Section 9.20. Masonry and Insulating Concrete Form Walls Not In Contact with the Ground

9.20.1. Application

9.20.1.1. General

1) Except as provided in Article 9.20.1.2., this Section applies to

a) unreinforced masonry and masonry veneer walls not in contact with the ground, where

i) the height of the walls constructed on the *foundation* walls does not exceed 11 m, and

ii) the roof or floor assembly above the *first storey* is not of concrete construction, and

b) flat insulating concrete form walls not in contact with the ground that (See Note A-9.15.1.1.(1)(c) and 9.20.1.1.(1)(b))

i) have a maximum floor-to-floor height of 3 m,

ii) are erected in *buildings* not more than 2 *storeys* in *building height* and containing only a single *dwelling unit*, and

iii) are erected in locations where the seismic spectral response acceleration, $S_a(0.2)$, is not greater than 0.4 (See Note A-9.20.1.2.).

2) For walls other than those described in Sentence (1), or where the masonry walls or insulating concrete form walls not in contact with the ground are designed for specified loads on the basis of ultimate and serviceability limit states, Subsection 4.3.2. shall apply.

9.20.1.2. Earthquake Reinforcement

(See Note A-9.20.1.2.)

1) In locations where the spectral response acceleration, $S_a(0.2)$, is greater than 0.55, *loadbearing* elements of masonry *buildings* more than 1 *storey* in *building height* shall be reinforced with not less than the minimum amount of reinforcement required by Subsection 9.20.15.

2) In locations where the spectral response acceleration, $S_a(0.2)$, is greater than 0.35 but less than or equal to 0.55, *loadbearing* elements of masonry *buildings* 3 *storeys in building height* shall be reinforced with not less than the minimum amount of reinforcement required by Subsection 9.20.15.

9.20.2. Masonry Units

9.20.2.1. Masonry Unit Standards

1) Masonry units shall comply with

a) ASTM C 73, "Calcium Silicate Brick (Sand-Lime Brick),"

b) ASTM C 126, "Ceramic Glazed Structural Clay Facing Tile, Facing Brick, and Solid Masonry Units,"

c) ASTM C 212, "Structural Clay Facing Tile,"

d) CAN/CSA-A82, "Fired Masonry Brick Made from Clay or Shale,"

e) CSA A165.1, "Concrete Block Masonry Units,"

f) CSA A165.2, "Concrete Brick Masonry Units," or

g) CSA A165.3, "Prefaced Concrete Masonry Units."

9.20.2.2. Used Brick

1) Used bricks shall be free of old mortar, soot or other surface coating and shall conform to Article 9.20.2.1.

9.20.2.3. Glass Blocks

1) Glass blocks shall not be used as *loadbearing* units or in the construction of fireplaces or *chimneys*.

9.20.2.4. Cellular Concrete

1) Masonry made with cellular concrete shall not be used in contact with the *soil* or exposed to the weather.

9.20.2.5. Stone

1) Stone shall be sound and resistant to deterioration.

9.20.2.6. Concrete Blocks Exposed to the Weather

1) Concrete blocks exposed to the weather shall have density and water absorption characteristics conforming to concrete types A, B, C, or D described in CSA A165.1, "Concrete Block Masonry Units."

9.20.2.7. Compressive Strength

1) The compressive strength of concrete blocks shall conform to Table 9.20.2.7.

Table 9.20.2.7.
Compressive Strength of Concrete Blocks
Forming Part of Sentence 9.20.2.7.(1)

Type of Unit	Minimum Compressive Strength Over Net Area, MPa	
	Exposed to Weather	Not Exposed to Weather
Solid or hollow concrete blocks	15	10
Solid *loadbearing* cellular blocks	Not permitted	5
Solid non-*loadbearing* cellular blocks	Not permitted	2

9.20.3. Mortar and Grout

9.20.3.1. Materials

1) Cementitious materials and aggregates for mortar and grout shall comply with CSA A179, "Mortar and Grout for Unit Masonry."

2) Water and aggregate shall be clean and free of significant amounts of deleterious materials.

3) Lime used in mortar shall be hydrated.

4) If lime putty is used in mortar, it shall be made by slaking quicklime in water for not less than 24 h or soaking hydrated lime in water for not less than 12 h.

9.20.3.2. Mortar and Grout Mixes

1) Mortar types shall be in accordance with Table 9.20.3.2.-A.

2) Mortar for glass block masonry shall be

a) Type S Portland cement-lime where exposed to the exterior, or

b) Type S or N where protected from the exterior.

