THE CURE TO BRIDGE HEALTH

NBIS PROGRAM MANAGER?

By James K. Klein, P.E., S.E., Local Bridge Engineer, Illinois Department of Transportation

The Federal Highway Administration is now considering sanctions against the State and local agencies in Illinois for non-compliance with the National Bridge Inspection Standards (NBIS). Although still being discussed, such sanctions may involve withholding funding not only from the individual non-complying agency, but from ALL state and local agencies projects within that county. It is therefore imperative that all agencies with structures in the National Bridge Inventory come into full compliance. The following article is provided to enhance this effort.

Bridge safety is paramount to our security and the integrity of the transportation system. Responsibility of individual bridge owners for the inspection and safety of their structures may be facilitated with oversight by qualified personnel.

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Please pass this on to other interested parties in your office.
This edition of the Illinois Interchange has been dedicated to providing information about issues that may impact your local bridges and structures. Since the I-35 bridge collapse in Minnesota, the safety of the nation’s bridges and structures has become more scrutinized by the news media, elected officials, and the travelling public. Highway officials continue to balance increased material and construction costs with reduced governmental revenue while ensuring the safe and efficient movement of people and goods on our highways. The Federal Highway Administration (FHWA) has several resources to assist local highway agencies.

The FHWA Resource Center offers training and expert assistance in a variety of transportation technical areas. Their training offerings are designed to meet the needs of FHWA Division offices, state Departments of Transportation, Metropolitan Planning Organizations, local agencies, as well as other customer segments throughout the United States. The Resource Center’s Technical Service Teams offer tailored workshops, briefings, and seminars, based on customer requirements. In addition, many team members are instructors at courses offered through the National Highway Institute and National Transit Institute. Team members are also available for consultation on an as-needed basis.

The FHWA Resource Center has the following team sites related to bridges:

- Structures Team - www.fhwa.dot.gov/resourcecenter/teams/structures/index.cfm

The Federal Highway Administration's (FHWA) Office of Bridge Technology is dedicated to working together with their many partners within FHWA and in State, local, and tribal governments; industry; and academia; and among other stakeholders to provide the Nation with safe, secure, reliable, and efficient highway bridges and tunnels.

The FHWA Office of Bridge Technology has the following site:

- Bridge Technology - www.fhwa.dot.gov/bridge/

Please use the above resources and as always contact the Illinois Technology Transfer Center with any questions. Thank you.

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T2 Program Manager
With the failure of the I-35W Bridge over the Mississippi River on August 1, 2007, bridge safety and the integrity of the nation’s bridges has been under increased scrutiny. In Illinois, the Illinois Department of Transportation (IDOT) has received numerous questions from the media and the public, inquiries and examination by the Federal Highway Administration (FHWA), and has been audited by Office of the Auditor General (OAG) regarding structures on the Illinois transportation system.

Bridge engineers have also encountered more interest and curiosity from the general public about bridges. Engineering terminology and descriptions are sometimes not easily understood by others. When questioned about the I-35W failure, or bridges in general, a ready analogy was found by comparing the health of bridges to human health.

After a bridge is built, an initial inspection is performed, much like when a baby is first born. There is more attention early on to make sure the bridge is functioning as expected. Then, much as with humans, inspections are performed at longer intervals through the prime of life. There are bumps, bruises, and repairs along the way. As the bridge gets older, deterioration occurs at different rates depending on a variety of factors, and good maintenance goes a long way towards extended bridge life. Bridge life is also affected by overstressed systems, and a bridge may fail quickly and unexpectedly due to extreme conditions such as overweight vehicles, scour and seismic events. When a bridge is damaged, and as it ages, inspections are required more frequently and for special areas to check their integrity and to prolong their life, once again similar to the human cycle.

Having a good “doctor” who has personal knowledge and concern goes a long way to the health and prolonged life of the “patient”.

