

MICHIGAN
DEPARTMENT OF TRANSPORTATION

SPECIAL PROVISION
FOR
DYNAMIC MESSAGE SIGN FOUNDATION

ITS:EG

1 of 5

APPR:RWS:TEB:04-20-20
FHWA:APPR:04-23-20

a. Description. This work consists of fabricating, furnishing, and installing a dynamic message sign (DMS) drilled shaft foundation. Perform all work in accordance with the MDOT DMS Sign Support Foundation special detail plan sheets, standard specifications (substituting a DMS sign type for any dynamic message sign reference), the contract, and as specified herein.

b. Drilled Shaft Submittals. The following submittals are required to obtain approval from the Engineer prior to commencement of the work:

1. **Qualifications of Contractor.** The Contractor performing the work described in the contract must have installed drilled shafts with diameters and lengths similar to those detailed on the plans within the past 3 years. The Contractor's supervisor must have at least 3 years of acceptable experience installing similar types of drilled shafts. Demonstrate to the Engineer that the Contractor's supervisor and drillers performing the work have completed at least 3 projects of similar scope, drilled shaft diameters and lengths, and subsurface conditions to this project.

2. **Submit Drilled Shaft Installation Plan** per subsection 718.03.A of the Standard Specifications for Construction.

3. **Review and comment on soil boring logs** per subsection 718.03 of the Standard Specifications for Construction. Subsurface and groundwater information is detailed on the soil boring log.

c. Materials.

1. **Provide casings** meeting the requirements of subsection 718.02 of the Standard Specifications for Construction.

2. **Provide slurry** meeting the requirements of subsection 718.03.E of the Standard Specifications for Construction.

3. **Provide concrete** meeting the requirements of subsection 718.02 of the Standard Specifications for Construction.

4. **Provide anchor bolt templates** meeting the requirements of *ASTM A572/A572M*, *AASHTO M270M/M270*, *Grade 36 or 50*, or *ASTM A36/A36M*.

5. **Provide epoxy coated bar reinforcement** for foundation that meets the requirements of subsection 905.03 of the Standard Specifications for Construction.

6. Provide uncoated bar reinforcement for anchor bolt cage that meets the requirements of subsection 905.03 of the Standard Specifications for Construction, except *ASTM A706/A706M* is required.

7. Provide anchor bolts that meet subsection 908.14 of the Standard Specifications for Construction and supplementary requirement S1.

8. Provide conduit, grounding, and risers for electrical and lighting meeting the requirements of section 918 of the Standard Specifications for Construction. Other required material must meet local utility company specifications and the *NEC*.

d. Construction.

1. Drilled Shaft Construction Methods.

A. Dry Construction Method. Must meet the requirements of subsection 718.03.B.1 of the Standard Specifications for Construction.

B. Wet Construction Method. Must meet the requirements of subsection 718.03.B.2 of the Standard Specifications for Construction.

C. Temporary Casing Construction Method. Must meet the requirements of subsections 718.03.B.3 or 718.03.B.4 of the Standard Specifications for Construction.

D. Construction Method Log. Must meet the requirements of subsection 718.03.B.5 of the Standard Specifications for Construction.

2. Casings. Must meet the requirements of subsection 718.03.D of the Standard Specifications for Construction.

A. Where drilled shafts are located in open water areas, extend the casing a minimum of 12 inches above the water to protect plastic concrete from water action during placement of the concrete. Cut off the casing at the plan top of drilled shaft elevation after the concrete has cured. When practicable, install the casing in a manner that produces a positive seal at the bottom of the casing to prevent the entry of water or other material into the shaft excavation.

B. If it becomes necessary to remove a casing and substitute a longer or larger diameter casing through caving soils, stabilize the excavation with slurry or backfill before installing the new casing. Other methods to control the stability of the excavation and to protect the integrity of the foundation soils may only be used if approved by the Engineer.

C. Do not leave any casing in place unless authorized by the Engineer or shown on the shop drawings. Do not extract a casing until after placing the concrete to an appropriate level.

3. Drilled Shaft Excavation.

A. Remove all surface and subsurface obstructions encountered in the length of excavation at drilled shaft locations. Use special procedures and tools to remove obstructions, as approved by the Engineer, if the excavation cannot be advanced using

conventional augers fitted with soil or rock teeth, drilling buckets, and/or under-reaming tools.

B. If satisfactory founding material is not encountered at plan elevation, adjust the bottom of the shaft or alter the foundation, as determined by the Engineer, to satisfactorily comply with design requirements.

C. Do not damage existing structures and utilities. Prevent excessive caving of the excavation. Monitor and control vibrations from the driving of casing or sheeting, or drilling of the shaft, as needed.

D. Construct shafts after the placement of embankment fill and completion of any specified settlement periods unless otherwise detailed on the plans.

E. Do not excavate a shaft within two shaft diameters (clear) of an open excavation, or one in which concrete has been placed in the preceding 7 days.

