

2.4.1 SUBSTRUCTURES

2.4.1.3 PILES

GENERAL DESCRIPTION

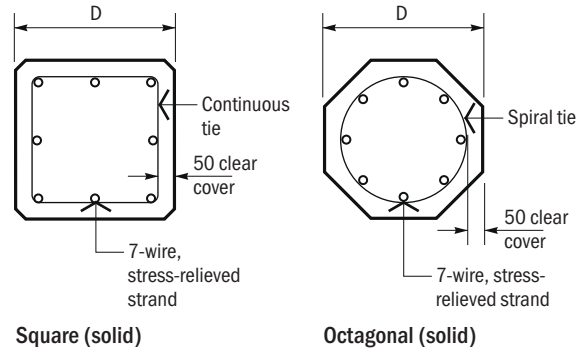
Precast concrete piles are important elements used in the footings of buildings, bridges and marine structures. Throughout Australia, many areas have poor soil conditions which therefore makes precast prestressed concrete piled footings an obvious choice for construction. This is true also for light-load structures. Prestressed piles are often the preferred choice among designers when permanence, toughness, durability and economy are considered.

When precast prestressed piles are used in aggressive soil or marine applications they can be designed for long-life durability, to safely support vertical loads together with bending moment arising from lateral loads such as wind, waves and earthquake, as essentially uncracked sections. The level of prestress is chosen to ensure crack-free performance is achieved for the service load and, accordingly, members are very durable in resistance to chloride-induced corrosion of the reinforcement.

COMPONENT DETAILS

Prestressed piles are commonly supplied in square or octagonal profiles (see *Typical Sections*). In larger-size ranges, eg 700 mm and above, they may be produced with circular voids to reduce dead weight and improve structural efficiency. Properties and allowable service loads for a range of solid piles are given in *Section Properties*.

TYPICAL SECTIONS



SECTION PROPERTIES

| Section | Size, D (mm) | Area, A (mm ²) | Moment of inertia, I (mm ⁴) | Radius of gyration, r (mm) | Section modulus, Z (mm ³) | Mass (kN/m) | Perimeter (mm) | Strand No./size | Allowable concentric imposed action (kN)* for concrete strength (MPa) | | | |
|-------------------|--------------|----------------------------|---|----------------------------|---------------------------------------|-------------|----------------|-----------------|---|------|------|------|
| | | | | | | | | | 32 | 40 | 50 | 60 |
| Square (solid) | 350 | 122 500 | 1250 x 10 ⁶ | 101 | 7146 x 10 ³ | 3.00 | 1400 | 8/12.7 | 1055 | 1375 | 1780 | 2185 |
| | 400 | 160 000 | 2133 x 10 ⁶ | 116 | 10 666 x 10 ³ | 3.92 | 1600 | 8/12.7 | 1450 | 1870 | 2400 | 2930 |
| | 450 | 202 500 | 3417 x 10 ⁶ | 130 | 15 187 x 10 ³ | 4.97 | 1800 | 10/12.7 | 1840 | 2375 | 3040 | 3710 |
| | 600 | 360 000 | 10 800 x 10 ⁶ | 173 | 36 000 x 10 ³ | 8.83 | 2400 | 16/12.7 | 3220 | 4275 | 5460 | 6650 |
| Octagonal (solid) | 400 | 132 622 | 1403 x 10 ⁶ | 103 | 7015 x 10 ³ | 3.25 | 1328 | 8/12.7 | 1160 | 1510 | 1950 | 2385 |
| | 450 | 167 652 | 2242 x 10 ⁶ | 116 | 9964 x 10 ³ | 4.11 | 1488 | 8/12.7 | 1530 | 1970 | 2525 | 3080 |
| | 550 | 250 660 | 5011 x 10 ⁶ | 141 | 18 223 x 10 ³ | 6.15 | 1824 | 12/12.7 | 2290 | 2950 | 3780 | 4605 |

* Allowable actions based on: $N = A_{pc}(0.33f'_c - 0.27f_{pe})$ where: $f_{pe} = 0.6P_U/A_{pc}$ (See Chapter 6 for explanation of notations)