

3.6 Group Effect

The effect of pile or shaft grouping on the single pile or shaft load capacities is dependent on pile or shaft spacing, pile or shaft length and soil characteristics throughout the pile or shaft length and below the pile or shaft tips. Assuming a minimum center to center spacing of 3 ft., group effect should be unimportant for pile or shaft clusters of less than 6 piles or shaft. Group effect could become important for larger clusters and should be evaluated when actual pile or shaft layouts are known.

As per the New Orleans Amendment to Chapter 18 of the International Building Code (IBC), latest edition, the minimum center-to-center spacing for all piles should be either three (3) feet, three (3) times the pile diameter or width, or as determined by the following expression (whichever is greater):

$$SPAC = 0.05 (L1) + 0.025 (L2) + 0.0125 (L3)$$

Where:

SPAC = Center-to-center spacing of piles in ft

L1 = Pile penetration up to 100 ft

L2 = Pile penetration from 101 to 200 ft

L3 = Pile penetration beyond 201 ft

The allowable load-carrying capacity of a pile group is expressed by the following equation:

$$Q_a = \frac{(P L C)}{FS_F} + \frac{[2.6q_u (1 + 0.2 w/b)]}{FS_B}$$

Q_a = Allowable load-carrying capacity of pile group, lb.

P = Perimeter distance of pile group, ft.

L = Length of pile, ft.

C = Average (weighted) cohesion or shear strength of material between the surface and the depth of the pile tip, psf.

FS_F = Factor of safety for the group friction area = 2

q_u = Average unconfined compressive strength zone below pile tips, psf; the thickness of the zone shall consider the pile group size and shape, as well as the soil stratigraphy and soil properties.

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w = Width of base of pile group , ft.

b = Length of base of pile group, ft.

A = Base area of pile group, sq. ft.

FSB = Factor of safety for the group base area = 3

Where:

Q_a = allowable load-carrying capacity of the pile group, lb

P = perimeter distance of the pile group, ft

L = pile length, ft

C = average (weighted) cohesion or shear strength between ground surface and the depth of the pile tip, ft

Q_u = average confined compressive strength of the material in the zone below the pile tips, psf