F. If the excavation operation is stopped, protect the shaft cavity and opening in accordance with MIOSHA requirements. The Contractor is responsible for the safety of the shaft excavation, surrounding soil, and material supported by the soil, and the stability of the sidewalls. If necessary, to ensure such safety and stability, use a temporary casing, slurry, or other methods approved by the Engineer. Unless cased to the full depth, do not leave excavations unfilled overnight.

G. Friction type drilled shafts are defined as drilled shafts that do not bear on bedrock and obtain their ability to support load from a combination of end bearing on the soil and adhesion between soil and concrete along the length of the shaft. Use the dry construction method for friction type drilled shafts only in stable, cohesive soils. Remove the casing completely or partially, as detailed on the plans, if using a casing for the construction of a friction type drilled shaft. Maintain a positive head of fluid in the excavation to ensure that water is not continuously flowing into the excavation if the supporting soils are being eroded by water entering the excavation through the sides and bottom of the excavation.

H. Over-ream the sidewall to sound material if the Engineer determines that the excavation sidewall has softened due to excavation methods, swelled due to delays in concreting, or degraded because of slurry cake buildup. If the concrete is not placed the same day the excavation is completed, protect the excavation with a temporary casing and re-drill the excavation at least 6 inches larger in diameter and 6 inches deeper, clean the excavation, and place slurry to stabilize excavation before concreting.

I. Provide suitable access, lighting, and equipment for proper inspection of the completed excavation.

4. Excavation Inspection. Provide equipment and access for inspection per subsection 718.03.F.1 of the Standard Specifications for Construction.

5. Placing Reinforcing Steel. Place reinforcing steel meeting the requirements of subsection 718.03.G of the Standard Specifications for Construction.

6. Concrete Placement.

A. Immediately before placing concrete, ensure that the bottom of the completed drilled shaft excavation is as clean as practical and suitable for placement of concrete. Clean each shaft so at least 50 percent of the base contains less than 1/2 inch of sediment. Do not leave more than 1½ inch of debris on the base. Remove drilling spoils that adhere to the vertical sides of the bedrock socket. If not placing the concrete immediately after installing the cage, verify the integrity of the excavated area and ensure that loose/soft material is removed from the bottom of the excavation prior to placing the concrete.

B. Recover slurry and dispose of it as approved. Do not discharge displaced fluids into or in close proximity to streams or other bodies of water. For pours over water, provide a collar or other means of capturing slurry and the top portion of the concrete pushed from the shaft.

C. Concrete Placement. Place concrete meeting the requirements of subsection 718.03.H of the Standard Specifications for Construction.

(1) Free Fall Placement. Must meet the requirements of subsection 718.03.H.1 of the Standard Specifications for Construction.

(2) Tremie Placement. Must meet the requirements of subsection 718.03.H.2 of the Standard Specifications for Construction.

(3) Pump Placement. Must meet the requirements of subsection 718.03.H.3 of the Standard Specifications for Construction.

(4) Concrete Finish. Finish exposed surfaces in accordance with section 706 of the Standard Specifications for Construction. Drill shaft foundation must receive a rubbed surface finish from top of foundation to 6 inches below grade.

(5) Ensure templates that hold anchor bolts are supported, horizontally level and anchored in place for a minimum of 24 hours after the concrete placement is complete.

(6) Do not displace the anchor bolts during the concrete placement.

(7) Hammering on the anchor bolts or templates is prohibited. Chiseling or damaging of galvanized finish is prohibited.

(8) After the top template is removed, thread nuts on to the bolt flush with the bolt end to protect threads until the DMS sign support is erected.

D. Construction Tolerances. Must meet the requirements of subsection 718.03.C of the Standard Specifications for Construction.

7. Anchor Bolt Fabrication.

A. Certifications. Fabricator assembling anchor bolt cage and steel template must possess a valid *American Institute of Steel Construction (AISC) - Bridge Component QMS Certification (CPT)* or *Certified Bridge Fabricator - Simple (SBR)*.

B. Welding. Fabricate and weld in accordance with section 707 of the Standard Specifications for Construction and the *American Welding Society (AWS) D1.1, Structural*

Welding Code - Steel (as modified by 20SP-707A - Structural Steel and Aluminum Construction), hereafter called *AWS D1.1*, except as modified herein.

C. Grounding of structure includes electrically bonding the foundation reinforcing steel to the anchor bolts.

e. Measurement and Payment. The completed work, as described, will be measured and paid for at the contract unit prices using the following pay item:

Pay Item

Pay Unit

Dynamic Message Sign, Fdn.....Foot

Dynamic Message Sign, Fdn includes furnishing and installing foundation in accordance with this special provision and the contract plans. The foundation is to be measured by the number of feet along the axis of the drilled shaft from the required bottom elevation of the shaft to the proposed top plan elevation. Payment includes excavation; furnishing, placing, and removing steel casings; furnishing, processing, recovering, and disposing of slurry; furnishing and placing reinforcing steel and concrete by free fall, pumping, or tremie method; performing slurry testing; conducting slump tests; backfilling, and disposing of excess excavated material. Separate payment will not be made for the trial excavations, corrections required to fill oversize casings or oversize excavations.