On January 13, 2005, new rules became effective for the National Bridge Inspection Standards (NBIS), as provided in Title 23, Code of Federal Regulations, Part 650, Subpart C, dated December 14, 2004. One of the key provisions of these new rules was that all bridges in the National Bridge Inventory (NBI) must be assigned a qualified Program Manager (PM), and inspections of these bridges must be performed by a qualified Program Manager or Team Leader (TL) to ensure compliance with the NBIS. This Program Manager is essentially the bridge’s “doctor”.

The PM not only ensures the NBIS inspections are performed, but also that they are performed correctly and at the appropriate intervals, and that

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all data is correct. They also take care to ensure that any of the “patient’s” special needs are addressed, such as the NBIS requirement for certain structures to receive fracture critical inspections, underwater inspections, special feature inspections and damage inspections, and that scour plans of actions are prepared when necessary.

The Program Manager may be used on an “on-call” basis to provide quick and personal services to assist the Local Agency in emergencies such as the recent earthquake and flooding events, as well as for other damages.

IDOT worked with the FHWA to resolve issues regarding interpretation of the new NBIS rules, and on October 31, 2005, IDOT’s Bureau of Bridges and Structures (BBS) and Bureau of Local Roads and Streets (BLRS) jointly issued BLRS Procedure Memorandum 2005-07, “NBIS Rules Changes - Qualifications for Bridge Inspection Personnel”. This Procedure Memorandum may be found (starting on page 93) at www.dot.il.gov/blr/manuals/ProcedureMemo.pdf. This Procedure Memorandum also indicated that “All local agencies (LAs) having responsibility for a structure in the NBI must designate a PM to ensure compliance with the NBIS and to provide guidance and management of their bridge inventory.”

Information in this Procedure Memorandum has been updated and augmented, and has been superseded by Section 3 of the Department’s Structural Services Manual, located at www.dot.il.gov/bridges/brmanuals.html.

IDOT personnel discussed the requirements and worked with local agencies throughout the state to increase awareness of the requirements of the NBIS, and on November 19, 2007 the Department issued BLRS Circular Letter 2007-19, NBIS PERSONNEL QUALIFICATIONS. Among other discussion, the Circular Letter asked “that all agencies with a structure in the NBI provide the name of their approved Program Manager to the District BLRS by no later than February 29, 2008.”

However, many local agencies (about half of municipalities with qualifying structures) have not yet provided this information to the Department.

Many municipalities will rely on consultants to provide this service. The responsibilities placed upon these individuals are considerable for the relatively few hours that they spend actually inspecting a bridge; as in dealing with your own health, cheapest is not always best. The engineer you are currently using for other work may not be the best option for managing inspection of your bridges. Experience in this specialty is critical, and proximity of the individual to the municipality will significantly reduce costs for this relatively low number of hours required. There is a direct correlation between the type and condition of the bridge, or patient, to the costs that may be expected, and an experienced Program Manager who provides the best, or correct diagnosis, is well worth the extra investment.

The District Bureau of Local Roads and Streets has a recent list of Program Managers who have been approved by the Department. Other Program Managers may be added to this list as they submit applications and are certified by the Department. The BLRS may be contacted for verification of Program Manager approval. Continued mutual cooperation between local agencies and the Department is essential to comply with the requirements of the NBIS, and to ensure bridge health and the safety of the traveling public.
IDOT’S LOCAL BRIDGE UNIT PROVIDES SERVICE TO LOCAL AGENCIES

The Local Bridge Unit provides administrative and technical support to local agencies to assist them in the development of bridge construction, rehabilitation, and replacement projects, and by ensuring that measures are taken to evaluate the safety of local agency bridges, including:

