Florida Department of Transportation

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STRUCTURES DESIGN BULLETIN 13-08

(FHWA Approved: June 10, 2013)

DATE: June 11, 2013

TO: District Directors of Production, District Design Engineers, District Construction Engineers, District Structures Design Engineers

FROM: Robert V. Robertson, P. E., State Structures Design Engineer

COPIES: Tom Byron, Brian Blanchard, Duane Brautigam, David Sadler, Charles Boyd, Jeffrey Ger (FHWA)

SUBJECT: Top Slab Tendons Across Mid Span Closure Pours in Balanced Cantilever Segmental Bridges

REQUIREMENTS

1. Replace ***Structures Design Guidelines***, Table 4.5.5-3 with the following:

Table 4.5.5-3 Minimum Number of Tendons Required for Critical Post-Tensioned Elements

Post-Tensioned Bridge Element	Minimum Number of Tendons
Mid Span Closure Pour CIP and Precast Balanced Cantilever Bridges	Bottom slab – two tendons per web Top slab – See ***SDG*** 4.5.5.K for tendon number, size and anchorage requirements per cell
Span by Span Segmental	Four tendons per web
CIP Multi-Cell Bridges and Post-Tensioned U-Girder Bridges [1]	Three tendons per web
Post-Tensioned I-Girder Bridges [2]	Three tendons per girder
Unit End Spans CIP and Precast Balanced Cantilever Bridges	Three tendons per web
Diaphragms - Vertically Post-Tensioned	Six tendons if strength is provided by PT only; Four tendons if strength is provided by combination of PT and mild reinforcing
Diaphragms - Vertically Post-Tensioned	Four Bars per face, per cell
Segment - Vertically Post-Tensioned	Two Bars per web

1. Two U-Girders minimum per span.
2. Three girders minimum per span.

2. Add the following new section, table, figure and commentary to ***Structures Design Guidelines***, Section 4.5.5 at the end of the section:

K. Provide top slab continuity tendons across mid span closure pours in balanced cantilever bridges as follows.

1. For boxes with wing lengths less than or equal to 0.6 x W (See Figure 4.5.5-1), provide top slab continuity tendons across mid span closure pours as shown in Table 4.5.5-4.

Table 4.5.5-4 Minimum Number, Size and Anchor Location of Top Slab Tendons Across Mid Span Closure Pours

Web Spacing per cell - see Figure 4.5.5-1	Number and size of Tendons per cell [1]	Tendon Anchor Locations referenced from adjacent face of Closure Pour [2]
W ≤ 12 ft	Two tendons - 4-0.6" diameter	One adjacent to each web anchored in 2nd Segment back
12 ft < W ≤ 20 ft	Two tendons - 4-0.6" diameter	One adjacent to each web anchored in 3rd Segment back
20 ft < W ≤ 25 ft	Two tendons - 7-0.6" diameter	One adjacent to each web anchored in 3rd Segment back
25 ft < W ≤ 30 ft	Three tendons - 7-0.6" diameter	One adjacent to each web anchored in 2nd Segment back and one at middle of cell anchored in 3rd Segment back
W > 30 ft	Four tendons - 7-0.6" diameter	One adjacent to each web anchored in 3rd Segment back and two evenly spaced across cell anchored in 4th Segment back

1. Alternate strand or PT bar tendon configurations which provide an equivalent force may be substituted for tendon configurations shown.
2. The resulting distance from tendon anchor location to adjacent face of closure pour is the minimum. Locate top slab tendon anchors longitudinally so that the tendons overlap a minimum of one pair of cantilever tendons.

2. For boxes with wing lengths greater than 0.6 x W (See Figure 4.5.5-1), use the following methodology to determine top slab continuity tendon configurations:

