

Kansas

Department of Transportation

Standard Specifications for State Road & Bridge
Construction - 2015

703 - DRILLED SHAFTS

SECTION 703

DRILLED SHAFTS

703.1 DESCRIPTION

Construct drilled shafts by the cased or uncased method depending upon site conditions and Contract Document requirements.

BID ITEMS

Drilled Shaft (*) (**)
Permanent Casing (*) (Set Price)
Sonic Test (Drilled Shaft) (Set Price)
Core Hole (Investigative)

*Size

**Cased (If Contract Documents specify the cased method.)

UNITS

Linear Foot

Linear Foot

Each

Linear Foot

703.2 MATERIALS

a. Concrete. Unless otherwise shown in the Contract Documents, provide Grade 4.0 concrete that complies with **SECTIONS 401, 402 and 1102**. Provide a mix design with a target slump of 9 inches \pm 1 inch. Do not withhold mix water at the plant and do not add water at the site.

b. Grout/Flowable Fill. For backfilling the cross-hole sonic testing pipes and core holes, provide cementitious grout (mixed according to the manufacturer's directions) that complies with **DIVISION 1700**.

Provide grout or flowable fill for backfilling the void space between the temporary and permanent casing with:

- 28 day strength of 1000 psi;
- mortar sand, FA-M (**SECTION 1102**) mixed with 2 bags of Type II portland cement per cubic yard; and
- water-to-cement ratio less than 1.

c. Granular Backfill Material. Provide granular backfill material for backfilling the void space between the temporary and permanent casing that is fine enough to fill the entire volume. The Engineer will accept the granular material based on a visual inspection.

d. Reinforcing Steel. Provide steel bars for concrete reinforcement that comply with **DIVISION 1600**.

e. Casing. Provide casing of sufficient thickness to carry the working stresses and loads imposed on the casing during construction. At a minimum, use 14-gage corrugated metal pipe (CMP) for the permanent casing.

If required, provide a permanent casing that is less than or equal to 1 inch out-of-round. The deviation of a chord from end to end shall be a maximum of 2 inches.

The Engineer will accept the casing based on compliance with the specified requirements, and visual inspection for condition.

f. Pipe for Sonic Testing. Provide pipe that complies with **DIVISION 1900**.

703.3 CONSTRUCTION REQUIREMENTS

a. General. Drilled shaft lengths shown in the Contract Documents are an estimate from the top of formation elevations determined from borings. Actual formation elevations encountered at each shaft, may require the actual length of each drilled shaft be adjusted. If the Engineer changes the drilled shaft lengths, the Contractor will be advised (in writing) of the revised bottom of rock socket elevation.

A minimum of 28 days before constructing the drilled shafts, submit an installation plan to the Engineer for review. Include the following:

- Name and experience record of the drilled shaft superintendent in charge of drilled shaft operations;

703 - DRILLED SHAFTS

- In the presence of the Engineer, sound the bottom of the finished shaft. Use a weighted tape in a 12-inch grid across the base of the shaft;
- Provide access to the entire perimeter of the shaft;
- Flocculate the finished shaft to increase the visibility in the water, prior to using the underwater video camera. Use a commercially available flocculent agent per the manufacture's recommendations.
- Prior to concrete placement, perform a video inspection to inspect the sides and base of the rock socket. Along with the Engineer, review the video to verify the socket meets the cleanliness portion of this specification, prior to concrete placement;
- Perform sonic testing for all shafts. Submit test results to the Chief Geologist for review. No work will be done above the top of drilled shaft without the approval of the Chief Geologist; and
- Any required repairs or additional testing are the Contractor's expense.

d. Placing Reinforcing Steel and Sonic Testing Pipes. Tie reinforcing steel at all intersections of reinforcement, and place reinforcing steel as a unit for the full length of the shaft, prior to placing any concrete by either pour method. Use a minimum of 1 non-corrosive circular spacer per 30 inches of circumference of the reinforcing steel cage, within 2 to 4 feet of the bottom and top, and at intervals not to exceed 10 feet vertically. If the shaft is deepened and additional reinforcing steel cage is required, make the splice at the bottom of the steel cage.

Remove any corrosion protection coating from the sonic testing pipes by sandblasting. Sandblast the pipes to bare metal. Place the sonic testing pipes within 7 days of sandblasting.

In each shaft, place the number of testing pipes shown in the Contract Documents. All sonic testing pipes shall be the full length of the shaft from the bottom of the rock socket a minimum of 12 inches above the top of the shaft concrete. Before placement, measure and record the length of the sonic testing pipes and elevation of any pipe joints.

If multiple sections of pipe are required to reach the full length, the joints shall be watertight. The joints for all testing pipes in the shaft shall be at the same elevation. Completely seal the bottom of the pipe. After installation, fill pipes with potable water and install threaded caps. All testing pipes shall remain watertight until testing is complete.

Regardless of the connection used, conduct a pressure test of each pipe upon installation in the reinforcement cage.

Test all pipes after being placed and tied in the reinforcement cage. When the drilled shaft is greater than 30 feet in length, perform a second pressure test after the reinforcement and pipes are installed in the drilled shaft but prior to placing the concrete. Pressurize the pipe to 100 psi. Seal the pipe for 3 minutes. Pressure loss can not be greater than 5% in 3 minutes.

e. Final Inspection and Access. At the time of placing the concrete, a minimum of 75% of the base of the shaft must have less than ½ inch of sediment. The Engineer will determine the shaft cleanliness before concrete placement by:

- Visual inspection; or
- Underwater inspection using probes; or
- Down hole television camera and video recordings

Provide access to 100% of the hole from probing purposes. Probing will be done by a tape with a minimum weight of 1 pound.

Review and inspection by the Engineer prior to concrete placement does not relieve the Contractor of the responsibility for producing a defect-free shaft per specifications.

When directed by the Engineer, operate the camera and recorder such that the optimum clarity of the details can be obtained and all surface areas of the shaft, including the rock socket sides and base can be observed. Record video and store tapes such that later review is possible. Label the recorded media, which will become the property of KDOT.

f. Placing Drilled Shaft Concrete. Depending upon site conditions, place concrete by either the dry pour or wet pour method:

- Use the dry pour method if water inflow does not fill the shaft more than 4 inches in depth in a 5 minute period, and the shaft can be dewatered so a maximum of 2 inches of water is standing in the shaft when concrete placement begins.