• reviewing Bridge Condition Reports, Preliminary Bridge Designs and Hydraulic Reports, and bridge plans;
• inspecting and rating bridges to determine load-carrying capacity;
• reviewing load-carrying capacity analyses and bridge posting recommendations prepared by consulting engineers;
• reviewing local agency construction and permit loadings;
• reviewing and developing bridge repair details;
• providing specific information for NBIS inspection scheduling to minimize NBIS inspection delinquencies;
• developing policies and procedures to provide local agencies with efficient and effective methods of complying with NBIS inspection and evaluation requirements; and
• preparing and presenting training classes to provide information on basic NBIS inspection procedures, use of the Structures Information Management System, scour evaluation, and bridge repair methods.
The process review program in Illinois has been in existence for approximately 33 years and has continually evolved during that time. Emphasis of reviews has moved from Federal compliance and cyclical reviews to joint agency quality improvement reviews based on selection of review topics through a risk-based partnering process. Historically, process reviews were conducted by Federal Highway Administration (FHWA) personnel with limited involvement of Illinois Department of Transportation (IDOT) personnel on the review team. These reviews were required by FHWA stewardship policy in states with Certification Acceptance programs. The purpose of these reviews was mainly to determine how well policies and procedures were being followed. Many of the reviews were perceived to be compliance oriented with the focus of a “gotcha” mentality. Even with this perception, many reviews were very successful and resulted in significant improvements in many areas of the highway program in Illinois. As IDOT and FHWA have progressed and changed their stewardship roles, focus has shifted to joint process reviews with IDOT and FHWA sharing in the responsibilities of the reviews. In fact, recent process reviews have included team members from counties, consultants, and even contractors. Most process reviews focus on the state maintained system, but occasionally local agencies are reviewed for stewardship and oversight purposes. It is important to note that joint process reviews are not meant to heavily scrutinize and evaluate a particular District or local agency, but rather to assess statewide processes as a whole and make recommendations for improvement. Numerous policy, procedural, and specification improvements have resulted in all areas of the highway program resulting from the process review program.

As an example of a bridge-related process review, in 2007, the Illinois Department of Transportation and the Federal Highway Administration completed a process review focused on locally administered bridge construction projects. The purpose of the review was to evaluate the quality of bridge construction on the local system in Illinois. The review focused on general inspection and oversight of local bridge projects, including contract administration, specification compliance, amount of inspection and oversight on the project, compliance with Federal-aid requirements, and general construction and material quality.

The scope of the review included a total of 19 local bridge projects located in 4 IDOT Districts. The review included interviews with IDOT District staff to determine the IDOT role in oversight of the local construction program. It also included interviews with local bridge owners including County Engineers, County inspection staff, municipal engineers and consultant inspectors to assess problems, concerns and “best practices”. In-depth documentation reviews of the selected projects were not accomplished since it was determined that quality of documentation is routinely addressed through periodic and random checks from district documentation auditors. Site visits were made during construction to observe ongoing operations and to assess overall construction quality.

A final report was produced for this review which documented 15 observations. Some of the observations were categorized as “Best Practices” while others documented noted problems or concerns. Recommendations of the review team to address the noted observations were discussed at a statewide close-out meeting in April 2008. Final resolutions of the recommendations are documented in the final report as well. It should be noted that many resolutions to recommendations take time and manpower, so many action items occur well after the release of the report. In fact, sometimes it can
take up to two years to get a recommendation implemented.

The remainder of this article will discuss some of the specific observations of the Locally Administered Bridge Construction Process Review. It includes recommendations, as well as IDOT agreements or responses to those recommendations, and is meant to provide an example of the types of issues that are considered during a typical process review.

In general, the quality of construction was good on all projects reviewed. The team looked at active and completed projects and only noted very minor problems in the physical construction. It is probable that local ownership and pride result in good quality, in that the local agency must maintain what the contractor builds.

The review documented some best practices related to the usefulness of periodic County Engineer’s meetings and the use of Illinois Construction Records System (ICORS) for construction documentation. It also discussed some problems or concerns with the availability and advertisement of training for local agencies (and consultants).

A fairly important observation that was made from the review was the general unfamiliarity with the IDOT Manual for Fabrication of PPC Products, which provides important guidelines for the inspection, fabrication and storage of PPC products. As a result of this observation, Bureau of Local Roads and Streets Circular Letter 2008-06 was issued on May 20, 2008, which essentially advertised the existence and availability of the subject manual.

