

# Illinois Department of Transportation

2300 South Dirksen Parkway / Springfield, Illinois / 62764

August 9, 2004

Slipform Bridge Parapet Construction

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

#04-10

The Illinois Department of Transportation (IDOT) and the Federal Highway Administration (FHWA) recently completed the 2003 IDOT/FHWA Joint Process Review on Bridge Parapet Construction. The purpose of the review was to evaluate the adequacy and long-term performance of concrete bridge parapets. The review team identified widespread deterioration of parapets built using the slipform method that was not seen in conventionally formed parapets. The team's most significant finding was the lack of consistent concrete consolidation. This lack of consolidation has led to early distress, which typically presents itself several years later as severe cracking in the top portion of the parapet.

The department has an interest in not only the initial cost and timesavings associated with the slipform process, but also has an obligation to the public for the safety, durability and long-term costs of structures on the highway system. IDOT and the FHWA have determined that a temporary moratorium is necessary until improvements in details, equipment, procedures and specifications address all concerns with slipform parapet construction.

**MORATORIUM TIMEFRAME/SCOPE.** The moratorium became effective on July 1, 2004 and will last for a minimum of six months. As this issue is considered a structural and safety concern, this moratorium also extends to all local bridges under the review of the Department (Federal and Motor Fuel Tax funded, as well as non-MFT bridges on County/Township system greater than 30' in length).

**REQUIREMENTS FOR LIFTING MORATORIUM.** Enclosure #1 outlines the requirements necessary for lifting the moratorium. It is intended that industry (statewide and national associations, contractors, material suppliers and equipment manufacturers) work collectively to develop a comprehensive set of recommendations that address consolidation, rebar cage rigidity, air content, geometry and acceptance procedures. Near the end of the six-month period, the department and IDOT/FHWA Review Team will evaluate Industry's efforts and make a decision to either: 1) adopt their recommendations and lift the moratorium; 2) extend the temporary moratorium to allow further investigation; or 3) make the moratorium permanent.

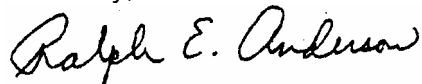
**PROJECTS LET BEFORE MORATORIUM.** The moratorium does not apply to projects let prior to July 1, 2004; however, all further parapet slipforming shall conform to Enclosure #2. This will allow construction supervision personnel to assess the quality of the internal concrete consolidation before acceptance. These projects may be used to test proposed improvements to the slipform process. However, any changes are subject to the approval by the Local Agency, the Bureau of Bridges and Structures and IDOT/FHWA Review Team. Proposed changes should be submitted to the Local Agency for review and approval. Any portion of a parapet with unconsolidated concrete or other voids will be removed and replaced at no additional cost to the owner.

In order to make the department-wide acceptance of slip-formed parapets as consistent as possible, every effort will be made to have a member of the joint process review team present during any future parapet slip-form operations on existing contracts. The review team's involvement is especially important, since these slip-forming operations are also opportunities for industry to demonstrate future acceptability of the slip-forming option. For these reasons, we ask that the local agency contact the District Bureau of Local Roads **at least three weeks** in advance of the anticipated pour date so that they may contact and coordinate with the FHWA/IDOT Review Team members. If a member of the review team is unable to observe the construction, it will be incumbent on the project construction supervision personnel to ensure compliance with the provisions of Enclosure #2.

**PROJECTS LET AFTER MORATORIUM.** For projects not already let, a special provision should be added to all bridge contracts to disallow the slipform option as stated in Article 503.17. See Enclosure 3 for example special provision. It is understood that, due to timing, some local projects let after July 1, 2004 will not include a special provision disallowing the option for slipforming concrete bridge parapets. Those projects should follow the guidelines provided in Enclosure #2.

Any questions on local agency projects regarding this moratorium may be directed to Jim Klein of the Local Bridge Unit, telephone 217/782-5928.