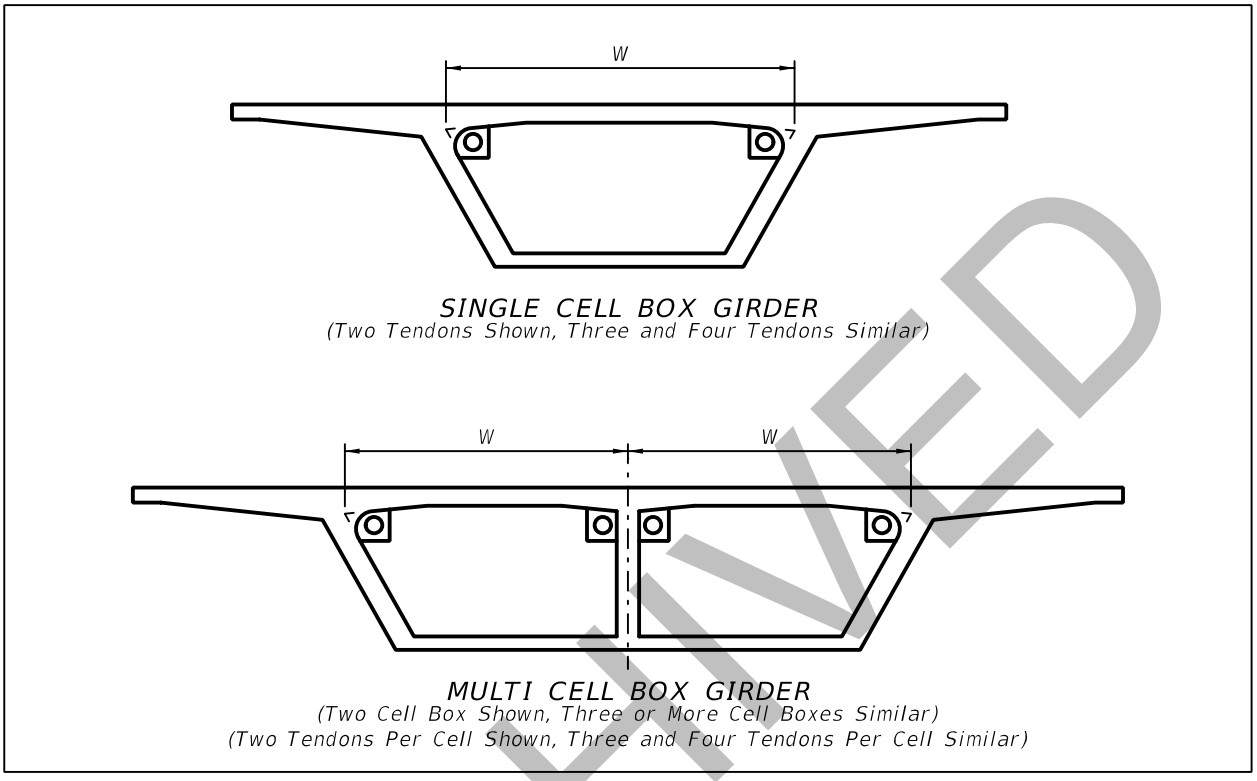
a. Determine lateral distribution of tendon force across the top slab using ***LRFD*** [C4.6.2.6.2] (the ***LRFD*** 30-degree model).

b. Locate top slab tendon anchors sufficient distances back from the closure pour to ensure full distribution of tendon forces across the closure pour and so that the tendons overlap a minimum of one pair of cantilever tendons. Do not anchor top slab tendons in the segments adjacent to the closure pour.

c. Provide a minimum of 75 psi compression across the top slab assuming a uniform stress of P/A on the top slab area only (See Figure 4.5.5-1). Neglect the effects of the bottom slab continuity post-tensioning for this calculation.

d. Locate top slab tendon anchors adjacent to the webs as shown in Figure 4.5.5-1. Provide additional tendons evenly spaced across each cell and within the wings as required to provide the required uniform minimum compression.

Figure 4.5.5-1 Top Slab Tendon Layout versus Web Spacing At Mid Span Closure Pours



Commentary: This is a minimum requirement and is not to be added to those required by the longitudinal analysis, i.e. if the number and size of top slab tendons across closure pours required by the longitudinal analysis exceeds these minimums, no additional tendons are required.

BACKGROUND

The absence of a sufficient number of tendons across the top slab closure pour and the resulting lack of compression has been identified as contributing to in-service performance issues with closure pours in balanced cantilever spans.

IMPLEMENTATION

These requirements are effective immediately on all design-bid-build projects in Phase I design development (less than 30% complete). These requirements may be implemented immediately on all design-bid-build projects in Phase II, III or IV at the discretion of the District.

These requirements are effective immediately on all design build projects that have yet to release the final RFP. Design build projects that have had the final RFP released are exempt from these requirements unless otherwise directed by the District.

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