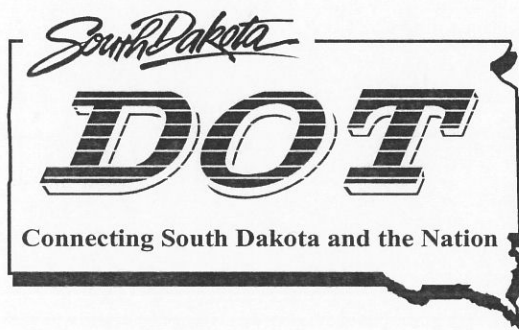


**STANDARD
SPECIFICATIONS
FOR
ROADS AND BRIDGES**



2015

**SOUTH DAKOTA
DEPARTMENT OF TRANSPORTATION**

The pipes shall each be fitted with a watertight shoe on the bottom and a removable cap on the top.

- D. Grout:** Grout for filling the access tubes at the completion of the CSL tests shall conform to the requirements of Section 460.2 or shall consist of Portland cement, water, and a water reducing admixture mixed in the following proportions:

Portland Cement Type I or II	1 Sack (94 lbs.)
Water.....	4.5 Gallons Maximum
Water Reducing Admixture.....	Manufacturer's Recommendation
Fly Ash (Optional).....	20 Pounds Maximum

465.3 CONSTRUCTION REQUIREMENTS

- A. Drilled Shaft Installation Plan:** Not less than 30 calendar days before beginning drilled shaft construction, the Contractor shall submit an installation plan for approval to the Office of Bridge Design, through the Area Engineer. The installation plan shall provide the following information:

1. A list of all proposed equipment to be used and available on site including, but not limited to, cranes, drill augers, pilot bits, bailing buckets, final cleaning equipment, dewatering pumps, tremies, concrete pumps, casing, etc. Include the casing diameter and wall thickness in the equipment list;
2. Details of the overall shaft construction sequence in each substructure unit or group of drilled shafts;
3. A detailed explanation of how the casing is to be installed. It is required that a T-bar be on the project site such that the casing can be twisted into the specified formation to achieve as watertight of a seal as possible. Tamping or pounding the casing into the ground will not be allowed;
4. Details of shaft excavation methods to be used;
5. Methods to be used to clean the shaft excavation;
6. Details of reinforcement centering devices and their spacing;
7. Details and methods for supporting and lifting reinforcing steel cages;
8. Details of the tremie tube that is to be used in the event that a wet excavation is encountered. Include all other details of concrete placement such as free fall (allowed only for shafts 36 inches in diameter or greater), pumping, etc. A tremie tube is required to be on the project site. Details for the disposal of contaminated concrete from a wet excavation shall also be included; and,

Upon completion of drilling, install reinforcing steel, and place concrete. After the concrete has attained the specified strength, the section of the casing between the plan shown cutoff elevation and the top shall be removed. When the cutoff elevation is not shown on the plans, the cutoff elevation is assumed to be flowline or ground line as appropriate. The casing shall be cutoff by use of a cutoff saw. Use of an oxyacetylene torch or other methods which produce high heat damaging the concrete will not be allowed. Casings may only be cutoff and removed when both of the following conditions are met:

1. The drilled shaft concrete has cured for 72 hours according to the specifications.
2. The drilled shaft concrete has attained 2500 psi minimum compressive strength.

F. Excavation and Drilling Equipment: Excavation and drilling equipment shall have adequate capacity including power, torque, and downward force. The excavation and over reaming tools shall be of adequate design, size, and strength to perform the work shown in the plans and described in this specification. The excavation and drilling equipment shall be capable of excavating to the plans depth without the use of an extension bar. When the material encountered cannot be drilled using conventional earth augers and under reaming tools, the Contractor shall provide special drilling equipment including, but not limited to, rock core barrels, rock tools, air tools, blasting materials, and other equipment as necessary to excavate the shaft to the size and depth required. Approval by the Engineer is required before any excavation by blasting is conducted.

G. Reinforcing Steel Cage Construction and Placement: The reinforcing steel cage (consisting of longitudinal bars, spirals or tie bars, cage stiffener bars, spacers, crosshole sonic log (CSL) access tubes, and centralizers) shall be completely assembled and placed as a unit into the excavated shaft. Placement of the reinforcing steel cage shall take place immediately after the shaft excavation is inspected and approved by the Engineer and before concrete placement.

The reinforcing steel cage shall be tied and supported in the shaft so the cage will remain within the specified tolerances. Welding of the reinforcing steel cage will not be allowed. Concrete centralizers or other approved noncorrosive centering devices shall be used within 1 foot of the bottom. Centralizers shall also be used at intervals not exceeding 5 feet along the length of the shaft. Each level of centralizers shall be rotated 45 degrees in the horizontal plane relative to the level below. Concrete centralizers shall be constructed of concrete equal in quality and durability to the concrete specified for the shaft. The concrete centralizers shall have the ends beveled to minimize the potential for catching on obstructions during reinforcing steel placement and they shall have a minimum of two tie wires cast in the concrete. Wrapping wires around the concrete centralizers to hold them in place is not an acceptable method of attachment. Any type of steel used as centralizers shall be epoxy coated. The reinforcing steel cage shall not be in contact with the bottom of the shaft.

The elevation of the top of the reinforcing steel cage shall be checked before and after the concrete is placed. If the reinforcing steel cage is not maintained within the specified