3) Mortar shall be mixed within the proportion limits provided in Table 9.20.3.2.-B, with sufficient water to bring the mixture to a consistency adequate for laying masonry units.

4) Grout shall be mixed within the proportion limits provided in Table 9.20.3.2.-C, with sufficient water to provide a suitable flow to fill all voids completely, without excessive segregation or bleeding.

5) Except as provided in Sentence (6), mortar shall be used and placed in final position

a) within 1.5 h after mixing when the air temperature is 25°C or higher, or

b) within 2.5 h after mixing when the air temperature is less than 25°C.

6) Mortar and grout containing a set-control admixture shall be manufactured off-site in a batching plant and shall be used and placed in final position within a time not exceeding the useful life stipulated by the manufacturer.

7) Grout used for reinforced masonry shall be placed in accordance with the requirements of CSA A371, "Masonry Construction for Buildings."

Table 9.20.3.2.-A
Mortar Use
Forming Part of Sentence 9.20.3.2.(1)

Location	***Building* Element**	Mortar Type
Exterior, Above Ground	*Loadbearing* walls and columns	S
	Non-*loadbearing* walls and columns	N or S
	Parapets, *chimneys*, masonry veneer	N or S
Exterior, At or Below Ground	*Foundation* walls and columns	S
Interior	*Loadbearing* walls and columns	N
	Non-*loadbearing* walls and columns	N

Table 9.20.3.2.-B
Mortar Mix Proportions (by volume)
Forming Part of Sentence 9.20.3.2.(3)

Mortar Type	Portland Cement	Lime	Masonry Cement Type N	Masonry Cement Type S	Fine Aggregate (damp, loose-state sand)
Type S	1	½	–	–	3½ to 4½
	–	–	–	1	2¼ to 3
	½	–	1	–	3½ to 4½
Type N	1	1	–	–	4½ to 6
	–	–	1	–	2¼ to 3

Table 9.20.3.2.-C
Grout Mix Proportions (by volume)
Forming Part of Sentence 9.20.3.2.(4)

Portland Cement	Lime	Fine Aggregate (sand)	Coarse Aggregate
1	0 to 1/10	2¼ to 3 times the sum of the cement and lime volumes	1 to 2 times the sum of the cement and lime volumes

9.20.4. Mortar Joints

9.20.4.1. Thickness

1) Except as provided in Sentence (2), mortar joint thickness for burned clay brick and concrete masonry units shall be 10 mm.

2) Permitted tolerances in head and bed joints shall be not more than ± 5 mm.

9.20.4.2. Solid Masonry Units

1) *Solid masonry units* shall be laid with full head and bed joints.

9.20.4.3. Laying of Masonry Units

1) Hollow masonry units shall be laid with mortar applied to head and bed joints of both inner and outer face shells.

2) Vertically aligned webs of hollow masonry units shall be laid in a full bed of mortar

a) under the starting course,

b) in all courses of columns, and

c) where adjacent to cells or cavities that are to be filled with grout.

3) Except for head joints left open for weep holes and ventilation, *solid masonry units* shall be laid with full head and bed joints.

9.20.5. Masonry Support

9.20.5.1. Masonry Support

1) All masonry shall be supported on masonry, concrete or steel, except that masonry veneer walls may be supported on *foundations* of wood frame constructed in conformance with Sentence 9.15.2.4.(1).
(See Note A-9.20.5.1.(1).)

2) Every masonry wall shall be at least as thick as the wall it supports, except as otherwise permitted in Article 9.20.12.2.

9.20.5.2. Lintels or Arches

1) Masonry over openings shall be supported by steel, masonry or reinforced concrete lintels, or masonry arches.

2) Steel angle lintels supporting masonry veneer above openings shall

a) conform to Table 9.20.5.2., and

b) have a bearing length not less than 90 mm.

Table 9.20.5.2.
Maximum Allowable Spans for Steel Lintels Supporting Masonry Veneer
Forming Part of Sentence 9.20.5.2.(2)

Minimum Angle Size, mm			Maximum Allowable Spans, m		
Vertical Leg	Horizontal Leg	Thickness	Supporting 75 mm Brick	Supporting 90 mm Brick	Supporting 100 mm Stone
89	76	6.4	2.55	–	–
89	89	6.4	2.59	2.47	2.30
102	89	6.4	2.79	2.66	2.48
127	89	7.9	3.47	3.31	3.08
127	89	11	3.64	3.48	3.24

3) Steel angle lintels supporting masonry other than veneer, masonry and reinforced concrete lintels, and masonry arches shall be designed in accordance with Part 4 to support the imposed load.

