

BRIDGE DESIGN MEMORANDUM – DM0111

TO: RPG Structural Engineers
Design Consultants

DATE: March 7, 2011

RE: Drilled Shafts – Revisions to Sections 12.5.3.2, 15.3.1.2, 19.3.3, and 20.3.2.1 of the *SCDOT Bridge Design Manual* and Sections 16.4 and 22.2.1.2 of the *SCDOT Geotechnical Design Manual*

To address some recent issues involving drilled shaft construction, Sections 12.5.3.2, 15.3.1.2, 19.3.3, and 20.3.2.1 of the *SCDOT Bridge Design Manual* and Sections 16.4 and 22.2.1.2 of the *SCDOT Geotechnical Design Manual* shall be revised as described in the following paragraphs.

In Section 12.5.3.2 of the *SCDOT Bridge Design Manual*, the second sentence of the first paragraph shall be deleted.

Figure 15.3-2 in Section 15.3.1.2 of the *SCDOT Bridge Design Manual* shall be revised to require a 4-inch minimum concrete cover for drilled shafts in both soil and rock conditions. This minimum cover must be provided to the transverse reinforcement.

In Section 19.3.3 of the *SCDOT Bridge Design Manual*, Item 5 shall be deleted and Items 1 and 2 shall be deleted and replaced with the following:

1. Location of Top of Shaft. The top of drilled shafts should be set at the higher of either the ground line or 5 feet above the water elevation expected during construction. Typically, the tops of drilled shafts within a bent are set at the same elevation. Also, the elevations of the tops of shafts from bent to bent are usually set at the same elevation in water and in flat land areas such as floodplains. If the distance from the top of a shaft to the bottom of a bent cap is less than 5 feet, the Contractor should be given the option, at no additional cost to SCDOT, of extending the shaft to the bottom of the bent cap.
2. Casing for Shafts. Unless approved otherwise by the Regional Production Engineer, all shafts shall be detailed with construction casing. The portion of the shaft below the bottom of the casing, whether in soil or rock, shall be detailed with a diameter that is six inches smaller than the diameter of the



construction casing. To provide a construction tolerance, the bridge design shall include provisions for allowing the top and bottom of casing to be raised or lowered 2 feet. The casing shall not be considered in the determination of the structural resistance of the shaft. However, it should be considered when evaluating the seismic response of the foundation because the casing will provide additional resistance.

In Section 20.3.2.1 of the *SCDOT Bridge Design Manual*, the second paragraph shall be deleted and replaced with the following:

Where supported on drilled shafts, a minimum of 3 inches should be detailed from the edge of shaft to the edge of column at the column/shaft interface. If the column supported on a drilled shaft would be less than 5 feet tall, the Contractor should be given the option, at no additional cost to SCDOT, of extending the shaft to the bottom of the bent cap. On projects with large water elevation fluctuations, provide for permissible construction joints in casings and shafts to facilitate construction. Detail the permissible construction joint in the shaft a minimum of 2 feet below the permissible construction joint in the casing.

In Section 16.4 of the *SCDOT Geotechnical Design Manual*, the second paragraph shall be deleted and replaced with the following:

Drilled shaft sizes (diameters) can range from 30 inches (2-1/2 feet) to 144 inches (12 feet). Drilled shaft sizes typically used by SCDOT range from 42 inches (3-1/2 feet) to 84 inches (7 feet) in diameter. Drilled shaft diameters should be a minimum of 6 inches larger than the column above the shaft. Unless approved otherwise by the Regional Production Engineer, all shafts shall be detailed with construction casing. The portion of the shaft below the bottom of the casing, whether in soil or rock, shall be detailed with a diameter that is six inches smaller than the diameter of the construction casing.

In Section 22.2.1.2 of the *SCDOT Geotechnical Design Manual*, the first paragraph shall be deleted and replaced with the following:

The following Plan Notes apply to drilled shafts. Drilled shafts are typically used at interior bents only, but Plan Notes are also required if drilled shafts are used at end bents. The geotechnical designer typically determines the bottom elevation of the casing. In dry environments, the top of casing elevation should be set at the ground line. In wet or fluctuating water environments, the top of casing elevation should be set 5 feet above the water elevation expected during construction. If the column supported on a drilled shaft would be less than 5 feet tall, the Contractor

should be given the option, at no additional cost to SCDOT, of extending the shaft to the bottom of the bent cap. The designer shall also provide for permissible construction joints in casings to facilitate construction on projects with large water elevation fluctuations. The notes and tables included herein are generic in nature and should be made project specific. Underlined capital letters are used to indicate areas where project specific information is required. In addition, when the tables presented herein include numbers, these numbers shall be changed to the requirements of specific projects.

The above revisions shall apply to all projects where the substructure design has not been substantially completed.

*Original Signed by James W. Kendall, Jr.
on March 7, 2011*

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Preconstruction Support Engineer

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Bridge Maintenance Engineer
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Preconstruction Support Managers
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