Timely closing out of locally let projects was found to be a problem throughout the State. Physical completion is usually accomplished very rapidly, but closing out the project files often takes much longer (sometimes more than 2 years). Because there is no mechanism currently in place to compel a local agency to complete the paperwork and final out a project, recommendations were made to improve that situation.

Other observations that are discussed in much greater detail in the report are as follows:

- Inadequate curing of grout in PPC deck beam keyways
- Field testing of concrete varies widely and does not always conform to the IDOT Project Procedures Guide
- District-scheduled preconstruction conferences occasionally do not allow for attendance by the local owner due to lack of coordination of schedules
- There is a definite need for local agency training class on PPC deck beam construction
- Annual statewide and district-wide documentation audit summary reports are not shared with locals, so there is no information sharing on common documentation problems.
- Calibration of concrete testing equipment is not always performed at the correct frequency, and sometimes not at all.
- Lack of coordination and communication causes confusion and delay in the overall materials certification process.
- Wage rate interviews are not always being conducted per Federal requirement.

All of these items are discussed in much more detail in the final report. Specific recommendations for improvement are also documented. There are several action items assigned to team members and others that remain outstanding based on agreements reached at the statewide close-out meeting. Once completed, the actions will improve an already good local agency bridge construction program in Illinois. A copy of the final report of this process review may be obtained by contacting Dan Brydl, FHWA Division Bridge Engineer at 217-492-4632 (e-mail: dan.brydl@fhwa.dot.gov).
Since the introduction of the automobile in the early 20th century, there has been continual advancements in road and bridge construction that have culminated in the extensive highway system that we take for granted in our daily travels. To help us recall and appreciate the monumental effort that went into providing us with our present infrastructure, Illinois has established procedures for identifying and, to the best of our ability, preserving bridges with historical significance.

On June 22, 1972, President Nixon issued Executive Order 11593, regarding the Protection and Enhancement of the Cultural Environment. Subsequent to the issuance of the Executive Order, the Illinois Division of the Federal Highway Administration (FHWA) informed the Illinois Department of Transportation (IDOT) of the need to locate, inventory and nominate bridges for historic designation by July 1, 1973. The initial review of the inventory of Illinois bridges resulted in the designation of the Eads Bridge over the Mississippi River at St. Louis and six (6) covered bridges as historic.

With the passage of the Surface Transportation Assistance Act of 1978, efforts to identify bridges with historic significance were renewed and, subsequently, a committee was formed within the IDOT to further review Illinois’ bridge inventory and to develop criteria for determining historic significance. In July, 1981, the committee issued draft guidelines for the identification and categorization of historic bridges, and selected 241 bridges as having the potential to be designated historic. In July, 1981, the committee’s recommendations were then reviewed department-wide, within the IDOT, and field reviews were conducted, resulting in the identification of 398 potentially historic bridges in May of 1983.

After the establishment of the potential list of historic bridges in 1983 by the IDOT, lengthy discussions with the FHWA and the Illinois Historic Preservation Agency (IHPA) began and continued until November, 1990, when a Memorandum of Understanding (MOU) was established between the IDOT, IHPA and FHWA. The MOU required the establishment of a list of structures with historic significance to be called the Historic Bridge Survey (HBS). Some 350 bridges were included in the initial HBS, and these structures were divided into “primary” and “secondary” examples of 24 different bridge types. The IDOT Bureau of Design and Environment (BDE) maintains a copy of the HBS on the IDOT website at www.dot.state.il.us/historicbridgesurvey.pdf.

In April of 2004, the 1990 MOU was superseded by a Programmatic Agreement (PA) signed by the IDOT, IHPA and FHWA. The present PA is effective for 5 years from the date of its ratification and will be reviewed for extension and/or modification in 2009. The PA established that:

• The IDOT, in consultation with the IHPA, would establish a “primary” and “secondary” list of structures with historic significance, which was to “be known as the Historic Bridge Survey”.

