



BRIDGE DESIGN MEMORANDUM – DM0524

TO: RPG Structural Engineers
Alternative Delivery Structural Design Engineer
Design Consultants

Date: July 11, 2024

RE: *Prestressed Concrete Adjacent Box Beams*

Apply these requirements to all projects where design has not advanced beyond preliminary plans submittal and/or whenever SCDOT Structural Drawings and Details are incorporated into the 95% bridge plans.

Structural drawings with an instructional memorandum have been prepared for Prestressed Concrete Adjacent Box Beams and are presented in the *SCDOT Structural Drawings and Details* (available on the SCDOT website). Standard box beam cross sections are 3'-0" by 2'-9" or 3'-3". The drawings have standard span lengths of 80 ft, 90 ft, and 100 ft. The drawings provide details for bridge roadway widths of 27'-10", 33'-10", and 39'-10", as well as, skew angles of +15°, 0°, and -15° for each span length.

Make the following revisions in the *Bridge Design Manual*:

Add new subsection:

12.3.2.6 Box Beams (Prestressed Concrete Adjacent Box Beams)

Prestressed concrete adjacent box beams ("box beams") are an alternative to cored slabs when longer spans are needed with a minimized superstructure depth. Box beam bridges consist of longitudinal, precast voided concrete members placed against each other to form a self-supported bridge deck. Box beam details are available in span lengths of 80 ft, 90 ft, and 100 ft. See the *SCDOT Structural Drawings and Details* (available at the SCDOT website).

The use of box beams is limited because of durability concerns due to the longitudinal and transverse joints. Box beams are not allowed on any National Highway System (NHS) route nor on any facility with a current ADT that equals or exceeds 3000 vpd.



For Contractor-designed projects, such as design/build, box beams will only be allowed if the bid documents specifically allow their use. The substitution of a box beam is not a valid Value Engineering proposal.

The maximum allowable skew is 15°, and the bridge designer must ensure a proper fit on the bent caps where the bridge is on a longitudinal grade or on a skew. Bent caps may need to be sloped along the longitudinal grade to ensure proper fit. In addition, other geometric elements may merit special consideration in the design of a box beam.

Due to adverse effects associated with large bridge widths, box beam bridge widths shall be limited to typical sections of 17 units or less.

Box beams bridges shall be constructed on tangent horizontal alignments. The use of skewed chorded spans to create horizontal curves will not be allowed.

Box beam bridges shall be limited to tangent vertical grades of 4% or less or on slight crest vertical curves. No sag vertical curves will be allowed on box beam bridges. Transversely, box beams shall be limited to a maximum rate of superelevation of 4%. Superelevation transitions are not allowed on box beam bridges.

Due to box beam unit widths being fixed at 3'-0", the roadway widths for bridges constructed of box beams do not exactly match the approach roadway widths detailed in the typical sections of the roadway plans.

The table below provides minimum allowable widths of box beam bridges for common two-lane roadway sections on tangent alignment.

Approach Roadway Width	Bridge Roadway Width	Bridge Width Out-to-Out	Number of Box Beam Units per Span	Approach Roadway Lane Width	Approach Roadway Shoulder Width	Bridge Shoulder Width
28'-0"	27'-10"	30"-0"	10	10'-0"	4'-0"	3'-11"
34'-0"	33'-10"	36'-0"	12	11'-0"	6'-0"	5'-11"
40'-0"	39'-10"	42'-0"	14	12'-0"	8'-0"	7'-11"
44'-0"	45'-10"	48'-0"	16	12'-0"	10'-0"	10'-11"

For other combinations of approach roadway widths when sidewalks are not present, the minimum bridge shoulder widths shall be no more than 1" narrower than the shoulder widths on the approach roadway and shall not be less than 4'-0". Shoulder widths for box beam bridges built on a tangent alignment, but, with a horizontal curve on the roadway across the bridge, shall also be no more than 1" narrower than the shoulder widths on the approach roadway and shall not be less than 4'-0".



For box beam bridges where sidewalks are used, the bridge roadway width shall comply with the requirements of the SCDOT Roadway Design Manual.

Please note the changes above in your copy of the *SCDOT Bridge Design Manual*.

Terry B. Koon, P.E.
Structural Design Support Engineer

TBK:hl

ec:

Julie Barker, Dir. of Preconstruction
Robbie Isgett, Dir. of Construction
Jeff Terry, Dir. of Maintenance
Brent Dillon, Dir. of Traffic Engineering
Chris Gaskins, Dir. of Alternate Delivery
Rob Bedenbaugh, Dir. of Engr. Support
Chris Lacy, Dir. of Bridge Management

Jeremy Harmon, Acting RP Engr. - Lowcountry
Leah Quattlebaum, RP Engr. – Pee Dee
Adam Humphries, RP Engr. - Midlands
Julie Barker, RP Engr. – Upstate
Jae Mattox Preconstruction Alt. Deliv. Engr.
Tad Kitowicz, FHWA
Blake Gerken, FHWA

