

CODE

COMMENTARY

Table 18.13.5.7.1—Minimum reinforcement for uncased cast-in-place or augered concrete piles or piers

Minimum reinforcement		SDC C – All Site Classes	SDC D, E, and F – Site Class A, B, C, and D	SDC D, E, and F – Site Class E and F
Minimum longitudinal reinforcement ratio (minimum number of bars)		0.0025 (minimum number of bars in accordance with 10.7.3.1)	0.005 (minimum number of bars in accordance with 10.7.3.1)	0.005 (minimum number of bars in accordance with 10.7.3.1)
Minimum reinforced pile length		Longest of (a) through (d): (a) 1/3 pile length (b) 3 m (c) 3 times the pile diameter (d) Flexural length of pile - distance from bottom of pile cap to where $0.4M_{cr}$ exceeds M_u	Longest of (a) through (d): (a) 1/2 pile length (b) 3 m (c) 3 times the pile diameter (d) Flexural length of pile - distance from bottom of pile cap to where $0.4M_{cr}$ exceeds M_u	Full length of pile except in accordance with [1] or [2].
Transverse confinement reinforcement zone	Length of reinforcement zone	3 times the pile diameter from the bottom of the pile cap	3 times the pile diameter from the bottom of the pile cap	7 times the pile diameter from the bottom of the pile cap
	Type of transverse reinforcement	Closed ties or spirals with a minimum 10 mm diameter	Minimum of No. 10 closed tie or 10 mm diameter spiral for piles ≤ 500 mm diameter Minimum No. 13 closed tie or 13 mm diameter spiral for piles > 500 mm diameter	
	Spacing and amount of transverse reinforcement	Spacing shall not exceed lesser of 150 mm or 8 longitudinal bar diameters	In accordance with 18.7.5.3 and not less than one-half the requirement of Table 18.7.5.4 Item (e)	In accordance with 18.7.5.3 and not less than the requirement of Table 18.7.5.4 Item (e).
Transverse reinforcement in remainder of reinforced pile length	Type of transverse reinforcement	Closed ties or spirals with minimum 10 mm diameter	Minimum of No. 10 closed tie or 10 mm diameter spiral for piles ≤ 500 mm diameter Minimum of No. 13 closed tie or 13 mm diameter spiral for piles > 500 mm diameter	
	Spacing and amount of transverse reinforcement	Maximum spacing of 16 longitudinal bar diameters	In accordance with 18.7.5.2	
			Spacing shall not exceed the least of (a) through (c): (a) 12 longitudinal bar diameters (b) 1/2 the pile diameter (c) 300 mm	

[1] For piles sufficiently embedded in firm soil or rock, reinforcement shall be permitted to be terminated a length above the tip equal to the lesser of 5 percent of the pile length and 33 percent of the length of the pile within rock or firm soil.

[2] In lieu of providing full length minimum flexural reinforcement, the deep foundation element shall be designed to withstand maximum imposed curvatures from the earthquake ground motions and structural response. Curvatures shall include free-field soil strains modified for soil-foundation-structure interaction coupled with foundation element deformations associated with earthquake loads imparted to the foundation by the structure. Minimum reinforced length shall not be less than the requirement for SDC D, E, or F; Site Class D.

18.13.5.7.2 Minimum longitudinal and transverse reinforcement shall be provided along minimum reinforced lengths measured from the top of the pile in accordance with Table 18.13.5.7.1.

18.13.5.7.3 Longitudinal reinforcement shall extend at least the development length in tension beyond the flexural length of the pile, which is defined in Table 18.13.5.7.1 as the distance from the bottom of the pile cap to where $0.4M_{cr} > M_u$.

R18.13.5.7.3 Reinforcement should extend ℓ_d beyond the point where plain concrete is no longer adequate to resist the factored moment.

18.13.5.8 Metal-cased concrete piles

R18.13.5.8 Metal-cased concrete piles

18.13.5.8.1 For structures assigned to SDC C, D, E, or F, longitudinal reinforcement requirements and minimum reinforced lengths for metal-cased concrete piles shall be the same as for uncased concrete piles in 18.13.5.7.

18.13.5.8.2 Metal-cased concrete piles shall have a spiral-welded metal casing of a thickness not less than 2 mm that

R18.13.5.8.2 Spiral-welded metal casing with the specified wall thickness provides confinement equivalent to