4) Steel angle lintels supporting masonry shall be prime painted or otherwise protected from corrosion.

9.20.6. Thickness and Height

9.20.6.1. Thickness of Exterior Walls

1) Masonry exterior walls, other than *cavity walls*, in 1-*storey buildings* and the top *storeys* of 2- and 3-*storey buildings* shall be not less than 140 mm thick, provided the walls are not more than 2.8 m high at the eaves and 4.6 m high at the peaks of gable ends.

2) The exterior walls of the bottom *storeys* of 2-*storey buildings*, and exterior walls of the bottom 2 *storeys* of 3-*storey buildings* shall be not less than 190 mm thick.

3) In exterior walls composed of more than one wythe, each wythe shall be not less than 90 mm thick.

9.20.6.2. Cavity Walls

1) *Cavity walls* shall be made with not less than 90 mm wide units if the joints are raked and not less than 75 mm wide units if the joints are not raked.

2) The width of a cavity in a *cavity wall* shall be not less than 50 mm and not greater than 150 mm.

3) The minimum thickness of *cavity walls* above the supporting base shall be 230 mm for the top 7.6 m and 330 mm for the remaining portion, except that where 75 mm wide units are used, the wall height above the top of the *foundation* wall shall not exceed 6 m.

9.20.6.3. Thickness of Interior Walls

1) The thickness of *loadbearing* interior walls shall be determined on the basis of the maximum lateral support spacing as provided in Sentences 9.20.10.1.(2) and (3).

2) The thickness of interior non-*loadbearing* walls shall be

a) determined on the basis of the maximum lateral support spacing as provided in Sentences 9.20.10.1.(2) and (3), and

b) in any case, not less than 65 mm.

9.20.6.4. Masonry Veneer

1) Except for masonry veneer where each masonry unit is supported individually by the structural backing, masonry veneer shall consist of *solid masonry units* not less than 75 mm thick.

2) Veneer described in Sentence (1) over wood-frame walls shall have not less than a 25 mm air space behind the veneer.

3) Masonry veneer less than 90 mm thick shall have unraked joints.

4) Masonry veneer shall conform to Subsection 4.3.2., where the masonry units are required to be individually supported by the structural backing.

9.20.6.5. Parapet Walls

1) The height of parapet walls above the adjacent roof surface shall be not more than 3 times the parapet wall thickness.

2) Parapet walls shall be *solid masonry*

a) with the cells of hollow or semi-solid units filled with mortar, grout, or concrete, and

b) that extends from the top of the parapet to not less than 300 mm below the adjacent roof level.

9.20.6.6. Stone or Concrete Facings

1) Slab and panel facings of precast concrete and natural or artificial stone shall conform to Subsection 4.3.2.

9.20.7. Chases and Recesses

9.20.7.1. Maximum Dimensions

1) Except as permitted in Sentence 9.20.7.2.(2) and Article 9.20.7.4., the depth of any chase or recess shall not exceed one third the thickness of the wall, and the width of the chase or recess shall not exceed 500 mm.

9.20.7.2. Minimum Wall Thickness

1) Except as permitted in Sentence (2) and Article 9.20.7.4., no chase or recess shall be constructed in any wall 190 mm or less in thickness.

2) Recesses may be constructed in 190 mm walls provided they do not exceed 100 mm in depth, 750 mm in height and 500 mm in width.

9.20.7.3. Separation of Chases or Recesses

1) Chases and recesses shall be not less than

a) 4 times the wall thickness apart, and

b) 600 mm away from any pilaster, cross wall, buttress or other vertical element providing required lateral support for the wall.

9.20.7.4. Non-Conforming Chases or Recesses

1) Chases or recesses that do not conform to the limits specified in Articles 9.20.7.1. to 9.20.7.3. shall be considered as openings, and any masonry supported above such a chase or recess shall be supported by a lintel or arch as provided in Article 9.20.5.2.

9.20.7.5. Chases or Recesses Cut into Walls

1) Chases and recesses shall not be cut into walls made with hollow units after the masonry units are in place.

9.20.8. Support of Loads

9.20.8.1. Capping of Hollow Masonry Walls

1) Except as permitted in Sentence (2), *loadbearing* walls of hollow masonry units supporting roof or floor framing members shall be capped with not less than 50 mm of *solid masonry* or have the top course filled with concrete.

2) Capping required in Sentence (1) may be omitted where the roof framing is supported on a wood plate not less than 38 mm by 89 mm.