Sincerely,



Ralph E. Anderson  
Engineer of Bridges and Structures

JKK/

cc- Charles J. Ingersoll  
Norman R. Stoner/Attn: Daniel R. Brydl

Attachments

**Industry Requirements for Lifting the Moratorium on Slipforming Option for Bridge Parapet Construction**

In order to ensure that slipformed parapets can be consistently constructed to perform at a high level of quality, the following steps shall be completed before the moratorium is lifted:

1. Improve consolidation and eliminate entrapped air voids. This may require changes to equipment, construction methods, reinforcement details or concrete mix design.
2. Develop construction procedures, reinforcement details and concrete mix designs that will accommodate the inherent variability of workmanship, timeliness of concrete delivery, and concrete workability.
3. Develop quality control procedures to ensure that the concrete discharged into the slipform paving machine is consistent in workability and entrained air content. If a new concrete mix design is proposed, trial batches shall demonstrate that the design is able to hold entrained air, respond well to vibration, and hold its shape after slipforming.
4. Develop acceptance/rejection criteria and associated destructive or non-destructive testing methods. Areas to be addressed are surface defects, entrapped air, rebar cage stiffness, voids under reinforcement bars, geometry and air content.
5. Prepare full-scale slipformed parapet trials to demonstrate proposed changes and perform both non-destructive and destructive testing to verify the results.
6. Develop a comprehensive set of production requirements/recommendations for use after the moratorium is lifted that will ensure the continued production of high quality slipform parapets.

If the above steps are satisfactorily addressed and accepted by the department and IDOT/FHWA Review Team, the moratorium will be lifted. If significant progress has not been made by January 3, 2005, the slipforming option will be permanently discontinued.

### Slipformed Parapets for Existing Contract

For parapets that have already been completed prior to July 1, 2004 on active contracts, no further action will be required unless obvious defects are noted prior to closing the contract. If obvious defects are noted, the Process Review Team is to be contacted. Additional investigation may be performed, and final acceptance and payment for the parapets will be decided on a case-by-case basis.

On projects let before July 1, 2004, parapets that are slipformed on or after July 1, 2004, the following procedures will apply:

1. The FHWA/IDOT Process Review Team is to be contacted by the district so that a team member can arrive prior to the pour to observe. The contractor is to coordinate with the Resident to ensure the review team is notified in a timely manner.
2. The reinforcing cage must be rigid. Any movement in the cage during slipforming will create voids that will lead to premature deterioration. Diagonal bracing and other rigid supports between the front and back vertical reinforcement may be used to prevent the cage from racking, spreading apart, or pinching together as the concrete is placed. No additional payment will be made to make the reinforcing cage rigid.
3. The contractor may propose alternate parapet reinforcing bar details. The Bureau of Bridges and Structures will review any such proposal to check for conformance with NCHRP 350 crash requirements. The purpose of the proposal should be to make the cage more rigid. No additional payment will be allowed.
4. Voids on the surface of the parapet are an indication of poorly consolidated concrete. If surface voids are present, the probability of internal voids is very high. Areas with significant surface voids should be either: (a) left and later removed and replaced, or (b) removed before hardened and later formed and replaced. If there is a question as to the severity of the voids, the area should not be finished, and as an alternative to removal and replacement the Contractor will be given the option to core at that location to determine if internal voids exist and repair is necessary. In no case should an area of adjacent or continuous surface voids larger than three inches by three inches be repaired with paste, mortar, concrete, or by finishing before the parapet concrete has hardened.
5. Consolidation problems are frequently found at the starting and ending headers of slipformed parapets. Voids at the ends of the parapet can be minimized by providing waste areas beyond the limits of the wall and/or insertion of hand vibrators through the top of the slipforming machine. Concrete may be removed to achieve the final shape, but surface voids should be addressed as indicated in Item 4.
6. It is critical to the crash performance for the bottom vertical face and sloped face to be as close as possible to the design dimensions. Deviation from plan dimensions may be a cause for rejection of a parapet.
7. Random coring will identify the most severe cases of continuous voids but will not be effective in finding localized areas with poor consolidation. If a continuous void or a localized area is suspect, then one or more cores should be taken. In the case of investigating for a continuous void, the core(s) is to include the top horizontal reinforcing bar.

For contracts let after July 1, 2004, the slipforming option will not be allowed.

**SLIPFORMED PARAPETS**

Effective June 11, 2004

The slipforming option, as stated in Article 503.17(e)(1) of the Standard Specifications will not be allowed on this project.