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Illustrations from Illustrated NBC Part 09 & Canadian Wood-Frame House Construction

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Illustrations from Illustrated NBC Part 09 & Canadian Wood-Frame House Construction

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Illustrations from Illustrated NBC Part 09 & Canadian Wood-Frame House Construction

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Illustrations from Illustrated NBC Part 09 & Canadian Wood-Frame House Construction

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Supplementary Standards

The following Supplementary Standards may be covered in the exam:

- Supplementary Standard SA-1 - Objectives and Functional Statements Attributed to the Acceptable Solutions
- Supplementary Standard SB-1 - Climatic and Seismic Data
- Supplementary Standard SB-2 - Fire Performance Ratings
- Supplementary Standard SB-3 - Fire and Sound Resistance of Building Assemblies
- Supplementary Standard SB-7 - Guards for Housing and Small Buildings

Illustrations from Illustrated NBC Part 09 & Canadian Wood-Frame House Construction

- Supplementary Standard SB-9 - Requirements for Soil Gas Control
- Supplementary Standard SB-12 - Energy Efficiency for Housing

9.1 General

1. **Scope:** ↓ = 3 storeys, ↓ = 600 m², C,D,E or F2&3 occupancy, ↓ = 2.40 KPa live load, ↓ = 4550 m² Roof area, no member is greater than 12.2 m. **(9.1.1.1)**

Table 9.1.-B
Occupancies Covered by Part 9 (NBC Article 1.3.3.3. of Division A)

Occupancy	Designation	Description of Use	Examples
Residential	Group C	Sleeping rooms for persons who are not detained involuntarily or who do not need care or treatment	Houses, hotels, dormitories, boarding or lodging houses, motels, apartments, convalescent and children's custodial homes, houses with a secondary suite
Business and personal services	Group D	Transaction of business or for personal or professional services	Banks, barbershops, dental offices, medical offices, offices, tool rental, appliance service
Mercantile	Group E	Display of merchandise or sale of retail goods	Stores, supermarkets, shops
Medium-hazard industrial	Group F, Division 2	Making, repairing or storing goods or materials (combustible content > 50 kg/m ² or 1 200 MJ/m ²)	Warehouses, workshops, salesrooms, factories, planing mills, repair garages, laboratories, service stations
Low-hazard industrial	Group F, Division 3	Same as above but with low fire load (combustible content ≤ 50 kg/m ² or 1 200 MJ/m ²)	Creameries, factories, laboratories, storage garages, salesrooms, warehouses, storage rooms, workshops

Part 9

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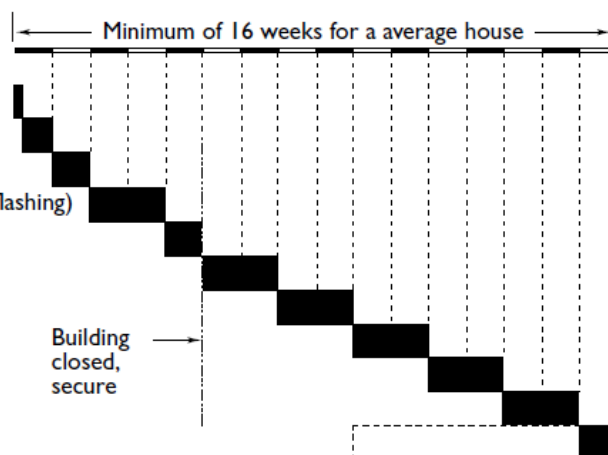
NBC Section	Use and Egress	Fire Protection	Building Structure	Environmental Separation	Building Services
9.1.	General				
9.2.	Definitions				
9.3.	Materials, Systems and Equipment				
9.4.			Structural Requirements		
9.5.	Design of Areas and Spaces				
9.6.				Glass	
9.7.				Windows, Doors and Skylights	
9.8.	Stairs, Ramps, Handrails and Guards				
9.9.	Means of Egress				
9.10.		Fire Protection			
9.11.				Sound Transmission	
9.12.			Excavation		
9.13.				Dampproofing, Waterproofing and Soil Gas Control	
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4 Sample single house construction schedule

Stage of construction

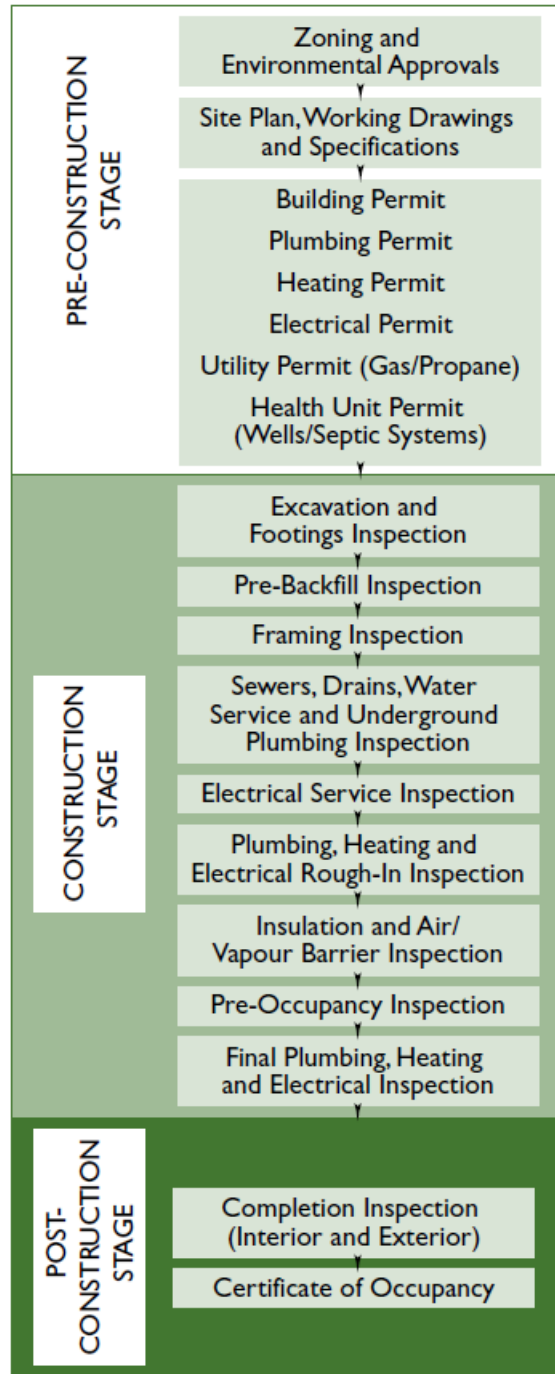
Drawings, Financing and Permits*
 Layout of Building
 Excavation and Footings
 Foundations and Drainage
 Framing and Backfill (includes roofing and flashing)
 Doors and Windows
 Plumbing, Heating and Electrical Rough-In
 Insulation, Air and Vapour Barriers
 Exterior Finishes
 Interior Finishes
 Paint, Cabinets and Fixtures
 Landscaping



* Drawings, financing and permits as well as any other aspects of the pre-construction stage will have a variable duration depending on site and house characteristics.

Building Permit

2 Approval, permits and inspection processes for new houses



BCA (Building Code Act) 1(1) Definition

“building” means,

- (a) a structure occupying an area greater than ten square metres consisting of a wall, roof and floor or any of them or a structural system serving the function thereof including all plumbing, works, fixtures and service systems appurtenant thereto,
- (b) a structure occupying an area of ten square metres or less that contains plumbing, including the plumbing appurtenant thereto,
- (c) plumbing not located in a structure,
 - (c.1) a sewage system, or
- (d) structures designated in the building code

OBC (Ontario Building Code) Div C Part 1

Section 1.3. Permits and Inspections

1.3.1. Permits

1.3.1.1. Requirement for Permits

- (1) A person is exempt from the requirement to obtain a permit under section 8 of the Act,
 - (a) for the *demolition* of a *building* located on a farm,
 - (b) subject to Sentence (2), for the *construction* or *demolition* of a *building* in territory without municipal organization, or
 - (c) for the *construction* of a Class 1 *sewage system*.
- (2) The exemption in Clause (1)(b) from the requirement to obtain a permit does not apply to the *construction* of a *sewage system* in territory without municipal organization.

- (3) The application for a permit respecting the *demolition* of a

building to which Sentence 1.2.2.3.(1) applies shall include descriptions of the structural design characteristics of the *building* and the method of *demolition* of the *building*.

- (4) No person shall commence *demolition* of a *building* or any part of a *building* before the *building* has been vacated by the occupants except where the safety of the occupants is not affected.

(5) A tent or group of tents is exempt from the requirement to obtain a permit under section 8 of the Act and is exempt from compliance with the Code provided that the tent or group of tents are,

- (a) not more than 60 m² in aggregate ground area,
- (b) not attached to a *building*, and
- (c) constructed more than 3 m from other structures.

(6) A shed is exempt from the requirement to obtain a permit under section 8 of the Act and is exempt from compliance with this Code, provided that the shed,

- (a) is not more than 15 m² in *gross area*,
- (b) is not more than one *storey* in *building height*,
- (c) is not attached to a *building* or any other structure,
- (d) is used only for storage purposes ancillary to a principal *building* on the lot, and
- (e) does not have plumbing.

(7) A *demountable stage* or *demountable support structure* not regulated by Section 3.16A. of Division B is exempt from the requirement to obtain a permit under section 8 of the Act and is exempt from compliance with this Code.

BCA (Building Code Act)

Building permits

8 (1) No person shall construct or demolish a building or cause a building to be constructed or demolished unless a permit has been issued therefor by the chief building official.

Application for permit

(1.1) An application for a permit to construct or demolish a building may be made by a person specified by regulation and the prescribed form or the form approved by the Minister must be used and be accompanied by the documents and information specified by regulation.

OBC (Ontario Building Code) Div C Part 1

1.3.1.2. Applications for Permits under Section 8 of the Act

(1) An application for a permit under section 8 of the Act to *construct* or *demolish* a *building* shall be made by,

- (a) the owner of the property on which the proposed *construction* or *demolition* is to take place, or
- (b) the authorized agent of the owner referred to in Clause (a).

(2) An application referred to in Sentence (1) shall be in a form approved by the *Minister*.

(3) In Sentence (1),

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“owner” includes, in respect of the property on which the *construction* or *demolition* will take place, the registered owner, a lessee and a mortgagee in possession.

1.3.1.3. Period Within Which a Permit is Issued or Refused

(1) Subject to Sentences (2) and (3) and unless the circumstances set out in Sentence (6) exist, if an application for a permit under subsection 8 (1) of the Act that meets the requirements of Sentence (5) is submitted to a *chief building official*, the *chief building official* shall, within the time period set out in Column 2 of Table 1.3.1.3. corresponding to the class of *building* described in Column 1 of Table 1.3.1.3. for which the application is made,

(a) issue the permit, or

(b) refuse to issue the permit and provide in writing all of the reasons for the refusal.

Table 1.3.1.3.
Period Within Which Permit Shall be Issued or Refused

Forming Part of Article 1.3.1.3.

Item	Column 1 Class of <i>Building</i>	Column 2 Time Period
1.	(a) Except for a <i>retirement home</i> , a house where no <i>dwelling unit</i> is located above another <i>dwelling unit</i> .	10 days
	(b) A detached structure that serves a <i>building</i> described in Clause (a) and does not exceed 55 m ² in <i>building area</i> .	
	(c) A tent to which Section 3.14. of Division B applies.	
	(d) A sign to which Section 3.15. of Division B applies.	
	(e) A <i>demountable stage</i> or <i>demountable support structure</i> to which Section 3.16A. of Division B applies.	
2.	(a) <i>Buildings</i> described in Clause 1.1.2.4.(1)(a), (b) or (c) of Division A, other than <i>buildings</i> described in Column 1 of any of Items 1 and 4 of this Table.	15 days
	(b) <i>Farm buildings</i> that do not exceed 600 m ² in <i>building area</i> .	
3.	(a) <i>Buildings</i> described in Clause 1.1.2.2.(1)(a) or (b) of Division A, other than <i>buildings</i> described in Column 1 of any of Items 1 and 4 of this Table.	20 days
	(b) <i>Farm buildings</i> exceeding 600 m ² in <i>building area</i> .	
	(c) <i>Retirement homes</i> .	
4.	(a) <i>Post-disaster buildings</i> .	30 days
	(b) <i>Buildings</i> to which Subsection 3.2.6. of Division B or any provision in Articles 3.2.8.3. to 3.2.8.11. of Division B applies.	

BCA (Building Code Act)

Notice of readiness for inspection

10.2 (1) At each stage of construction specified in the building code, the prescribed person shall notify the chief building official or the registered code agency, if any, that the construction is ready to be inspected.

Inspection

(2) After the notice is received, an inspector or the registered code agency, as the case may be, shall carry out the inspection required by the building code within the prescribed period.

OBC (Ontario Building Code) Div C Part 1

1.3.5. Notices and Inspections

1.3.5.1. Prescribed Notices

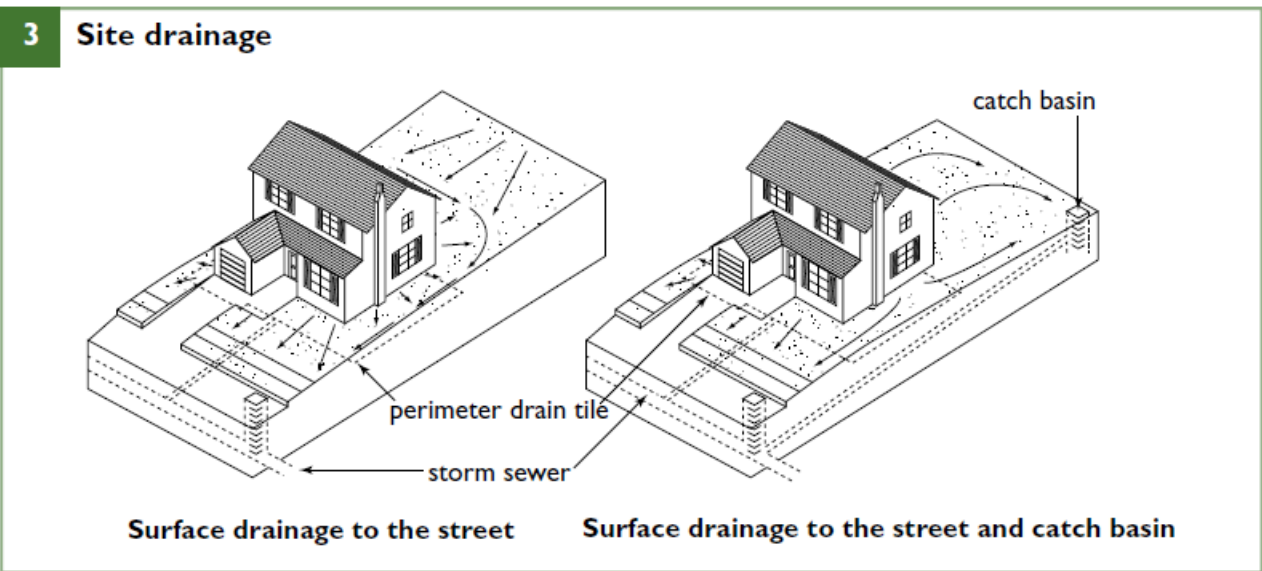
(1) This Article sets out the notices that are required under section 10.2 of the Act.

