



Illinois Department of Transportation

2300 South Dirksen Parkway / Springfield, Illinois / 62764

November 30, 2007

CIRCULAR LETTER 2007-20

PPC DECK BEAM – NEW SHAPE IMPLEMENTATION, STANDARD BRIDGE PLAN RETIREMENT, AND PPC DECK BEAM INSPECTION

COUNTY ENGINEERS/SUPERINTENDENTS OF HIGHWAYS
MUNICIPAL ENGINEERS/DIRECTORS OF PUBLIC WORKS
CONSULTING ENGINEERS

The Bureau of Bridges and Structures (BBS), in response to the new Load Resistance Factor Design (LRFD) requirements, reviewed the adequacy of the current Precast Prestressed Concrete Deck Beam (PPCDB) designs for the new LRFD design. The existing beam shapes were found to be inadequate in shear for LRFD. Therefore, the BBS took the opportunity to not only design the PPC Deck Beams for LRFD, but also to address other known design and fabrication issues.

NEW PPC DECK BEAM DESIGN

ALL BRIDGE DESIGNERS MEMORANDUM 07.2 (ABD 07.2), New PPC Deck Beam Designs and Details on State System, was issued on August 29, 2007, and provides a summary of improvements, new deck beam planning and design aids, as well as an example calculation. Although ABD 07.2 indicates that it applies to the state system, much of the memorandum also applies to the local system, especially for urban structures and on high traffic volume routes that receive significant amounts of anti-icing agents. ABD 07.2 may be found at the following web link: <http://www.dot.il.gov/bridges/abd072.pdf>. Another ABD Memorandum is being prepared that will provide more guidance, planning and design aids for low volume local agency structures.

The new PPCDB shapes will be used on the state system beginning with the June 13, 2008 state letting. To allow for an efficient and cost-effective transition to the new shapes for the industry, we encourage all local agencies to also transition at or around this date. Although not mandatory for most projects, use of the new design with the incorporated improvements is strongly recommended. In addition, LRFD design, and therefore, the new PPCDB shapes, will be required for federal-aid projects initiated after September 30, 2007 as discussed in the Bureau of Local Roads and Streets' Circular Letter 2007-06, LRFD Design Implementation, dated April 30, 2007. Circular Letter 2007-06 may be found at <http://www.dot.il.gov/blr/manuals/infocirculars/CL2007-06.pdf>. Exceptions to the LRFD design requirement are noted in the circular letter.

CIRCULAR LETTER 2007-20

Page 2 of 5

November 30, 2007

Agencies may expect some delays in delivery beyond normal delivery times during the transition to the new PPCDB shapes as the fabricators manage the retooling, modification of forms, mixes, equipment and inventory.

Rehabilitations Using New PPC Deck Beam Design

The new PPC Deck Beam shapes may be used on rehabilitation and beam replacement projects as the geometry is compatible with the previous shapes. Larger shear keys used in the new design will match up to the adjacent existing beams. The additional weight of the beams will be a consideration during the planning phase for reuse of the existing substructure. Additional information will be contained in a future ALL BRIDGE DESIGNERS MEMORANDUM.

LRFD 1000-Year Seismic Design

The LRFD design code will soon require a 1000-year design return period for seismic design, rather than the current 500-year design return period. We expect that this portion of the LRFD design code will be distributed in early 2008. The BBS will develop procedures and timelines for the implementation of the 1000-year design return period for LRFD projects. Load factor designs will continue to use the 500-year design return period.

With the new 1000-year design, the structures' seismic performance category or zone will now depend on the foundation soil strength, rather than just the bedrock acceleration. The new spectral accelerations and more detailed soil site class amplification will often result in a design response spectrum producing greater transverse forces on the structure, depending on the local soil conditions.

Due to the significant increase in the loading and the number of variables associated with the 1000-year seismic design, the continued use of the Standard Plans for Precast Prestressed Concrete Deck Beam Bridges or Standard Bridge Plans was determined to be impractical.

The use of the Standard Bridge Plans will, therefore, be phased out. This will require the use of custom plans, sealed by an Illinois Licensed Structural Engineer. In order to alleviate the impact of the retirement of the Standard Bridge Plans, we recommend the use of the CADD libraries for base sheets and details. In addition, the BBS will provide design examples with simplified design procedures. Suggested guidelines are presented in the following section, subject to the timeline for implementation of the 1000-year seismic design.

STANDARD BRIDGE PLAN RETIREMENT

The Standard Bridge Plans will be available for use for a limited time. However, with the conversion to the new PPCDB shapes, in order to use the Standard Bridge Plans, they must be modified. New superstructure sheets must be used, and the substructure design and pile loads reviewed and modified as necessary.

CIRCULAR LETTER 2007-20

Page 3 of 5

November 30, 2007

Various transition scenarios are based on funding, who the Structural Engineer of Record is (BBS, consultant, or other), timeframe, seismic code, etc. The following is provided as clarification on projects with letting in June on the cusp of the scenarios:

Local Agency PPCDB Projects to be Let *Before* June 2008

1. All projects initiated before September 30, 2007
 - Standard Bridge Plans and Custom Designs
Status Quo: Use current LFD, current PPCDB details and 500-year seismic design.
2. Federal-aid projects initiated after September 30, 2007
 - Custom Designs
Use LRFD, new PPCDB details and 500-year seismic design.
(Anticipate few, if any in this category.)
3. Federal-aid project initiated after September 30, 2007
 - Standard Bridge Plans
LFD not applicable or allowed.
4. State- or locally-funded projects Initiated after September 30, 2007
 - Standard Bridge Plans and Custom Designs
Status Quo: Use current LFD, current PPCDB details and 500-year seismic design.

