

1810.3.8.3.1 Effective prestress. The effective prestress in the pile shall be not less than 400 psi (2.76 MPa) for piles up to 30 feet (9144 mm) in length, 550 psi (3.79 MPa) for piles up to 50 feet (15 240 mm) in length and 700 psi (4.83 MPa) for piles greater than 50 feet (15 240 mm) in length.

Effective prestress shall be based on an assumed loss of 30,000 psi (207 MPa) in the prestressing steel. The tensile stress in the prestressing steel shall not exceed the values specified in ACI 318.

1810.3.8.3.2 Seismic reinforcement in Seismic Design Category C. For structures assigned to *Seismic Design Category C*, precast prestressed piles shall have transverse reinforcement in accordance with this section. The volumetric ratio of spiral reinforcement shall not be less than the amount required by the following formula for the upper 20 feet (6096 mm) of the pile.

$$\rho_s = 0.04(f'_c / f_{yh})[2.8 + 2.34P / (f'_c A_g)] \text{ (Equation 18-5)}$$

where:

A_g = Pile cross-sectional area square inches (mm²).

f'_c = Specified compressive strength of concrete, psi (MPa).

f_{yh} = Yield strength of spiral reinforcement \leq 85,000 psi (586 MPa).

P = Axial load on pile, pounds (kN), as determined from Equations 16-5 and 16-7.

ρ_s = Spiral reinforcement index or volumetric ratio (vol. spiral/vol. core).

Not less than one-half the volumetric ratio required by Equation 18-5 shall be provided below the upper 20 feet (6096 mm) of the pile.

Exception: The minimum spiral reinforcement index required by Equation 18-5 shall not apply in cases where the design includes full consideration of load combinations specified in ASCE 7, Section 2.3.6 and the applicable overstrength factor, Ω_0 . In such cases, minimum spiral reinforcement index shall be as specified in Section 1810.3.8.1.

1810.3.8.3.3 Seismic reinforcement in Seismic Design Categories D through F. For structures assigned to *Seismic Design Category D, E or F*, precast prestressed piles shall have transverse reinforcement in accordance with the following:

1. Requirements in ACI 318, Chapter 18, need not apply, unless specifically referenced.
2. Where the total pile length in the soil is 35 feet (10 668 mm) or less, the lateral transverse reinforcement in the ductile region shall occur through the length of the pile. Where the pile length exceeds 35 feet (10 668 mm), the ductile pile region shall be taken as the greater of 35 feet (10 668 mm) or the distance from the underside of the pile cap to the point of zero

curvature plus three times the least pile dimension.

3. In the ductile region, the center-to-center spacing of the spirals or hoop reinforcement shall not exceed one-fifth of the least pile dimension, six times the diameter of the longitudinal strand or 8 inches (203 mm), whichever is smallest.
4. Circular spiral reinforcement shall be spliced by lapping one full turn and bending the end of each spiral to a 90-degree hook or by use of a mechanical or welded splice complying with Section 25.5.7 of ACI 318.
5. Where the transverse reinforcement consists of circular spirals, the volumetric ratio of spiral transverse reinforcement in the ductile region shall comply with the following:

$$\rho_s = 0.06(f'_c / f_{yh})[2.8 + 2.34P / (f'_c A_g)] \text{ (Equation 18-6)}$$

but not exceed:

$$\rho_s = 0.021 \text{ (Equation 18-7)}$$

where:

A_g = Pile cross-sectional area, square inches (mm²).

f'_c = Specified compressive strength of concrete, psi (MPa).

f_{yh} = Yield strength of spiral reinforcement \leq 85,000 psi (586 MPa).

P = Axial load on pile, pounds (kN), as determined from Equations 16-5 and 16-7.

ρ_s = Volumetric ratio (vol. spiral/vol. core).

This required amount of spiral reinforcement is permitted to be obtained by providing an inner and outer spiral.

Exception: The minimum spiral reinforcement required by Equation 18-6 shall not apply in cases where the design includes full consideration of load combinations specified in ASCE 7, Section 2.3.6 and the applicable overstrength factor, Ω_0 . In such cases, minimum spiral reinforcement shall be as specified in Section 1810.3.8.1.

6. Where transverse reinforcement consists of rectangular hoops and cross ties, the total cross-sectional area of lateral transverse reinforcement in the ductile region with spacing, s , and perpendicular dimension, h_c , shall conform to:

$$A_{sh} = 0.3s h_c (f'_c / f_{yh})(A_g / A_{ch} - 1.0) / [0.5 + 1.4P / (f'_c A_g)] \text{ (Equation 18-8)}$$