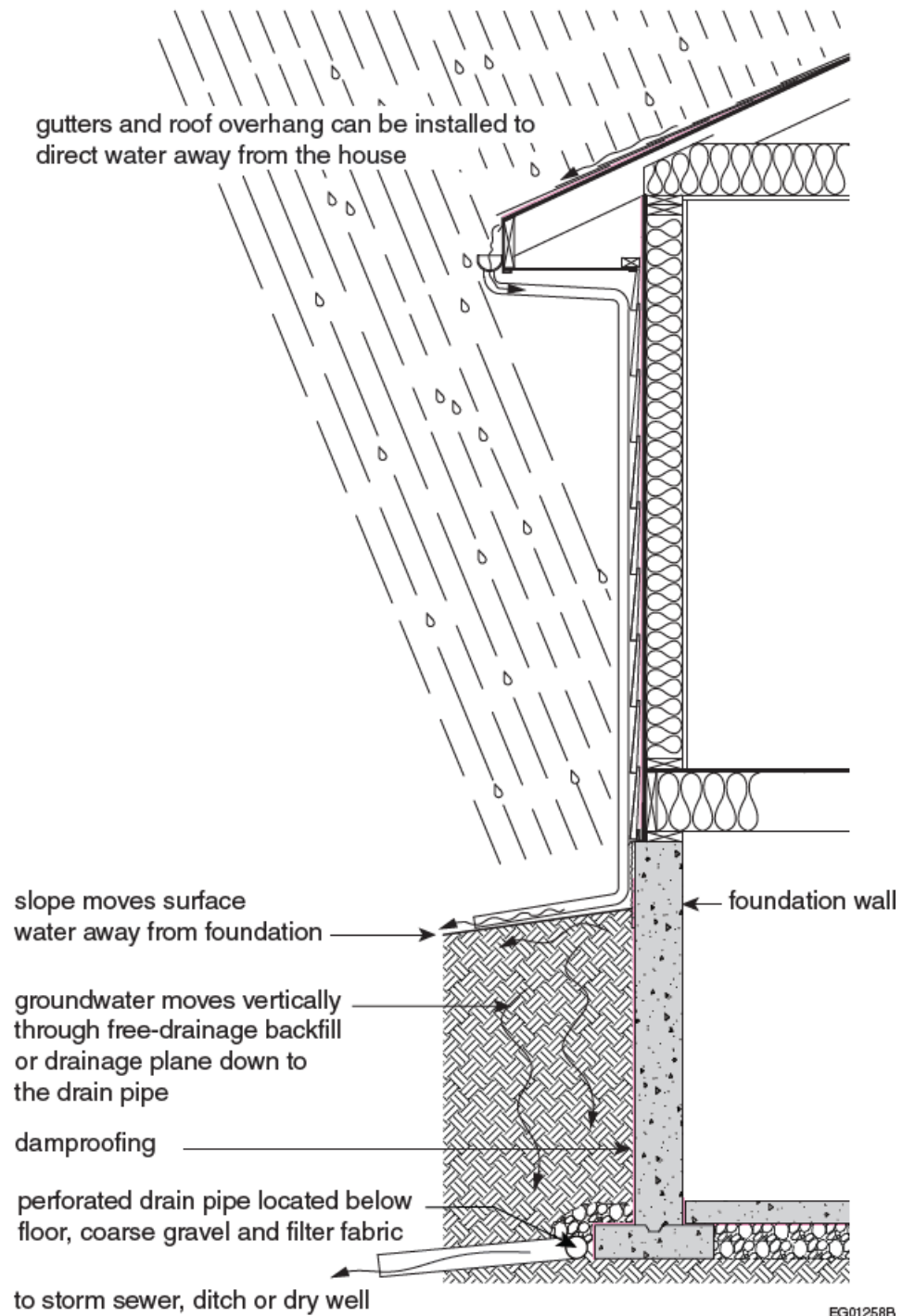
(2) The person to whom a permit under section 8 of the Act is issued shall notify the *chief building official* or, where a *registered code agency* is appointed under the Act in respect of the *construction* to which the notice relates, the *registered code agency* of,

- (a) readiness to *construct* footings,
- (b) substantial completion of footings and *foundations* prior to commencement of backfilling,
- (c) substantial completion of structural framing and ductwork and piping for heating and *air-conditioning* systems, if the *building* is within the scope of Part 9 of Division B,
- (d) substantial completion of structural framing and roughing-in of heating, ventilation, *air-conditioning* and air-contaminant extraction equipment, if the *building* is not a *building* to which Clause (c) applies,
- (e) substantial completion of insulation and *vapour barriers*,
- (f) substantial completion of *air barrier systems*,
- (g) substantial completion of all required *fire separations* and *closures* and all fire protection systems including standpipe, sprinkler, fire alarm and emergency lighting systems,
- (h) substantial completion of fire access routes,
- (i) readiness for inspection and testing of,
 - (i) *building sewers* and *building drains*,
 - (ii) *water service pipes*,
 - (iii) *fire service mains*,
 - (iv) *drainage systems* and *venting systems*,
 - (v) the *water distribution system*, and
 - (vi) *plumbing fixtures* and *plumbing appliances*,
- (j) readiness for inspection of suction and gravity outlets, covers and suction piping serving outlets of an *outdoor pool* described in Clause 1.3.1.1.(1)(j) of Division A, a *public pool* or a *public spa*,
- (k) substantial completion of the circulation / *recirculation system* of an *outdoor pool* described in Clause 1.3.1.1.(1)(j) of Division A, a *public pool* or *public spa* and substantial completion of the pool before it is first filled with water,
- (l) readiness to *construct* the *sewage system*,

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- (m) substantial completion of the installation of the *sewage system* before the commencement of backfilling,
- (n) substantial completion of installation of *plumbing* not located in a structure, before the commencement of backfilling,
- (o) completion of *construction* and installation of components required to permit the issue of an occupancy permit under Sentence 1.3.3.1.(3) or to permit occupancy under Sentence 1.3.3.2.(1), if the *building* or part of the *building* to be occupied is not fully completed, and
- (p) completion of *construction* and installation of components required to permit the issue of an occupancy permit under Sentence 1.3.3.4.(4), 1.3.3.5.(3) or 1.3.3.7.(8).



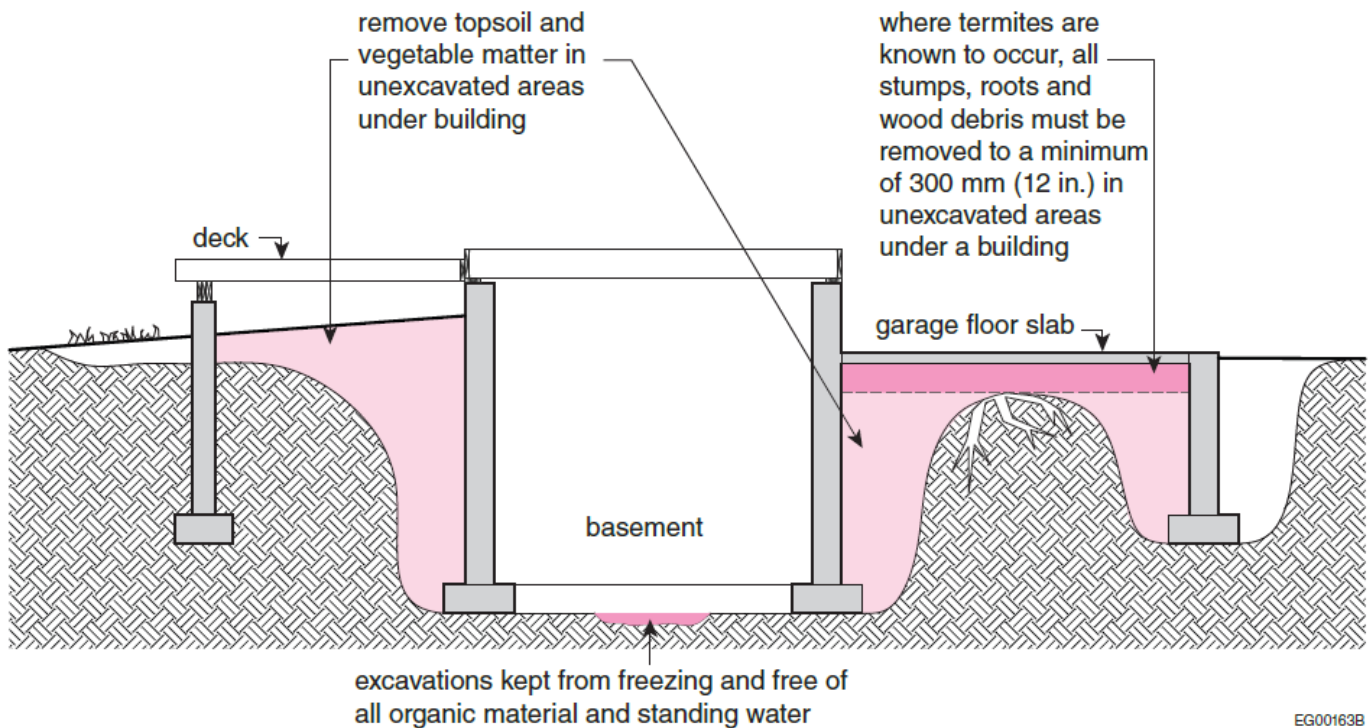


Section 9.12. Excavation

9.12.1. General

9.12.1.1. Removal of Topsoil and Organic Matter

- (1) The topsoil and vegetable matter in all unexcavated areas under a *building* shall be removed.
- (2) In localities where termite infestation is known to be a problem, all stumps, roots and other wood debris shall be removed from the *soil* to a depth of not less than 300 mm in unexcavated areas under a *building*.
- (3) The bottom of every *excavation* shall be free of all organic material.



9.12.1.2. Standing Water

- (1) *Excavations* shall be kept free of standing water.

9.12.1.3. Protection from Freezing

- (1) The bottom of *excavations* shall be kept from freezing throughout the entire construction period.

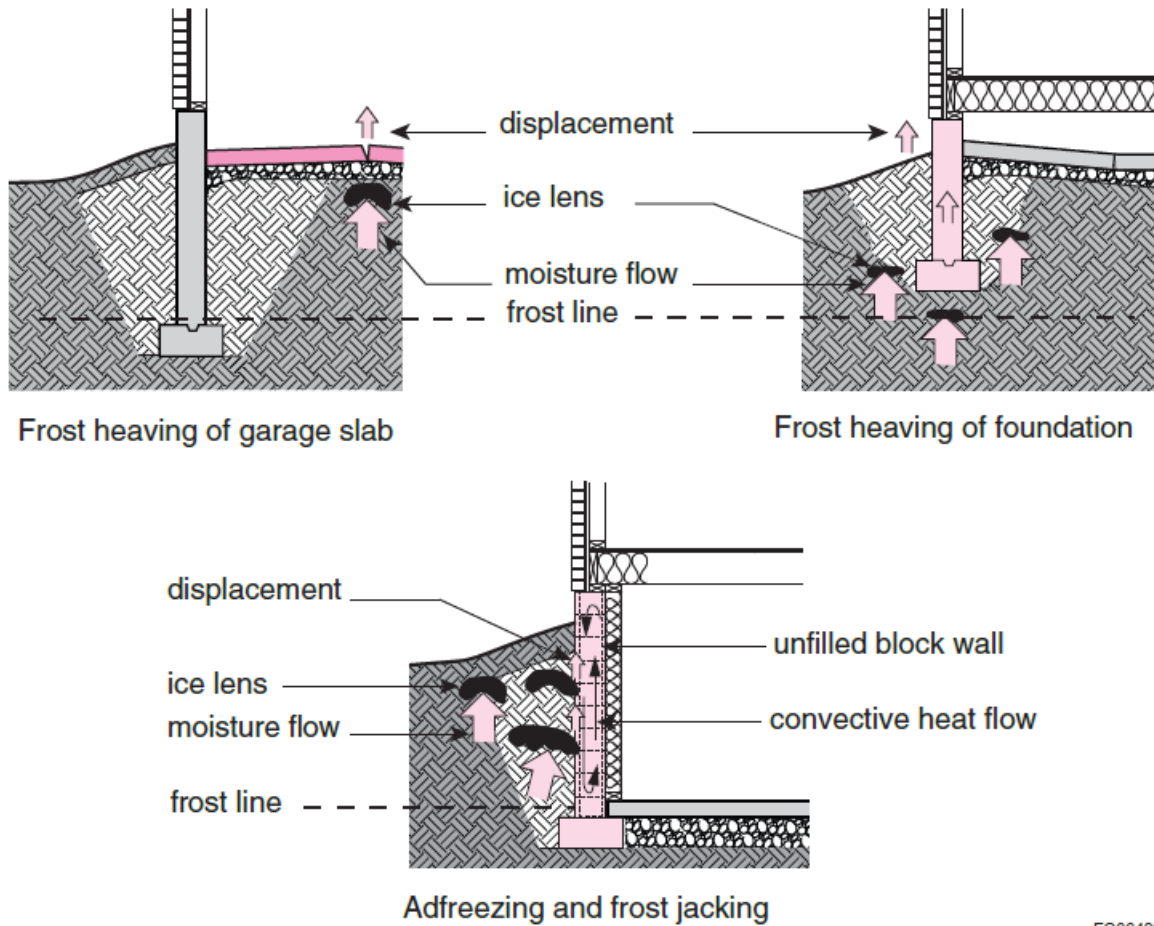
9.12.1.4. Precautions During Excavation

- (1) Every *excavation* shall be undertaken in such a manner to prevent damage to adjacent property, existing structures, utilities, roads and sidewalks at all stages of construction.
- (2) Material shall not be placed nor shall equipment be operated or placed in or adjacent to an *excavation* in a manner that may endanger the integrity of the *excavation* or its supports.

