lintel provided the top plate forms a tie across the lintel.
- (3) A single top plate is permitted to be used in *loadbearing* walls where the concentrated loads from ceilings, floors and roofs are not more than 50 mm (2 in) to one side of the supporting studs and in all non-*loadbearing* walls.
- (4) The top plates need not be provided in a section of *loadbearing* wall containing a lintel provided the lintel is tied to the adjacent wall section with,
 - (a) not less than 75 mm (3 in) by 150 mm (5⁷/₈ in) by 0.91 mm (0.036 in) thick galvanized steel, or
 - (b) 19 mm (1 in) by 89 mm (4 in) by 300 mm (11¾ in) wood splice nailed to each wall section with at least three 63 mm (2½ in) nails.

9.23.11.4. Joints in Top Plates

- (1) Joints in the top plates of *loadbearing* walls shall be staggered not less than one stud spacing.
- (2) The top plates in *loadbearing* walls shall be lapped or otherwise suitably tied at corners and intersecting walls in accordance with Sentence (4).

- (3) Joints in single top plates used with *loadbearing* walls shall be tied in accordance with Sentence (4).
- (4) Ties referred to in Sentences (2) and (3) shall be the equivalent of not less than 75 mm (3 in) by 150 mm (5⁷/₈ in) by 0.91 mm (0.036 in) thick galvanized steel nailed to each wall with at least three 63 mm (2¹/₂ in) nails.

9.23.12. Framing Over Openings

9.23.12.1. Openings in Non-Loadbearing Walls

- (1) Except as provided in Sentence (2), openings in non-*loadbearing* walls shall be framed with not less than 38 mm (1¹/₂ in) material the same width as the studs securely nailed to adjacent studs.
- (2) Openings for doors in *non-loadbearing* walls required to be *fire separations* with a *fire-resistance rating* shall be framed with the equivalent of at least two 38 mm (1¹/₂ in) thick members that are the same width as the wall plates.

9.23.12.2. Openings in Loadbearing Walls

- (1) Openings in *loadbearing* walls greater than the required stud spacing shall be framed with lintels designed to carry the superimposed loads to adjacent studs.
- (2) Except as provided in Sentence 9.23.12.3.(2), where 2 or more members are used in lintels, they shall be fastened together with not less than 82 mm (3¹/₄ in) nails in a double row, with nails not more than 450 mm (17³/₄ in) apart in each row.
- (3) Lintel members may be separated by filler pieces.

9.23.12.3. Lintel Spans and Sizes

- (1) Spans and sizes of wood lintels shall conform to the spans shown in Tables A-12 to A-16,
 - (a) for *buildings of residential occupancy*,
 - (b) where the wall studs exceed 38 mm by 64 mm (2 in by 3 in) in size,
 - (c) where the spans of supported joists do not exceed 4.9 m (16 ft 1 in), and
 - (d) where the spans of trusses do not exceed 9.8 m (32 ft 2 in).
- (2) In *loadbearing* exterior and interior walls of 38 mm by 64 mm (2 in by 3 in) framing members, lintels shall consist of,
 - (a) solid 64 mm (2¹/₂ in) thick members on edge, or
 - (b) 38 mm (1¹/₂ in) thick and 19 mm (³/₄ in) thick members fastened together with a double row of nails not less than 63 mm (2¹/₂ in) long and spaced not more than 450 mm (17³/₄ in) apart.
- (3) Lintels referred to in Sentence (2),
 - (a) shall be not less than 50 mm (2 in) greater in depth than those shown in Tables A-12 to A-16 for the maximum spans shown, and
 - (b) shall not exceed 2 240 mm (7 ft 4 in) in length.

9.23.13. Roof and Ceiling Framing

9.23.13.1. Continuity of Rafters and Joists

- (1) Roof rafters and joists and ceiling joists shall be continuous or shall be spliced over vertical supports that extend to suitable bearing.

9.23.13.2. Framing around Openings

- (1) Roof and ceiling framing members shall be doubled on each side of openings greater than 2 rafter or joist spacings wide.

