



Florida Department of Transportation

JEB BUSH
GOVERNOR

605 Suwannee Street
Tallahassee, FL 32399-0450

JOSÉ ABREU
SECRETARY

December 31, 2003

MEMORANDUM

TO: District Structures Design Engineers:
(Gerard Moliere, Rod Nelson, Keith Shores, John Danielsen,
Neil Kenis, Kim Saing, Jose Rodriguez, and Agnes Spielmann)

FROM: William N. Nickas, P.E., State Structures Design Engineer

COPIES: Assistant Secretary, Ken Morefield,
State Highway Engineer, Freddie Simmons,
Director Office of Design, Bob Greer,
District Directors of Production:
(Mike Williams, Dave Byrd, Gene Martin, Gerry O'Reilly, Noranne
Downs, Javier Rodriguez, Donald Skelton, Nancy Clements)

SUBJECT: **Temporary Design Bulletin C03-14**
FDOT Structures Design Guidelines (LRFD) Topic 625-020-154-b
Section 4.3.1.E Prestressed Beams – Factored Bursting Resistance

REQUIREMENTS:

Add the following sub-section “E” to Section 4.3.1 of the Structures Design Guidelines:

E. Use the following maximum steel stress (f_s) when calculating the Factored Bursting Resistance of the vertical reinforcing, in lieu of the maximum 20 ksi steel stress in **LRFD [5.10.10.1]**:

<u>Beam Type</u>	<u>f_s</u>
AASHTO Type II thru VI	13 ksi
Florida Bulb-Tees	13 ksi
Florida U Beams	18 ksi
Inverted Tees	20 ksi

No losses shall be applied to the prestressing force at transfer. The maximum number of debonded strands may be increased from 25% in **LRFD [5.11.4.3]** to 33%, provided the longitudinal reinforcement requirement in **LRFD [5.8.3.5]** is satisfied. The minimum length of debonding from the ends of the beams is 5 feet.

COMMENTARY:

Minor cracking in the ends of AASHTO and Florida Bulb-Tee beams has been observed with vertical anchorage reinforcing designed to 20 ksi stress based on 4% of the bonded prestressing force and distributed over a distance of $h/5$. To minimize these cracks and accommodate the longer distribution length ($h/4$) adopted by **LRFD** in 2002, the maximum reinforcing stress has been decreased for these beam sections. 13 ksi steel stress for AASHTO and Florida Bulb-Tee beams is equivalent to a 20% decrease from 2001 **LRFD** requirements. Florida-U beams and Inverted-T beams have not shown similar problems, so the reduction in maximum steel stress only provides equivalent resistance to the previous **LRFD** requirements using the $h/5$ distribution length.

BACKGROUND:

The use of higher strength concrete, higher release strengths and larger strand diameters in recent years, to accommodate longer spans and wider beam spacings, has resulted in much higher bursting forces in the ends of prestressed beams. This has aggravated the minor cracking traditionally observed in the ends of these beams. Additional reinforcing was added to the ends of the prestressed beams in the June 30, 2000 release of the Standard Drawings to satisfy the Bursting Resistance requirements in **LRFD** and utilize the full strand pattern available in most of these beams. Undesirable cracking in the ends of AASHTO and Florida Bulb-Tee beams has been reported for beam designs near the upper limits of the **LRFD** (2001) Bursting Resistance requirements. Additionally, the 2002 Interim Revision to LRFD [5.10.10.1] has effectively increased the allowable bursting forces at the ends of prestressed beams by approximately 25%, necessitating a reduction in the allowable reinforcing stress for prestressed beams in Florida.

FOLLOW-UP:

The standard reinforcing patterns in the January 2004 Structures Standard Drawings, Index Series 100, 200 & 300 will be modified to meet the Structures Design Guideline requirements for most beam designs when a maximum 25% of the strands are debonded at the ends of the beams. Higher total prestress forces are not recommended but may be accommodated by debonding additional strands, or redesigning the vertical reinforcing in the ends of the beams. Redesign of the vertical reinforcing shall only be considered after consultation with the State Structures Design Office.

IMPLEMENTATION:

Effective immediately all projects under design using AASHTO Type II, III, IV, V & VI beams and Florida Bulb-Tees should comply with these new requirements for both LFD and LRFD designs. Florida-U Beams and Inverted-T Beams will not require any design changes if designed in accordance with Section 5.10.10.1 of the AASHTO LRFD Bridge Design Specifications prior to the 2002 Interim Revision. The following table lists the new maximum prestress force at

beam ends, from fully bonded strands for the applicable Standard Drawings:

<u>Beam Type</u>	<u>Standard Drawing (Issue Date)</u>	<u>Max. Bonded Prestress Force</u>
AASHTO Type II	Index No. 120 (2-14-01)	650 kips
AASHTO Type III	Index No. 130 (2-14-01)	995 kips
AASHTO Type IV	Index No. 140 (2-14-01)	1270 kips
AASHTO Type V	Index No. 150 (7-31-03)	1635 kips
AASHTO Type VI	Index No. 160 (7-31-03)	1800 kips
Florida Bulb-T 72	Index No. 172 (7-31-03)	1300 kips
Florida Bulb-T 78	Index No. 178 (6-30-00)	1430 kips
Florida U 48	Index No. 248 (2-14-01)	2790 kips
Florida U 54	Index No. 254 (2-14-01)	2790 kips
Florida U 63	Index No. 263 (2-14-01)	3070 kips
Florida U 72	Index No. 272 (2-14-01)	3070 kips
Inverted-T	Index No. 320 (10-01-01)	310 kips

All projects let after June 2004 shall use the revised January 2004 Standard Drawings. These Standard Drawings will have minor changes to the reinforcing in the ends of the AASHTO & Florida Bulb-Tee beams and list the Maximum Bonded Prestress Force on the "Typical Beam Details and Notes" Index Nos. 110, 210 & 310.

For projects let in or before April 2004, any changes to the plans to meet these new requirements need only be made at the discretion of the District Structures Design Engineer after notification by the Project Manager, taking into consideration the amount of overstress at the ends of the beams and any adverse impact to the production schedule.

No changes to the Specification Package or Quantities will be required as a result of these changes.

WNN/sjn