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DM0395

October 20, 1995

MEMORANDUM TO DESIGN GROUP LEADERS & CONSULTANTS

SUBJECT: Debonding of Strands in Prestressed Members

Debonding (shielding) of strands in precast/prestressed concrete members will be allowed. When debonding is used, the design and details of the member shall comply with the attached Policy for Debonding of Strands for Precast/Prestressed Concrete Girders dated October 20, 1995.

Rocque L. Kneece
Bridge Design Engineer

Attachment:
cc: Assistant Bridge Design Engineers

POLICY FOR DEBONDING OF STRANDS IN PRESTRESSED CONCRETE GIRDERS

October 20, 1995

Debonding (shielding) of strands at the end of precast/prestressed concrete girders will be allowed on projects for the SCDOT with the following restrictions:

- A maximum of 25 % of the total prestressing strands may be debonded to satisfy the allowable stress limits. In any row, debonded strands shall not exceed 50 % of the total strands in that row.

- Not more than 40 % of the shielded strands, or four strands, whichever is greater, shall be terminated at any section.

- Strands shall be debonded in a pattern that is symmetrical about the vertical axis of the beam.

- The theoretical number of debonded strands shall be rounded to the closest even number (pairs) of strands except that debonded strands will not be permitted in rows containing three strands or less.

- All exterior strands shall be fully bonded (including bottom row).

In analyzing stresses and/or determining the required length of debonding, stresses shall be limited to the following values (see AASHTO 9.15.2):

At Release :

- Tension at top of beam $0.498\sqrt{f'_{ci}}$ Mpa ($6\sqrt{f'_{ci}}$ psi)
- Tension at bottom of beam 0
- Compression at top of beam $0.6f'_{ci}$
- Compression at bottom of beam $0.6f'_{ci}$

At Final:

- Tension at top of beam $0.249\sqrt{f'_{ci}}$ or 1.4 Mpa ($3\sqrt{f'_{ci}}$ or 200 psi)
- Tension at bottom of beam $0.249\sqrt{f'_{c}}$ Mpa ($3\sqrt{f'_{c}}$ psi)
- Compression at top of beam $0.4f'_{c}$
- Compression at bottom of beam $0.4f'_{c}$

Computations for stirrups in the end zone areas should be based on the reduced prestress force due to transfer length and the shielding of the strands. Transfer length and development length of strands shall comply with the requirements of AASHTO Sections 9.20.2.4 and 9.27, respectively.

The following notes should appear on the plans:

- Fully bonded strands shall be detensioned prior to debonded strands.
- Tying reinforcing steel to debonded strands will not be allowed.

The following specifications shall apply:

(a) All debonding material (sheathing) shall be tubular conduit capable of resisting the pressure exerted by the concrete. Slit conduits may be used provided double conduits are used with slits placed on opposing sides. The conduit used shall be of high density polyethylene or polyprophylene with a minimum wall thickness of 600 µm (0.025 in). The inside diameter of the conduit shall be of sufficient size to allow free movement of the encased strand but it shall not be greater than the diameter of the strand plus 3 mm ($\frac{1}{8}$ in). The conduit shall be secured so that longitudinal movement along the strand will be prevented, and bonding of the strand will be prevented at the location shown on the plans plus or minus 25 mm (1 in). Concrete shall be prevented from entering the conduit by taping. The tape shall be manufactured from a non-corrosive material compatible with the concrete, conduit, and steel.

(b) Release of the strands shall be in accordance with Sec. 704.13 (b) of the Standard Specifications, except that fully bonded strands shall be cut first, followed progressively by those strands having the minimum length of tubular sheathing through to those strands having the maximum length of tubular sheathing. The strand release schedule shall be an integral part of the shop drawings.

(c) After beams are cast and detensioned, openings between strands and sheathing shall be sealed within 48 hours of detensioning by use of either an approved epoxy or silicone sealant. The silicone sealant shall be a low modulus silicone sealant, white in color.