9.23.13.3. End Bearing Length

- (1) The length of end bearing of joists and rafters shall be not less than 38 mm (1½ in).

9.23.13.4. Location and Attachment of Rafters

- (1) Rafters shall be located directly opposite each other and tied together at the peak, or may be offset by their own thickness if nailed to a ridge board not less than 17.5 mm (11/16 in) thick.
- (2) Except as permitted in Sentence (3), framing members shall be connected by gusset plates or nailing at the peak in conformance with Table 9.23.3.4.
- (3) Where the roof framing on opposite sides of the peak is assembled separately, such as in the case of factory-built houses, the roof framing on opposite sides is permitted to be fastened together with galvanized-steel strips not less than 200 mm (7¾ in) by 75 mm (3 in) by 0.41 (0.016 in) thick spaced not more than 1 200 mm (3 ft 11 in) apart and nailed at each end to the framing by at least two 63 mm (2½ in) nails.

9.23.13.5. Shaping of Rafters

- (1) Rafters shall be shaped at supports to provide even bearing surfaces and supported directly above the exterior walls.

9.23.13.6. Hip and Valley Rafters

- (1) Hip and valley rafters shall be not less than 50 mm (2 in) greater in depth than the common rafters and not less than 38 mm (1½ in) thick, actual dimension.

9.23.13.7. Intermediate Support for Rafters and Joists

- (1) Ceiling joists and collar ties of not less than 38 mm by 89 mm (2 in by 4 in) lumber are permitted to be assumed to provide intermediate support to reduce the span for rafters and joists where the roof slope is 1 in 3 or greater.
- (2) Collar ties referred to in Sentence (1) more than 2 400 mm (7 ft 10 in) long shall be laterally supported near their centres by not less than 19 mm by 89 mm (1 in by 4 in) continuous members at right angles to the collar ties.
- (3) Dwarf walls and struts may be used to provide intermediate support to reduce the span for rafters and joists.
- (4) When struts are used to provide intermediate support they shall be not less than 38 mm by 89 mm (2 in by 4 in) material extending from each rafter to a *loadbearing* wall at an angle of not less than 45° to the horizontal.
- (5) When dwarf walls are used for rafter support, they shall be framed in the same manner as *loadbearing* walls and securely fastened top and bottom to the roof and ceiling framing to prevent overall movement.
- (6) Solid blocking shall be installed between floor joists beneath dwarf walls referred to in Sentence (5) that enclose finished rooms.

9.23.13.8. Ridge Support

- (1) Except as provided in Sentence (4), roof rafters and joists shall be supported at the ridge of the roof by,
 - (a) a *loadbearing* wall extending from the ridge to suitable bearing, or
 - (b) a ridge beam supported by not less than 89 mm (3½ in) length of bearing.
- (2) Except as provided in Sentence (3), the ridge beam referred to in Sentence (1) shall conform to the sizes and spans shown in Table A-12, provided,
 - (a) the supported rafter or joist length does not exceed 4.9 m (16 ft 1 in), and
 - (b) the roof does not support any concentrated loads.
- (3) The ridge beam referred to in Sentence (1) need not comply with Sentence (2) where,
 - (a) the beam is of not less than 38 mm (1½ in) by 140 mm (5½ in) material, and
 - (b) the beam is supported at intervals not exceeding 1 200 mm (3 ft 11 in) by not less than 38 mm by 89 mm (2 in by 4 in) members extending vertically from the ridge to suitable bearing.
- (4) When the roof slope is 1 in 3 or more, ridge support need not be provided when the lower ends of the rafters are adequately tied to prevent outward movement.
- (5) Ties required in Sentence (4) are permitted to consist of tie rods or ceiling joists forming a continuous tie for opposing rafters and nailed in accordance with Table 9.23.13.8.
- (6) Ceiling joists referred to in Sentence (5) shall be fastened together with at least one more nail per joist splice than required for the rafter to joist connection shown in Table 9.23.13.8.
- (7) Members referred to in Sentence (6) are permitted to be fastened together either directly or through a gusset plate.

