

## Revised National Bridge Inspection Standards (NBIS)

### What structural engineers need to know...

By Brian J. Lesbko, P.E.

The National Bridge Inspection Standards (NBIS) were revised effective January 13<sup>th</sup>, 2005. How will the changes affect the way we inspect? The answer to this question is important to structural engineers. In order to properly frame the issue, a brief history of the national bridge inspection program is necessary.



### Background

As detailed in the Federal Highway Administration (FHWA) *Bridge Inspector's Reference Manual* (BIRM), the impetus for establishing a comprehensive national safety inspection program was the catastrophic collapse of the Silver Bridge over the Ohio River at Point Pleasant, WV on December 15<sup>th</sup>, 1967. The fracture of an eyebar at a pin connection during rush hour traffic caused 31 of 37 cars on the bridge at the time to plunge into the frigid river, resulting in 46 fatalities. This tragic event set into motion federal legislation to establish safety inspection and maintenance standards for bridges nationwide. The U.S. Congress added a section to the "Federal Aid Highway Act of 1968", formally establishing a national bridge inspection standard.

### NBIS

In 1971, the National Bridge Inspection Standards (NBIS) were implemented as a Federal regulation establishing requirements for 1) inspection procedures, 2) frequency of inspections, 3) qualifications of personnel, 4) inspection reports, and 5) inventories.

(See the additional sidebar on the chronology of the NBIS from inception to the recent revision in the on-line version of this article; [www.structuremag.org](http://www.structuremag.org)).

### Changes to the Standards

As summarized in the National Bridge Inspection Standards (NBIS), 23 CFR Part 650, published in the *Federal Register*, Vol. 69, No. 239, on December 14<sup>th</sup>, 2004, the FHWA revised its NBIS regulation to clarify language that is vague or ambiguous; reorganize the standards into a more logical sequence; and make it easier for persons administering highway bridge inspection programs at the state and federal level to read and understand.

The complete *Questions and Answers on the National Bridge Inspection Standards* expand in detail on the following topics (number of questions and answers in parentheses): Implementation (5), General (2), Purpose (1), Applicability (6), Definitions (4), Bridge Inspection Organization (9), Qualifications of Personnel (10), Inspection Frequency (4), Inspection Procedures (18), Inventory (3), and Reference Manuals (3).

A summary of changes to the existing NBIS follows:

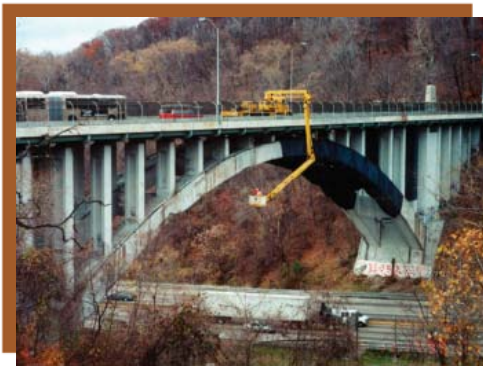
- Reformats the NBIS.
- Places referenced definitions within one location.
- Clarifies responsibilities for Federal Bridges.
- Purpose—Sets the national standards for safety inspection of all highway bridges in accordance with 23 U.S.C. 151.

- Applicability—Applies to highway bridges that carry public roads. It does not pertain to non-highway bridges (pedestrian/railroad), bridges on private roads, tunnels, and ancillary structures (high mast structures).
- Definitions—Organizes commonly used terms into a new section. Defines 33 terms.
- Bridge Inspection Organization — Delineates responsibilities of a bridge inspection organization. Defines what can be delegated, but does not relieve State or Federal agencies of their responsibilities. Overall program is run by a Program Manager.
- Qualifications—Clarifies qualifications of the Program Manager and Team Leader. Provides two ways to qualify as a Program Manager. Provides five ways to qualify as a Team Leader. Requires the individual charged with overall responsibility for load ratings be a registered professional engineer (P.E.). Requires an underwater bridge inspection diver to complete an FHWA approved comprehensive bridge inspection training course or other FHWA approved underwater bridge inspection training course. Completion of an FHWA approved comprehensive bridge inspection training course is now an explicit requirement to be a Project Manager and Team Leader.

