Illinois Department of Transportation
Memorandum

To:	ALL BRIDGE DESIGNERS	25.1
From:	Jayme F. Schiff	
Subject:	Structural Services Manual Update – Section 3 & Section 5	
Date:	February 14, 2025	

All Bridge Designers (ABD) Memorandum 25.1 introduces updates to Section 3 Bridge Inspection and Section 5 Tunnel Inspection of the Structural Services Manual. The Section 3 update is a full revision with editorial changes. Section 5 incorporates updates to the NBI Subscription Service Announcement 20201221. A summary of the general changes to Section 3 and Section 5 are provided below.

Section 3

- Reorganization of section to be consistent with the National Bridge Inspection Standards (NBIS).
- Rewrite of existing content.
- Updated content for the 2022 NBIS Regulations.
- Inclusion of various interim policies.
- Inclusion of various National Bridge Inspection Program Metric requirements/guidelines.
- Updated most of the content for the 2022 Specification for the National Bridge Inventory (SNBI).
- Removal of content not related to Bridge Inspection Policy.

Section 5

- Update to account for the FHWA Tunnel Inspection metric requirements.
- New IDOT inspection forms specifically for Tunnels are now required.
- New section documenting Tunnel Load Rating requirements.
- Added requirements for determining when damage inspections will be needed.
- Numerous updates to the Quality Control and Quality Assurance section.

These updated sections are provided as a stand-alone document to get it to users as soon as possible, however, they will be incorporated in the update of the full Structural Services Manual to be issued later this year.

While many of the policies found in the updated Sections have been implemented for some time, for the intent of this notification, all policies are effective immediately. Please direct questions and comments to the Bridge Management and Inspection Unit at dot.bbs.bridgemgmt@illinois.gov for Section 3, and Sarah Wilson at Sarah.Wilson@illinois.gov for Section 5.

Attachments:
SSM Section 3 Update
SSM Section 5 Update

Structural Services Manual - 2025

Prepared by:

Bureau of Bridges & Structures
Office of Program Development

Agency:

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Table of Contents

Table of Contents **1**
Section 3 Bridge Inspection **3-7**
3.1 Purpose **3-7**
3.2 National Bridge Inspection Standards (NBIS) **3-7**
3.2.1 Documents Included by Reference (23 CFR 650.317) 3-8
3.2.2 Applicability (23 CFR 650.303) 3-8
3.2.2.1 Non-IDOT Bridge Owners 3-9
3.2.2.1.1 Non-IDOT State Agencies 3-9
3.2.2.1.2 Local Public Agencies 3-9
3.2.2.1.3 Other 3-9
3.2.2.2 Transit Highways 3-9
3.2.2.3 Privately Owned Bridges 3-10
3.2.3 FHWA Oversight of Compliance with the NBIS 3-10
3.2.3.1 Compliance Metrics 3-10
3.2.3.2 Compliance Levels 3-10
3.3 Illinois Bridge Inspection Organization **3-12**
3.3.1 Inspection Organization Responsibilities 3-12
3.3.2 Illinois Structure Information System / Bridge Inspection System (ISIS / BIS) 3-13
3.3.3 Structure Information and Procedure Manual (SIP) 3-13
3.3.4 Bridge Management System (BMS) 3-13
3.3.5 Structure Information Management System (SIMS) 3-13
3.4 Qualifications of Personnel **3-14**
3.4.1 Certified NBIS Program Manager 3-14
3.4.2 Certified NBIS Team Leader 3-15
3.4.3 Bridge Inspection Experience 3-16
3.5 Inspection Interval **3-18**
3.5.1 General 3-18
3.5.2 Routine Inspection Interval 3-18
3.5.2.1 48-Month Inspection Interval Criteria 3-19
3.5.2.2 12-Month Inspection Interval Criteria 3-21
3.5.2.3 Routine Inspection Interval for Bridges over Waterways 3-22
3.5.3 Underwater Inspection Interval 3-23