Table 9.23.13.8.
Rafter-to-Joist Nailing (Unsupported Ridge)
 Forming Part of Sentences 9.23.13.8.(5) and (6)

Roof Slope	Rafter Spacing, mm (in)	Minimum Number of Nails not less than 75 mm (3 in) Long											
		Rafter Tied to every Joist						Rafter Tied to Joist every 1.2 m (3 ft 11 in)					
		Building Width up to 8.0 m (26 ft 3 in)			Building width up to 9.8 m (32 ft 2 in)			Building Width up to 8.0 m (26 ft 3in)			Building Width up to 9.8 m (32 ft 2 in)		
		Roof Snow Load, kPa (psf)			Roof Snow Load, kPa (psf)			Roof Snow Load, kPa (psf)			Roof Snow Load, kPa (psf)		
		1.0 (20) or less	1.5 (30)	2.0 (40) or more	1.0 (20) or less	1.5 (30)	2.0 (40) or more	1.0 (20) or less	1.5 (30)	2.0 (40) or more	1.0 (20) or less	1.5 (30)	2.0 (40) or more
1 in 3	400 (16)	4	5	6	5	7	8	11	—	—	—	—	—
	600 (24)	6	8	9	8	—	—	11	—	—	—	—	—
1 in 2.4	400 (16)	4	4	5	5	6	7	7	10	—	9	—	—
	600 (24)	5	7	8	7	9	11	7	10	—	—	—	—
1 in 2	400 (16)	4	4	4	4	4	5	6	8	9	8	—	—
	600 (24)	4	5	6	5	7	8	6	8	9	8	—	—
1 in 1.71	400 (16)	4	4	4	4	4	4	5	7	8	7	9	11
	600 (24)	4	4	5	5	6	7	5	7	8	7	9	11
1 in 1.33	400 (16)	4	4	4	4	4	4	4	5	6	5	6	7
	600 (24)	4	4	4	4	4	5	4	5	6	5	6	7
1 in 1	400 (16)	4	4	4	4	4	4	4	4	4	4	4	5
	600 (24)	4	4	4	4	4	4	4	4	4	4	4	5
Col. 1	2	3	4	5	6	7	8	9	10	11	12	13	14

9.23.13.9. Restraint of Joist Bottoms

(1) Roof joists supporting a finished ceiling, other than plywood, OSB or waferboard, shall be restrained from twisting along the bottom edges by means of furring, blocking, cross bridging or strapping conforming to Article 9.23.9.3.

9.23.13.10. Ceiling Joists Supporting Roof Load

(1) Except as permitted in Sentence (2), ceiling joists supporting part of the roof load from the rafters shall be not less than 25 mm (1 in) greater in depth than required for ceiling joists not supporting part of the roof load.

(2) When the roof slope is 1 in 4 or less, the ceiling joist sizes referred to in Sentence (1) shall be determined from the span tables for roof joists.

9.23.13.11. Wood Roof Trusses

- (1) Roof trusses that are not designed in accordance with Part 4 shall,
 - (a) be capable of supporting a total ceiling load (*dead load plus live load*) of 0.35 kPa (7.3 psf) plus two and two-thirds times the specified live roof load for 24 h, and
 - (b) not exceed the deflections shown in Table 9.23.13.11. when loaded with the ceiling load plus one and one-third times the specified roof snow load for 1 h.

Table 9.23.13.11.
Maximum Roof Truss Deflections
 Forming Part of Sentence 9.23.13.11.(1)

Truss Span	Type of Ceiling	Maximum Deflection
4.3 m (14 ft 1 in) or less	Plaster or gypsum board	1/360 of the span
	Other than plaster or gypsum board	1/180 of the span
Over 4.3 m (14 ft 1 in)	Plaster or gypsum board	1/360 of the span
	Other than plaster or gypsum board	1/240 of the span
Column 1	2	3

(2) The joint connections used in trusses described in Sentence (1) shall be designed in conformance with the requirements in Subsection 4.3.1. (See Appendix A.)

(3) Where the length of compression web members in roof trusses described in Sentence (1) exceeds 1 830 mm (6 ft), such web members shall be provided with continuous bracing to prevent buckling.

