



**DEVELOPMENTAL SPECIFICATIONS
FOR
CONCRETE DRILLED SHAFT FOR SUPPORT STRUCTURES**

**Effective Date
January 20, 2009**

THE STANDARD SPECIFICATIONS, SERIES 2009, ARE AMENDED BY THE FOLLOWING MODIFICATIONS AND ADDITIONS. THESE ARE SUPPLEMENTAL SPECIFICATIONS AND THEY SHALL PREVAIL OVER THOSE PUBLISHED IN THE STANDARD SPECIFICATIONS.

09032.01 DESCRIPTION.

- A. A concrete drilled shaft foundation consists of reinforced concrete placed in a drilled shaft that is seated in bedrock or soil and with or without a rock socket as shown in the contract documents. References to "rock" and "rock socket" throughout this document are only applicable to shafts that are seated into bedrock with rock sockets as specified in the contract documents.
- B. Ensure elevations, dimensions, and depth of the drilled shafts and rock sockets are as specified in the contract documents. If bearing strata are encountered at different elevations or are judged to be of a different quality, the Engineer may adjust the socket elevation.

09032.02 MATERIALS.

Submit information in electronic format.

A. Slurry.

1. Use only mineral or polymer slurries in the drilling process unless the Engineer, in writing, approves other drilling fluids. Ensure the percentage and specific gravity of the material used to make the suspension is sufficient to maintain the stability of the excavation and to allow proper concrete placement. In the event of a sudden significant loss of slurry to the excavation, stop foundation construction until the Engineer has approved either: 1) methods to stop slurry loss; or 2) an alternate construction procedure.
2. Perform all tests at a slurry temperature of 40°F (4°C) or higher.
3. Thoroughly premix mineral slurry or polymer slurry with clean, fresh water. Mix for the adequate time (as prescribed by the manufacturer) allotted for hydration in slurry tanks. Adequate capacity slurry tanks are required for slurry circulation, storage, treatment, and disposal. No excavated slurry pits will be allowed. Prior to introduction into the shaft excavation, draw sample sets from the slurry tanks and test the samples for conformance with the specified material properties. A sample set consists of samples taken at mid-height and within 2 feet (0.6 m) of the bottom of the slurry tanks.
4. In the Engineer's presence, sample and test all slurry, unless directed otherwise. Record the date, time, persons' names sampling and testing the slurry, and the test results. Submit a copy of the recorded slurry test results to the Engineer at the completion of each shaft, and during construction of each shaft when the Engineer requests.
5. During shaft excavation, take and test sample sets of all slurry, composed of samples taken at mid-height and within 2 feet (0.6 m) of the bottom of the shaft, as necessary to verify the control of the slurry

properties. As a minimum, take and test sample sets at least once every 2 hours after beginning slurry use. When the test results show consistent specified properties, take and test sample sets at least once every four hours of slurry use. When tests show that the sample sets do not have consistent specified properties, either recirculate the slurry or agitate it with drilling equipment.

6. When samples are found to be unacceptable, either clean, recirculate, desand, or replace the slurry in order to maintain the required slurry properties. Do not begin cleaning the bottom of the excavation and placing concrete until after tests show that the sample sets have consistent specified properties.
7. Demonstrate to the Engineer's satisfaction that stable conditions are being maintained. If the Engineer determines that stable conditions are not being maintained, immediately take action to stabilize the shaft. Submit a revised installation plan which corrects the problem and prevents future instability. Do not continue with shaft construction until receiving the Engineer's approval of the revised shaft installation plan.

a. Mineral Slurry.

Ensure mineral slurry complies with Table DS-09032.02-1:

Table DS-09032.02-1: Mineral Slurry Requirements

Property	Test Method	Requirements
Density (lb/ft ³ (kg/m ³))	Slurry Density Materials I.M. 387	64 to 75 (1030 to 1200)
Viscosity (sec/gal (sec/L))	Marsh Funnel and Cup Materials I.M. 387	104 to 201 (27.5 to 53)
pH	pH Paper	8 to 11
Sand Content (%)	Sand Content Test Materials I.M. 387	*
* Sand content of mineral slurry prior to placing the reinforcing steel cage and immediately prior to placing concrete less than or equal to 4.0%.		

b. Polymer Slurry.

- 1) For polymer slurry use, comply with the manufacturer's recommendations and this specification. Submit to the Engineer the name and telephone number of the manufacturer's representative. The manufacturer's representative is to provide technical assistance in the use of the polymer slurry as needed.

- 2) Ensure polymer slurry complies with Table DS-09032.02-2:

Table DS-09032.02-2: Polymer Slurry Requirements

Property	Test Method	Requirements
Density (lb/ft ³ (kg/m ³))	Slurry Density Materials I.M. 387	62 to 63 (995 to 1010)
Viscosity (sec/gal (sec/L))	Marsh Funnel and Cup Materials I.M. 387	136 to 227 (36 to 60) 231 to 252 (61 to 66.5) (dry sand/gravel)
pH	pH Paper	8 to 11
Sand Content (%)	Sand Content Test Materials I.M. 387	*
* The sand content of polymer slurry prior to placing the reinforcing steel cage and immediately prior to placing concrete less than 2.0%.		

- 3) Wait 30 minutes after the last drilling and scouring to allow contaminants to settle out before taking and testing a sample set of slurry. After the reinforcing steel cage is placed in the excavation, take and test a sample set of slurry immediately prior to concrete placement.

B. Concrete.

Comply with the following: