

FOOTINGS AND FOUNDATIONS INFORMATION

The following information is intended as a guide, and is based on the Minnesota State Building Code and good building practice. Although every attempt has been made to verify accuracy in the handout, no guarantees are made to its accuracy. As the Minnesota State Building Code includes over 500 pages of building requirements, this document cannot include all information that might be relevant to your project. Responsibility for compliance with applicable codes belongs to the permit holder. For specific questions regarding the code requirements, refer to the applicable codes or contact us. **Permits are required for all new, replacement, and repair work on footings and foundations.**

R401.3: Drainage: Lots shall be graded to drain surface water away from foundation walls. The grade away from the foundation walls shall fall a minimum of 6 inches within the first 10 feet. Where slopes or physical barriers prevent this, drains or swales shall be provided.

R403.1.1 Minimum Size: The minimum sizes for concrete and masonry footings for all structures (excluding decks) shall be based on soil type as set forth in Table R401.4.1 and sized per Tables R403.1(1) (Light Frame), R403.1(2) (Brick Veneer), R403.1(3) (Cast in Place or Grouted Masonry). Deck Footings shall be sized in accordance with Table R507.3.1. Footing projections "P" shall be at least 2" and shall not exceed the thickness of the footing. The size of footings supporting piers and columns shall be based on the tributary load and allowable soil pressure in accordance with Table R401.4.1.

R402.2: Minimum Compressive Strength: The minimum compressive strength for concrete footings shall be as set forth in Table R402.2.

R403.1(1) Footing Types: For specific footing details for structures see Figure R403.1(1). For specific footing details for decks see Figure R507.3.

R403.1.4.1 Frost Protection: Footings shall not bear on frozen soil. Foundation walls, piers and other permanent supports of buildings and structures not otherwise protected from frost shall be protected by one or more of the following methods:

1. Extended below the frost line specified in Table R301.2(1), MN Rule part 1303.1600 (42" to base of footing in Zone 5 and 60" in Zone 6);
2. Constructing in accordance with Section R403.3 (Shallow frost protected footings);
3. Constructing in accordance with ASCE 32;
4. Erected on solid rock; or
5. Constructing in accordance with Minnesota Rules Chapter 1303 (Slab on grade).

Minnesota Rule 1303.1600 "**Slab on Grade**": Slab on grade construction may be placed on any soil except peat or muck for detached-one story private garage, carport and shed buildings not larger than 1000 s.f.

Under Slab Work: Prior to pouring a concrete floor it is important to ensure that any work covered by the slab is inspected. This may include inspections for:

1. Underground Plumbing Rough-In (separate permit required)
2. Underground Mechanical Rough-in (separate permit required)
3. Under Slab Radon System
4. Under Slab Vapor Barrier/Soil Gas Membrane
5. Insulation (when the foundation insulation or required under slab insulation, such as when using hydronic heat, will be covered by a slab)

1303.2402 Subp. 2: **Soil gas membrane** – At habitable areas, a soil-gas membrane shall be placed on top of the gas-permeable material prior to placing a floor on top of or above the soil. The soil-gas membrane shall cover the entire floor area. Separate sections of membrane must be lapped at least 12".

R506.2.3 Vapor Retarder: In heated areas of non-habitable structures, an approved vapor retarder with joints lapped not less than 6" (153 mm) shall be placed between the concrete floor slab and the base course or the prepared subgrade where no base course exists.

MN Rules Chapter 1300.0130 Supb. 8, **Approval of Remaining Work:** Issuance of a footing/foundation permit **DOES NOT** guarantee approval of the remaining structure or that changes to the approved work won't be required after review of the final design. In regards to this MRC 1300.0130 Supb. 8 specifically states: "...The holder of the permit for the foundation or other parts of a building or structure shall proceed at the holder's own risk with the building operation and without assurance that a permit for the entire structure will be granted." It is strongly recommended when applying for a footing/foundation permit that you work closely with your builder/designer to already have a good idea of the major structural loading and design issues for your site.