Local Agency PPCDB Projects to be Let *After* June 2008

1. All Projects using Standard Bridge Plans with a Foundation/Pile Design *by BBS*
 - Use current LFD, new PPCDB details and 500-year seismic design. The Bureau of Bridges and Structures will provide new PPCDB superstructure sheets, substructure sheets (if necessary), and pile/geotechnical recommendation. For projects already approved, send a request through the district BLRS to the Local Bridge Unit. Include a proposed letting date and General Plan & Elevation sheet. If the approval was some time ago, we may also require a copy of the approved Preliminary Bridge Design and Hydraulic Report with Borings. (We will let you know after receipt of original submittal.)
2. All Projects using Custom Plans, or Standard Bridge Plans with a Foundation/Pile Design *by Consultant/Others*
 - Use current LFD, new PPCDB details and 500-year seismic design. The Structural Engineer of record should prepare new PPCDB base sheets, substructure sheets (if required), and pile/geotechnical recommendations. If preliminary bridge design has already been approved by the BBS, please advise the Local Bridge Unit of the change, along with the proposed letting date, through the district BLRS.

CIRCULAR LETTER 2007-20

Page 4 of 5

November 30, 2007

Exceptions:

3. Federal-aid projects initiated after September 30, 2007
 - Custom Designs
 - Use LRFD; new PPCDB details and 500-year seismic design.
4. If Custom Designs are performed *by BBS*, they will be by LRFD.

We ask that requests and submittal of Standard Bridge Plans to the BBS for rework to the new PPC Deck Beams (including plans on the shelf) be provided no later than June 30, 2008. However, the Standard Bridge Plans will be available for consultant rework until a date is set for full implementation of LRFD and the 1000-year design return period for seismic design.

PPC DECK BEAM INSPECTION

Proper inspection of PPC Deck Beams is imperative to discovery of deficiencies. In the past, the inspection of PPC Deck Beams has been primarily visual, and often from some distance. Research and experience has led to a more critical evaluation of in-service PPC Deck Beams. Please reference Circular Letter 2004-13, Inspection and Rating of PPC Deck Beam Bridges at <http://www.dot.il.gov/blr/manuals/cl2004-13.pdf>. Sounding and removal of delaminated concrete is essential to proper inspection and, when deficiencies are found, rating of the beams for load capacity.

When this policy was initiated on the state system, it was not uncommon for a structure previously inspected visually to have the superstructure condition rating drop from "7" or "6" (Good or Satisfactory) to "4" or "3" (Poor or Serious). Condition ratings for PPC Deck Beams are provided in the Illinois Structure Information and Procedure Manual, starting on page 140, at <http://www.dot.il.gov/isis/pdf/s59.pdf>.

Removal of delaminated concrete should be done as part of the routine NBI Inspection, and **MUST BE DONE BEFORE** inspection by the Local Bridge Unit (LBU). This may require use of a ladder or snooper to access the beams for a "hands-on" inspection. The LBU typically does not have the equipment and resources to perform this function. Repeat trips to a structure delay the structural evaluation and potentially necessary postings and uses valuable staff time.

Evaluation/Prioritization for Inspection Resources

In order to evaluate and prioritize the inspection resources, such as for personnel, time, traffic control, equipment, and snoopers, we suggest that local agencies incorporate a screening process when planning their inspection work. Decisions may be based on the age and location of the structure, traffic volume, history, inspection photographs, lack of drain holes in the beams, use of de-icing agents, and brief field visits. Accessibility is also often affected by the time of year when the work is performed. It is advisable to include a listing of resources required and other information pertinent to the inspections in the structure file for each structure.

CIRCULAR LETTER 2007-20

Page 5 of 5

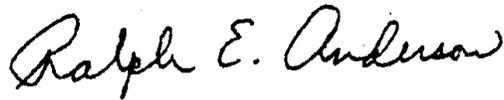
November 30, 2007

Beams Exposed to Deicing Agents. Beams that only have one layer of prestressing strands do not have reserve capacity and may be of particular concern for deteriorated beams. Issues such as ADT/importance, age of structure, previous inspection history and equipment needs may be considered.

Beams Not Exposed to Deicing Agents. The extent of inspection for locations not exposed to de-icing agents could be based on defects observed during a routine inspection, such as shear key deterioration/leakage, longitudinal cracks, spalling, exposed steel, etc.

As a general rule, if numerous defects can be observed visually, significant deterioration may be uncovered during a "hands-on" inspection.

If you have any questions regarding this Circular Letter, please contact Mr. Jim Klein at (217) 782-5928 or james.klein@illinois.gov.



Ralph E. Anderson, P.E., S.E.
Engineer of Bridges and Structures



Charles J. Ingersoll, P.E.
Engineer of Local Roads and Streets

cc: FHWA, Illinois Division, Attn: Dan Brydl
Illinois Department of Natural Resources, Attn: Gary Iles
Illinois State Toll Highway Authority
Township Officials of Illinois, Attn: Bryan Smith
Township Highway Commissioners of Illinois, Attn: Ron Johnson
(St. Charles Township, Kane County)