Illinois Department of Transportation
2300 South Dirksen Parkway / Springfield, Illinois / 62764

March 22, 2007

CIRCULAR LETTER 2007-05

SCOUR CRITICAL BRIDGES AND PLANS OF ACTION

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

The information presented in this Circular Letter will be incorporated as part of the Structural Services Manual at a future date, and is provided at this time to expedite meeting the requirements of the National Bridge Inspection Standards (NBIS). The NBIS requires:

1. The evaluation of all bridges crossing waterways to determine their susceptibility to scour.
2. The development of a Plan of Action (POA) to monitor all bridges determined to be Scour Critical.

More information follows, but we are asking that the process be completed by the end of **Calendar Year 2009**.

ISIS ITEM 113 CODED "3" OR LESS. Those structures considered Scour Critical should be identified in the Illinois Structure Information System (ISIS) by assigning a rating of "3" or less for Scour Critical Evaluation (ISIS Item 113).

In order to comply with the NBIS, **each Local Agency (LA) must develop a POA for each bridge that has ISIS Item 113 rated "3" or less.** We recommend that each LA review the Scour Evaluation Study (SES) on file for each Scour Critical Bridge to verify that the current rating for ISIS Item 113 is appropriate.

Typically, in conjunction with the preparation of a SES, anticipated depths of scour were computed using procedures provided in the Federal Highway Administration (FHWA) publication, Hydraulic Engineering Circular (HEC) 18, "Evaluating Scour at Bridges". Many of the existing SES's were prepared at a time when LA and consultant personnel were being introduced to scour evaluation procedures for the first time. Personnel now have experience and knowledge in these procedures that was not as developed during earlier years. We ask that the current Scour Evaluation Team (SET) review existing SES's to identify errors or omissions that, when addressed, would require the present rating for ISIS Item 113 to be revised. The SET should be composed of personnel with hydraulic, geotechnical and structure expertise. Once reviews have been completed, any required changes to ISIS Item 113 should be reported to the District Bureau of Local Roads and Streets.

ISIS ITEM 113 CODED "7". Based on information presently contained in the FHWA "Recording and Coding Guide for the Structure Inventory and Appraisal of the Nation's Bridges", the **LA must develop a POA for each bridge that has ISIS Item 113 rate "7"**.

As part of the review of existing SES's, attention should be given to bridges that presently have ISIS Item 113 rated "7" to determine if the rating should be revised, based on the performance of countermeasures that have been installed at the site to address existing scour. The FHWA Recoding and Coding Guide presently provides the following statement in reference to assigning a rating of "7" to ISIS Item 113:

> "Countermeasures have been installed to mitigate an existing problem with scour and to reduce the risk of bridge failure during a flood event. Instructions contained in a plan of action have been implemented to reduce the risk to users from a bridge failure during or immediately after a flood event."

A scour POA is not required if the rating of "7" can be raised to a rating of "8". The FHWA now provides the following statement for assigning a rating of "8" to ISIS Item 113:

> "Bridge foundations determined to be stable for the assessed or calculated scour conditions. Scour is determined to be above top of footing (Example A) by assessment (i.e. bridge foundations are on rock formations that have been determined to resist scour within the service life of the bridge), by calculation or by properly designed countermeasures (see HEC 23)."

Based on the guidance provided by the FHWA for assigning a rating of either "7" or "8" for ISIS Item 113, the following should apply:

1. If properly designed countermeasures were installed at a site to address existing scour; and it has been determined by observation or by analysis/experience that the countermeasures are effective; and scour is determined to be above the top of the footing, ISIS Item 113 can be rated "8".
2. If properly designed countermeasures were installed at a site to address existing scour; and the adequacy of the countermeasures will need to be verified by observation of performance; and scour is determined to be above the top of the footing, ISIS Item 113 should be rated "7".

ISIS ITEM 113 CODED "6". In addition to the bridges presently coded as Scour Critical in ISIS, we ask that each LA review all structures presently rated as "6" for ISIS Item 113. Since a rating of "6" indicates that a SES has not been completed, these structures are either miscoded or the LA must initiate/complete a SES as soon as possible to address scour susceptibility.

The present guidance provided by the FHWA requires the LA to develop a POA for all bridges with unknown foundations (ISIS Item 113B coded "C") that have not been evaluated for scour (ISIS Item 113 coded "6"). For bridges with Item 113 coded as "6", the "Bridge Scour Assessment Procedure" (BSAP) may be used as a tool by a SET within the overall process of determining the appropriate rating for ISIS Item 113. If BSAP determines the bridge to be scour critical, the anticipated depth of scour must be computed using procedures outlined in HEC 18.