9.12.2.1. Excavation to Undisturbed Soil

(1) *Excavations for foundations shall extend to undisturbed soil.*

9.12.2.2. Minimum Depth of Foundations



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(1) Except as provided in Sentences (4) to (7), the minimum depth of *foundations* below finished ground level shall conform to Table 9.12.2.2.

Table 9.12.2.2.
Minimum Depths of Foundations
Forming Part of Sentence 9.12.2.2.(1)

Item	Column 1	Column 2	Column 3	Column 4	Column 5
	Type of <i>Soil</i>	Minimum Depth of <i>Foundation</i> Containing Heated <i>Basement</i> or <i>Crawl Space</i> ⁽¹⁾		Minimum Depth of <i>Foundation</i> Containing no Heated Space ⁽²⁾	
		Good <i>Soil</i> Drainage	Poor <i>Soil</i> Drainage	Good <i>Soil</i> Drainage	Poor <i>Soil</i> Drainage
1.	Rock	No limit	No limit	No limit	No limit
2.	Coarse grained <i>soils</i>	No limit	No limit	No limit	Below the depth of frost penetration
3.	Silt	No limit	No limit	Below the depth of frost penetration ⁽³⁾	Below the depth of frost penetration
4.	Clay or <i>soils</i> not clearly defined	1.2 m ⁽³⁾	1.2 m	1.2 m but not less than the depth of frost penetration ⁽³⁾	1.2 m but not less than the depth of frost penetration

Notes to Table 9.12.2.2.:

⁽¹⁾ *Foundation* not insulated to reduce heat loss through the footings.

⁽²⁾ Including *foundations* containing heated space insulated to reduce heat loss through the footings.

⁽³⁾ Good *soil* drainage to not less than the depth of frost penetration.

(2) Where a *foundation* is insulated in a manner that will reduce the heat flow to the *soil* beneath the footings, the *foundation* depth shall conform to that required for *foundations* containing no heated space.

(3) The minimum depth of *foundations* for exterior concrete steps with more than 2 risers shall conform to Sentences (1), (2) and (5).

(4) Concrete steps with 1 and 2 risers are permitted to be laid on ground level.

(5) The *foundation* depths required in Sentence (1) are permitted to be decreased where experience with local *soil* conditions shows that lesser depths are satisfactory, or where the *foundation* is designed for lesser depths.

(6) The *foundation* depths required in Sentence (1) do not apply to *foundations* for,

(a) *buildings*,

(i) that are not of masonry or masonry veneer construction, and

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(ii) whose superstructure conforms with the requirements of the deformation resistance test in CSA 2240.2.1, "Structural Requirements for Manufactured Homes", or

(b) accessory *buildings*,

(i) that are not of masonry or masonry veneer construction,

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

(iii) not more than 55 m² in *building area*, and

(iv) where the distance from the finished ground to the underside of the floor joists is not more than 600 mm.

(7) The *foundation* depths required in Sentence (1) do not apply to *foundations* for decks and other accessible exterior platforms,

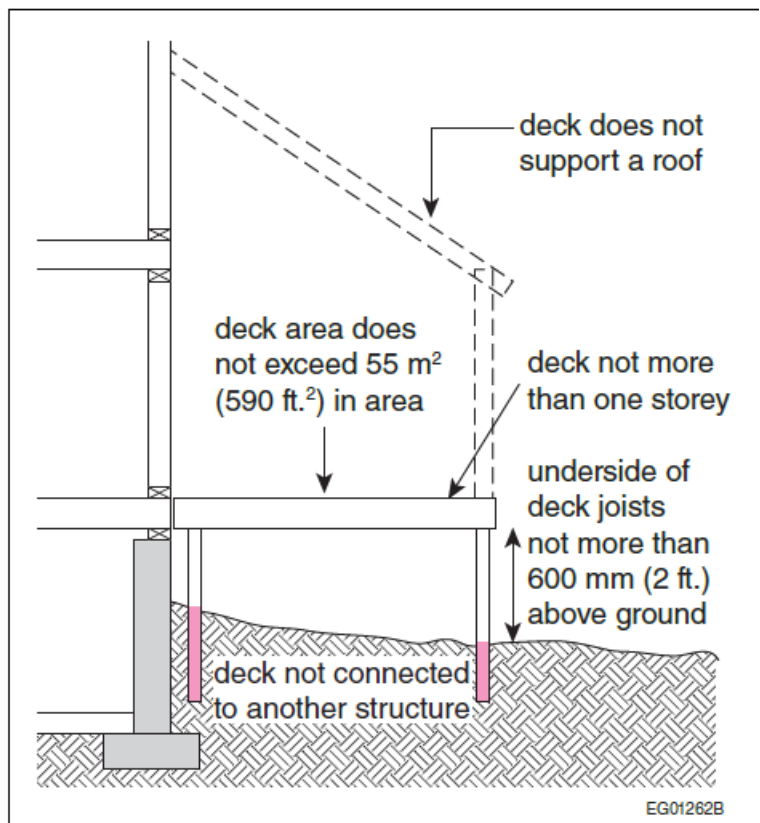
(a) that are of not more than 1 *storey*,

(b) that are not more than 55 m² in area,

(c) where the distance from the finished ground to the underside of the floor joists is not more than 600 mm,

(d) that are not supporting a roof, and

(e) that are not attached to another structure, unless it can be demonstrated that differential movement will not adversely affect the performance of that structure.



9.12.3. Backfill

9.12.3.1. Placement of Backfill

(1) Backfill shall be placed to avoid damaging the *foundation* wall, the drainage tile, drainage layer, externally applied thermal insulation, waterproofing and dampproofing of the wall.

9.12.3.2. Grading of Backfill

(1) Backfill shall be graded to prevent drainage towards the *foundation* after settling.

9.12.3.3. Deleterious Debris and Boulders

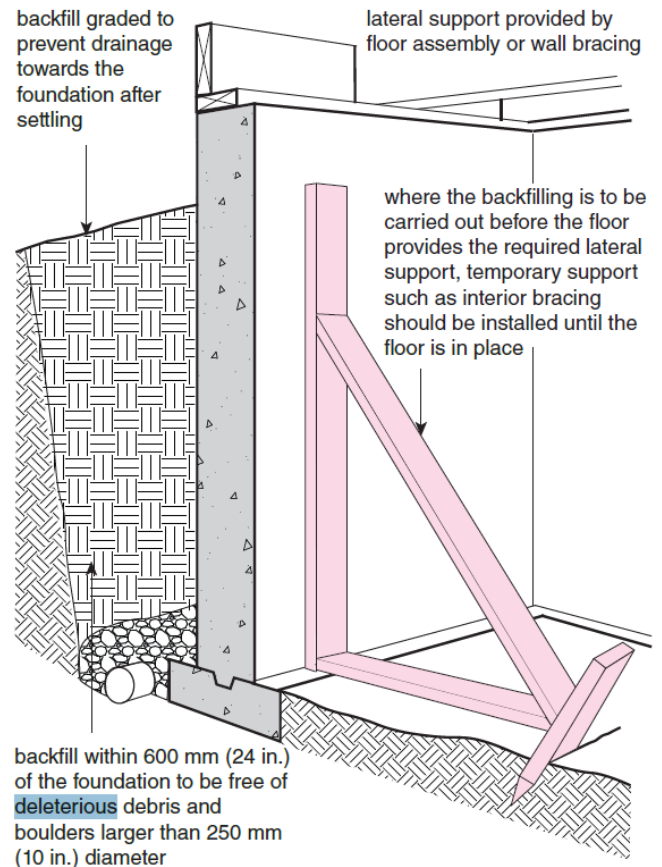
(1) Backfill within 600 mm of the *foundation* shall be free of deleterious debris and boulders larger than 250 mm diam.

(2) Except as permitted in Sentence (3), backfill shall not contain pyritic material or material that is susceptible to ice lensing in concentrations that will damage the *building* to a degree that would adversely affect its stability or the performance of assemblies separating dissimilar environments.

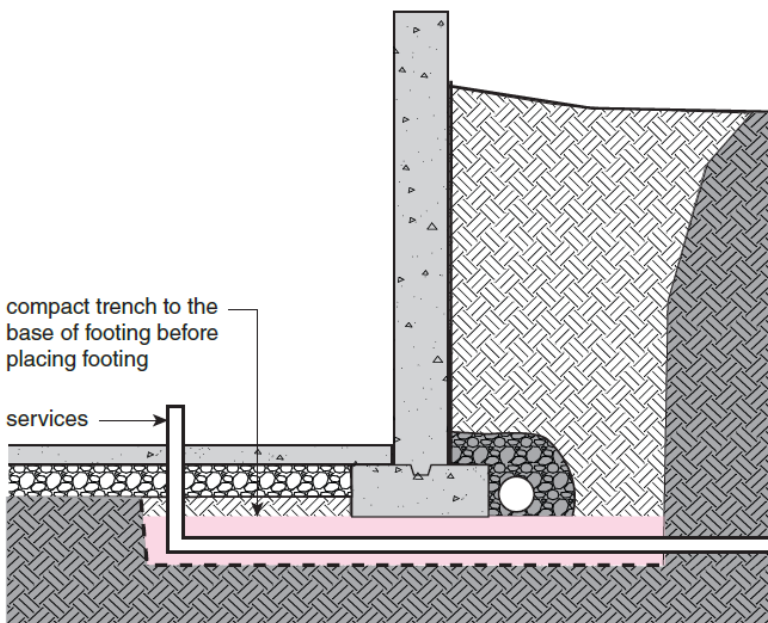
(3) Backfill with material of any concentration that is susceptible to ice lensing is permitted where *foundation* walls are cast-in-place concrete, concrete block insulated on the exterior or concrete block protected from the backfill by a material that serves as a slip plane.

9.12.3.4. Lateral Support of Foundation Wall

(1) Where the height of *foundation* wall is such that lateral support is required, or where the required concrete strength of the wall has not been reached, the wall shall be braced or laterally supported before backfilling.



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9.12.4. Trenches Beneath Footings

9.12.4.1. Compacting or Filling With Concrete

(1) The *soil* in trenches beneath footings for sewers and watermain shall be compacted by tamping up to the level of the footing base, or shall be filled with concrete having a strength not less than 10 MPa to support the footing.

Section 9.3. Materials, Systems and Equipment (Selected)

9.3.1. Concrete

9.3.1.1. General

(1) Except as provided in Sentence (2) and Articles 9.3.1.6. and 9.3.1.7., unreinforced and nominally reinforced concrete shall be designed, mixed, placed, cured and tested in accordance with the requirements for “R” class concrete stated in Section 9 of CSA A23.1, “Concrete Materials and Methods of Concrete Construction”.



(2) Unreinforced and nominally reinforced site-batched concrete shall be designed, mixed, placed and cured in accordance with Articles 9.3.1.2. to 9.3.1.9.

(3) Except as provided in Sentence (4), Subsection 9.15.4. and Section 9.39., reinforced concrete shall be designed to conform to the requirements of Part 4.

(4) For flat insulating concrete form walls described in Clause 9.15.1.1.(1)(c) or 9.20.1.1.(1)(b), the concrete and reinforcing shall comply with Part 4 or,

- (a) the concrete shall conform to CSA A23.1, “Concrete Materials and Methods of Concrete Construction”, with a maximum aggregate size of 19 mm, and
- (b) the reinforcing shall,



- (i) conform to CSA G30.18, "Carbon Steel Bars for Concrete Reinforcement",
- (ii) have a minimum specified yield strength of 400 MPa, and
- (iii) be lapped a minimum of 450 mm for 10M bars and 650 mm for 15M bars.

9.3.1.2. Cement

(1) Cement shall meet the requirements of CSA A3001, "Cementitious Materials for Use in Concrete".

9.3.1.3. Concrete in Contact with Sulfate Soil

(1) Concrete in contact with sulfate *soil*, which is deleterious to normal cement, shall conform to the requirements in Clause 4.1.1.6. of CSA A23.1, "Concrete Materials and Methods of Concrete Construction".

9.3.1.4. Aggregates

(1) Aggregates shall,

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

9.3.1.5. Water

(1) Water shall be clean and free of injurious amounts of oil, organic matter, sediment or any other deleterious material.

9.3.1.6. Compressive Strength

(1) Except as provided elsewhere in this Part, the compressive strength of unreinforced concrete after 28 days shall be not less than,

- (a) 32 MPa for garage floors, carport floors and all exterior flatwork,
- (b) 20 MPa for interior floors other than those for garages and carports, and
- (c) 15 MPa for all other applications. (1 MPa = roughly 100,000 Kg force/ M2)

(2) Site-batched concrete used for garage floors, carport floors and exterior flatwork shall have air entrainment of 5 to 8%.

9.3.1.7. Concrete Mixes

(1) For pre-mixed concrete and for the site-batched concrete mixes described in Table 9.3.1.7., the maximum ratio of water to cementing materials measured by weight shall not exceed,

- (a) 0.45 for garage floors, carport floors and all exterior flatwork,
- (b) 0.65 for interior floors other than those for garages and carports, and
- (c) 0.70 for all other applications.

(2) The size of aggregate in unreinforced site-batched concrete mixes referred to in Sentence (1) shall not exceed,

(a) $\frac{1}{5}$ the distance between the sides of vertical forms, or

(b) $\frac{1}{3}$ the thickness of flatwork.

9.3.1.8. Admixtures

(1) Admixtures shall conform to ASTM C260 / C260M, "Air-Entraining Admixtures for Concrete", or ASTM C494 / C494M, "Chemical Admixtures for Concrete", as applicable.

9.3.1.9. Cold Weather Requirements

(1) When the air temperature is below 5°C , concrete shall be,

(a) kept at a temperature of not less than 10°C or more than 25°C while being mixed and placed, and

(b) maintained at a temperature of not less than 10°C for 72 h after placing.

(2) No frozen material or ice shall be used in concrete described in Sentence (1).

9.4.4. Foundation Conditions (Selected)

9.4.4.1. Allowable Bearing Pressures

(1) Footing sizes for *shallow foundations* shall be,

- (a) determined in accordance with Section 9.15., or
- (b) designed in accordance with Section 4.2. using,
 - (i) the maximum *allowable bearing pressures* in Table 9.4.4.1., or
 - (ii) *allowable bearing pressures* determined from *subsurface investigation*.