9.20.8.2. Cavity Walls Supporting Framing Members

1) Floor joists supported on *cavity walls* shall be supported on *solid masonry units* not less than 57 mm high.

2) Floor joists described in Sentence (1) shall not project into the cavity.

3) Roof and ceiling framing members bearing on *cavity walls* shall be supported on

a) *solid masonry units* not less than 57 mm high that bridge the full thickness of the wall, or

b) a wood plate not less than 38 mm thick, bearing not less than 50 mm on each wythe.

9.20.8.3. Bearing of Beams and Joists

1) The bearing area under beams and joists shall be sufficient to carry the supported load.

2) In no case shall the minimum length of end bearing of beams supported on masonry be less than 90 mm.

3) The length of end bearing of floor, roof or ceiling joists supported on masonry shall be not less than 40 mm.

9.20.8.4. Support of Beams and Columns

1) Beams and columns supported on masonry walls shall be supported on pilasters where the thickness of the masonry wall or wythe is less than 190 mm.

2) Not less than 190 mm depth of *solid masonry* or concrete shall be provided under the beam or column referred to in Sentence (1).

3) Pilasters required in Sentence (1) shall be bonded or tied to masonry walls.

4) Concrete pilasters required in Sentence (1) shall be not less than 50 mm by 300 mm.

5) Unit masonry pilasters required in Sentence (1) shall be not less than 100 mm by 290 mm.

9.20.8.5. Projection of Masonry Veneer Beyond Supporting Members

1) Masonry veneer of hollow and *solid masonry units* resting on a bearing support shall not project more than one third of the thickness of the veneer. (See Note A-9.20.8.5.(1).)

2) Where the masonry veneer described in Sentence (1) is rough stone masonry,

a) the projection shall be measured as the average projection of the units, and

b) the thickness of the veneer shall be measured as the average thickness of the veneer.

9.20.9. Bonding and Tying

9.20.9.1. Joints to be Offset or Reinforced

1) Vertical joints in adjacent masonry courses shall be offset unless each wythe of masonry is reinforced with the equivalent of not less than 2 corrosion-resistant steel bars of 3.76 mm diam placed in the horizontal joints at vertical intervals not exceeding 460 mm.

2) Where joints in the reinforcing referred to in Sentence (1) occur, the bars shall be lapped not less than 150 mm.

9.20.9.2. Bonding or Tying of Other than Masonry Veneer

1) Except as provided in Article 9.20.9.5. regarding masonry veneer, masonry walls that consist of 2 or more wythes shall have the wythes bonded or tied together with masonry bonding units as described in Article 9.20.9.3. or with metal ties as described in Article 9.20.9.4.

9.20.9.3. Bonding

1) Where wythes are bonded together with masonry units, the bonding units shall comprise not less than 4% of the wall surface area.

2) Bonding units described in Sentence (1) shall be spaced not more than 600 mm vertically and horizontally in the case of brick masonry and 900 mm o.c. in the case of block or tile.

3) Units described in Sentence (1) shall extend not less than 90 mm into adjacent wythes.

9.20.9.4. Tying

1) Where 2 or more wythes are tied together with metal ties of the individual rod type, the ties shall conform to the requirements in Sentences (3) to (6).

2) Other ties may be used where it can be shown that such ties provide walls that are at least as strong and as durable as those made with the individual rod type.

3) Metal ties of the individual rod type shall

a) be corrosion-resistant,

b) have a minimum cross-sectional area of not less than 17.8 mm^2, and

c) have not less than a 50 mm portion bent at right angles at each end.

4) Metal ties of the individual rod type shall

a) extend from within 25 mm of the outer face of the wall to within 25 mm of the inner face of the wall,

b) be completely embedded in mortar except for the portion exposed in *cavity walls*, and

c) be staggered from course to course.

5) Where 2 or more wythes in walls other than *cavity walls* and masonry veneer/masonry backing walls are tied together with metal ties of the individual rod type, the space between wythes shall be completely filled with mortar.

6) Ties described in Sentence (5) shall be

a) located within 300 mm of openings and spaced not more than 900 mm apart around openings, and

b) spaced not more than 900 mm apart horizontally and 460 mm apart vertically at other locations.

7) Except as required in Sentences (8) and (9), where the inner and outer wythes of *cavity walls* are tied with individual wire ties, the ties shall be spaced not more than 900 mm apart horizontally and 400 mm apart vertically.