PLAN OF ACTION REQUIREMENTS. Attached to this circular letter is a copy of the descriptions that will be included in the Structure Information and Procedure (SIP) Manual for coding ISIS Item 113. The descriptions included in the attachment have been reviewed by the ISIS Committee and are intended to address changes that have been made by the FHWA to the Federal Recording and Coding Guide. SET's should utilize the attached descriptions when re-evaluating existing SES's.

Bridges requiring a POA are identified in the ISIS as follows:

1. Bridges that have "Scour Critical Evaluation" (ISIS Item 113) coded "3" or less;
2. Bridges that have "Scour Critical Evaluation" (ISIS Item 113) coded "6" and "Scour Critical Evaluation Method" (ISIS Item 113B) coded "C"; and
3. Bridges that have "Scour Critical Evaluation" (ISIS Item 113) coded "7".

Based on information provided by the Federal Highway Administration (FHWA), a POA must provide at a minimum the following:

1. Instructions regarding the type and frequency of inspections required to ensure adequate monitoring of conditions at the bridge site;
2. Identification of fixed scour monitoring devices or reference points that have been installed at the site and are to be routinely referenced by inspection personnel;
3. Reference data for use by inspection personnel for assessing existing site conditions and evaluating the effect of current conditions on structure stability;
4. Guidance to inspection personnel for reporting site deficiencies;
5. Guidance to inspection personnel for initiating or recommending bridge closures;
6. Information relative to the type of countermeasures in-place or presently scheduled for placement at the site to mitigate or correct existing or potential scour problems; and
7. Information regarding the schedule for the development of future countermeasures to address concerns with existing or potential scour problems.

Form BBS 2680 has been developed for a "Scour Critical Bridge – Plan of Action" as a guide for personnel preparing a POA and may be found at the following site: http://www.dot.il.gov/Forms/BBS%202680.doc. The form was developed using references provided by the FHWA, and is applicable to POA preparation for most structures. However, Major River Bridges or other unique structures may require POA documentation beyond that contained in Form BBS 2680. After development, the POA must be maintained with the Bridge File, which contains all other inspection information related to compliance with the NBIS rules, and a copy of the POA should be available for use during field inspections. The Bridge File should also contain a copy of the Scour Evaluation Study (SES).

We anticipate that LA's will begin a concerted effort to prepare the required POA's this year, with the intention of completing the process by the end of calendar year 2009. To ensure that the LA directs time and resources on the development of POA's for the proper bridges, please proceed immediately with the review of the existing SES's

The intent is that this work begin as soon as possible. Emphasis should first be placed on completing the screening of those structures coded as a "6". Resources should be then focused on the most critical structures. We understand that additional training may be required, and information is provided below regarding training courses. With this understanding, we suggest as a goal that local agencies make significant progress, say at least 50% completion, by the end of calendar year 2008.

Some training for personnel may be necessary to familiarize involved staff with scour evaluation procedures. The National Highway Institute has available training courses titled "Stream Stability and Scour at Highway Bridges" number FHWA-NHI-135046 and "Countermeasure Design for Bridge Scour and Stream Instability" number FHWA-NHI-135048. Note that Course 135046 provides training in identifying and analyzing stream instability and scour problems at highway bridges and is recommended as a prerequisite for Course 135048. If there is sufficient interest, these classes may be scheduled. For more information, to request enrollment in these training classes, and to assist us in assessing the need for scheduling such training, please contact Brad Risinger of the IDOT Bureau of Employee Services at phone 217-782-3708; email brad.risinger@illinois.gov.

If you have any questions, please contact Jayme Schiff at 217/785-8748.

Sincerely,

Ralph E. Anderson

Ralph E. Anderson
Engineer of Bridges and Structures

Attachment
JFS/bb28801
cc- Illinois Department of Natural Resources
FHWA, Illinois Division/Attn: Dan Brydl
Illinois State Toll Highway Authority

ISIS Item 113
Code and Screen Entry Instructions

(August 2006)

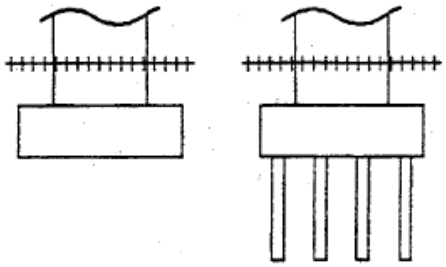
The following entry instructions for ISIS Item 113 should be used in lieu of those presently provided in the Structure Information and Procedure (SIP) Manual that are dated as effective 07/01/02. The instructions have been revised to be consistent with the most recent direction received from the Federal Highway Administration (FHWA) and information updates to the federal "Recording and Coding Guide for the Structure Inventory and Appraisal of the Nation's Bridges".