(4) Bracing required in Sentence (3) shall consist of not less than 19 mm by 89 mm (1 in by 4 in) lumber nailed at right angles to the web members near their centres with at least two 63 mm (2½ in) nails for each member.

(5) Where the ability of a truss design to satisfy the requirements of Sentence (1) is demonstrated by testing, it shall consist of a full scale load test carried out in conformance with CSA S307-M, "Load Test Procedure for Wood Trusses for Houses and Small Buildings".

(6) Where the ability of a truss design to satisfy the requirements of Sentence (1) is demonstrated by analysis, it shall be carried out in accordance with good engineering practice such as described in TPIC, "Truss Design Procedures and Specifications for Light Metal Plate Connected Wood Trusses".

9.23.14. Subflooring

9.23.14.1. Subflooring Required

(1) Subflooring shall be provided beneath finish flooring where the finish flooring does not have adequate strength to support the design loads.

9.23.14.2. Material Standards

(1) Except as provided in Sentence (2), wood-based panels for subfloors shall conform to,

- (a) CSA O121-M, "Douglas Fir Plywood",
- (b) CSA O151, "Canadian Softwood Plywood",
- (c) CSA O153-M, "Poplar Plywood",
- (d) CAN/CSA-O325.0, "Construction Sheathing", or
- (e) CSA O437.0, "OSB and Waferboard".

(2) Particleboard subflooring may be used only where a *building* is constructed in a factory so that the subfloor will not be exposed to the weather.

(3) Subflooring described in Sentence (2) shall conform to grade D-2 or D-3 in ANSI A208.1, "Particleboard, Mat-Formed Wood".

(4) Subflooring described in Sentence (2) shall have its upper surface and all edges treated to restrict water absorption where the subfloor is used in bathrooms, kitchens, laundry rooms or other areas subject to periodic wetting. (See Appendix A.)

9.23.14.3. Edge Support

(1) Where the edges of panel-type subflooring are required to be supported, such support shall consist of tongue-and-groove panel edges or not less than 38 mm by 38 mm (2 in by 2 in) blocking securely nailed between framing members.

9.23.14.4. Direction of Installation

(1) Plywood subflooring shall be installed with the surface grain at right angles to the joists and with joints parallel to floor joists staggered.

(2) OSB subflooring conforming to CAN/CSA-O325.0, "Construction Sheathing", or to O-1 and O-2 grades in CSA O437.0, "OSB and Waferboard", and waferboard subflooring conforming to R-1 grade in CSA O437.0 shall be installed with the direction of face orientation at right angles to the joists and the joints parallel to the floor joists are staggered. (See Appendix A.)

9.23.14.5. Subfloor Thickness or Rating

(1) Except as provided in Sentences (2) and (3), subfloors shall conform to Table 9.23.14.5.A. or Table 9.23.14.5.B.

**Table 9.23.14.5.A.
Thickness of Subflooring**
Forming Part of Sentences 9.23.14.5.(1) and 9.23.15.7.(1)

Maximum Spacing of Supports, mm (in)	Minimum Thickness, mm (in)			
	Plywood and OSB, O-2 Grade	OSB, O-1 Grade, and Waferboard, R-1 Grade	Particleboard	Lumber
400 (16)	15.5 (5/8)	15.9 (5/8)	15.9 (5/8)	17.0 (11/16)
500 (20)	15.5 (5/8)	15.9 (5/8)	19.0 (3/4)	19.0 (3/4)
600 (24)	18.5 (3/4)	19.0 (3/4)	25.4 (1)	19.0 (3/4)
Column 1	2	3	4	5

**Table 9.23.14.5.B.
Rating for Subfloor when Applying CAN/CSA-O325.0**
Forming Part of Sentences 9.23.14.5.(1) and 9.23.15.7.(1)

Maximum Spacing of Supports, mm (in)	Panel Mark	
	Subfloor	Used with Panel-Type Underlay
400 (16)	1F16	2F16
500 (20)	1F20	2F20
600 (24)	1F24	2F24
Column 1	2	3