• The FHWA had submitted the documentation needed to obtain a “Determination of Eligibility” from the Keeper of the National Register of Historic Places (NRHP) for all primary structures included on the HBS.

• Bridges not on the HBS will “be considered to have no historic value and may be repaired or replaced without” coordination with the IHPA.

• Bridges on the HBS would receive “routine maintenance consisting of repair or replacement in kind of

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- Documentation of repairs or rehabilitation of HBS structures would be maintained by the IDOT and periodically reviewed by the IHPA.
- If a “primary” HBS structure is lost, an analogous “secondary” HBS structure should be designated as a replacement for the lost “primary” structure, and another analogous structure should be added as a “secondary” to the HBS.
- If demolition of a “primary” or “secondary” HBS structure is required for overriding safety concerns, documentation of the need to remove the structure must be submitted to and approved by the IHPA. A Memorandum of Agreement establishing how adverse effects will be resolved must be executed.
- The HBS would be periodically updated by IDOT with IHPA consultation.
- Public meetings for bridge projects should include information as to whether or not the structure is considered historic.
- Bridges listed on the NRHP, due to nomination by the public, shall be added to the HBS.
- HBS structures to be demolished must be recorded in accordance with the Historic American Engineering Record Standards.

To the casual observer, the designation of bridges as historic may appear to be somewhat arbitrary. However, a significant amount of time, effort and interagency coordination went into the development of the HBS, and any alterations to the HBS by the IDOT can only be accomplished with the concurrence of the IHPA and the FHWA.

Even with routine maintenance and repair; continuous exposure to traffic loads and environmental elements will eventually require a bridge to be rehabilitated or, perhaps, even replaced. Projects affecting structures included in the Historic Bridge Survey must be processed and developed in accordance with the rules contained within the PA established between the IDOT, IHPA and FHWA.

When estimating the amount of time necessary to evaluate the impact of a project on a HBS structure, it is important to remember that all bridges designated in the HBS as “primary” examples fall into at least one of the following categories:
- Listed on the NRHP.
- Determined to be eligible for listing on the NRHP.
- Located within a site or area listed on the NRHP.

Documenting a project’s impact and developing mitigation for a “primary” structure associated with the NRHP could require considerable time. The IDOT attempts to minimize the time required by working closely with the IHPA during project review.

The development of projects affecting a structure in the HBS typically involves a search of the Illinois bridge inventory for bridges of similar type, age and construction that could be substituted for the HBS structure. When searching for a similar structure, the search typically begins within the county developing the project, then expands into all of the counties within the IDOT District overseeing the development of the project, and lastly into all of the counties within Illinois.

Projects involving structures in the HBS typically propose one of the following three (3) alternatives:

**Bypass the Existing Bridge**

The option of leaving a HBS structure in place, and constructing a replacement structure in the immediate vicinity of the existing bridge, is a very effective option for minimizing or eliminating the negative impact of a project on a HBS structure. A project that bypasses a HBS structure usually involves a realignment of the approach roadway to improve highway safety.

After right-of-way issues are resolved for a project bypassing a HBS structure, the existing bridge may be located within the original owner-agency’s right-of-way or on private property. Regardless of the final jurisdictional location of the HBS structure, the original owner-agency is responsible for ensuring

*Covered Bridge Constructed as Replacement for Destroyed Historic Bridge (Knox County – Wolf Bridge)*

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future maintenance and repair of the bridge. As an alternative to retaining responsibility for the HBS structure, the original owner-agency may, with the concurrence of the IDOT and the IHPA, transfer ownership and future responsibilities to another reputable agency or organization. The agency or organization with future repair and maintenance responsibility does not need to provide ready access to the HBS structure, designated parking areas for visitors, or signs to inform the public of the historical significance of the bridge. However, the responsible agency or organization must make the HBS structure available for viewing, when contacted by interested parties.