3.5.3.1 Substructure and Channel Monitoring Requirements and Options 3-23
3.5.4 Nonredundant Steel Tension Member (NSTM) Inspection Interval 3-27
3.5.5 Element Level Inspection Interval 3-27
3.5.6 Special Inspection Interval 3-27
3.6 Inspection Procedures 3-28
3.6.1 General 3-28
3.6.1.1 IDOT Bridge Inspection Forms 3-29
3.6.2 Initial Inspection – Applicable to New and Rehabilitated Bridges 3-30
3.6.3 Routine Inspection 3-30
3.6.3.1 Element Level Inspection 3-33
3.6.3.2 In-Depth Inspection 3-34
3.6.3.2.1 Inspection of Accessible Vaulted Spans 3-34
3.6.3.2.2 Channel Cross Sections 3-34
3.6.4 Underwater Inspection 3-36
3.6.4.1 Assessing Substructure Conditions Below Waterline 3-37
3.6.4.2 Procedures for Underwater Inspections 3-38
3.6.4.3 Substructure Condition Rating Based on Deficiencies Below Waterline 3-38
3.6.4.4 Determining Safe Conditions for Standard Diving Inspections 3-39
3.6.4.4.1 Procedures for Underwater Diving Inspections 3-40
3.6.5 Nonredundant Steel Tension Member (NSTM) Inspection 3-41
3.6.5.1 Identifying Bridges with NSTMs 3-43
3.6.5.2 Recording NSTM Inspections 3-45
3.6.5.3 Identifying Misclassified Bridges 3-45
3.6.5.4 NSTM Inspection – Gusset Plates 3-45
3.6.5.5 NSTM Inspection – Non-Destructive Testing 3-46
3.6.6 Special Inspection 3-46
3.6.6.1 Performing and Recording Special Inspections 3-47
3.6.6.2 Special Inspections for Multi-Girder Pin-and-Link Assemblies 3-48
3.6.6.3 Special Inspections for Dapped Beams 3-48
3.6.7 Damage Inspection 3-49
3.6.8 Load Rating Inspection 3-49
3.6.8.1 Load Rating Inspection for IDOT-Maintained Bridges/Culverts 3-50
3.6.8.2 Load Rating Inspection for Non-IDOT Bridges/Culverts 3-50
3.6.9 Complex Bridge Inspection 3-51
3.6.9.1 General Complex Bridge Inspection Procedures 3-52

3.6.9.1.1 Team Members....3-52
3.6.9.1.2 Navigable Waterways....3-53
3.6.9.1.3 Inspection Access Equipment....3-53
3.6.9.1.4 Inspection Equipment....3-54
3.6.9.1.5 Documentation....3-54
3.6.9.2 General Inspection Requirements for Suspension Bridges....3-54
3.6.9.2.1 Deck....3-55
3.6.9.2.2 Cable....3-55
3.6.9.2.3 Cable Anchorage....3-55
3.6.9.2.4 Hangers....3-56
3.6.9.2.5 Towers....3-56
3.6.9.2.6 Miscellaneous....3-56
3.6.9.3 General Inspection Requirements for Cable-Stayed Bridges....3-56
3.6.9.3.1 Deck....3-57
3.6.9.3.2 Cable....3-57
3.6.9.3.3 Cable Anchorages....3-57
3.6.9.3.4 Tower....3-58
3.6.9.3.5 Miscellaneous....3-58
3.6.9.4 General Inspection Requirements for Movable Bridges....3-58
3.6.9.4.1 Deck....3-59
3.6.9.4.2 Superstructure....3-59
3.6.9.4.3 Mechanical Systems....3-59
3.6.9.4.4 Electrical Systems....3-59
3.6.10 Critical Findings....3-59
3.6.10.1 Automatic Critical Finding Per NBIS....3-60
3.6.10.2 Potential Critical Finding....3-60
3.6.10.3 Critical Finding Reporting Requirements....3-61
3.6.10.4 FHWA Notification of a Critical Finding....3-61
3.6.11 Inspection of Bridges/Culverts under Construction....3-62
3.6.11.1 Bridge/Culvert Replacement, Repair, or Rehabilitation – Staged Construction....3-62
3.6.11.2 Bridge/Culvert Replacement – New Bridge/Culvert on New Alignment....3-62
3.6.11.3 Bridge Replacement/Rehabilitation – Closed to Traffic During Construction....3-62
3.6.11.4 Temporary Structures – Open to Traffic for > 24 Months....3-63

3.6.12 Inspection of Closed Bridges 3-63
3.7 Non-Destructive Testing 3-64
3.7.1 General 3-64
3.8 Inspection of Pins, Links, and Hangers 3-65
3.8.1 Inspection of Pin & Link Assemblies 3-65
3.8.1.1 General 3-65
3.8.1.2 Inspector Qualifications 3-65
3.8.1.3 Link Inspections 3-66
3.8.1.4 Pin Inspections 3-66
3.8.1.4.1 Preliminary Pin Inspections (PPI) 3-67
3.8.1.4.2 Supplemental Pin Inspections (SPI) 3-70
3.8.1.5 Inspection Records 3-70
3.8.2 Inspection of Cantilever Truss Suspended Span Pins & Hanger Members 3-71
3.8.2.1 General 3-71
3.8.2.2 Pin Inspections 3-72
3.8.2.3 Hanger Inspections 3-72
3.8.3 Inspection of Pins and Eyebars in Eyebar Trusses 3-72
3.8.3.1 General 3-72
3.8.3.2 Pin Inspections 3-73
3.8.3.3 Eyebar Inspections 3-73
3.9 Bridge/Culvert Scour Critical Evaluation (SCE) and Scour POA 3-74
3.9.1 General 3-74
3.9.2 Scour Evaluation and Stability Assessment (SES) of New/Rehabilitated Bridges over Waterways 3-75
3.9.3 Scour Evaluation and Stability Assessment of Existing Bridges Over Waterways 3-75
3.9.4 Reporting Field-Observed Scour 3-77
3.9.4.1 Scour Critical Bridges 3-77
3.9.4.2 Scour Susceptible Bridges 3-77
3.9.4.3 Non-Scour Critical/Susceptible Bridges 3-77
3.9.5 Revising the Coding of Scour Critical Evaluation – Item 113 3-78
3.9.6 Scour Plan of Action (POA) 3-78
3.9.7 Bridge Scour Monitoring System - BridgeWatch® 3-80
3.9.8 Countermeasures 3-82
3.10 Inspection Safety 3-83
3.10.1 Bridge Inspection Safety Training 3-83