Code	Description
Blank	Bridge not over waterway
9	Bridge foundation (including piles) well above flood water elevations
8	Bridge foundation determined to be stable for the assessed or calculated scour conditions. Assessed or calculated scour is above top of footing (Example A), or six (6) feet or less of assessed or calculated scour occurring at a pile bent substructure with adequate support remaining after scour. The following apply: • Properly designed countermeasures installed to prevent scour from accessing footing or adversely affecting pile bent substructure (see HEC 23 – Bridge Scour and Stream Instability Countermeasures). • Structure assessed as stable for scour and not requiring scour analysis (foundations on rock with ability to resist scour for expected service life of the bridge).
7	Countermeasures installed to mitigate an existing problem with scour and to reduce the risk of bridge failure during a flood event. Instructions contained in a Plan of Action have been implemented to reduce the risk to users from a bridge failure and to ensure the adequacy of the countermeasures during or immediately after a flood event. Item 93B5 should be coded accordingly.
6	Scour calculation/evaluation has not been made. (Code "6" is used only to describe cases where a structure has not yet been evaluated for scour potential.)

5	Bridge foundation determined by the evaluation team to be stable for assessed or calculated scour conditions. Scour is determined to be within the limits of footing or piles (Example B), or more than six (6) feet of assessed or calculated scour occurring at a pile bent substructure with adequate support remaining after scour. The following apply: • Properly designed countermeasures installed to prevent scour from accessing footing or adversely affecting pile bent substructure (see HEC 23 - Bridge Scour and Stream Instability Countermeasures). • Structure assessed as stable for scour and not requiring scour analysis (foundations on rock with ability to resist scour for expected service life of the bridge).
4	Bridge foundation determined by the evaluation team to be stable for assessed or calculated scour conditions. Field review indicates action is required to protect exposed foundations (see HEC 23 - Bridge Scour and Stream Instability Countermeasures).
3	Bridge is scour critical. Scour POA required. Bridge foundations determined by the scour evaluation to be unstable for assessed or calculated scour conditions. One or the following is applicable: • Scour is determined to be within the limits of footing or piles (Example B), or more than six (6) feet of assessed or calculated scour occurring at a pile bent substructure with <u>inadequate</u> support remaining after scour. • Scour is determined to be below spread footing or piles tips (Example C).
2	Bridge is scour critical. Scour POA required. Field review indicates that extensive scour has occurred at bridge foundations, which are determined to be unstable by one of the following: • A comparison of calculated scour and observed scour during the bridge inspection. • An engineering evaluation of the observed scour condition reported by the bridge inspector in Item 60.
1	Bridge is scour critical. Scour POA required. Field review indicates that failure of pier/abutments is imminent. Bridge is closed to traffic. Failure is imminent based on one of the following: • A comparison of calculated scour and observed scour during the bridge inspection. • An engineering evaluation of the observed scour condition reported by the bridge inspector in Item 60.
0	Bridge is scour critical. Bridge has failed and is closed to traffic.

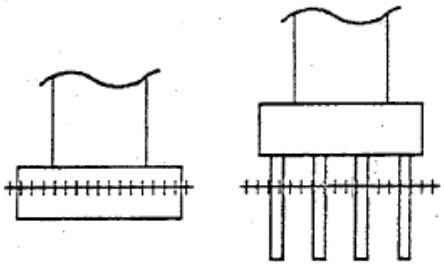
EXAMPLES: CALCULATED SCOUR DEPTH ACTION NEEDED

A. Above top of footing



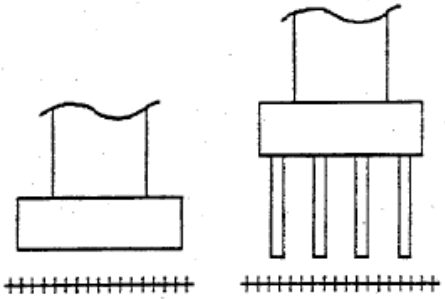
None - indicate rating of 8 for this item

B. Within limits of footing or piles



Conduct foundation structural analysis

C. Below pile tips or spread-footing base



Provide for monitoring and scour countermeasures as necessary

SPREAD FOOTING (NOT FOUNDED IN ROCK) PILE FOOTING

++++++++++++++++ = Calculated scour depth