A formal 106-4(f) Report is usually not required for a project bypassing a HBS structure. In lieu of a formal report, a letter to the IDOT with maps, photos and plan information illustrating the alignment of the bypass is sufficient. The IDOT will utilize the letter and accompanying information in coordination with the IHPA, which typically occurs in an expeditious manner. Although it is not to be taken as a certainty, a final determination of “No Effect” is usually issued for a project that allows a HBS structure to remain in place by utilizing a bypass.

**Relocate the Existing Bridge**

The option of moving an HBS structure to a new location, rather than demolishing the bridge, is an effective option for minimizing the negative impact of a project on a HBS structure. A project that relocates a HBS structure may call for the intact movement of the bridge or the disassembling and reassembling of the bridge. The new location for the HBS structure must be one that provides suitable access to the bridge, with the access being equal to or greater than that provided at the original site of the bridge.

Regardless of the final location of the HBS structure, the original owner-agency is responsible for ensuring future maintenance and repair of the bridge. As an alternative to retaining responsibility for the HBS structure, the original owner-agency may, with the concurrence of the IDOT and the IHPA, transfer ownership and future responsibilities to another reputable agency or organization. The agency or organization with future repair and maintenance responsibility does not have to provide ready access to the HBS structure, designated parking areas for visitors, or signs to inform the public of the historical significance of the bridge. However, the responsible

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agency or organization must make the HBS structure available for viewing, when contacted by interested parties.

A formal 106-4(f) Report is usually not required for a project that relocates a HBS structure. In lieu of a formal report, a letter to the IDOT with maps, photos and information relative to the removal and relocation plan is sufficient. The IDOT will utilize the letter and accompanying information in coordination with the IHPA, which typically occurs in a timely manner. Although it is not to be taken as a certainty, a final determination of “No Adverse Effect” is usually issued for a project that relocates a HBS structure to a suitable location.

Remove the Existing Bridge
Removing/demolishing an HBS structure should be the last option considered, and it should be selected only after all other options have been considered and found to be unfeasible. The owner-agency must provide public notice of its intent to remove the bridge, which should include direct contact with local historic preservation groups and a publicized notice of intent in locally distributed newspapers. Documentation of public contacts and notices must be provided with reports submitted to the IDOT for review.

A project that calls for the removal/demolition of a HBS structure must be developed in full accordance with the PA established between the IDOT, IHPA and FHWA. A formal 106-4(f) Report must be submitted to the IDOT, and coordination between the IDOT and IHPA may take several months. A final determination of “Adverse Effect” is typically issued for a project that removes a HBS structure, and a search must be conducted for structures that can be placed on the HBS as a replacement for the removed bridge.

If the IDOT and IHPA concur with the removal of the HBS structure, a Memorandum of Agreement (MOA) must be established between the owner-agency, IDOT, IHPA and FHWA. The MOA establishes the mitigations required of the owner-agency in order for the IDOT, IHPA and FHWA to concur with the implementation of the project.

Within the Bureau of Design & Environment, coordination and review of projects affecting HBS structures are accomplished within the Environment Section by the Cultural Unit.

Although the procedures established for processing a project affecting a structure on the HBS may sometimes required additional time for project development, it is important to remember that, of the more than 27,000 bridges serving Illinois roadways, only the 379 structures presently on the HBS require additional coordination due to historic significance. Also, as described in this article, it can be seen that the procedures used by the IDOT do not preclude an agency from developing a project in a manner that best addresses highway needs. The established procedures only require agencies to give due consideration to the preservation of structures on the HBS and, if preservation is not possible, that proper documentation of the structure is accomplished prior to removal. As we can all agree that the past should not stand in the way of progress that will benefit society as a whole, we can also agree that taking the time to preserve reminders of our heritage and the efforts of those who came before us has great merit.
The Technology Transfer (T2) Program is a nationwide effort financed jointly by the Federal Highway Administration and individual state departments of transportation. Its purpose is to transfer the latest state-of-the-art technology in the areas of roads and bridges by translating the technology into terms understood by local and state highway or transportation personnel.

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