Structural Engineering Guidance No. 14-02

Date: December 31, 2014

Distribution: All Engineering Resources

SUBJECT: NEW PRESTRESSED BRIDGE APPROACH SLABS (PBAS) TENTATIVE IMPLEMENTATION

Contact: Gregory Sanders

EPG Status: To Be Submitted

Std. Drawing Status: Incorporated

Effective Date: January 2015

Expiration/Duration: When Incorporated into EPG

Background and Purpose:

New prestressed bridge approach slabs were developed as part of the external research that developed the new (cast-in-place) bridge approach slabs. Prestressed bridge approach slabs have been implemented on two replacement bridge jobs as part of the university field evaluation research. They were installed at each end on one major road bridge and one minor road bridge and are performing satisfactorily. See Structural Engineering Guidance 14-01 for more information.

Prestressed bridge approach slab is still a trial approach slab solution. Construction costs for the two jobs where they were implemented were greater than anticipated but not so great that it cannot be explained by risk alone considering that this was a new applied research concept with special monitoring equipment installation requirements. Hence, the tentative implementation status seems rational at this time.

The importance of having researched a prestressed bridge approach slab option meaning the cost of the analysis and design of the beams that make it up, the detailing, the trial fabrication and construction of four of these slabs and the separate field evaluation study all seem to justify that the acknowledgement to the engineering users of this available tool and the subsequent release of the details for availability for system-wide tentative implementation outweigh having one less option. Developing the guidance and standard drawings now was determined to be the right direction in order to create the opportunity for its use rather than have inopportunity dictate the direction later.

Instructions:

Tentatively implement new prestressed bridge approach slab for any new or replacement bridge approach slab jobs for existing bridges in accordance with the following guidance and standard drawing guidance. Tentative implementation is based upon approval of the Assistant State Bridge Engineer, projected cost and time to construct.

Tentatively implement for any new or replacement bridges on a minor road. Tentative implementation is based upon approval of the Assistant State Bridge Engineer, projected cost and time to construct.

Tentatively implement for any new or replacement bridges on a major road with low AADT in order to further evaluate their field performance. Tentative implementation is based upon approval of the Assistant State Bridge Engineer, projected cost and time to construct.

GUIDANCE BEGINS ON NEXT SHEET.

GUIDANCE:

New Standard Prestressed Bridge Approach Slab (PBAS) and Description:

A new standard Prestressed Bridge Approach Slab (PBAS) is available in two lengths.

* Prestressed Bridge Approach Slab (20 Feet)
* Prestressed Bridge Approach Slab (25 Feet)
* Description.
* Alternative bridge approach slab designed to meet fast construction times.
* The PBAS most closely resembles a single span adjacent concrete box beam bridge superstructure with grouted shear keys and transverse posttensioning tie rods.
* Variable bridge approach widths are possible by using standardized 3-foot and/or 4-foot wide prestressed concrete beam combinations.
* Prestressed beams are 10” thick.
* ½” diameter pretensioning strands; 1” diameter posttensioning rods.
* Includes sleeper slab.
* 1 ½” asphaltic overlay plus waterproof membrane will be conventional (concrete overlay is a design option).
* Total thickness of bridge approach slab is 12” (Min.) at gutterline.
* Crowning is address with overlay.
* Anchored to approach notch (corbel) (Drilling required).
* Base drainage provisions are same as current BAS.

Effective date on the new PBAS Standard Drawing is January 2015.

New Tentative Practice for (1) New or Replacement Prestressed Bridge Approach Slabs for Existing Bridges and for (2) New or Replacement Bridges:

:

* Approval of the Assistant State Bridge Engineer is required.
* Principal intended use is for existing bridges with in-place, settled backfill because of less risk of settlement. Lesser intended use is for new bridges.
* Replacement bridge approach slabs may be 20 or 25 feet based on the actual conditions of the job, scope and working with districts.
* New bridge approach slabs will be 20 feet.
* A good structural solution since a 25-foot slab is available for ground conditions where “longer bridging” may be necessary.
* Quick construction time; tight construction deadlines could contain a greater construction cost.
* Staging is possible.
* Could be made optional to a cast-in-place bridge approach slab solution to gauge contractor interest and watch costs.
* If used for a major road bridge, curbs may need to be added integrally to exterior beams, or

Standard Drawing Features for New PBAS:

* The prestressed slab is broken down on two sheets intended to reflect the dominant engineered action at work as well as to show the division of work between the construction of the system and the construction/fabrication of the beams; for example, the first sheet shows the posttensioning of the prestressed beams in the field where instructions are given for the actual connecting of the individual beams to each other, and the second sheet shows the pretensioning of the beams and the reinforcement layout necessary for the fabrication of the beams that are detailed similarly to other prestressed girders and box beam standard drawings.
* The beams are connected to each other by partial width posttensioning. This is where each beam that is placed after the first beam is placed is posttensioned to the earlier placed beam.
* Full width posttensioning is available where the instructions would be revised. This is where all of the beams are placed and then posttensioned as a whole group.
* Only one standard drawing (two sheets) for skewed RA PBAS with guidance is complete at this time and may be used for either approach slab length; easily modified for squared bridges until available.
* The pay item is Prestressed Bridge Approach Slab per square yard for both available lengths.

Bridge End Drainage:

Curbs are not used with the prestressed bridge approach slab as is the case for the cast-in-place concrete and asphalt bridge approach slabs. Secondly, the PBAS overall width is not wide enough to place curbs. Place 3-foot rock drain flume adjacent to end of wings, or extend rock blanket up to and along the full length of the approach slab.

See Structural Engineering Guidance 14-01 for more information.

Bridge Reference Database:

1. This in-house program should be updated to allow for the possibility that a new or rehab bridge can have a PBAS.
2. It may be a good idea at this time to have staff review incoming construction as-built plans for indicator boxes that are checked and update the Bridge Reference Database and TMS.

Further Issues (Sticky Points):

* Account for lead time in working or calendar days for fabrication and delivery of prestressed beams.
* Cost is greater than conventional cast-in-place BAS because of newness and presumed risk.
* Bridge on a major road should have curbs on the bridge approach slab because concrete approach pavement is typically used in tandem. Concrete approach pavement has curbs that run to drain basins which may or may not be required. Other methods of bridge end drainage for this application should be investigated.
* Posttensioning using tie rods only is detailed. Using pretensioning strands could be an option but it is not detailed.
* The details of a prestressed bridge approach slab are included in the standard drawings in order to make them available since the research was concluded. While they may not be popular at first, they may have an advantage over cast-in-place in some very unique situations.
* While staging is listed as possible, it has not been tried.

Report Deviations from Guidance:

Deviations or amendments to guidance based on Bridge Memo or Design Layout conferences or discussions with management or districts, or special cases or interpretations should be reported to Development Section or Preliminary and Review Section so that guidance and EPG are updated.

Suggestions and recommendations concerning this guidance or procedure should be directed to the Development Section for review and updating the Engineering Policy Guide.