Common examples of issues that could arise after the fact are:

- A heavy point load from a roof or floor girder is added after the foundation is approved, which now requires pad footings to be added underneath the already constructed walls at the expense of the permit applicant.
- A deck has been approved for footings only. The builder decides to add a small cantilever and move the stair location. This change in loading now makes several footings undersized requiring footings to be dug up or additional footings to be added at the expense of the permit applicant.
- A footing/foundation permit is approved to code minimums. When applying for the permit for the remainder of the structure an engineer's design is submitted that requires specific foundation sizes and reinforcements to handle the lateral wind resistance system (wall bracing). This new design exceeds the code minimums the foundation was approved to. The affected sections of the foundation will have to be removed/replaced at the expense of the permit applicant.

Table R401.4.1: Presumptive load bearing values of foundation materials^a

Class of Material	Load-Bearing Pressure (PSF)
Crystalline bedrock	12,000
Sedimentary and foliated rock	4,000
Sandy gravel and/or gravel (GW and GP)	3000
Sand, silty sand, clayey sand, silty gravel and clayey gravel (SW, SP, SM, SC, GM and GC)	2000
Clay, sandy, silty clay, clayey silt, silt and sandy silt clay (CL, ML, MH and CH)	1500 ^b

- a. Where soil tests are required by Section R401.4, the allowable bearing capacities of the soil shall be part of the recommendations.
- b. Where the building official determines that in-place soils with an allowable bearing capacity of less than 1,500 psf are likely to be present at the site, the allowable bearing capacity shall be determined by a soils investigation.

Table R402.2: Minimum compressive strength of concrete

Type or Location of Concrete Construction	Minimum Specified Compressive Strength ^a (F'_c)
	Weathering Potential
	Severe
Footings ^{g,h}	5000
Basement walls, foundations, and other concrete not exposed to the weather	2500 ^c
Basement slabs and interior slabs on grade, except garage floor slabs	2500 ^c
Basement walls, foundation walls, exterior walls, and other vertical concrete work exposed to the weather	3000 ^d
Porches, carport slabs, and steps exposed to the weather and garage floor slabs	3500 ^{d,e,f}

For Sl: 1 pound per sq" = 6.895 kPa.

- a. Strength at 28 days psi.
- b. See Table R301.2(1) for weathering potential.
- c. Concrete in these locations that may be subject to freezing and thawing during construction shall be air-entrained concrete in accordance with Footnote d.
- d. Concrete shall be air-entrained. Total air content (percent by volume of concrete) shall be not less than 5% or more than 7%.
- e. See Section R402.2 for maximum cementitious materials content.
- f. For garage floors with a steel troweled finish, reduction of the total air content (percent by volume of concrete) to not less than 3% is permitted if the specified compressive strength of the concrete is increased to not less than 4000psi.
- g. Compressive strength (F'_c) of 2500psi, with an approved admixture that provides a water and vapor resistance at least equivalent to 5000psi concrete.
- h. Compressive strength (F'_c) of 5000psi, is not required for post footings for decks or porches, wood foundations, slab-on-grade foundation walls, and footings for floating slabs.

Table R403.1(1): Minimum width and thickness for concrete footings for light frame construction^{a,b}

Snow Load or Roof Live Load	Story and Type of Structure With Light Frame	Load Bearing Value of Soil (PSF)					
		1500	2000	2500	3000	3500	4000
50 PSF	1 story slab-on-grade	12x6	12x6	12x6	12x6	12x6	12x6
	1 story-with crawl space	12x6	12x6	12x6	12x6	12x6	12x6
	1 story + basement	21x6	16x6	13x6	12x6	12x6	12x6
	2 story-slab-on-grade	14x6	12x6	12x6	12x6	12x6	12x6
	2 story-with crawl space	19x6	14x6	12x6	12x6	12x6	12x6
	2 story + basement	25x7	19x6	15x6	12x6	12x6	12x6
	3 story-slab-on-grade	17x6	13x6	12x6	12x6	12x6	12x6
	3 story-with crawl space	22x6	17x6	13x6	12x6	12x6	12x6
	3 story + basement	28x9	21x6	17x6	14x6	12x6	12x6

- a. Interpolation allowed, extrapolation is not allowed.
 b. Based on a 32' wide house with a load bearing center wall that carries half of the tributary attic and floor framing. For every 2' of adjustment to the width of the house, add or subtract 2" of footing width and 1" of footing thickness (but not less than 6" thick).

Table R507.3.1: Minimum footing sizes for decks

Live Load ^b	Tributary Area	Load Bearing Value of Soils (PSF)											
		1500 ^e			2000 ^e			2500 ^e			≥3000 ^e		
		Square Footing	Round Footing	Thick	Square Footing	Round Footing	Thick	Square Footing	Round Footing	Thick	Square Footing	Round Footing	Thick
40	20	12	14	6	12	14	6	12	14	6	12	14	6
	40	14	16	6	12	14	6	12	14	6	12	14	6
	60	17	19	6	15	17	6	13	15	6	12	14	6
	80	20	22	7	17	19	6	15	17	6	14	16	6
	100	22	25	8	19	21	6	17	19	6	15	17	6
	120	24	27	9	21	23	7	19	21	6	17	19	6
	140	26	29	10	22	25	8	20	23	7	18	21	6
	160	28	31	11	24	27	9	21	24	8	20	23	7

- a) Interpolation permitted, extrapolation not permitted.
 b) Live load = 40 psf, dead load = 10 psf.
 c) Assumes minimum square footing to be 12"x12"x6" for a 6"x6" post.
 d) IF the support is a brick or CMU pier, the footing shall have a minimum 2" projection on all sides.
 e) Area, in square feet, of deck surface supported by post and footings.