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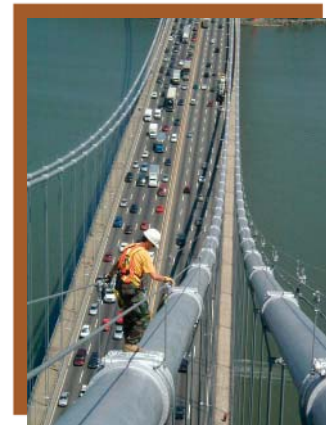


Further discussion related to highly experienced Professional Engineers actively serving as a Program Manager or Team Leader under the previous NBIS was addressed with respect to meeting the comprehensive training requirement. To satisfy the intent of the comprehensive training requirement, a Program Manager or Team Leader would need to meet the following four requirements:

- 1) Held one of these titles and were actively serving in this capacity prior to January 13<sup>th</sup>, 2005; and
- 2) are registered Professional Engineers; and
- 3) have extensive on-the-job training of 5 years or more involving direct field inspection of bridges; and
- 4) successfully complete bridge inspection refresher training within a reasonable time period (one year from inception).

The combination of professional engineering licensing requirements, prior on-the-job training, and refresher training will be considered equivalent to the comprehensive training requirement as defined in the new NBIS.

- Inspection Frequency—Maintains existing biennial not to exceed safety inspection interval. Requires establishing criteria for level and frequency of inspection at less than 24 month intervals. Maintains current 48 month not to exceed interval with FHWA approval. Maintains current 60 month underwater inspection interval. Requires establishing criteria for level and frequency of inspection less than 60 month intervals. Extends underwater inspection interval not to exceed 72 months with FHWA approval. Clearly defines fracture critical member inspection intervals not to exceed 24 months and requires establishing criteria for less than 24 month intervals. Requires establishing criteria for level and frequency of damage, in depth and special inspections.
- Inspection Procedures—Requires a Team Leader to be on site during initial, routine, in-depth, fracture critical member and underwater inspections. Specifically addresses scour critical bridges and complex bridges. Requires establishing fracture critical member and underwater inspection procedures. Establishes quality assurance/quality control requirements, which addresses refresher training. Provides for follow-up on critical findings.
- Inventory—Reaffirms reporting intervals for State or Federal agencies.
- Reference Manuals—Incorporates by reference the AASHTO manual.



## Summary

Recent changes to the National Bridge Inspection Standards, effective January 13<sup>th</sup>, 2005, were mainly a re-packaging of the previous information into a better format, with the exception of the following significant additions: Requires the individual charged with overall responsibility for load ratings to be a registered Professional Engineer; requires an underwater bridge inspection diver complete an FHWA approved comprehensive bridge inspection training course or other FHWA approved underwater bridge inspection training course; requires Project Managers and Team Leaders complete an FHWA approved comprehensive bridge inspection training course; requires a Team Leader be on site during initial, routine, in-depth, fracture critical member and underwater inspections; addresses scour critical bridges and complex bridges; requires establishing fracture critical member and underwater inspection procedures; and establishes quality assurance/quality control requirements, which address refresher training.

These changes to the NBIS have a direct impact on structural engineers engaged in bridge inspection activities. It is incumbent upon us to stay abreast of these additional requirements to limit the resulting impact on our livelihood. ■

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The complete revised *National Bridge Inspection Regulation (NBIS) December 14<sup>th</sup>, 2004*, along with the informative *Questions and Answers on the National Bridge Inspection Standards* is available online at <http://www.fhwa.dot.gov/bridge/nbis/htm>.

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## Chronology of the National Bridge Inspection Standards (NBIS)

**1968** – U.S. Congress adds a section to the “Federal Aid Highway Act of 1968” formally establishing a national bridge inspection standard.

**1970** – The FHWA *Bridge Inspector’s Training Manual 70 (Manual 70)* sets the standard for bridge inspector training. The AASHTO *Manual for Maintenance Inspection of Bridges* serves as a standard providing uniform policies and procedures for determining physical condition, maintenance needs and load capacity of highway bridges.

**1971** – The National Bridge Inspection Standards (NBIS) are implemented as a Federal regulation establishing requirements for 1) inspection procedures, 2) frequency of inspections, 3) qualifications of personnel, 4) inspection reports, and 5) inventories.

**1972** – The FHWA *Recording and Coding Guide for the Structure Inventory and Appraisal of the Nation’s Bridges (Coding Guide)* provides thorough and detailed guidance in evaluating and coding specific bridge data.

**1977** – The FHWA *Bridge Inspector’s Manual for Movable Bridges* is added as a supplement to *Manual 70* to address maintenance and inspection problems associated with movable bridges.

**1978** – The “Surface Transportation Assistance Act of 1978” is enacted to (1) provide funding for rehabilitation and new construction, and (2) require all public bridges over 20 feet in length be inspected and inventoried IAW the NBIS by December 31, 1980. AASHTO revises their *Manual for Maintenance Inspection of Bridges (AASHTO Manual)*.

**1979** – The NBIS and the FHWA *Coding Guide* are revised to provide state agencies with definite guidelines for compliance with the NBIS.

**1986** – The FHWA *Culvert Inspection Manual* is added as a supplement to *Manual 70* to address problems after several tragic failures. The FHWA *Inspection of Fracture Critical Bridge Members* is added as a supplement to *Manual 70* to address problems with fatigue and fracture critical bridges highlighted by the collapse of Connecticut’s Mianus River Bridge in June 1983.

**1988** – The FHWA *Scour at Bridges* technical advisory is published to provide guidance for developing and implementing a scour evaluation program in response to the collapse of New York’s Schoharie Creek Bridge in April 1987. Based on suggestions in the “1987 Surface Transportation and Uniform Relocation Assistance Act”, the NBIS is modified to require states to identify bridges with fracture critical details and with substructure units requiring underwater inspections, and establish special inspection procedures. The revisions also allowed for adjustment to frequency of inspections and acceptance of NICET Level III and IV certification for inspector qualifications. The FHWA *Coding Guide* is revised to provide inspectors with additional direction to perform uniform and accurate bridge inspections.

**1991** – FHWA sponsors development of the “Pontis” bridge management system, allowing customization to organizations responsible for maintaining a network of bridges. The Intermodal Surface Transportation Efficiency Act (ISTEA) required that each state implement a comprehensive bridge management system by October 1995.

**1993** – The NBIS is revised to permit bridge owners to request approval from FHWA to extend inspection cycles up to four years for bridges meeting certain requirements.

**1994** – The AASHTO *Manual for Condition Evaluation of Bridges (AASHTO Manual)* is revised to provide state agencies with guidelines for compliance with the NBIS.

**1995** – The FHWA *Coding Guide* is revised. The FHWA *Bridge Inspector’s Training Manual 90 (Manual 90)* is revised. The “National Highway System (NHS) Act of 1995” rescinded the requirement for bridge management systems, previously mandated by ISTEA.

**1998** – The Transportation Equity Act of the 21st Century (TEA-21) builds on and improves the initiatives established in ISTEA.

**2002** – *Manual 90* is revised and updated as part of a complete overhaul of the FHWA Bridge Safety Inspection Training Program. The new manual, the *Bridge Inspector’s Reference Manual (BIRM)*, incorporates all of *Manual 90*; *Manual 70* Supplements for culvert inspection and Fracture Critical Members, and course curriculum material not specifically part of the revised course objectives.

**2004** – The NBIS is revised, dated December 14, 2004.

**2005** – The revised NBIS is effective January 13, 2005.