(2) Where the finished flooring consists of not less than 19 mm ($\frac{3}{4}$ in) matched wood strip flooring laid at right angles to joists, spaced not more than 600 mm (23 $\frac{3}{8}$ in) o.c., subflooring shall be permitted to consist of not less than,

- (a) 12.5 mm ($\frac{1}{2}$ in) thick plywood,
- (b) 12.5 mm ($\frac{1}{2}$ in) thick OSB conforming to O-2 grade,
- (c) 12.7 mm ($\frac{1}{2}$ in) thick OSB conforming to O-1 grade,
- (d) 12.7 mm ($\frac{1}{2}$ in) thick waferboard conforming to R-1 grade, or
- (e) OSB conforming to 2R32 / 2F16 grade.

(3) Except where the flooring consists of ceramic tiles applied with adhesive, where a separate panel-type underlay or concrete topping is applied to a subfloor on joists spaced not more than 400 mm (15 $\frac{3}{8}$ in) o.c., the subfloor may consist of not less than,

- (a) 12.5 mm ($\frac{1}{2}$ in) thick plywood,
- (b) 12.5 mm ($\frac{1}{2}$ in) thick OSB conforming to O-2 grade,
- (c) 12.7 mm ($\frac{1}{2}$ in) thick OSB conforming to O-1 grade,
- (d) 12.7 mm ($\frac{1}{2}$ in) thick waferboard conforming to R-1 grade, or
- (e) OSB conforming to 2R32 / 2F16 grade.

9.23.14.6. Annular Grooved Nails

(1) When resilient flooring is applied directly to an OSB, waferboard, particleboard or plywood subfloor, the subfloor shall be fastened to the supports with annular grooved nails.

9.23.14.7. Lumber Subflooring

- (1) Lumber subflooring shall be laid at an angle of not less than 45° to the joists.
- (2) Lumber subflooring shall be fully supported at the ends on solid bearing.
- (3) Lumber for subflooring shall be of uniform thickness and not more than 184 mm (7 $\frac{1}{4}$ in) wide.

9.23.15. Roof Sheathing

9.23.15.1. Required Roof Sheathing

(1) Except as provided in Section 9.26., continuous lumber or panel-type roof sheathing shall be installed to support the roofing.

9.23.15.2. Material Standards

- (1) Wood-based panels used for roof sheathing shall conform to the requirements of,
 - (a) CSA O121-M, "Douglas Fir Plywood",
 - (b) CSA O151, "Canadian Softwood Plywood",
 - (c) CSA O153-M, "Poplar Plywood",
 - (d) CAN/CSA-O325.0, "Construction Sheathing", or
 - (e) CSA O437.0, "OSB and Waferboard".

9.23.15.3. Direction of Installation

- (1) Plywood roof sheathing shall be installed with the surface grain at right angles to the roof framing.
- (2) OSB roof sheathing conforming to CAN/CSA-O325.0, "Construction Sheathing", or to O-1 and O-2 grades as specified in CSA O437.0, "OSB and Waferboard", shall be installed with the direction of face orientation at right angles to the roof framing members.

9.23.15.4. Joints in Panel-Type Sheathing

- (1) Panel-type sheathing board shall be applied so that joints perpendicular to the roof ridge are staggered where,
- the sheathing is applied with the surface grain parallel to the roof ridge, and
 - the thickness of the sheathing is such that the edges are required to be supported.
- (2) A gap of not less than 2 mm (3/32 in) shall be left between sheets of plywood, OSB or waferboard.

9.23.15.5. Lumber Roof Sheathing

- (1) Lumber roof sheathing shall not be more than 286 mm (11 1/4 in) wide and shall be applied so that all ends are supported with end joints staggered.

9.23.15.6. Edge Support

- (1) Except as permitted in Sentence (2), where panel-type roof sheathing requires edge support, the support shall consist of,
- metal H clips, or
 - not less than 38 mm by 38 mm (2 in by 2 in) blocking securely nailed between framing members.
- (2) The supports referred to in Sentence (1) are not required when tongued-and-grooved edged panel-type sheathing board is used.