Figure R507.3: Deck post to deck footing connection

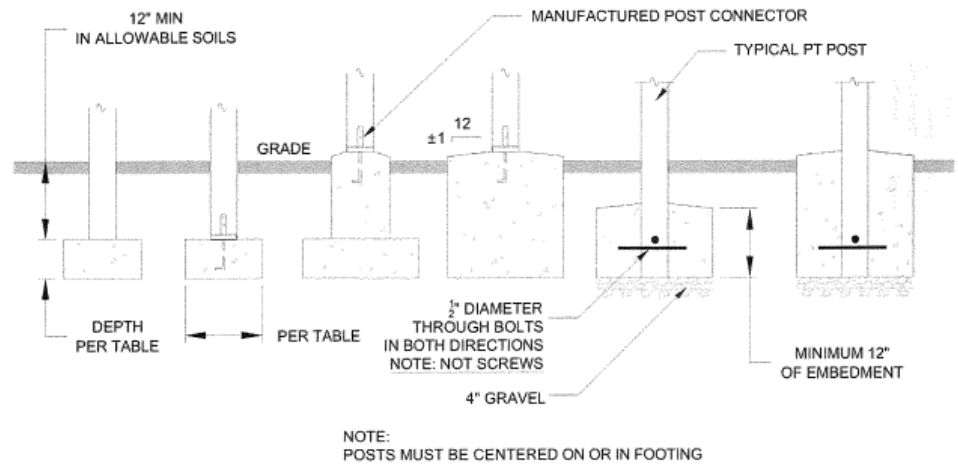
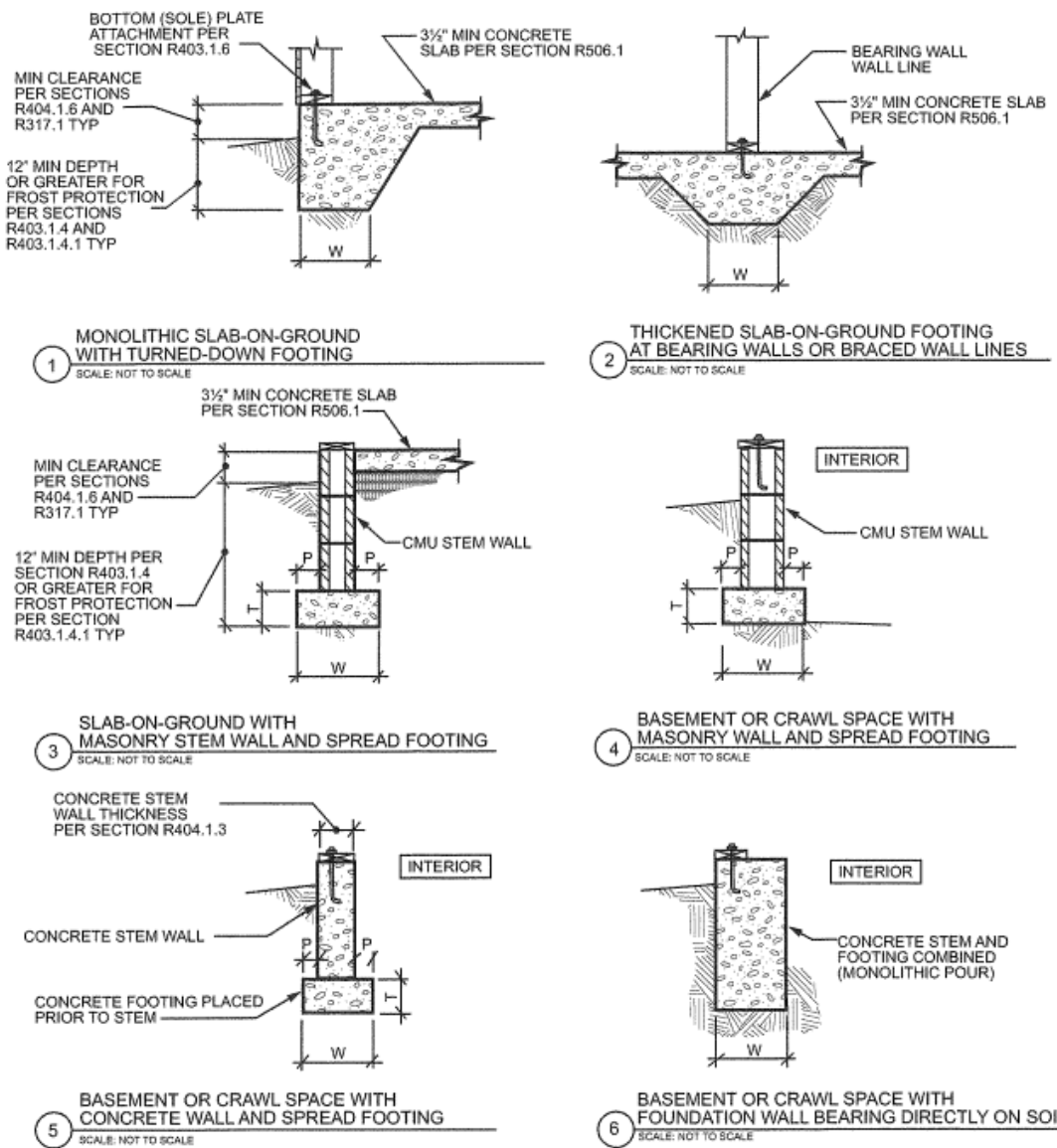


Figure R403.1(1): Plain concrete footings with masonry and concrete stem walls.



For SI: 1 inch = 25.4 mm.

W = Width of footing, T = Thickness of footing and P = Projection per Section R403.1.1

NOTES:

- a. See Section R404.3 for sill requirements.
- b. See Section R403.1.6 for sill attachment.
- c. See Section R506.2.3 for vapor barrier requirements.
- d. See Section R403.1 for base.
- e. See Figure R403.1.3 for additional footing requirements for structures in SDC D₀, D₁ and D₂ and townhouses in SDC C.
- f. See Section R408 for under-floor ventilation and access requirements.