



Illinois Department of Transportation

2300 South Dirksen Parkway / Springfield, Illinois / 62764

May 12, 1998

Precast Prestressed Concrete Deck Beams

COUNTY ENGINEERS/SUPERINTENDENT OF HIGHWAYS
MUNICIPAL ENGINEERS
CONSULTING ENGINEERS

#98-06

We are contacting personnel involved in the inspection of local agency bridges to provide information in regard to the deterioration of structures containing Precast Prestressed Concrete (PPC) deck beams. In recent years the following problems have occurred in this type of beam on state, county, township and municipal structures:

- **Longitudinal Cracking in the Bottom Surface of the Beams**

This problem is caused by the freezing of water trapped inside the voids of the PPC deck beams. Water can enter the voids when the vent holes, which are cast in the top surface of PPC deck beams during fabrication, become unsealed. When the drain holes cast in the bottom surface become plugged or when no drain holes have been provided, the water entering the voids cannot escape and can damage the beams when freezing occurs. Inspectors should be instructed to insure that the drain holes are cleared or to report the incidence of plugged holes to the responsible local official. Also, unsealed vent holes found in the top surface of the beams should be reported so that they can be sealed by personnel responsible for the maintenance of the structure. If drain holes were not provided and evidence of water entering the voids is found, consideration should be given to drilling holes in the bottom of the beam to drain the water from the voids. The Local Bridge Unit of the Bureau of Bridges and Structures should be contacted for guidance prior to drilling drainage holes in the bottom of existing beams. Beams with longitudinal cracks in their bottom surface must be evaluated to determine the effect of the cracks on the load-carrying capacity of the affected beams. Considering that prestressing strands deteriorate rapidly when exposed, the strands adjacent to or intersected by a crack must be assumed to have lost all structural capacity when performing a structural evaluation. This problem was also addressed in the Local Roads and Streets Circular Letter #88-44.

- **Loss or Deterioration of Concrete Protecting Prestressing Strands**

Due to the high stress present in prestressing strands, they corrode very rapidly when the concrete cover is lost or infiltrated by moisture. This is especially true for beams exposed to deicing agents or at a location on the beam subjected to a concentrated discharge of drainage from the deck. When areas of the beam surface are discolored from exposure to drainage or rust staining is visible on the bottom of PPC deck beams, the

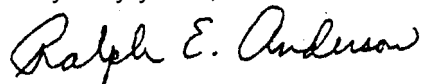
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affected area should be thoroughly investigated by sounding of the concrete to determine the extent of the problem. Often, strands may be corroded even though the concrete cover has not yet fallen off. When strands have become exposed or when the concrete cover protecting them has delaminated, the extent of prestressing strand deterioration must be determined and the beams must be analyzed to determine if their load-carrying capacity has been affected.

Bridge inspectors should look for unsealed vent holes, plugged drain holes, longitudinal cracking, delaminated concrete and exposed prestressing strands when performing routine inspections for PPC deck beam bridges as required by the National Bridge Inspection Standards (NBIS). If deterioration described in this letter is found, the inspector should record the specific type, location and extent of deterioration present on each beam in a manner that will provide a basis for measuring the progress of the deterioration during future inspections. In order to provide the information necessary to evaluate the effect of deterioration on load-carrying capacity, documentation should record the length of cracks, areas of concrete delimitation, areas of strand exposure and locations of severely deteriorated strands. The agency responsible for the structure should contact the Local Bridge Unit of the Bureau of Bridges and Structures or retain the services of a licensed structural engineer to evaluate the effect of the deterioration on the load-carrying capacity of the bridge.

The District Bureaus of Local Roads and Streets have been provided with a list of PPC deck beam bridges for each local agency, grouped according to the current condition rating of the superstructure. Local agencies should immediately inspect PPC deck beam bridges with superstructure condition ratings of "6" or less to determine if the extent of deterioration requires that the load-carrying capacity of the bridge be evaluated. Bridges with superstructure condition ratings of "7" or greater should be inspected as described in this letter during the next scheduled NBIS inspection. Questions may be directed to your district office or to Tim Souther of the Local Bridge Unit, phone 217/785-8748.

Very truly yours,



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Engineer of Bridges and Structures

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cc- District Engineers
Illinois Department of Natural Resources
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