3.10.1.1 Personal Protection Equipment (PPE) 3-83
3.11 Quality Control and Quality Assurance 3-84
3.11.1 General 3-84
3.11.2 Quality Control (QC) 3-85
3.11.2.1.1 Bridge Inspection Organization Responsibilities (23 CFR 650.307) 3-85
3.11.2.1.1.1 Bridge Inspection Organization 3-85
3.11.2.1.2 Qualifications of Personnel (23 CFR 650.309) 3-86
3.11.2.1.2.1 Program Manager 3-86
3.11.2.1.2.2 Team Leader(s) 3-86
3.11.2.1.2.3 Underwater Bridge Inspection Diver 3-87
3.11.2.1.2.4 Damage, Special, and Service Inspection Types 3-88
3.11.2.1.3 Inspection Interval (23 CFR 650.311) 3-88
3.11.2.1.3.1 Routine 3-88
3.11.2.1.3.2 Underwater 3-89
3.11.2.1.3.3 Nonredundant Steel Tension Member (NSTM) 3-89
3.11.2.1.3.4 Special, In-Depth, and Service 3-90
3.11.2.1.3.5 Interval Criteria 3-90
3.11.2.1.4 Inspection Procedures (23 CFR 650.313) 3-91
3.11.2.1.4.1 Quality Inspections 3-91
3.11.2.1.4.2 Load Rating 3-91
3.11.2.1.4.3 Post or Restrict 3-92
3.11.2.1.4.4 Bridge Files 3-92
3.11.2.1.4.5 Nonredundant Steel Tension Member (NSTM) 3-93
3.11.2.1.4.6 Underwater 3-94
3.11.2.1.4.7 Scour 3-95
3.11.2.1.4.8 Complex Feature 3-95
3.11.2.1.4.9 In-Depth 3-96
3.11.2.1.4.10 Inspection Procedures – Quality Control (QC) and Quality Assurance (QA) 3-97
3.11.2.1.4.11 Critical Findings 3-97
3.11.2.1.5 Inventory (23 CFR 650.315) 3-98
3.11.2.1.5.1 Bridge Data Quality 3-98
3.11.2.1.5.2 Timely Updating of Data 3-99
3.11.2.2 Review of Bridge Inspection Reports 3-99

3.11.2.3 Inspector Performance....3-100
3.11.2.4 Illinois Certified NBIS Program Manager/Team Leader - Supporting Documentation....3-101
3.11.2.5 Review of Bridge Files....3-101
3.11.2.6 Inventory Data Verification....3-102
3.11.2.7 Bridge Inspection Refresher Training....3-103
3.11.3 Quality Assurance (QA) – Bridge Inventory / Bridge Files / Inspection....3-104
3.11.3.1 IDOT NBIS Reviews....3-104
3.11.3.1.1 Bridge Inventory and File Review - Virtual....3-104
3.11.3.1.2 Bridge Inspection Review - Field Visit (at IDOT's Discretion)....3-105
3.11.3.2 NBIS QA Review Report....3-105
3.12 Inspection of Non-NBIS Bridges/Culverts....3-106
3.12.1 General....3-106
3.12.2 Small Bridge/Culvert Inspection Program....3-106
3.12.2.1 Inventory and Appraisal....3-107
3.12.2.2 Routine Inspection of Small Bridges/Culverts....3-108
3.12.3 Ancillary Bridges....3-109
3.12.4 Bridges Not Carrying Public Roadways....3-109
3.12.4.1 Bridges Not Carrying Public Roadway Over Public Roadway – Both Maintained by Same Agency....3-110
3.12.4.2 Bridges Not Carrying Public Roads Over Public Roadway – Maintained by Different Agencies....3-110
3.12.4.3 Bridges Not Carrying Public Roadway Over Private Roadway....3-111
3.13 Bridge/Culvert Inventory....3-111
3.13.1 The National Bridge Inventory (NBI)....3-111
3.13.2 Recording Bridge Inventory Information....3-111
3.13.3 Updating Structure Inventory & Appraisal (SI&A) Information....3-112

Section 3 Bridge Inspection

3.1 Purpose

This Section of the IDOT *Structural Services Manual* provides documentation of the official bridge inspection policies for the State of Illinois.