9.23.15.7. Thickness or Rating

- (1) The thickness or rating of roof sheathing on a flat roof used as a walking deck shall conform to either Table 9.23.14.5.A. or Table 9.23.14.5.B. for subfloors.
- (2) The thickness or rating of roof sheathing on a roof not used as a walking deck shall conform to either Table 9.23.15.7.A. or Table 9.23.15.7.B.

Table 9.23.15.7.A.
Thickness of Roof Sheathing
 Forming Part of Sentence 9.23.15.7.(2)

Maximum Spacing of Supports, mm (in)	Minimum Thickness, mm (in)				Lumber
	Plywood and OSB, O-2 Grade		OSB, O-1 Grade and Waferboard, R-1 Grade		
	Edges Supported	Edges Unsupported	Edges Supported	Edges Unsupported	
300 (12)	7.5 (5/16)	7.5 (5/16)	9.5 (3/8)	9.5 (3/8)	17.0 (11/16)
400 (16)	7.5 (5/16)	9.5 (3/8)	9.5 (3/8)	11.1 (7/16)	17.0 (11/16)
600 (24)	9.5 (3/8)	12.5 (1/2)	11.1 (7/16)	12.7 (1/2)	19.0 (3/4)
Column 1	2	3	4	5	6

Table 9.23.15.7.B.
Rating for Roof Sheathing When Applying CAN/CSA-O325.0
 Forming Part of Sentence 9.23.15.7.(2)

Maximum Spacing of Supports, mm (in)	Panel Mark	
	Edges Supported	Edges Unsupported
400 (16)	2R16	1R16
500 (20)	2R20	1R20
600 (24)	2R24	1R24
Column 1	2	3

(3) Asphalt-coated or asphalt-impregnated fibreboard not less than 11.1 mm (7/16 in) thick conforming to CAN/ULC-S706, "Wood Fibre Thermal Insulation for Buildings", is permitted to be used as a roof sheathing over supports spaced not more than 400 mm (15¾ in) o.c. provided the roofing consists of,

- (a) a continuous sheet of galvanized steel not less than 0.33 mm (0.013 in) in thickness, or
- (b) a continuous sheet of aluminum not less than 0.61 mm (0.024 in) in thickness.

(4) All edges of sheathing described in Sentence (3) shall be supported by blocking or framing.

9.23.16. Wall Sheathing

9.23.16.1. Required Sheathing

(1) Exterior walls and gable ends shall be sheathed when the *exterior cladding* requires intermediate fastening between supports or if the *exterior cladding* requires solid backing.

9.23.16.2. Thickness, Rating and Material Standards

(1) Where wall sheathing is required, it shall conform to Table 9.23.16.2.A. or Table 9.23.16.2.B.

Table 9.23.16.2.A.
Wall Sheathing Thickness and Specifications
 Forming Part of Sentence 9.23.16.2.(1)

Type of Sheathing	Minimum Thickness, mm ⁽¹⁾ (in)		Material Standards
	With Supports 400 mm (15¾ in) o.c.	With Supports 600 mm (23¾ in) o.c.	
Fibreboard (insulating)	9.5 (¾)	11.1 (7/16)	CAN/ULC-S706
Gypsum Sheathing	9.5 (¾)	12.7 (½)	CAN/CSA-A82.27-M
			ASTM-C1177 / C1177M
			ASTM C1396 / C1396M
Lumber	17.0 (11/16)	17.0 (11/16)	See Table 9.3.2.1.
Mineral Fibre, Rigid Board, Type 2	25 (1)	25 (1)	CAN/ULC-S702
Column 1	2	3	4

Table 9.23.16.2.A. (Cont'd).
Wall Sheathing Thickness and Specifications
 Forming Part of Sentence 9.23.16.2.(1)

