

- (d) Results of tests performed.
- (e) Levelness of bottom.
- (f) Seepage of water.
- (g) Top and bottom elevation of any casings left in place.
- (h) Any unusual conditions.
- (i) Variation of dimensions from planned.
- (j) Dates of start and completion of excavation.
- (k) Inspection, testing, and placement of concrete (including any delays in concreting and location of construction joints in shafts).
- (l) Reinforcing steel.
- (m) Any additional information relevant to the as-built drilled installation.

Record and maintain information pertinent to each drilled shaft and provide required data to other testing and inspection personnel.

Provide all facilities required for the safe and convenient conduct of the Engineer's inspection and testing procedures.

**412.03.03 Geotechnical Engineer.** When specified, employ the services of a qualified geotechnical engineer for inspection and testing for installation of drilled shafts. Ensure that the geotechnical engineer is a professional engineer registered in the State of Maryland, has a demonstrated record of experience with similar drilled installations, and is approved prior to beginning auguring for the drilled shafts.

The geotechnical engineer shall submit a plan containing the proposed methods to be used to inspect the drilled shafts as specified herein.

The geotechnical engineer shall visually inspect the bottom of each drilled shaft and perform tests as necessary to verify the bearing capacity. Drilled shafts shall be founded in material having the specified minimum design bearing capacity. The geotechnical engineer shall provide certification that the drilled shafts were properly drilled to a satisfactory depth and bearing.

**412.03.04 Shaft Requirements.** Excavate shafts by auguring, drilling, or hand excavation as necessary to reach the required bearing strata. When

earth walls cannot be maintained without spilling into the shaft, install casings or slurry as excavation proceeds. Ensure that the casings are full-length and watertight. The casings shall be of sufficient thickness to withstand compressive, displacement, and withdrawal stresses; and to maintain the shaft walls. Withdraw casings as concrete is placed unless otherwise specified.

The geotechnical engineer shall determine the final bottom elevation of drilled shafts when the services are required. All holes shall be inspected and approved.

Do not excavate holes for successive drilled shafts until adjacent holes are filled with concrete and allowed to set.

Drilled shaft tolerances:

- (a) Maximum permissible variation of center line locations is not more than  $1/24$ th of the shaft diameter or 3 in., whichever is less.
- (b) Maximum out of plumb is 1.5 percent of the depth, 12.5 percent of the shaft diameter, or 15 in., whichever is less.
- (c) The top of the shaft or concrete cut-off elevation shall be within 1 in. of the design elevation.

If the specified tolerances are exceeded, provide corrective construction to compensate for excessive eccentricity at no additional cost to the Administration. Submit proposed methods of corrective construction for approval.

Excavate the bottom of drilled shafts to an undisturbed, level plane. Remove all loose material prior to placing concrete.

Dewater drilled shafts as required to facilitate excavation, inspection, and concreting.

Ensure that the each drilled shaft has been inspected before placing concrete.

**Reinforcing Steel.** Fabricate and place reinforcing steel cages for each drilled shaft as one continuous unit. Place reinforcement accurately and symmetrically about the axis of the hole, and keep securely in position during concrete placement.

Protect exposed ends of extended reinforcement from damage.