Table 9.4.4.1.
Allowable Bearing Pressure for Soil or Rock

Forming Part of Sentence 9.4.4.1.(1)

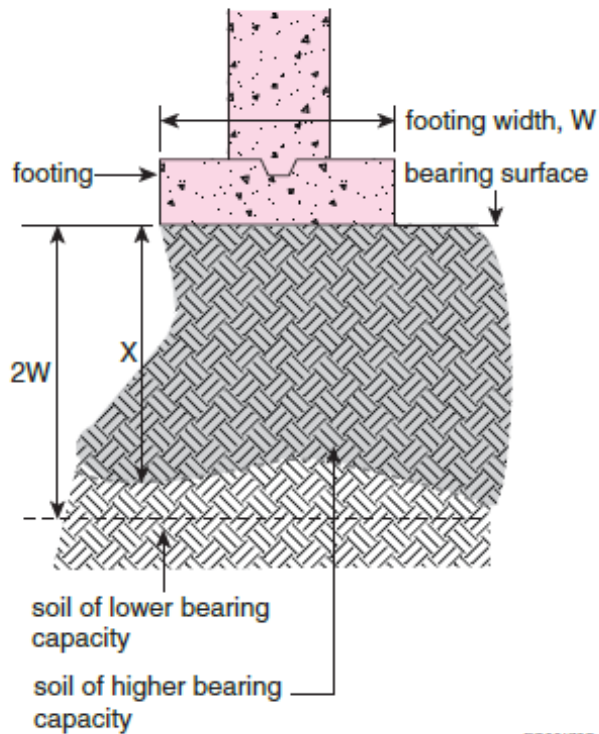
Item	Column 1 Type and Condition of <i>Soil or Rock</i>	Column 2 Maximum <i>Allowable Bearing Pressure</i> , kPa
1.	Dense or compact sand or gravel	150
2.	Loose sand or gravel	50
3.	Dense or compact silt	100
4.	Stiff clay	150
5.	Firm clay	75
6.	Soft clay	40
7.	Till	200
8.	Clay shale	300
9.	Sound <i>rock</i>	500

(2) The design procedures described in Section 4.2. are permitted to be used in lieu of the design procedures in this Subsection.

(3) The design procedures described in Section 4.2. shall be used where,

- (a) *deep foundations* are used,
- (b) the footing size falls outside the scope of this Section, or
- (c) the *foundation* is constructed on peat, filled ground or on sensitive clays as described in Article 9.15.1.1.

Where $X < 2W$, footing sizes must be calculated using the lower bearing capacity in NBC Table 9.4.4.1.

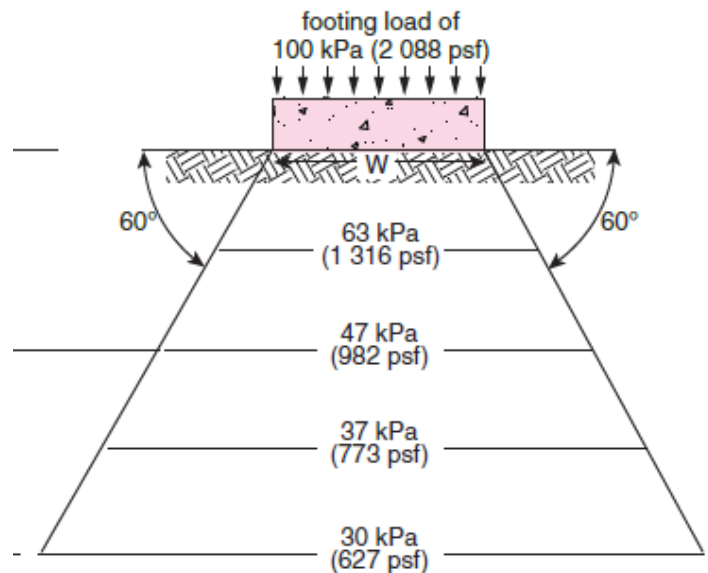


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9.4.4.2. Foundation Capacity in Weaker Soil and Rock

(1) Where a soil or rock within a distance equal to twice the footing width below the bearing surface has a lower allowable bearing pressure than that at the bearing surface as shown in Article 9.4.4.1., the design capacity of the foundation shall not be greater than would cause the weakest soil or rock to be stressed beyond its allowable bearing pressure.

(2) In calculating subsurface pressures referred to in Sentence (1), the loads from the footings shall be assumed to be distributed uniformly over a horizontal plane within a frustum extending downward from the footing at an angle of

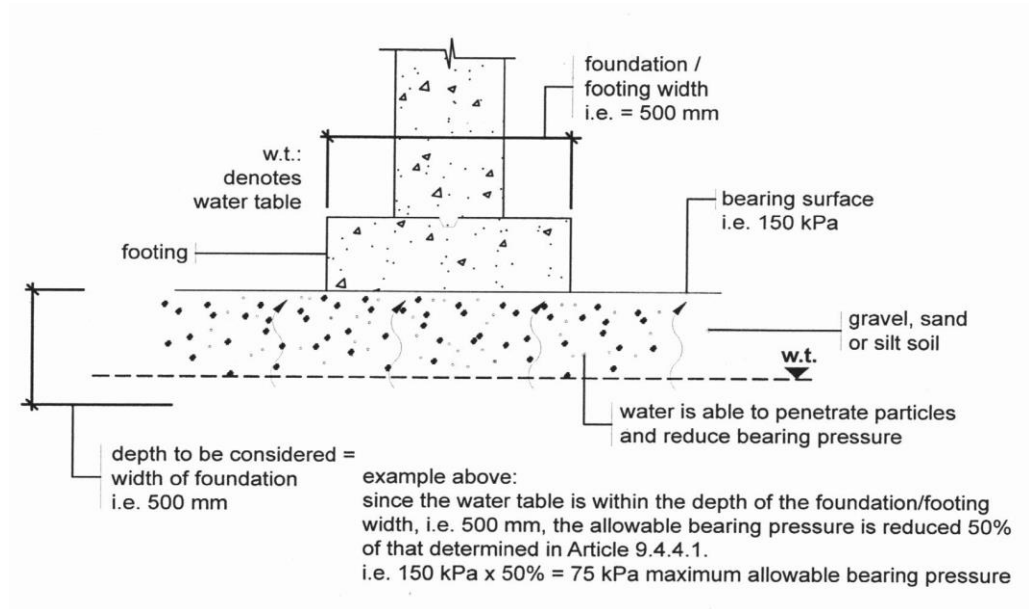


Footing load distribution assumed in NBC Sentence 9.4.4.2.(2)

60° to the horizontal.

9.4.4.3. High Water Table

(1) Where a *foundation* bears on gravel, sand or silt, and the water table is within a distance below the *bearing surface* equal to the width of the *foundation*, the *allowable bearing pressure* shall be 50% of that determined in Article 9.4.4.1.



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9.4.4.4. Soil Movement

(1) Where a *foundation* is located in an area where *soil* movement caused by changes in *soil* moisture content, freezing, or chemical-microbiological oxidation is known to occur to the extent that it will damage a *building*, measures shall be taken to preclude such movement or to reduce the effects on the *building* so that the *building's* stability and the performance of assemblies will not be adversely affected.

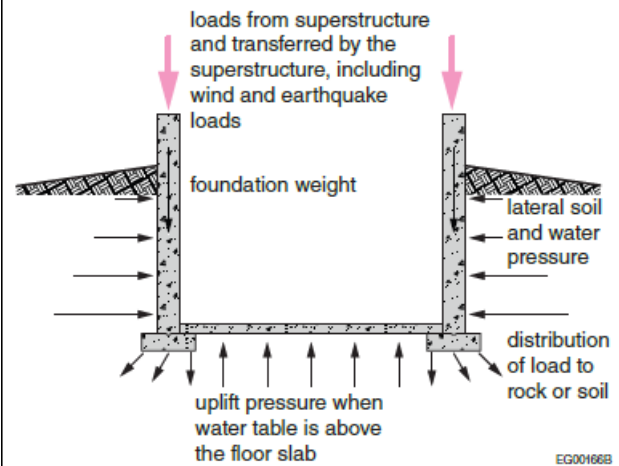
Section 9.15 Footing and Foundation

9.15.1. Application

9.15.1.1. General

(1) Except as provided in Articles 9.15.1.2. and 9.15.1.3., this Section applies to,

- (a) concrete or unit masonry *foundation* walls and concrete footings not subject to surcharge,
- (i) on stable *soils* with an *allowable bearing pressure* of 75 kPa or greater, and
- (ii) for *buildings* of wood frame or masonry construction,
- (b) wood frame *foundation* walls and wood or concrete footings not subject to surcharge,



- (i) on stable *soils* with an *allowable bearing pressure* of 75 kPa or greater, and
 - (ii) for *buildings* of wood frame construction, and
 - (c) flat insulating concrete form *foundation* walls and concrete footings not subject to surcharge,
 - (i) on stable *soils* with an *allowable bearing pressure* of 75 kPa or greater, and
 - (ii) for *houses* of light frame or flat insulating concrete form construction that are not more than 2 *storeys* in *building height*, with a maximum floor to floor height of 3 m.
- (2) *Foundations* for applications other than as described in Sentence (1) shall be designed in accordance with Section 9.4.
- (3) Where a *foundation* is erected on filled ground, peat or sensitive clay, the footing sizes shall be designed in conformance with Section 4.2.
- (4) For the purpose of Sentence (3), sensitive clay means the grain size of the majority of the particles is smaller than 0.002 mm, including leda clay.

Application this section applies to the following Foundation and Footings. (Subject to no surcharge loads)

Under Part 9, four types of Foundations, all on stable soil with minimum bearing pressure of 75 KPa, anything else Part 4.

1. Concrete or Masonry foundation with Concrete Footings,
 - for buildings of wood frame or
 - masonry.
2. Wooden Foundation with Wooden or Concrete Footings,
 - for building of wood frames.
3. Flat Insulated Concrete Foundation with Concrete Footings,

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- for houses not more than two Storeys height with the max. floor to floor height of 3m.

4. Pier Type Foundations

- 1 Storey high
- Mostly manufactured homes, decks or extensions
- Height of Pier not more than 3 times the least dimension

Foundation has two components;

1. Footing
2. Load (Walls, Columns. .etc)

9.15.1.2. Permafrost

(1) *Buildings* erected on permafrost shall have *foundations* designed by a *designer* competent in this field in accordance with the appropriate requirements of Part 4.

9.15.1.3. Foundations for Deformation Resistant Buildings

(1) Where the superstructure of a detached *building* conforms to the requirements of the deformation resistance test in CSA Z240.2.1, "Structural Requirements for Manufactured Homes", the *foundation* shall be constructed in conformance with,

- (a) this Section, or
- (b) CSA Z240.10.1, "Site Preparation, Foundation, and Installation of Buildings".

9.15.2. General

9.15.2.1. Concrete

(1) Concrete shall conform to Section 9.3.

9.15.2.2. Unit Masonry Construction

Div B Part 1 Documents Referred

(1) Concrete block shall conform to CSA A165.1, "Concrete Block Masonry Units", and shall have a compressive strength over the average net cross-sectional area of the block of not less than 15 MPa.

(2) Mortar, grout, mortar joints, corbelling and protection for unit masonry shall conform to Section 9.20.

(3) For concrete block *foundation* walls required to be reinforced,

- (a) mortar shall be Type S, conforming to CSA A179, "Mortar and Grout for Unit Masonry",
- (b) grout shall be coarse, conforming to CSA A179, "Mortar and Grout for Unit Masonry", and
- (c) placement of grout shall conform to CSA A371, "Masonry Construction for Buildings".

9.15.2.3. Pier Type Foundations

(1) Where pier type *foundations* are used, the piers shall be designed to support the applied loads from the superstructure.

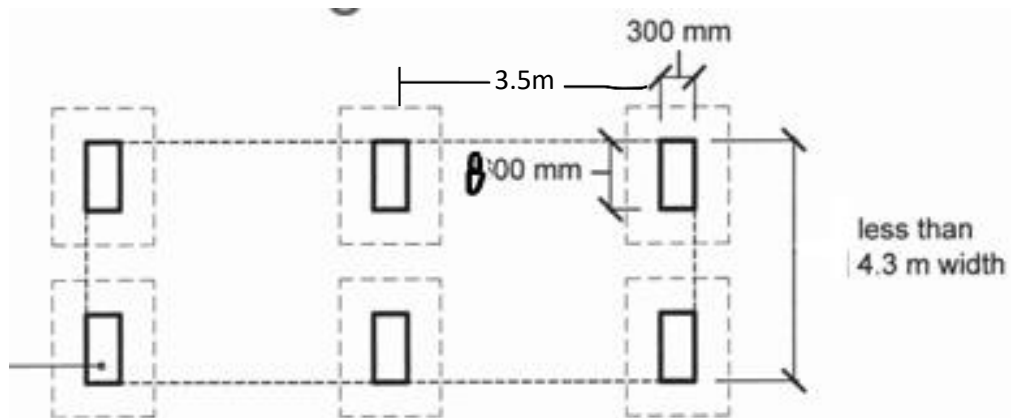
(2) Where piers are used as a *foundation system* in a *building* of 1 storey in *building height*, the piers shall be installed to support the principal framing members and shall be spaced not more than 3.5 m apart along the framing, unless the piers and their footings are designed for larger spacings.

(3) The height of piers described in Sentence (2) shall not exceed 3 times their least dimension at the base of the pier.



<https://countryplans.com/smf/index.php?topic=7077.0>

(4) Where concrete block is used for piers described in Sentence (2), they shall be laid with cores placed vertically, and where the width of the *building* is 4.3 m or less, placed with their longest dimension at right angles to the longest dimension of the *building*.