8) Within 100 mm of the bottom of each floor or roof assembly where the cavity extends below the assemblies, the ties described in Sentence (7) shall be spaced not more than 600 mm apart horizontally.

9) Within 300 mm of any openings, the ties described in Sentence (7) shall be spaced not more than 900 mm apart.

9.20.9.5. Ties for Masonry Veneer

1) Masonry veneer 75 mm or more in thickness and resting on a bearing support shall be tied to masonry backing or to wood framing members with straps that are

a) corrosion-resistant,

b) not less than 0.76 mm thick,

c) not less than 22 mm wide,

d) shaped to provide a key with the mortar, and

e) spaced in accordance with Table 9.20.9.5.

Table 9.20.9.5.
Veneer Tie Spacing
Forming Part of Sentence 9.20.9.5.(1)

Maximum Vertical Spacing, mm	Maximum Horizontal Spacing, mm
400	800
500	600
600	400

2) Straps described in Sentence (1) that are fastened to wood framing members shall be

a) bent at a right angle within 6 mm from the fastener, and

b) fastened with corrosion-resistant 3.18 mm diam screws or spiral nails having a wood penetration of not less than 63 mm.

3) Masonry veneer individually supported by masonry or wood-frame backing shall be secured to the backing in conformance with Subsection 4.3.2.

9.20.9.6. Reinforcing for Glass Block

1) Glass block shall have horizontal joint reinforcement of 2 corrosion-resistant bars of not less than 3.76 mm diam or expanded metal strips not less than 75 mm wide

a) spaced at vertical intervals of not more than 600 mm for units 200 mm or less in height, and

b) installed in every horizontal joint for units higher than 200 mm.

2) Reinforcement required in Sentence (1) shall be lapped not less than 150 mm.

9.20.10. Lateral Support

9.20.10.1. Lateral Support Required

1) Masonry walls shall be laterally supported by floor or roof construction or by intersecting masonry walls or buttresses.

2) The spacing of supports required in Sentence (1) shall be not more than

a) 20 times the wall thickness for all *loadbearing* walls and exterior non-*loadbearing* walls, and

b) 36 times the wall thickness for interior non-*loadbearing* walls.

3) In applying Sentence (2), the thickness of *cavity walls* shall be taken as the greater of

a) two-thirds of the sum of the thicknesses of the wythes, or

b) the thickness of the thicker wythe.

4) Floor and roof constructions providing lateral support for walls as required in Sentence (1) shall be constructed to transfer lateral loads to walls or buttresses approximately at right angles to the laterally supported walls.

9.20.11. Anchorage of Roofs, Floors and Intersecting Walls

9.20.11.1. Anchorage to Floor or Roof Assemblies where Masonry Walls Require Lateral Support

1) Where required to receive lateral support (See Subsection 9.20.10.), masonry walls shall be anchored to each floor or roof assembly at maximum intervals of 2 m, except that anchorage to floor joists not more than 1 m above *grade* may be omitted.

2) Anchors required in Sentence (1) shall be corrosion-resistant and be not less than the equivalent of 40 mm by 4.76 mm thick steel straps.

3) Anchors required in Sentence (1) shall be shaped to provide a mechanical key with the masonry and shall be securely fastened to the horizontal support to develop the full strength of the anchor.

4) When joists are parallel to the wall, anchors required in Sentence (1) shall extend across not less than 3 joists.

9.20.11.2. Bonding and Tying Intersecting Masonry Walls where Walls Require Lateral Support

1) Where required to provide lateral support, intersecting walls shall be bonded or tied together.

2) Where bonding is used to satisfy the requirements of Sentence (1), 50% of the adjacent masonry units in the intersecting wall, distributed uniformly over the height of the intersection, shall be embedded in the laterally supported wall.

3) Where tying is used to satisfy the requirements of Sentence (1), the ties shall be

a) corrosion-resistant metal,

b) equivalent to not less than 4.76 mm by 40 mm steel strapping,

c) spaced not more than 800 mm o.c. vertically, and

d) shaped at both ends to provide sufficient mechanical key to develop the strength of the ties.

9.20.11.3. Anchoring Intersecting Wood-Frame Walls to Masonry Walls

1) Wood-frame walls shall be anchored to masonry walls that they intersect with not less than 4.76 mm diam corrosion-resistant steel rods spaced not more than 900 mm o.c. vertically.

2) Anchors required in Sentence (1) shall be fastened to the wood framing at one end and shaped to provide a mechanical key at the other end to develop the strength of the anchor.