Type of Sheathing	Minimum Thickness, mm ⁽¹⁾ (in)		Material Standards
	With Supports 400 mm (15 $\frac{1}{4}$ in) o.c.	With Supports 600 mm (23 $\frac{5}{8}$ in) o.c.	
OSB, O-2 Grade	6.0 (1/4)	7.5 (5/16)	CSA O437.0
OSB, O-1 Grade, and Waferboard, R-1 Grade	6.35 (1/4)	7.9 (5/16)	CSA O437.0
Phenolic, faced	25 (1)	25 (1)	CAN/CGSB-51.25-M
Plywood (exterior type)	6.0 (1/4)	7.5 (5/16)	CSA O121-M
			CSA O151
			CSA O153-M
Polystyrene, Types 1 and 2	38 (1 $\frac{1}{2}$)	38 (1 $\frac{1}{2}$)	CAN/ULC-S701
Polystyrene, Types 3 and 4	25 (1)	25 (1)	CAN/ULC-S701
Polyurethane and Polyisocyanurate Type 1, faced	38 (1 $\frac{1}{2}$)	38 (1 $\frac{1}{2}$)	CAN/ULC-S704
Polyurethane and Polyisocyanurate Types 2 and 3, faced	25 (1)	25 (1)	CAN/ULC-S704
Column 1	2	3	4

Notes to Table 9.23.16.2.A.:

(1) See also Sentences 9.27.5.1.(2) to (4).

Table 9.23.16.2.B.
Rating For Wall Sheathing When Applying CAN/CSA-O325.0
 Forming Part of Sentence 9.23.16.2.(1)

Maximum Spacing of Supports, mm (in)	Panel Mark
400 (16)	W16
500 (20)	W20
600 (24)	W24
Column 1	2

9.23.16.3. Attachment of Cladding to Sheathing

- (1) Gypsum sheathing, rigid insulation and fibreboard shall not be used for the attachment of siding materials.
- (2) Nails used in attaching the materials listed in Sentence (1) shall be not less than 3.2 mm (1/8 in) diam with a minimum head diameter of 11 mm (7/16 in).

9.23.16.4. Lumber Sheathing

- (1) Lumber wall sheathing shall be applied so that all ends are supported.
- (2) Where lumber wall sheathing is required to provide bracing according to Article 9.23.10.2., it shall be applied with end joints staggered.

9.23.16.5. Joints in Panel-Type Sheathing

- (1) A gap of not less than 2 mm ($3/32$ in) shall be left between sheets of plywood, OSB, waferboard or fibreboard.

9.23.16.6. Mansard Style Roofs

- (1) Where the bottom portions of mansard style roofs are vented, the vertical framing members behind the sloping portions shall be considered on the same basis as exterior wall studs and shall conform to the appropriate requirements in Articles 9.27.3.2. to 9.27.3.6.

Section 9.24. Sheet Steel Stud Wall Framing**9.24.1. General****9.24.1.1. Application**

- (1) This Section applies to sheet steel studs for use in non-*loadbearing* exterior and interior walls.
- (2) Where *loadbearing* steel studs are used, they shall be designed in conformance with Part 4.

9.24.1.2. Material Standards

- (1) Steel studs and runners shall conform to CAN/CGSB-7.1, "Lightweight Steel Framing Components".

9.24.1.3. Metal Thickness

- (1) Metal thickness specified in this Section shall be the minimum base steel thickness exclusive of coatings.

9.24.1.4. Screws

- (1) Screws for the application of cladding, sheathing or interior finish materials to steel studs, runners and furring channels shall conform to ASTM C1002, "Steel Self-Piercing Tapping Screws for the Application of Gypsum Panel Products or Metal Plaster Bases to Wood Studs or Steel Studs".

9.24.1.5. Cladding, Sheathing and Interior Finish Required

- (1) Cladding or sheathing, and interior finish shall be installed on steel stud framing and shall be fastened with screws,
 - (a) spaced at the appropriate spacing described in Section 9.29., and
 - (b) penetrating not less than 10 mm ($3/8$ in) through the metal.

9.24.2. Size of Framing**9.24.2.1. Size and Spacing of Studs in Interior Walls**

- (1) Except as required in Articles 9.24.2.3. and 9.24.2.4., the size and spacing of steel studs for non-*loadbearing* interior walls shall conform to Table 9.24.2.1.