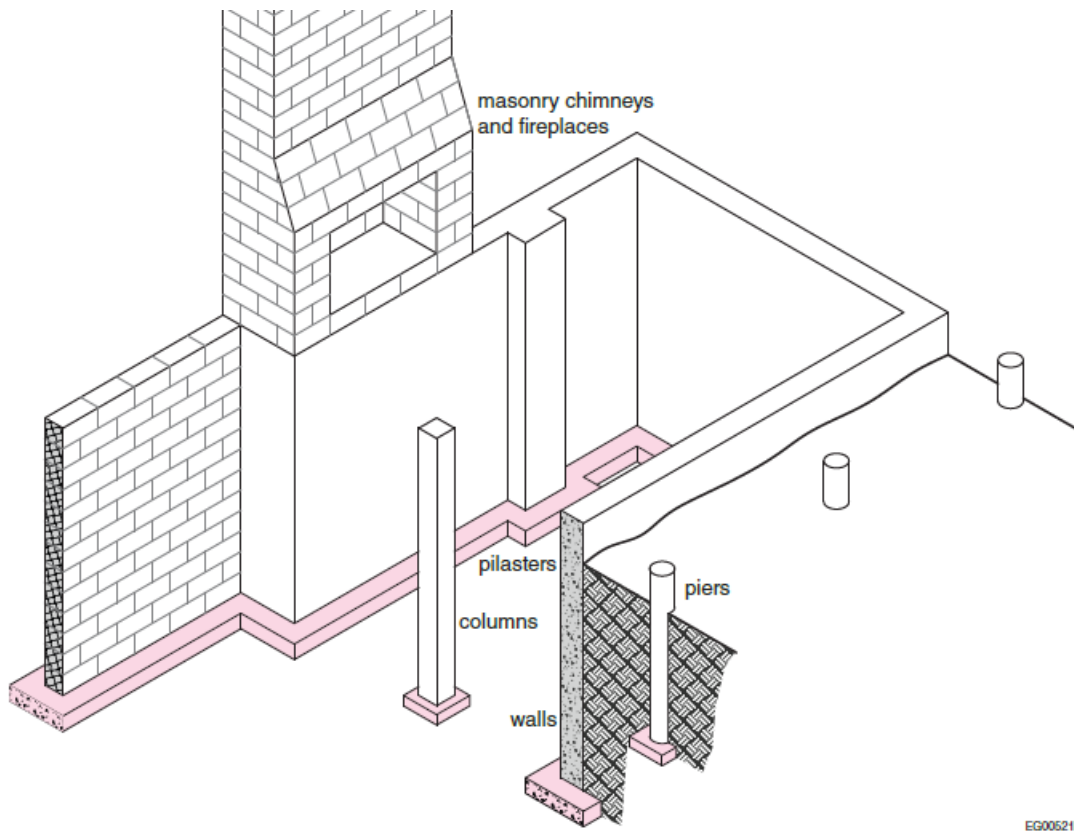


9.15.2.4. Wood Frame Foundations

(1) *Foundations* of wood frame construction shall conform to,

- (a) CSA S406, “Permanent Wood Foundations for Housing and Small Buildings”, or
- (b) Part 4.

9.15.3. Footings



9.15.3.1. Footings Required

(1) Footings shall be provided under walls, pilasters, columns, piers, fireplaces and *chimneys* that bear on *soil* or *rock*, except that footings are permitted to be omitted under piers or monolithic concrete walls if the safe *loadbearing* capacity of the *soil* or *rock* is not exceeded.

9.15.3.2. Support of Footings

(1) Footings shall rest on undisturbed *soil*, *rock* or compacted granular *fill*.

(2) Granular *fill* shall not contain pyritic material in a concentration that would adversely affect its stability or the performance of assemblies separating dissimilar environments.

9.15.3.3. Application of Footing Width and Area Requirements

(1) Except as provided in Sentence 9.15.3.4.(2), the minimum footing width or area requirements provided in Articles 9.15.3.4. to 9.15.3.7. shall apply to footings where,

(a) the footings support,

(i) *foundation* walls of masonry, concrete, or flat insulating concrete form walls,

(ii) above ground walls of masonry, flat insulating concrete form walls or light wood frame construction, and

(iii) floors and roofs of light wood frame construction,

(b) the span of supported joists does not exceed 4.9 m, and

(c) the specified *live load* on any floor supported by the footing does not exceed 2.4 kPa. (240 Kgs/m²)

(2) Except as provided in Sentence 9.15.3.4.(2), where the span of the supported joists exceeds 4.9 m, footings shall be designed in accordance with Section 4.2.

(3) Where the specified *live load* exceeds 2.4 kPa footings shall be designed in accordance with Section 4.2.

Footing 9.15.3

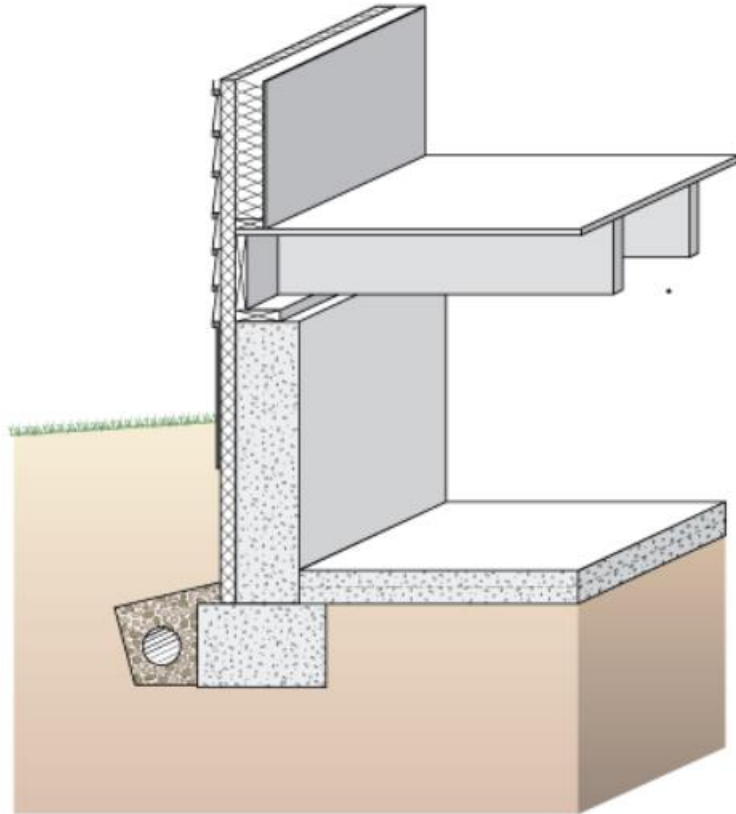
Footing will be provided under everything that weighs down onto the soil beneath.

All Walls, Columns, Pilasters, Chimneys, Fireplaces, Piers **9.15.3.1**

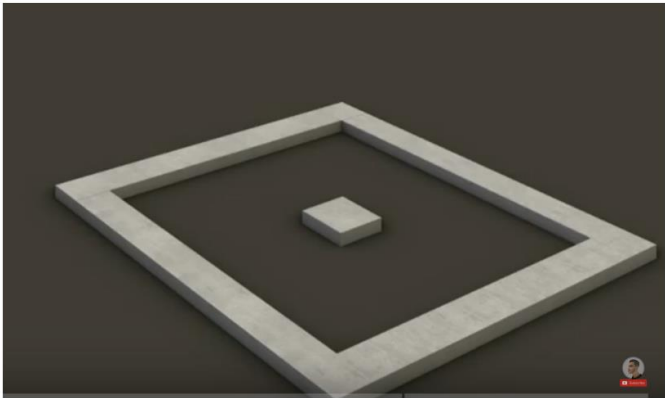
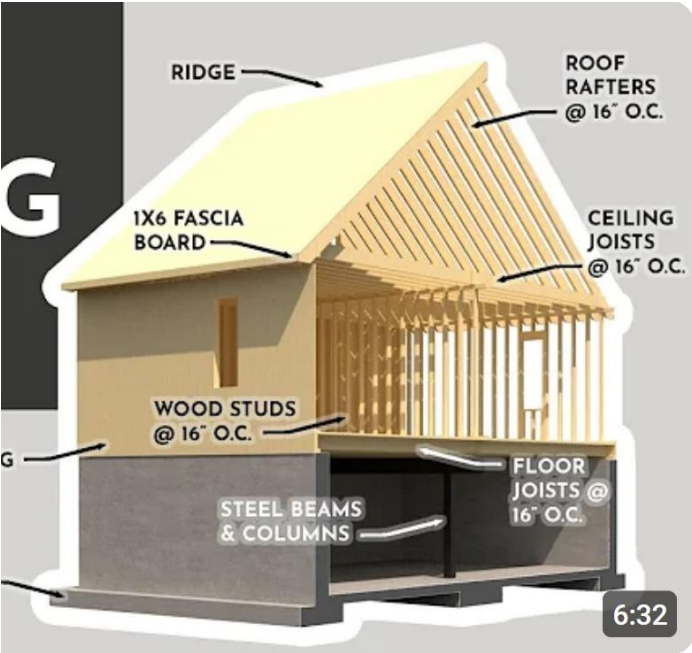
Footing will rest on undisturbed soil, rock or compacted granular fill. **9.15.3.2**

Limits of footings under Part 9.15.3.3

- i. Foundation walls of concrete, masonry, ICF
- ii. Above ground walls of masonry, ICF or Light wood frame
- iii. Floors and roof of Light wood
- iv. Max span of Joists 4.9 meters (Proviso below)
- v. Max specified live load on floor of 2.4 KPa



(Beyond these limits go to Part IV)



9.15.3.4. Basic Footing Widths and Areas

(1) Except as provided in Sentences (2) and (3) and in Articles 9.15.3.5. to 9.15.3.7., the minimum footing width or area shall comply with Table 9.15.3.4.

Table 9.15.3.4.
Minimum Footing Sizes

Forming Part of Sentence 9.15.3.4.(1)

Item	Column 1	Column 2	Column 3	Column 4
	Number of Floors Supported	Minimum Width of Strip Footings, mm		Minimum Footing Area for Columns Spaced 3 m o.c. ⁽¹⁾ , m ²

Illustrations from Illustrated NBC Part 09 & Canadian Wood-Frame House Construction

		Supporting Exterior Walls ⁽²⁾	Supporting Interior Walls ⁽³⁾	
	1	250	200	0.40
	2	350	350	0.75
	3	450	500	1.0

Notes to Table 9.15.3.4.:

⁽¹⁾ See Sentence 9.15.3.7.(1).

⁽²⁾ See Sentences 9.15.3.5.(1).

⁽³⁾ See Sentence 9.15.3.6.(1).

(2) Where the supported joist span exceeds 4.9 m in *buildings* with light wood frame walls, floors and roofs, footing widths shall be determined according to,

(a) Section 4.2., or

(b) the following formula:

$$W = w \cdot [\sum sjs / (storeys \cdot 4.9)]$$

where,

W = minimum footing width,

w = minimum width of footings supporting joists not exceeding 4.9 m, as defined by Table 9.15.3.4.,

$\sum sjs$ = the sum of the supported joist spans on each *storey* whose load is transferred to the footing, and

storeys = number of *storeys* supported by the footing.

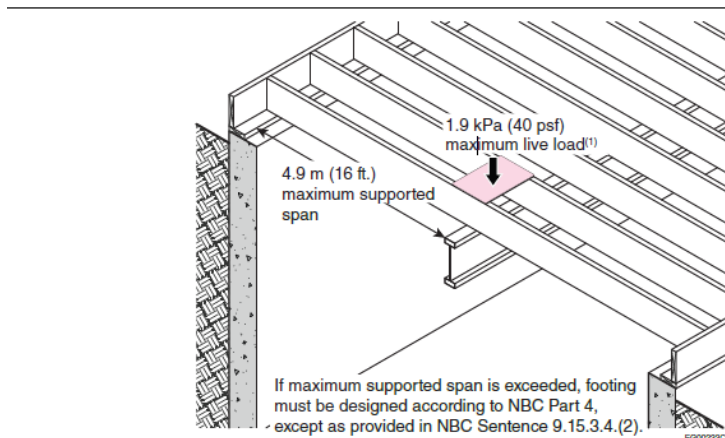


Figure 9.15-4
Maximum spans and live loads

Note to Figure 9.15-4:

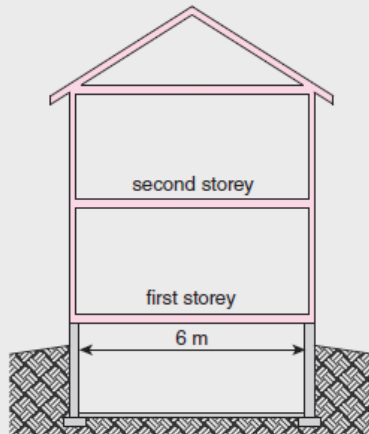
(1) The 1.9 kPa (40 psf) maximum live load is the specified live load for residential floors. The footing sizes specified in NBC Subsection 9.15.3. can carry live loads not exceeding 2.4 kPa (50 psf).

Example 13 – Minimum Footing Sizes for Spans Greater Than 4.9 m (16 ft.)

It has become common to use flat wood trusses or wood I-joists to span greater distances in floors of residential buildings. Where these spans exceed 4.9 m, minimum footing sizes can be determined according to the following method (NBC Article 9.15.3.3.):

1. Determine the span of joists for each storey that will be supported on a given footing. Sum these lengths (sum_1).
2. Multiply the number of storeys by 4.9 (sum_2).
3. Determine the ratio of $(\text{sum}_1)/(\text{sum}_2)$.
4. Multiply the minimum footing size determined from NBC Table 9.15.3.4. by this ratio.

For a two-storey house built using wood I-joists spanning 6 m:



$$\text{sum}_1 = 6 \text{ m} + 6 \text{ m} = 12 \text{ m}$$

$$\text{sum}_2 = 2 \times 4.9 \text{ m} = 9.8 \text{ m}$$

$$\text{Minimum footing ratio} = 12 \text{ m} / 9.8 \text{ m} = 1.22$$

Multiply the minimum footing width from NBC Table 9.15.3.4. by the minimum footing ratio:
 $350 \text{ mm} \times 1.22 = 427 \text{ mm}$

Therefore, the minimum required footing width for the house is 427 mm (17 in.).

EG00238D

Figure A

Example calculation of minimum footing sizes for spans greater than 4.9 m (16 ft.)

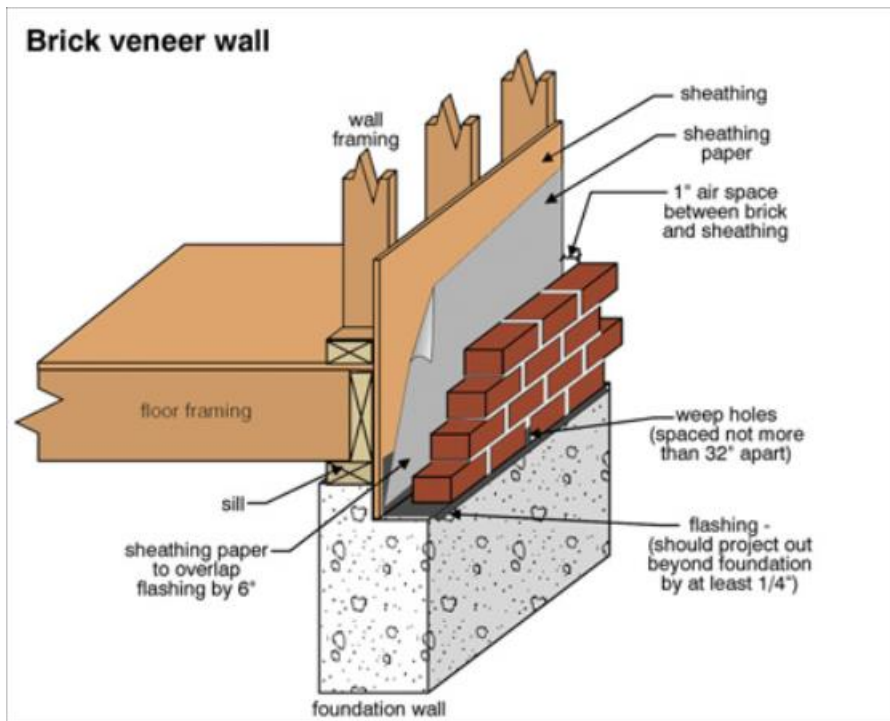
(3) Where a *foundation* rests on gravel, sand or silt in which the water table level is less than the width of the footings below the *bearing surface*, **(9.4.4.3)**

- (a) the footing width for walls shall be not less than twice the width required by Sentences (1) and (2), and Articles 9.15.3.5. and 9.15.3.6., and
- (b) the footing area for columns shall be not less than twice the area required by Sentences (1) and (2), and Article 9.15.3.7.

9.15.3.5. Adjustments to Footing Widths for Exterior Walls

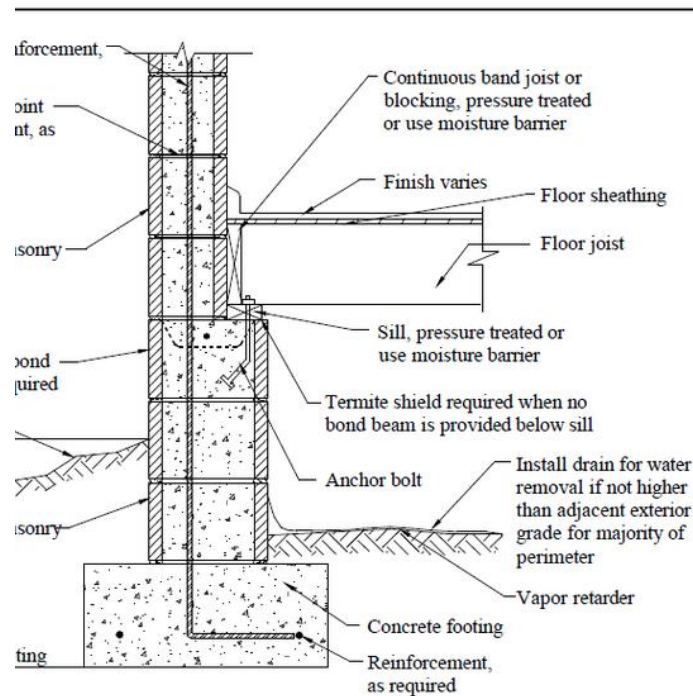
(1) The strip footing widths for exterior walls shown in Table 9.15.3.4. shall be increased by,

(a) 65 mm for each *storey* of masonry veneer over wood frame construction supported by the *foundation wall*,



<https://www.carsondunlop.com>

(b) 130 mm for each *storey* of masonry construction supported by the *foundation wall*, and



—Crawlspace Stemwall with Masonry Above Grade

- (c) 150 mm for each *storey* of flat insulating concrete form wall construction supported by the *foundation* wall.

Example 14 – Width of Footings

A foundation wall supports a two-storey wood-frame house. Brick veneer is used on the first storey, and stucco on the second. Find the size of footings required.

1. From NBC Table 9.15.3.4., the minimum footing width for exterior walls with no masonry veneer is equal to 350 mm.

For one storey of masonry veneer, this is increased by 65 mm (NBC Article 9.15.3.5.).

Therefore, the total required width for exterior wall footings

$$\begin{aligned} &= 350 + 65 \\ &= 415 \text{ mm} \end{aligned}$$

2. If interior supports for floors are columns, footing pads for columns are 0.75 m^2 (8.07 ft.²) (NBC Table 9.15.3.4., 870 × 870 mm).
3. If floors are supported on interior wood-frame bearing walls, the minimum width for interior strip footings is 350 mm (13 3/4 in.) (NBC Table 9.15.3.4.).

9.15.3.6. Adjustments to Footing Widths for Interior Walls

- (1) The minimum strip footing widths for interior *loadbearing* masonry walls shown in Table 9.15.3.4. shall be increased by 100 mm for each *storey* of masonry construction supported by the footing.

Example 15 – Width of Footings for Three-Storey Masonry Construction

A foundation wall supports a three-storey masonry apartment building. The interior support for the floors is a loadbearing masonry wall that extends up through the top storey. Find the footing sizes required.

1. From NBC Table 9.15.3.4., the minimum footing width for exterior walls with no masonry veneer = 450 mm.

For three storeys of masonry, this is increased by $3 \times 130 \text{ mm}$, or 390 mm (NBC Article 9.15.3.5.).

Therefore, the total required width for exterior wall footings

$$\begin{aligned} &= 450 + 390 \\ &= 840 \text{ mm (33 in.)} \end{aligned}$$

2. From NBC Table 9.15.3.4., the minimum footing width for interior loadbearing walls with no masonry = 500 mm.

For three storeys of masonry above the basement, plus the interior basement bearing wall, this is increased by $4 \times 100 \text{ mm}$, or 400 mm (NBC Article 9.15.3.6.).

Therefore, the total required width for interior wall footings

$$\begin{aligned} &= 500 + 400 \\ &= 900 \text{ mm (36 in.)} \end{aligned}$$

- (2) Footings for interior non-*loadbearing* masonry walls shall be not less than 200 mm wide for walls up to 5.5 m high and the width shall be increased by 100 mm for each additional 2.7 m of height.

9.15.3.7. Adjustments to Footing Area for Columns

(1) The footing area for column spacings other than shown in Table 9.15.3.4. shall be adjusted in proportion to the distance between columns.

Example 16 – Footing Sizes for Columns

In Example 14, the required column footing area is 0.75 m² (8 ft.²) (two floors supported) when columns are spaced up to 3.0 m (9 ft. 10 in.) apart. If the columns are to be spaced 4 m (13 ft. 1 in.) apart, the required footing area

$$\begin{aligned} &= \frac{4}{3} \times 0.75 \text{ m}^2 \\ &= 1.0 \text{ m}^2 \text{ (11 ft.}^2\text{)} \end{aligned}$$

(i.e., 1 000 × 1 000 mm) (NBC Article 9.15.3.7).

9.15.3.8. Footing Thickness

(1) Footing thickness shall be not less than the greater of,

(a) 100 mm, or

(b) the width of the projection of the footing beyond the supported element.

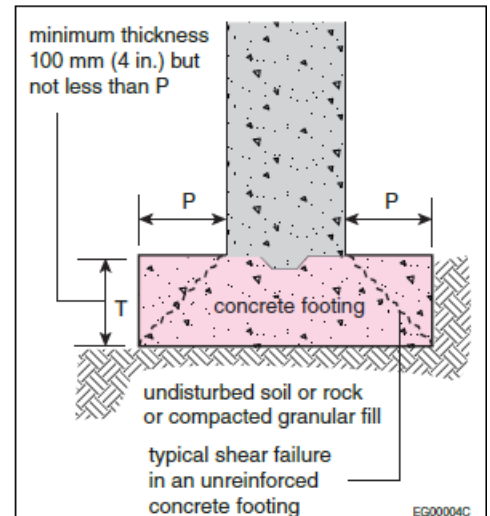


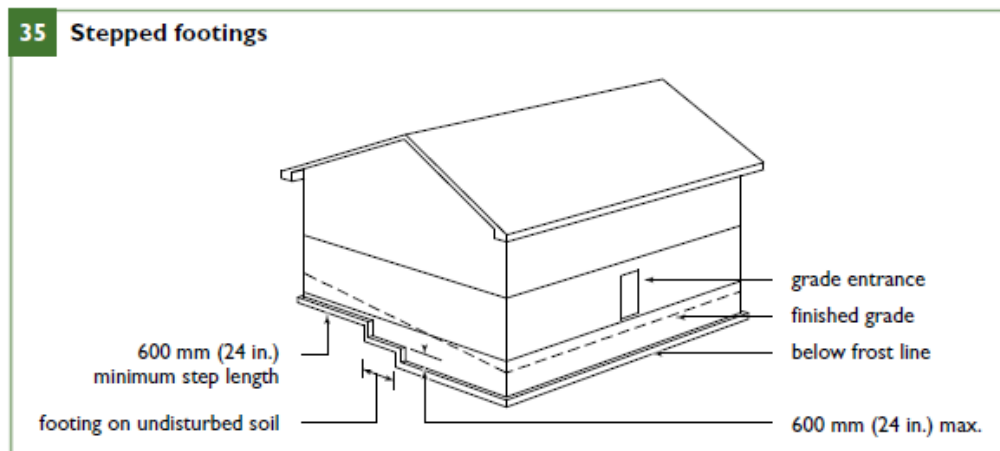
Figure 9.15-8
Minimum footing thickness

9.15.3.9. Step Footings

(1) Where step footings are used,

(a) the vertical rise between horizontal portions shall not exceed 600 mm, and

(b) the horizontal distance between risers shall be not less than 600 mm.



Example 17 – Footing Thickness

Find the footing thickness required for the exterior foundation wall and the interior loadbearing wall in Example 15, assuming the foundation wall is 200 mm (8 in.) thick and the interior bearing wall is 150 mm (6 in.) thick.

1. Width of exterior footing = 840 mm. Extension beyond face of wall

$$\begin{aligned} &= \frac{840 - 200}{2} \\ &= 320 \text{ mm} \end{aligned}$$

The minimum required unreinforced footing thickness is 320 mm (NBC Article 9.15.3.8.).

2. Width of interior footing = 900 mm.
3. Extension beyond wall face

$$\begin{aligned} &= \frac{900 - 150}{2} \\ &= 375 \text{ mm} \end{aligned}$$

Therefore, the required minimum footing thickness = 375 mm (15 in.) (NBC Article 9.15.3.8.).

Example 18 – Footing Thickness for Columns

Find the footing thickness for the column in Example 16 supported on a 1.0 m² footing if the columns are 140 × 140 mm.

1. The extension beyond the face of the column

$$\begin{aligned} &= \frac{1\,000 - 140}{2} \\ &= 430 \text{ mm} \end{aligned}$$

Therefore, the minimum required unreinforced concrete thickness = 430 mm (NBC Article 9.15.3.7.).

2. The thickness is somewhat excessive and could be reduced by providing a 300 × 300 mm pedestal on top of the footing (flush with the top of the slab).

With the pedestal, the minimum required footing thickness is

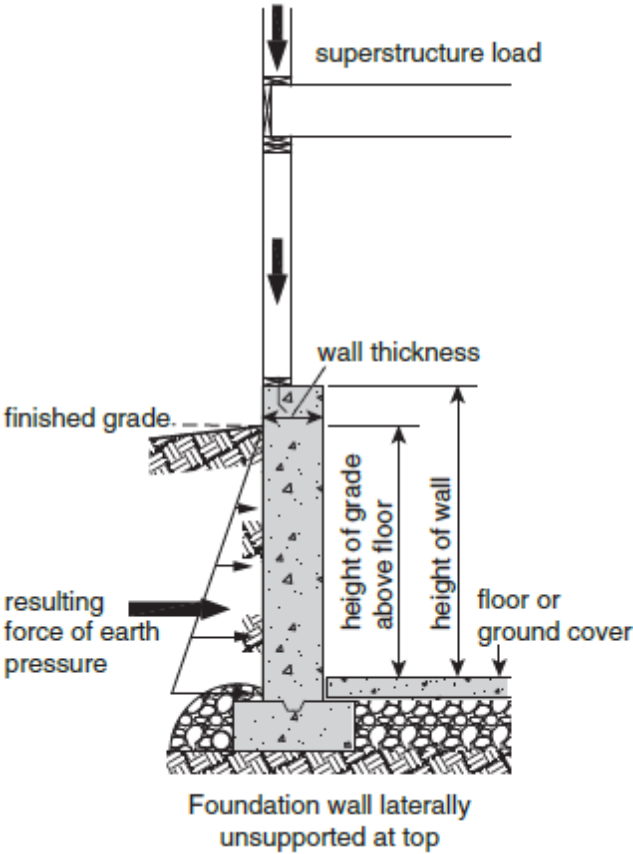
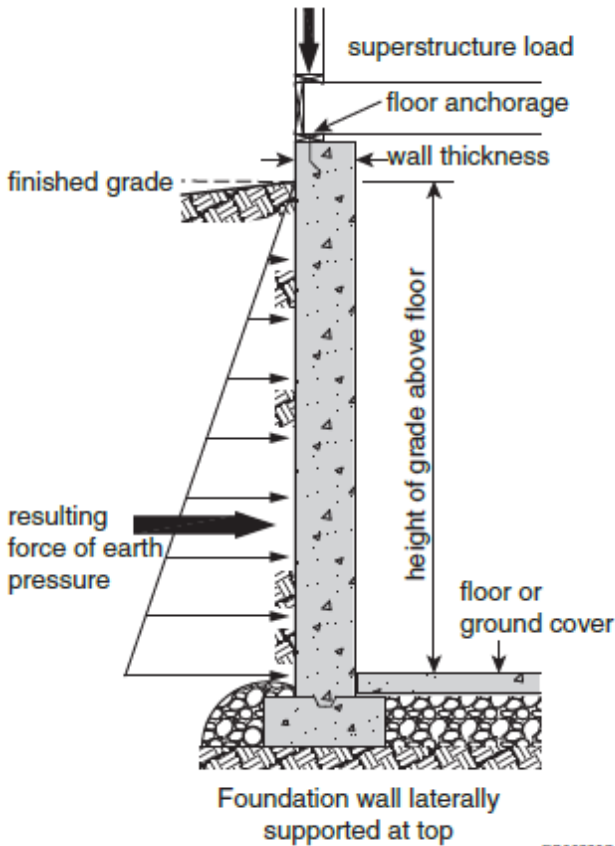
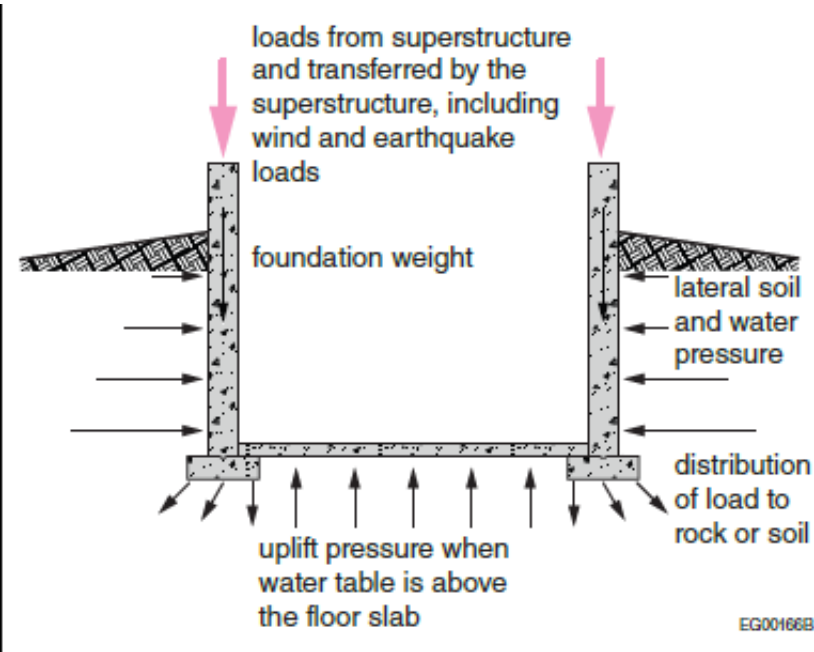
$$\begin{aligned} &= \frac{1\,000 - 300}{2} \\ &= 350 \text{ mm} \end{aligned}$$

3. If the space between columns were reduced to 3 m on centre, the size of the footing could be reduced to 870 × 870 mm as in Example 14.