9.20.11.4. Anchoring Wood-Frame Roof Systems to Masonry Walls

1) Except as permitted in Sentence (2), roof systems of wood-frame construction shall be anchored to exterior masonry walls by not less than 12.7 mm diam anchor bolts,

a) spaced not more than 2.4 m apart,

b) embedded not less than 90 mm into the masonry, and

c) fastened to a rafter plate of not less than 38 mm thick lumber.

2) The roof system described in Sentence (1) is permitted to be anchored by nailing the wall furring strips to the side of the rafter plate.

9.20.11.5. Anchoring Masonry Cornices, Sills and Trim to Masonry Walls

1) Cornices, sills or other trim of masonry material which project beyond the wall face shall have not less than 65% of their mass, but not less than 90 mm, within the wall or shall be adequately anchored to the wall with corrosion-resistant anchors.

9.20.11.6. Anchoring to Masonry Piers

1) Where anchor bolts are to be placed in the top of a masonry pier, the pier shall conform to the requirements of Sentence 9.15.2.3.(4) and shall be capped with concrete or reinforced masonry not less than 200 mm thick.

9.20.12. Corbelling

9.20.12.1. Corbelling

1) All corbelling shall consist of *solid masonry units*.

2) The units referred to in Sentence (1) shall be corbelled so that the horizontal projection of any unit does not exceed 25 mm and the total projection does not exceed one third of the total wall thickness.

9.20.12.2. Corbelling for Cavity Walls

1) *Cavity walls* of greater thickness than the *foundation* wall on which they rest shall not be corbelled but may project 25 mm over the outer face of the *foundation* wall disregarding parging.

2) Where the *foundation* wall referred to in Sentence (1) is unit masonry, it is permitted to be corbelled to meet flush with the inner face of a *cavity wall* provided

a) the projection of each course does not exceed half the height or one third the thickness of the corbelled unit, and

b) the total corbel does not exceed one third of the *foundation* wall thickness.

(See Note A-9.20.12.2.(2).)

9.20.12.3. Corbelling for Masonry Veneer

1) Masonry veneer resting on a bearing support shall not project more than 25 mm beyond the supporting base where the veneer is not less than 90 mm thick, and 12 mm beyond the supporting base where the veneer is less than 90 mm thick.

2) In the case of rough stone veneer, the projection, measured as the average projection of the stone units, shall not exceed one-third the bed width beyond the supporting base.

9.20.13. Control of Rainwater Penetration

9.20.13.1. Materials for Flashing

1) Materials used for flashing shall conform to Table 9.20.13.1.

Table 9.20.13.1.
Flashing Materials
Forming Part of Sentence 9.20.13.1.(1)

Material	Minimum Thickness, mm	
	Exposed Flashing	Concealed Flashing
Aluminum	0.48	–
Copper	0.46	0.46
Copper or aluminum laminated to felt or kraft paper	–	0.05
Galvanized steel	0.33	0.33
Lead sheet	1.73	1.73
Polyethylene	–	0.50
Roll roofing, Type S	–	standard
Zinc	0.46	0.46

2) Aluminum flashing in contact with masonry or concrete shall be effectively coated or separated from the masonry or concrete by an impervious membrane.

9.20.13.2. Fastening of Flashing

1) Fastening devices for flashing shall be corrosion-resistant and, where metal flashing is used, shall be compatible with the flashing with respect to galvanic action.

9.20.13.3. Location of Flashing

1) Flashing shall be installed in masonry and masonry veneer walls

a) beneath jointed masonry window sills,

b) over the back and top of parapet walls,

c) over the heads of glass block panels,

d) beneath weep holes, and

e) over the heads of window or door openings in exterior walls when the vertical distance between the top of a window or door frame and the bottom edge of the eave exceeds one-quarter of the horizontal eave overhang.

9.20.13.4. Extension of Flashing

1) When installed beneath jointed masonry window sills or over the heads of openings, flashing shall extend from the front edge of the masonry up behind the sill or lintel.

9.20.13.5. Flashing for Weep Holes in Masonry/Masonry Walls

1) Flashing beneath weep holes in *cavity walls* and masonry veneer/masonry backing walls shall

a) be bedded not less than 25 mm in the inside wythe,

b) extend to not less than 5 mm beyond the outer face of the *building* element below the flashing, and

c) be installed with a nominally horizontal slope toward the outside wythe.

9.20.13.6. Flashing for Weep Holes in Masonry Veneer

1) Flashing beneath weep holes in masonry veneer over masonry backing walls shall conform to the flashing requirements for *cavity walls* and masonry veneer/masonry backing walls in Article 9.20.13.5.

