



12-1 STANDARD DETAILS AND STRUCTURAL DESIGN INFORMATION FOR CIDH PILES

Introduction:

The intent of the standard details and design information for CIDH piles is to provide details that have been reviewed for constructability and also pile structural capacity calculations. Structural capacity has been provided for various axial loads, main reinforcement ratios, and hoop spacing.

Guidelines:

Structural details and design information for CIDH piles of 2, 2.5, 3, 3.5, 4, 4.5, 5, 5.5, 6, 6.5, 7, 7.5, 8, 9, 10, 11, 12, and 13 ft diameter are given in Attachment A. A library of design information based on xSECTION output for these CIDH cross-sections has been created and shown on the plans, and can be used for production. The intent of the xSECTION library is to provide a single document with all the section properties needed for structural design under Strength and Extreme Event load combinations of AASHTO LRFD Bridge Design Specifications and California Amendments, without requiring the engineer to perform any sectional analysis.

The library information can be also used for any cross-section not available in the library. This is accomplished by interpolating between the values listed for varying amounts of longitudinal reinforcement, hoop spacing, and axial load. When creating any other cross-section, designers need to ensure that longitudinal and transverse reinforcement are spaced to provide a minimum 5in. x 5in. clear window in the shaft for concrete flow and prevention of defects, except at the location of inspection pipes where the clear distance between the pipe and main reinforcement is at least 3 inches. Inspection pipes shall be placed along the shaft circumference at a maximum spacing of 33 in. center-to-center. Memo to Designers 3-1 provides more information about Caltrans practice for the design and construction of drilled shafts.

Notation

- A_e = Effective cross-sectional area of shaft (in²)
- A_{st} = Total cross sectional area of longitudinal steel (in²)
- f'_{ce} = Expected compressive strength of unconfined concrete (ksi)
- f_{ye} = Expected yield stress of A706 steel reinforcement (ksi)
- ρ_l = Ratio of longitudinal steel area to effective cross-section area [$\rho_l = A_{st} / A_e$]
- M_{ne} = Expected nominal flexural capacity calculated at concrete maximum compressive strain of 0.003 (kip-ft)
- M_p = Idealized plastic moment capacity of a CIDH pile calculated by $M-\Phi$ analysis (kip-ft)
- Φ_p = Idealized plastic curvature (1/in)
- Φ_{yi} = Idealized yield curvature (1/in)
- P_n = Nominal axial resistance ($P_n = 0.85[0.85 f'_{ce} (A_e - A_{st}) + A_{st} \times f_{ye}]$) (kips)
- V_s = Nominal shear resistance provided by shear reinforcement (kips)
- I_{cr} = Cracked moment of inertia for computing member stiffness (ft⁴)