STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION

MICHAEL F. EASLEY
GOVERNOR

LYNDO TIPPETT
SECRETARY

MEMORANDUM TO: Project Engineers
Project Design Engineers

FROM: G. R. Perfetti, P.E.
State Bridge Design Engineer

DATE: September 28, 2004

SUBJECT: DESIGN GUIDELINES FOR BOX BEAMS

To accommodate longer span length requirements on lower traffic volume roads, the Structure Design Unit shall consider the use of box beam girder bridges. This interim policy memorandum presents some general guidelines on their use.

All box beam girder units shall be constructed in a side-by-side layout, similar to the current practice with cored slab bridges. The box beam precast prestressed units shall be 36" wide and have a depth of 27", 33", or 39" (similar to AASHTO Standard types BI-36, BII-36 and BIII-36, respectively). Span length limits are based on constructibility and rideability concerns more than stresses. Designers should ensure that camber does not infringe on the ability to provide a level riding surface. The following table shows the anticipated maximum span lengths for each type of box beam:

	Max. Span Length for Type of Construction	
Depth	**Conventional**	**Top-Down**
27"	70'	60'
33"	85'	65'
39"	100'	65'

In many cases construction loads for top-down construction of spans up to 55' may be approximated with an HS-25 loading. However, when top-down construction is required for spans greater than 55', designers are reminded to consider construction loads that may result from heavy construction equipment (especially cranes and cranes with payload).

Shear keys between box beams shall be grouted. In addition, the box beams shall be post-tensioned using a pair of rods or 0.6" strands in a continuous transverse diaphragm. The number

MAILING ADDRESS:
NC DEPARTMENT OF TRANSPORTATION
STRUCTURE DESIGN
1581 MAIL SERVICE CENTER
RALEIGH NC 27699-1581

TELEPHONE: 919-250-4037
FAX: 919-250-4082

WEBSITE: WWW.DOH.DOT.STATE.NC.US

LOCATION:
CENTURY CENTER COMPLEX
BUILDING A
1000 BIRCH RIDGE DRIVE
RALEIGH NC

and location of the transverse diaphragms shall ascribe to the method and guidelines detailed in the Section 8.9 of the current PCI Precast Prestressed Concrete Bridge Design Manual, which is attached for your reference. The transverse post-tensioning shall be installed symmetrically about the mid-height of the box beam section, and shall be parallel to the bridge skew. Box beams shall not be used on skews less than 60° or more than 120°.

The box beams shall have a concrete overlay with a minimum depth of 3" at midspan. The overlay shall be class AA concrete containing glass fibers and a maximum coarse aggregate gradation of 78M. The overlay shall be placed after the barrier rails have been constructed and have cured. Longitudinal joints in the overlay shall not be permitted, except where required for staged construction. Place the following note on the plans:

"Placement of the concrete overlay shall occur after casting the concrete rail [parapet]."

Detail the transverse joints on box beam bridges with evazote joints that incorporate the standard blockout, which is filled with elastomeric concrete. In addition, detail a backwall at the end bents.

Design Manual Figure 11-3 has been revised and is attached for your use. Also attached are the Prestressed Concrete Box Beam and Concrete Wearing Surface Special Provisions.

This interim policy is effective immediately. The Design Manual, NCBDS, and project Special Provisions will be updated at a later date. Structure Standards and are currently being developed and will be available at a later date.

Attachments

PCI Bridge Design Manual, Section 8.9 - Transverse Design of Adjacent Box Beam Bridges.
Fig. 11-3, Fig. 11-3 (Metric)
Prestressed Concrete Box Beam Special Provision
Concrete Wearing Surface Special Provision

GRP/GM

cc: R. V. Keith, P. E., with attachments
R. A. Raynor, P. E., with attachments
T. S. Drda, P. E.,FHWA, with attachments
E. C. Powell, Jr., P. E., Attn: R. Hancock, P. E., with attachments
J. Emerson, P. E., with attachments
D. R. Henderson, P. E., with attachments