2) Flashing beneath weep holes in masonry veneer over wood-frame walls shall be installed so that it extends from a point not less than 5 mm beyond the outer face of the *building* element below the flashing to a point 150 mm up the wood-frame wall.

3) Where the frame wall is sheathed with a sheathing membrane, a non-wood-based rigid exterior insulating sheathing or a semi-rigid insulating sheathing with an integral sheathing membrane, the flashing shall be installed behind the sheathing membrane or insulating sheathing.

4) Flashing described in Sentence (2) is permitted to conform to the requirements for concealed flashing in Table 9.20.13.1.

9.20.13.7. Flashing Joints

1) Joints in flashing shall be made watertight.

9.20.13.8. Required Weep Holes

1) Weep holes spaced not more than 800 mm apart shall be provided at the bottom of

a) cavities in *cavity walls*, and

b) cavities or air spaces in masonry veneer walls.

2) The cavities or air spaces described in Sentence (1) shall include those above lintels over window and door openings required to be flashed in conformance with Article 9.20.13.3.

9.20.13.9. Protection of Interior Finish

1) Except as provided in Sentence (3), where the interior finish of the exterior walls of a *building* is a type that may be damaged by moisture, exterior masonry walls, other than *cavity walls* or walls that are protected for their full height by a roof of a carport or porch, shall be covered on the interior surface with sheathing membrane conforming to CAN/CGSB-51.32-M, "Sheathing, Membrane, Breather Type," lapped not less than 100 mm at the joints.

2) In situations described in Sentence (1), flashing shall be provided where water will accumulate, to lead it to the exterior.

3) Where insulation that effectively limits the passage of water is applied by a waterproof adhesive or mortar directly to parged masonry, the requirements for sheathing membrane in Sentence (1) do not apply. (See Note A-9.20.13.9.(3).)

9.20.13.10. Mortar Droppings

1) *Cavity walls* shall be constructed so that mortar droppings are prevented from forming a bridge to allow the passage of rain water across the cavity.

9.20.13.11. Caulking at Door and Window Frames

1) The junction of door and window frames with masonry shall be caulked in conformance with Subsection 9.27.4.

9.20.13.12. Drips beneath Window Sills

1) Where no flashing is installed beneath window sills, such sills shall be provided with a drip not less than 25 mm from the wall surface.

9.20.14. Protection during Work

9.20.14.1. Laying Temperature of Mortar and Masonry

1) Mortar and masonry shall be maintained at a temperature not below 5°C during installation and for not less than 48 h after installation.

2) No frozen material shall be used in mortar mix.

9.20.14.2. Protection from Weather

1) The top surface of uncompleted masonry exposed to the weather shall be completely covered with a waterproofing material when construction is not in progress.

9.20.15. Reinforcement for Earthquake Resistance

9.20.15.1. Amount of Reinforcement

1) Where reinforcement is required in this Section, masonry walls shall be reinforced horizontally and vertically with steel having a total cross-sectional area of not less than 0.002 times the horizontal cross-sectional area of the wall, so that not less than one-third of the required steel area is installed either horizontally or vertically and the remainder in the other direction.

9.20.15.2. Installation Standard

1) Where reinforcement for masonry is required in this Section, it shall be installed in conformance with the requirements for reinforced masonry as contained in CSA A371, "Masonry Construction for Buildings."

9.20.16. Corrosion Resistance

9.20.16.1. Corrosion Resistance of Connectors

1) Carbon steel connectors required to be corrosion-resistant shall be galvanized to at least the minimum standards in Table 9.20.16.1.

Table 9.20.16.1.
Minimum Requirements for Galvanizing
Forming Part of Sentence 9.20.16.1.(1)

Connector Material	ASTM Standard	Coating Class or Thickness
Wire ties and continuous reinforcing (hot-dipped galvanizing)	ASTM A 153/A 153M	Class B2 or 458 g/m^2
Hardware and bolts	ASTM A 153/A 153M	See ASTM A 153/A 153M
Strip, plate, bars and rolled sections (not less than 3.18 mm thick)	ASTM A 123/A 123M	610 g/m^2
Sheet (less than 3.18 mm thick)	ASTM A 123/A 123M	305 g/m^2 on material 0.76 mm thick(1)

Notes to Table 9.20.16.1.:

(1) ASTM A 123/A 123M does not apply to metal less than 3.18 mm thick. Galvanizing coatings may be interpolated for thicknesses between 3.18 mm and 0.76 mm.