For this column spacing and with a 300 × 300 mm pedestal, the required footing thickness

$$\begin{aligned} &= \frac{870 - 300}{2} \\ &= 285 \text{ mm (11 in.)} \end{aligned}$$

9.15.4. Foundation Walls



9.15.4.1. Permanent Form Material

(1) Insulating concrete form units shall be manufactured of polystyrene conforming to the performance requirements of CAN/ULC-S701.1, "Thermal Insulation, Polystyrene Boards", for Type 2, 3 or 4 polystyrene.

9.15.4.2. Foundation Wall Thickness and Required Lateral Support

(1) Except as required in Sentence (2), the thickness of *foundation* walls made of unreinforced concrete block or solid concrete and subject to lateral earth pressure shall conform to Table 9.15.4.2.A. for walls not exceeding 3.0 m in unsupported height.

Table 9.15.4.2.A.

Thickness of Solid Concrete and Unreinforced Concrete Block Foundation Walls
Forming Part of Sentence 9.15.4.2.(1)

Item	Column 1	Column 2	Column 3	Column 4	Column 5	Column 6
	Type of <i>Foundation</i> Wall	Minimum Wall Thickness, mm	Maximum Height of Finish Ground Above <i>Basement</i> Floor or Crawl Space Ground Cover, m			
			Height of <i>Foundation</i> Wall Laterally Unsupported at the Top ⁽¹⁾⁽²⁾	Height of <i>Foundation</i> Wall Laterally Supported at the Top ⁽¹⁾⁽²⁾		
			≤3.0 m	≤2.5 m	>2.5 m and ≤2.75 m	>2.75 m and ≤3.0 m
1.	Solid concrete, 15 MPa min. strength	150	0.8	1.5	1.5	1.4
		200	1.2	2.15	2.15	2.1
		250	1.4	2.3	2.6	2.5
		300	1.5	2.3	2.6	2.85
2.	Solid concrete, 20 MPa min. strength	150	0.8	1.8	1.6	1.6
		200	1.2	2.3	2.3	2.2
		250	1.4	2.3	2.6	2.85
		300	1.5	2.3	2.6	2.85
3.	Unreinforced concrete block	140	0.6	0.8	-	-
		190	0.9	1.2	(3)	(3)
		240	1.2	1.8	(3)	(3)

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		290	1.4	2.2	-	-
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Notes to Table 9.15.4.2.A.:

⁽¹⁾ See Article 9.15.4.3.

⁽²⁾ See Article 9.15.4.6.

⁽³⁾ See Table 9.15.4.2.B.

(2) The thickness of concrete in flat insulating concrete form *foundation* walls shall be not less than the greater of,

(a) 140 mm, or

(b) the thickness of the concrete in the wall above.

(3) *Foundation* walls made of flat insulating concrete form units shall be laterally supported at the top and at the bottom.

(4) The thickness and reinforcing of *foundation* walls made of reinforced concrete block and subject to lateral earth pressure shall conform to Table 9.15.4.2.B. and Sentences (5) to (8) where,

(a) the walls are laterally supported at the top,

(b) average stable *soils* are encountered, and

(c) wind loads on the exposed portion of the *foundation* are no greater than 0.70 kPa.

Table 9.15.4.2.B.
Reinforced Concrete Block Foundation Walls Laterally Supported at the Top⁽¹⁾
Forming Part of Sentence 9.15.4.2.(4)

<i>Item</i>	Column 1	Column 2	Column 3	Column 4	Column 5	Column 6	Column 7
	Maximum Height of	Size and Spacing of Continuous Vertical Reinforcement, M at mm o.c.					
	Finished Ground above	190 mm Minimum Wall Thickness			240 mm Minimum Wall Thickness		
	<i>Basement</i> Floor or Crawl	<i>Foundation</i> Wall Height			<i>Foundation</i> Wall Height		
	Space Ground Cover, m ⁽²⁾	≤ 2.5 m	≤ 2.75 m	≤ 3.0 m	≤ 2.5 m	≤ 2.75 m	≤ 3.0 m
1.	0.8	(3)	(3)	(3)	(3)	(3)	(3)
2.	1.0	(3)	1-15M at 1 800	1-15M at 1 800	(3)	(3)	(3)

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3.	1.2	(3)	1-15M at 1 600	1-15M at 1 600	(3)	1-20M at 2 000	1-20M at 2 000
4.	1.4	1-15M at 1 600	1-15M at 1 600	1-15M at 1 600	(3)	1-20M at 1 800	1-20M at 1 800
5.	1.6	1-15M at 1 400	1-15M at 1 400	1-15M at 1 400	(3)	1-20M at 1 600	1-20M at 1 600
6.	1.8	1-15M at 1 400	1-15M at 1 400	1-15M at 1 200	(3)	1-20M at 1 600	1-20M at 1 600
7.	2.0	1-15M at 1 200	1-15M at 1 000 or 1-20M at 1 200	2-15M at 1 200	1-20M at 1 600	1-20M at 1 600	1-20M at 1 600
8.	2.2	2-15M at 1 200	2-15M at 1 000	2-15M at 1 000	1-20M at 1 400	1-20M at 1 400	1-20M at 1 400
9.	2.4	2-15M at 1 000	2-15M at 1 000	2-15M at 800	1-20M at 1 400	1-20M at 1 400	1-20M at 1 200
10.	2.6	N/A	2-15M at 800 or 1-25M at 1 000	2-15M at 800 or 1-25M at 1 000	N/A	1-20M at 1 000	1-20M at 1 000
11.	2.8	N/A	N/A	1-20M at 600	N/A	N/A	1-20M at 800 or 2-15M at 1 000
12.	3.0	N/A	N/A	1-20M at 400 or 1-25M at 600	N/A	N/A	2-15M at 800

Notes to Table 9.15.4.2.B.:

⁽¹⁾ See Article 9.15.4.3.

⁽²⁾ See Article 9.15.4.6.

⁽³⁾ No reinforcement required.

(5) For concrete block walls required to be reinforced, continuous vertical reinforcement shall,

(a) be provided at wall corners, wall ends, wall intersections, at changes in wall height, at the jambs of all openings and at movement joints,

(b) extend from the top of the footing to the top of the *foundation* wall, and

(c) where *foundation* walls are laterally supported at the top, have not less than 50 mm embedment into the footing, if the floor slab does not provide lateral support at the wall base.

Canadian Rebar Sizes			
Metric Bar	Nominal Diameter		
size	millimetres	inches	
10M	11.3	0.445	3/8
12M	12.7	0.500	1/2
15M	16	0.625	5/8
20M	19.5	0.750	3/4
25M	25.2	1.000	1
30M	29.9	1.196	1 1/4
35M	35.7	1.410	1 1/2
45M	43.7	1.750	1 3/4
55M	56.4	2.256	2 1/4

(6) For concrete block walls required to be reinforced, a continuous horizontal bond beam containing at least one 15M bar shall be installed,

- (a) along the top of the wall,
- (b) at the sill and head of all openings greater than 1.2 m in width, and
- (c) at structurally connected floors.

(7) In concrete block walls required to be reinforced, all vertical bar reinforcement shall be installed along the centre line of the wall.

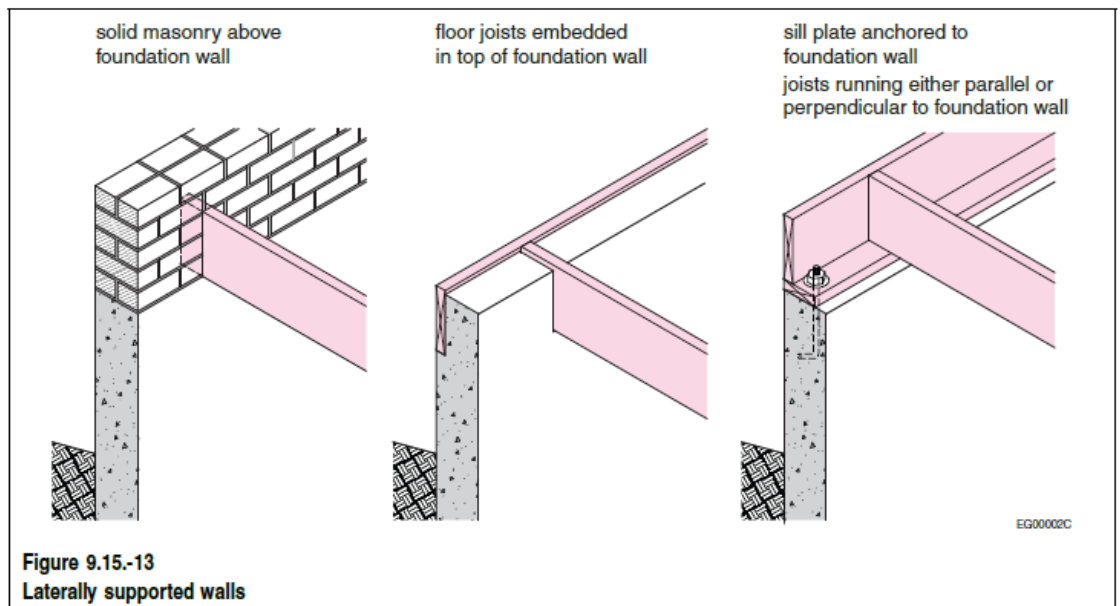
(8) In concrete block walls required to be reinforced, ladder or truss type lateral reinforcement not less than 3.8 mm in diameter (No. 9 ASWG) shall be installed in the bed joint of every second masonry course.

9.15.4.3. Foundation Walls Considered to be Laterally Supported at the Top

(1) Sentences (2) to (4) apply to lateral support for walls described in Sentence 9.15.4.2.(1).

(2) *Foundation* walls shall be considered to be laterally supported at the top if,

- (a) such walls support solid masonry superstructure,
- (b) the floor joists are embedded in the top of the *foundation* walls, or
- (c) the floor system is anchored to the top of the *foundation* walls with anchor bolts, in which case the joists may run either parallel or perpendicular to the *foundation* walls.

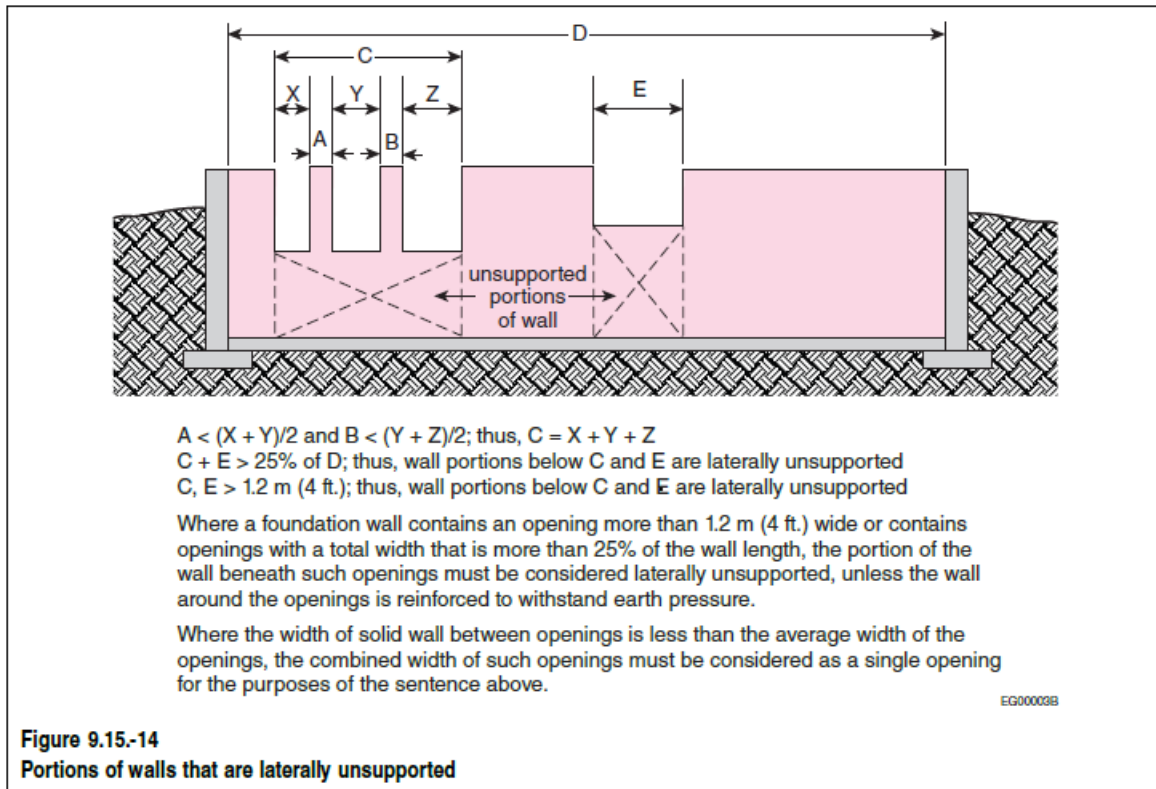


(3) Unless the wall around an opening is reinforced to withstand earth pressure, the portion of the *foundation* wall beneath an opening shall be considered laterally unsupported, if,

- (a) the opening is more than 1.2 m wide, or
- (b) the total width of the openings in the *foundation* wall constitutes more than 25% of the length of the wall.

(4) For the purposes of Sentence (3), the combined width of the openings shall be considered as a single opening if the average width is greater than the width of solid wall between them.

