



South Carolina  
Department of Transportation

## BRIDGE DESIGN MEMORANDUM – DM0312

**TO:** RPG Structural Engineers  
Design Consultants

**DATE:** November 28, 2012

**RE:** Prestressed Concrete Pile Connection Details  
Revisions to Section 19.2.6.3, Section 20.1.2, Figure 20.1-1, and Section 20.2.7.1  
of the *SCDOT Bridge Design Manual*

The University of South Carolina recently completed a research project that investigated the behavior of SCDOT's typical detail for the connection of prestressed concrete piles to cast-in-place bent caps. The final report for this research project, Project 672 – Behavior of Pile to Bent Cap Connections Subjected to Seismic Forces, can be viewed at <http://www.clemson.edu/t3s/scdot/completed%20test.htm>.

Findings of the research indicate that modifications are needed to SCDOT's current pile cap connection details for prestressed concrete piles. *SCDOT Bridge Drawings and Details* Drawings 704-01 and 704-02 have been updated to incorporate the recommended embedment requirements. In addition, please update your copy of the *SCDOT Bridge Design Manual* as noted below.

Delete Item 3 in Section 19.2.6.3 of the *SCDOT Bridge Design Manual* and replace with the following:

3. Prestressed Concrete Piles. The piles should be connected to the caps or footings by embedding the piles an equivalent of 1.3 pile widths. No roughening of the pile is required. However, the pile surface to be embedded shall be clean and free of any laitance prior to placement of the cap or footing concrete.

The pile should be oriented in the caps or footings such that the "top side" of the pile experiences the smaller moment demand. The "top side" is the top surface of the pile when it was poured in the casting bed.

To allow for constructability, the pile embedment length should have a tolerance of  $\pm 3$  in. Unless approved otherwise by the Regional Production Engineer, the pile embedment into the cap shall not be less than 12 in.



Delete the last sentence in Section 20.1.2 of the *Manual* and replace with the following sentence:

The minimum depths shall be increased as necessary to accommodate the pile embedment.

Add the following three paragraphs to Section 20.1.2 of the *Manual*:

For pile bents, the end and side clearances from piles to the surface of the cap should be considered during design to ensure that design forces will not cause the pile to break out of the sides or ends of the pile cap.

For pile bents supporting slab superstructures, the minimum bent cap depth should be 32 in for 18-in square prestressed concrete piles. For pile bents with piles larger than 18-in square, maximum pile embedment may dictate that deeper pile caps be used for constructability and due to the effects of punching shear. For pile bents supporting beams, regardless of pile size, the effects of punching shear shall be investigated.

The length of prestressed concrete pile bent caps should be set to provide a minimum overhang that is the equivalent of 2 pile widths.

Revise Figure 20.1-1 of the *Manual* to require a minimum cap width of 3'-4" for 20-in square prestressed concrete piles and a minimum cap width of 4'-0" for 24-in square prestressed concrete piles.

Delete Item 4 in Section 20.2.7.1 of the *Manual*.

These revisions apply to all projects where design has not advanced beyond the preliminary design phase.



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