



# Public Information

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## Building and Safety Standard B-49 Foundation and Geotechnical Investigation Reports Revised: May 11, 2020

Section 1803.1 of the California Building Code requires a geotechnical investigation for the classification and determination of soil engineering properties at the building site. Therefore, all plans for buildings and structures submitted for Building and Safety review shall be accompanied by a Geotechnical Investigation Report, except where supported by an approved Soils Report Waiver, Form B-50, or where foundation work is not required. When such Soils Report Waiver is used, the tables below shall be followed to determine the applicable foundation design limitations and requirements for the building or structure.

When the project is in a known Earthquake Fault Zone or Seismic Hazard Zone as shown in the most recently published map from the California Geologic Survey (CGS), Geotechnical Investigation Reports shall include a Geologic Hazard Evaluation.

Geotechnical Investigation reports must be prepared by a California licensed Engineer with experience in soils engineering. Geologic Hazard Evaluations when required, must be prepared by a California licensed Engineering Geologist and be based on the guidelines presented in the California Department of Conservation Special Publication 117.

USE/OCCUPANCY	HEIGHT OR STORIES	FLOOR AREA	FOUNDATION DESIGN REQUIREMENTS <sup>6</sup>
1. Any buildings not listed in below occupancies: <sup>1, 2, 3, 5, 8</sup> <ul style="list-style-type: none"> <li>Light-Frame Construction regardless of occupancy group</li> </ul>	1-Story <sup>4</sup>	1,000 Sq. Ft. or Less	<p style="text-align: center;"><u>Gravity Design</u></p> <ul style="list-style-type: none"> <li>Weighted Expansion Index (EI) of 91~130 from VCBC Table 1805.4.2</li> <li>Maximum Vertical Bearing Pressure = 1,500 psf</li> </ul> <p style="text-align: center;"><u>Lateral Design</u></p> <ul style="list-style-type: none"> <li>Passive Lateral Bearing Pressure = 100 psf/ft</li> <li>Cohesion = 130 psf</li> <li>Active Lateral Earth Pressure = 60 psf/ft = 30 psf/ft w/ Backfill <sup>10</sup></li> <li>Factor of Safety for Sliding and Overturning = 1.5</li> </ul>
2. Non-Residential Group, U (Not Agricultural): <sup>1, 2, 3, 5</sup> <ul style="list-style-type: none"> <li>Private Garages/Carports</li> <li>Structures Accessory to Private Residential Uses</li> </ul>	1-Story <sup>4</sup>	1,000 Sq. Ft. or Less	
3. Agricultural Group, U: <sup>2, 3, 5</sup> <ul style="list-style-type: none"> <li>Livestock Shelters and Buildings</li> <li>Poultry Shelters and Buildings</li> <li>Barns</li> <li>Ag. Equipment and Machinery Storage Sheds and Stables</li> </ul>	1-Story	3,000 Sq. Ft. or Less	
<ul style="list-style-type: none"> <li>Crop Protection Shelters and Greenhouses</li> </ul>	1-Story	12,000 Sq. Ft. or Less	
4. Retaining Walls: <sup>7</sup> <ul style="list-style-type: none"> <li>Reinforced Concrete and Masonry Using Conventional Spread Footings Only</li> </ul>	6-Feet measured from the top of the footing	N/A	
<ul style="list-style-type: none"> <li>Swimming Pools on Level Lot Only: <sup>2, 3</sup></li> </ul>	6-Feet	N/A	
5. Non-Building Structures, U: <sup>2, 9</sup> <ul style="list-style-type: none"> <li>Tanks, towers, vessels, mechanical equipment pads, fences, cantilevered structures, storage racks, antenna poles, pedestrian bridges, grain silos</li> </ul>	15-Feet	N/A	

Footnotes:

- Total proposed floor areas of attached buildings combined per items 1 and 2 shall not exceed 1,000 square feet.
- Exception is limited to foundations where construction will take place on an existing natural level lot containing no fill.
- When not exempted from plan check and inspection in accordance with VCBC Section 105.2 and 110.1.
- When supported by a letter from a qualified geotechnical engineer or geologist that liquefaction is not probable, one additional story may be allowed.
- Gutter and downspouts are required per VCBC Table 1809.7 Footnote #13.
- When an Expansion Index Report is provided by a Soil Engineer, the foundation depth may be reduced to equal the corresponding Index in Table 1809.7.
- For retaining wall design with non-saturated soil, use active fluid pressure as noted below. A grading permit is required when the quantity of fill exceeds 50 cubic yards.

Surface Slope	Equivalent Fluid Pressure	Equivalent Fluid Pressure with Backfill
Level	60 psf/ft	30 psf/ft
5 to 1	65 psf/ft	32 psf/ft
4 to 1	70 psf/ft	35 psf/ft
2 to 1	85 psf/ft	38 psf/ft

- Property located in earthquake fault hazard zone area does not qualify for waiver regardless of that area.
- 6-inches wide minimum x 12-inches thick thickened edge of slab-on-grade is acceptable for house keeping pads.
- Backfill material shall be comprised of 3/4" coarse gravel for a minimum of 12 inches width from the backfill face of the wall and for the full-height of the wall with a French drain at the bottom.