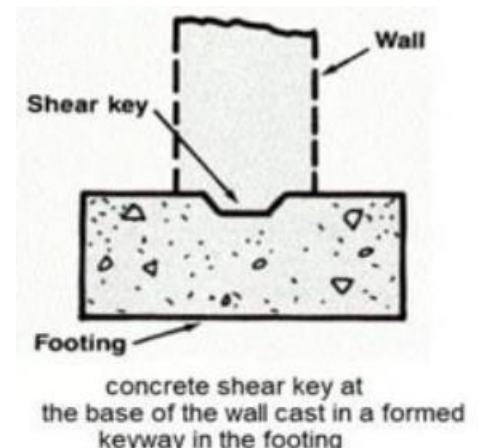
(5) Flat insulating concrete form *foundation* walls shall be considered to be laterally supported at the top if the floor joists are installed according to Article 9.20.17.5.



9.15.4.4. Foundation Walls Considered to be Laterally Supported at the Bottom

(1) Flat insulating concrete form *foundation* walls shall be considered to be laterally supported at the bottom where the *foundation* wall,

- (a) supports backfill not more than 1.2 m in height,
- (b) is supported at the footing by a shear key and is supported at the top by the ground floor framing, or
- (c) is dowelled to the footing with not less than 15M bars spaced not more than 1.2 m o.c.



9.15.4.5. Reinforcement for Flat Insulating Concrete Form Foundation Walls

(1) Horizontal reinforcement in flat insulating concrete form *foundation* walls shall,

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

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(ii) 10M bars spaced not more than 600 mm o.c., and

(b) be located,

(i) in the inside half of the wall section, and

(ii) with a minimum cover of 30 mm from the inside face of the concrete.

(2) Vertical wall reinforcement in flat insulating concrete form *foundation* walls shall,

(a) conform to,

(i) Table 9.15.4.5.A. for 140 mm walls,

(ii) Table 9.15.4.5.B. for 190 mm walls, and

(iii) Table 9.15.4.5.C. for 240 mm walls,

(b) be located in the inside half of the wall section with a minimum cover of 30 mm from the inside face of the concrete wall, and

(c) where interrupted by wall openings, be placed not more than 600 mm from each side of the openings.

(3) Cold joints in flat insulating concrete form *foundation* walls shall be reinforced with at least one 15M bar spaced not more than 600 mm o.c. and embedded not less than 300 mm on both sides of the joint.

(4) Reinforcing around openings in flat insulating concrete form *foundation* walls shall comply with Article 9.20.17.3. or 9.20.17.4.

Table 9.15.4.5.A.
Vertical Reinforcement for 140 mm Flat Insulating Concrete Form Foundation Walls
Forming Part of Sentence 9.15.4.5.(2)

<i>Item</i>	Column 1	Column 2	Column 3	Column 4
	Maximum Height of Finished Ground Above Finished <i>Basement</i> Floor, m	Minimum Vertical Reinforcement		
		Maximum Unsupported <i>Basement</i> Wall Height		
		2.44 m	2.75 m	3.00 m
1.	1.35	10M at 400 mm o.c.	10M at 400 mm o.c.	10M at 400 mm o.c.
2.	1.60	10M at 400 mm o.c.	10M at 380 mm o.c.	10M at 380 mm o.c.
3.	2.00	10M at 380 mm o.c.	10M at 380 mm o.c.	10M at 380 mm o.c.
4.	2.20	10M at 250 mm o.c.	10M at 250 mm o.c.	10M at 250 mm o.c.

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5.	2.35	n/a	10M at 250 mm o.c.	10M at 250 mm o.c.
6.	2.60	n/a	10M at 250 mm o.c.	10M at 250 mm o.c.
7.	3.00	n/a	n/a	10M at 250 mm o.c.

Table 9.15.4.5.B.
Vertical Reinforcement for 190 mm Flat Insulating Concrete Form Foundation Walls
Forming Part of Sentence 9.15.4.5.(2)

<i>Item</i>	Column 1	Column 2	Column 3	Column 4
1.	Maximum Height of Finished Ground Above Finished <i>Basement</i> Floor, m	Minimum Vertical Reinforcement		
		Maximum Unsupported <i>Basement</i> Wall Height		
		2.44 m	2.75 m	3.00 m
	2.20	none required	10M at 400 mm o.c.	10M at 400 mm o.c.
	2.35	n/a	10M at 300 mm o.c.	10M at 300 mm o.c.
3.	2.60	n/a	10M at 300 mm o.c.	15M at 400 mm o.c.
4.	3.00	n/a	n/a	15M at 400 mm o.c.

Table 9.15.4.5.C.
Vertical Reinforcement for 240 mm Flat Insulating Concrete Form Foundation Walls
Forming Part of Sentence 9.15.4.5.(2)

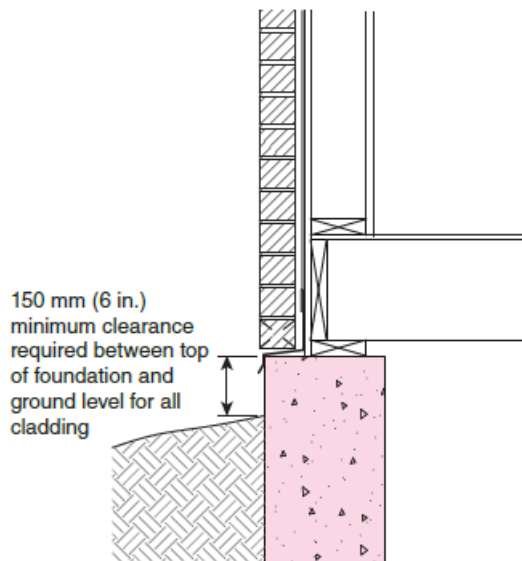
<i>Item</i>	Column 1	Column 2	Column 3	Column 4
1.	Maximum Height of Finished Ground Above Finished <i>Basement</i> Floor, m	Minimum Vertical Reinforcement		
		Maximum Unsupported <i>Basement</i> Wall Height		
		2.44 m	2.75 m	3.00 m
	2.20	none required	none required	none required

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2.	2.60	n/a	15M at 400 mm o.c.	15M at 400 mm o.c.
3.	3.00	n/a	n/a	15M at 400 mm o.c.

9.15.4.6. Extension above Ground Level

(1) Exterior *foundation* walls shall extend not less than 150 mm above finished ground level.



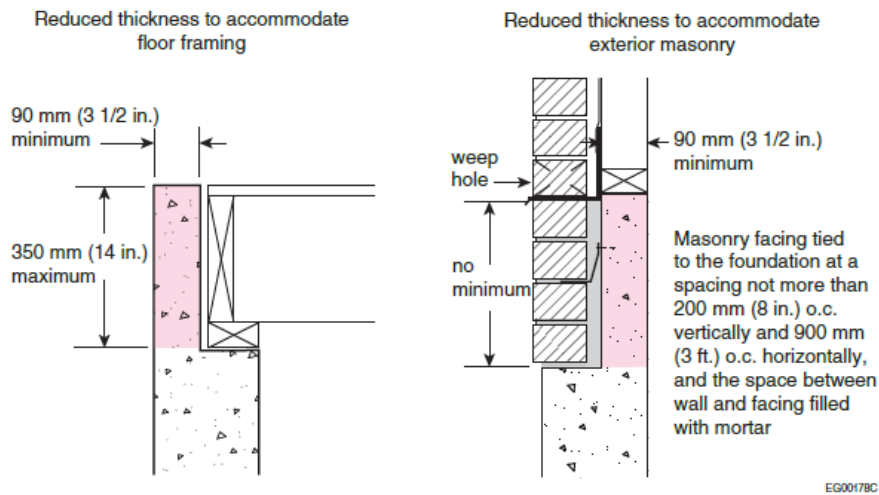
9.15.4.7. Reduction in Thickness

(1) Where the top of a *foundation* wall is reduced in thickness to permit the installation of floor joists, the reduced section shall be not more than 350 mm high and not less than 90 mm thick.

(2) Where the top of a *foundation* wall is reduced in thickness to permit the installation of a masonry exterior facing, the reduced section shall be,

- (a) not less than 90 mm thick, and
- (b) tied to the facing material with metal ties conforming to Sentence 9.20.9.4.(3) spaced not more than,
 - (i) 200 mm o.c. vertically, and

(ii) 900 mm o.c. horizontally.



(3) The space between wall and facing described in Sentence (2) shall be filled with mortar.

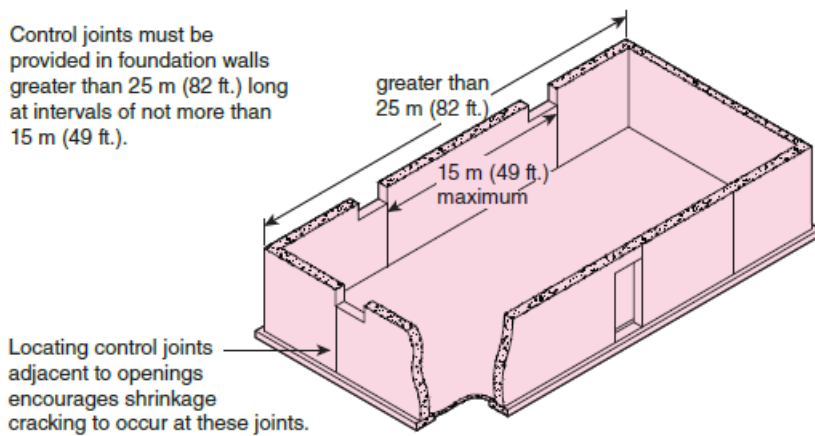
9.15.4.8. Corbelling

(1) Corbelling of masonry *foundation* walls supporting *cavity walls* shall conform to Article 9.20.12.2.

9.15.4.9. Crack Control Joints

(1) Crack control joints shall be provided in *foundation* walls more than 25 m long at intervals of not more than 15 m.

(2) Joints required in Sentence (1) shall be designed to resist moisture penetration and shall be keyed to prevent relative displacement of the wall portions adjacent to the joint.



9.15.4.10. Interior Masonry Walls

(1) Interior masonry *foundation* walls not subject to lateral earth pressure shall conform to Section 9.20.

9.15.5. Support of Joists and Beams on Masonry Foundation Walls

9.15.5.1. Support of Floor Joists

(1) Except as permitted in Sentence (2), *foundation* walls of hollow masonry units supporting floor joists shall be capped with,

- (a) not less than 50 mm of concrete,
- (b) *solid masonry units* that are 100% solid and not less than 50 mm high, or
- (c) semi-solid or hollow *solid masonry units* that have the top course completely filled with mortar, grout or concrete.

(2) Capping required in Sentence (1) is permitted to be omitted,

- (a) in localities where termites are not known to occur,
- (b) when the joists are supported on a wood plate not less than 38 mm by 89 mm, and
- (c) when the siding overlaps the *foundation* wall not less than 12 mm.

9.15.5.2. Support of Beams

(1) Not less than a 190 mm depth of solid masonry shall be provided beneath beams supported on masonry.

(2) Where the beam referred to in Sentence (1) is supported below the top of the *foundation* walls, the ends of such beams shall be protected from the weather.

9.15.5.3. Pilasters

(1) Pilasters shall be provided under beams that frame into unit masonry *foundation* walls 140 mm or less in thickness.

(2) Pilasters required in Sentence (1) shall be not less than 90 mm by 290 mm and shall be bonded or tied into the wall.

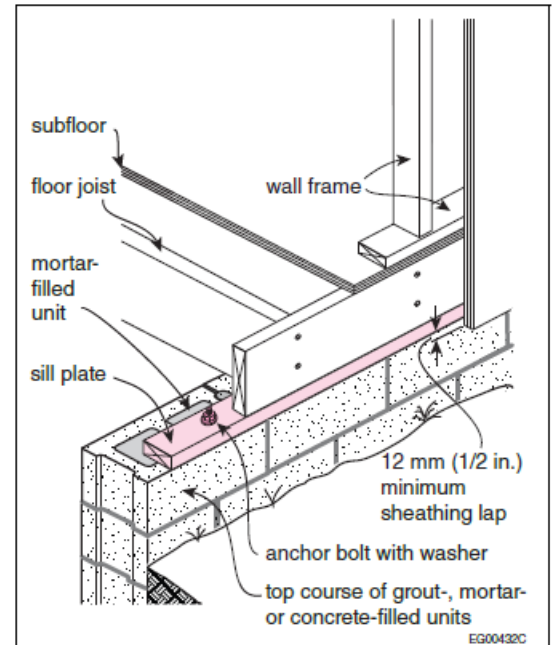


Figure 9.15-19
Support of floor joists

Note to Figure 9.15-19:

(1) Building envelope requirements are not shown.

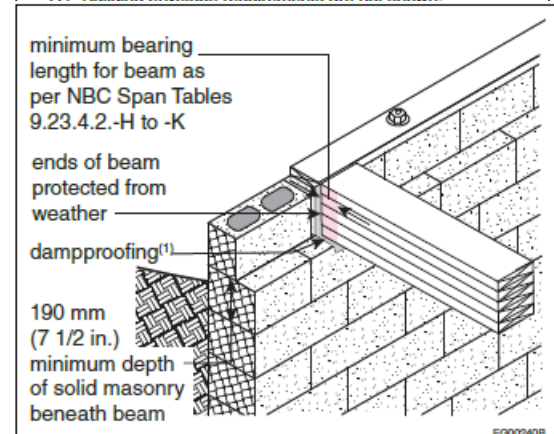


Figure 9.15-20
Beam supported by masonry

Note to Figure 9.15-20:

(1) Dampproofing is required if the beam is supported on concrete and is less than 150 mm (6 in.) above the ground, unless the beam is pressure-treated with a wood preservative (NBC Article 9.23.2.3.).

(3) The top 200 mm of pilasters required in Sentence (1) shall be *solid masonry* with the cells of hollow or semi-solid units filled with mortar, grout or concrete.

9.15.6. Parging and Finishing of Foundation Walls

9.15.6.1. Foundation Walls Below Ground

(1) Concrete block *foundation* walls shall be parged on the exterior face below ground level as required in Section 9.13.

9.15.6.2. Foundation Walls Above Ground

(1) Exterior surfaces of concrete block *foundation* walls above ground level shall have tooled joints, or shall be rendered, parged or otherwise suitably finished.

9.15.6.3. Form Ties

(1) All form ties shall be removed at least flush with the concrete surface.

Related concepts to be discussed

9.13. Dampproofing, Waterproofing and Soil Gas Control, all

Section 9.14 drainage

Section 9.16 Floors-on-Ground

Section 9.17 columns

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<https://nrc-publications.canada.ca/eng/view/object/?id=72431bc3-7a2e-4725-bdca-aace4b7f3837>

Building Compendium for Non Commercial Use

<https://www.ontario.ca/form/get-2012-building-code-compendium-non-commercial-use>