9.20.17. Above-Ground Flat Insulating Concrete Form Walls

9.20.17.1. Thickness of Flat Insulating Concrete Form Walls

1) The thickness of the concrete in flat insulating concrete form walls not in contact with the ground shall be

a) not less than 140 mm, and

b) constant for the entire height of the wall.

9.20.17.2. Reinforcement for Flat Insulating Concrete Form Walls

1) Horizontal reinforcement in above-grade flat insulating concrete form walls shall

a) consist of

i) one 10M bar placed not more than 300 mm from the top of the wall, and

ii) 10M bars at 600 mm o.c., and

b) be placed in the middle third of the wall section.

2) Vertical reinforcement in above-grade flat insulating concrete form walls shall

a) consist of 10M bars at 400 mm o.c., and

b) be placed in the middle third of the wall section.

3) Vertical reinforcement required by Sentence (2) and interrupted by wall openings shall be placed not more than 600 mm from each side of the opening.

9.20.17.3. Openings in Non-Loadbearing Flat Insulating Concrete Form Walls

1) No openings shall occur within 1 200 mm of interior and exterior corners of exterior non-*loadbearing* flat insulating concrete form walls.

2) Portions of walls above openings in non-*loadbearing* flat insulating concrete form walls shall have a minimum depth of concrete of no less than 200 mm across the width of the opening.

3) Openings that are more than 600 mm but not more than 3 000 mm in width in non-*loadbearing* flat insulating concrete form walls shall be reinforced at the top and bottom with one 10M bar.

4) Openings more than 3 000 mm in width in non-*loadbearing* flat insulating concrete form walls shall be reinforced on all four sides with two 10M bars.

5) Reinforcing bars described in Sentences (3) and (4) shall extend 600 mm beyond the edges of the opening.

6) The cumulative width of openings in non-*loadbearing* flat insulating concrete form walls shall not make up more than 70% of the length of any wall.

9.20.17.4. Openings in Loadbearing Flat Insulating Concrete Form Walls

1) No openings shall occur within 1 200 mm of interior and exterior corners of exterior *loadbearing* flat insulating concrete form walls.

2) In *loadbearing* flat insulating concrete form walls, lintels shall be provided over all openings wider than 900 mm.

3) Lintels described in Sentence (2) shall be constructed in accordance with Span Table 9.20.17.4.-A, 9.20.17.4.-B or 9.20.17.4.-C.

4) Lintels described in Sentence (2) over openings wider than 1 200 mm shall be reinforced for shear with 10M stirrups at a maximum spacing of half the distance from the bottom reinforcing bar to the top of the lintel.

9.20.17.5. Framing Supported on Flat Insulating Concrete Form Walls

1) Floor joists supported on the side of flat insulating concrete form walls shall be supported with joist hangers secured to wood ledger boards.

2) The ledger boards referred to in Sentence (1) shall be not less than

a) 38 mm thick, and

b) the depth of the floor joists.

3) Anchor bolts shall be used to secure ledger boards to flat insulating concrete form walls and shall be

a) embedded in the wall to a depth not less than 100 mm, and

b) spaced in accordance with Table 9.20.17.5.

4) Floor joists and *building* frames supported on the top of flat insulating concrete form walls shall be anchored in conformance with Article 9.23.6.1.

Table 9.20.17.5.
Maximum Anchor Bolt Spacing for the Connection of Floor Ledgers to Flat Insulating Concrete Form Walls
Forming Part of Sentence 9.20.17.5.(3)

Maximum Clear Floor Span, m	Maximum Anchor Bolt Spacing, mm	
	Staggered 12.7 mm Diameter Anchor Bolts	Staggered 16 mm Diameter Anchor Bolts
2.44	450	500
3.0	400	450
4.0	300	400
5.0	275	325

9.20.17.6. Anchoring of Roof Framing to the Top of Flat Insulating Concrete Form Walls

1) Roof framing supported on the top of flat insulating concrete form walls shall be fixed to the top plates, which shall be anchored to the wall with anchor bolts

a) not less than 12.7 mm in diameter, and

b) spaced at not more than 1 200 mm o.c.

2) The anchor bolts described in Sentence (1) shall be placed in the centre of the flat insulating concrete form wall and shall be embedded no less than 100 mm into the concrete.

3) Attachment of roof framing to wood top plates shall be in accordance with Table 9.23.3.4.

9.20.17.7. Protection from Precipitation and Damage

1) Above-ground flat insulating concrete form walls shall be protected from precipitation and damage in conformance with Section 9.27.