Table 1809.7  
PRESCRIPTIVE FOOTINGS FOR SUPPORTING WALLS OF LIGHT FRAME CONSTRUCTION

WEIGHTED EXPANSION INDEX <sup>13</sup>	FOUNDATION FOR SLAB & RAISED FLOOR SYSTEM <sup>4,8</sup>							CONCRETE SLABS <sup>8,12</sup>		PREMOISTENING OF SOILS UNDER FOOTINGS, PIERS, AND SLABS <sup>4,5</sup>	RESTRICTION ON PIERS UNDER RAISED FLOORS
	NUMBER OF STORIES	STEM THICKNESS	FOOTING WIDTH	FOOTING THICKNESS	ALL PERIMETER FOOTINGS <sup>5</sup>	INTERIOR FOOTINGS FOR SLAB AND RAISED FLOORS <sup>5</sup>	REINFORCEMENT FOR CONTINUOUS FOUNDATIONS <sup>2,6</sup>	3½ INCHES MINIMUM THICKNESS			
		(INCHES)						REINFORCEMENT <sup>3</sup>	TOTAL THICKNESS OF SAND (INCHES) <sup>10</sup>		
0 – 20 Very Low (non-expansive)	1	6	12	6	12	12	1-#4 top and bottom	#4 @ 48" o.c. each way, or #3 @ 36" o.c. each way	2	Moistening of ground recommended prior to placing concrete	Piers allowed for single floor loads only
	2	8	15	6	18	18					
	3	10	18	8	24	24					
21 – 50 Low	1	6	12	6	15	12	1-#4 top and bottom	#4 @ 48" o.c. each way, or #3 @ 36" o.c. each way	4	120% of optimum moisture required to a depth of 21" below lowest adjacent grade. Testing required.	Piers allowed for single floor loads only
	2	8	15	6	18	18					
	3	10	18	8	24	24					
51 – 90 Medium	1	6	12	6	21	12	1-#4 top and bottom	#3 @ 24" o.c. each way	4	130% of optimum moisture required to a depth of 27" below lowest adjacent grade. Testing required.	Piers not allowed
	2	8	15	6	21	18					
	3	10	18	8	24	24					
91 – 130 High	1	6	12	6	27	12	2-#4 top and bottom	#3 @ 24" o.c. each way	4	140% of optimum moisture required to a depth of 33" below lowest adjacent grade. Testing required.	Piers not allowed
	2	8	15	6	27	18					
	3	10	18	8	27	24					
Above 130 Very High	Special design by licensed engineer / architect										

Footnotes:

- Premoistening is required where specified in Table 1809.7 in order to achieve maximum and uniform expansion of the soil prior to construction and thus limit structural distress caused by uneven expansion and shrinkage. Other systems which do not include premoistening may be approved by the Building Official when such alternatives are shown to provide equivalent safeguards against the adverse effects of expansive soil.
- Reinforcement for continuous foundations shall be placed not less than 3" above the bottom of the footing and not less than 3" below the top of the stem.
- Reinforcement shall be placed at mid-depth of slab.
- After premoistening, the specified moisture content of soils shall be maintained until concrete is placed. Required moisture content shall be verified by an approved testing laboratory not more than 24 hours prior to placement of concrete.
- Crawl spaces under raised floors need not be pre-moistened except under interior footings. Interior footings which are not enclosed by a continuous perimeter foundation system or equivalent concrete or masonry moisture barrier complying with Footnote # 12 of Table 1809.7 shall be designed and constructed as specified for perimeter footings in Table 1809.7.
- Foundation stem walls which exceed a height of three times the stem thickness above lowest adjacent grade shall be reinforced in accordance with Chapter 21 and Chapter 19 in the CBC, or as required by engineering design, whichever is more restrictive.
- Bent reinforcing bars between exterior footing and slab shall be omitted when floor is designed as an independent, "floating" slab.
- Where frost conditions or unusual conditions beyond the scope of this table are found, design shall be in accordance with recommendations of a foundation investigation. Concrete slabs shall have a minimum thickness of 4 inches when the expansion index exceeds 50.
- The ground under a raised floor system may be excavated to the elevation of the top of the perimeter footing, except where otherwise required by engineering design or to mitigate groundwater conditions.
- GRADE BEAM, GARAGE OPENING. A grade beam not less than 12" x 12" in cross section, or 12" x depth required by Table 1809.7, whichever is deeper, reinforced as specified for continuous foundations in Table 1809.7, shall be provided at garage door openings.
- Where a post-tensioning slab system is used, the width and depth of the perimeter footings shall meet the requirements of this table.
- An approved vapor barrier shall be installed below concrete slab-on-grade floors of all residential occupancies in such a manner as to form an effective barrier against the migration of moisture into the slab. When sheet plastic material is employed for this purpose it shall be not less than 6 mils (.006 inch) in thickness. The installation of a vapor barrier shall not impair the effectiveness of required anchor bolts or other structural parts of a building. Foundations at the perimeter of concrete floor slabs shall form a continuous moisture barrier of Portland cement concrete or solid grouted masonry to the depths required by Table 1809.7.
- When buildings are located on expansive soil having an expansion index greater than 50, gutters, downspouts, piping, and/or other non-erosive devices shall be provided to collect and conduct rainwater to a street, storm drain, or other approved watercourse or disposal area.
- Fireplace footings shall be reinforced with a horizontal grid located 3" above the bottom of the footing and consisting of not less than No. 4 Bars at 12" on center each way. Vertical chimney reinforcing bars shall be hooked under the grid. Depth of fireplace chimney footings shall be no less than that required by Table 1809.7.