

shapes shall be completely filled with concrete or cement grout.

**1809.12 Timber footings.** Timber footings shall be permitted for buildings of Type V construction and as otherwise *approved* by the *building official*. Such footings shall be treated in accordance with AWP A U1 (Commodity Specification A, Use Category 4B). Treated timbers are not required where placed entirely below permanent water level, or where used as capping for wood piles that project above the water level over submerged or marsh lands. The compressive stresses perpendicular to grain in untreated timber footings supported upon treated piles shall not exceed 70 percent of the allowable stresses for the species and grade of timber as specified in the AF&PA NDS.

**1809.13 Footing seismic ties.** Where a structure is assigned to *Seismic Design Category* D, E or F in accordance with Section 1613, individual spread footings founded on soil defined in Section 1613.5.2 as *Site Class* E or F shall be interconnected by ties. Unless it is demonstrated that equivalent restraint is provided by reinforced concrete beams within slabs on grade or reinforced concrete slabs on grade, ties shall be capable of carrying, in tension or compression, a force equal to the lesser of the product of the larger footing design gravity load times the seismic coefficient,  $S_{DS}$ , divided by 10 and 25 percent of the smaller footing design gravity load.

## SECTION 1810 DEEP FOUNDATIONS

**1810.1 General.** Deep foundations shall be analyzed, designed, detailed and installed in accordance with Sections 1810.1 through 1810.4.

**1810.1.1 Geotechnical investigation.** Deep foundations shall be designed and installed on the basis of a geotechnical investigation as set forth in Section 1803.

**1810.1.2 Use of existing deep foundation elements.** Deep foundation elements left in place where a structure has been demolished shall not be used for the support of new construction unless satisfactory evidence is submitted to the *building official*, which indicates that the elements are sound and meet the requirements of this code. Such elements shall be load tested or redriven to verify their capacities. The design load applied to such elements shall be the lowest allowable load as determined by tests or redriving data.

**1810.1.3 Deep foundation elements classified as columns.** Deep foundation elements standing unbraced in air, water or fluid soils shall be classified as columns and designed as such in accordance with the provisions of this code from their top down to the point where adequate lateral support is provided in accordance with Section 1810.2.1.

**Exception:** Where the unsupported height to least horizontal dimension of a cast-in-place deep foundation element does not exceed three, it shall be permitted to design and construct such an element as a pedestal in accordance with ACI 318.

**1810.1.4 Special types of deep foundations.** The use of types of deep foundation elements not specifically mentioned herein is permitted, subject to the approval of the *building official*, upon the submission of acceptable test data, calculations and other information relating to the structural properties and load capacity of such elements.