Inspections of structures located on public roads are necessary to provide adequate safety for the traveling public, ensure compliance with the National Bridge Inspection Standards (NBIS), and protect the large investment in Illinois bridges.

The primary purpose of this section is to provide information pertaining to bridge inventory and inspection activities. The information provided in this section summarizes IDOT inspection policies and guidelines for the effective and efficient management of the bridge inspection program. The information provided in regard to inspection types and frequencies is also applicable to structures under the jurisdiction of agencies other than IDOT, where the oversight for inspections is the responsibility of the agency having jurisdiction.

The primary function of the bridge inspections performed in accordance with the NBIS is to ensure that bridges serving public roadways in Illinois remain safe. The results of the inspections are also used as a tool to assist in determining bridge preservation, maintenance, and improvement needs.

3.2 National Bridge Inspection Standards (NBIS)

Congress implements highway policy through passage of federal statutes that govern, in part, the inspection of the Nation's bridges. The statutes are codified in the United States Code (USC) as the National Bridge Inspection Standards (NBIS) in the Code of Federal Regulations (CFR) under Title 23, Chapter I, Subchapter G, Part 650, Subpart C. To maintain full compliance with the NBIS, IDOT must adhere to all policies, procedures, and regulations established by the Federal Highway Administration (FHWA).

Bridge inspections are generally performed and recorded under the requirements of the NBIS. The NBIS are federal regulations establishing minimum requirements for inspection

organizations, qualifications of personnel, frequency of inspections, inspection procedures, and the preparation and maintenance of a bridge inventory.

The FHWA administers the NBIS under the guidelines outlined in the FHWA *Recording and Coding Guide for the Structure Inventory and Appraisal of the Nation's Bridges* (Coding Guide) which is in the process of being replaced by the Specifications for the National Bridge Inventory (SNBI). The information collected, as required by the NBIS, is reported annually to the FHWA.

3.2.1 Documents Included by Reference (23 CFR 650.317)

Additional documents are incorporated into the requirements of the NBIS by reference. These include the following AASHTO publications:

- *The Manual for Bridge Evaluation* (MBE), Third Edition (2018) and Interim revisions, for procedures related to 23 CFR 650.305 - Definitions and 23 CFR 650.313 – Inspection Procedures.
- *Manual for Bridge Element Inspection* (MBEI), Second Edition (2019), for procedures related to 23 CFR 650.315 – Inventory.

Conformance with these manuals is required to be considered in compliance with the NBIS.

In addition to the Coding Guide and SNBI, several FHWA publications have been developed to assist the states in uniformly complying with the NBIS including, but not limited to, the following:

- *Bridge Inspector's Reference Manual* (BIRM), 2022 NBIS Edition (2023)
- *Underwater Bridge Inspection* (Publication No. FHWA-NHI-10-027)
- *Evaluating Scour at Bridges* (HEC-18), (Publication No. FHWA-HIF-12-003)

3.2.2 Applicability (23 CFR 650.303)

The NBIS apply to all structures defined as highway bridges located on all public roads, on and off Federal-aid highways, including tribally owned and federally owned bridges, private bridges that are connected to a public road on both ends of the bridge, temporary bridges, and bridges under construction with portions open to traffic. A public road is considered to be any road or street under the jurisdiction of, and maintained by, a public authority and open to public travel.

3.2.2.1 Non-IDOT Bridge Owners

Non-IDOT bridges in the inventory are delegated to a bridge owner for performance of management and duties associated with compliance with the NBIS. The owners are responsible for ensuring NBIS-related duties are performed by qualified personnel and documentation is provided to IDOT in a timely manner.

3.2.2.1.1 Non-IDOT State Agencies

- Illinois State Toll Highway Authority (ISTHA)
- Illinois Department of Natural Resources (IDNR)
- State Universities

3.2.2.1.2 Local Public Agencies

- Counties
- Townships
- Municipalities
- Park Districts
- Community Colleges

3.2.2.1.3 Other

- HOAs
- Private Companies
- Railroads

3.2.2.2 Transit Highways

The FHWA considers the NBIS to be applicable to roadways dedicated to publicly accessible transit vehicles, typically buses carrying the general public. As such, agencies with jurisdiction over these bridges are subject to the policies set forth in this manual.

3.2.2.3 Privately Owned Bridges

Although the NBIS requirements are not applicable to privately owned bridges that are not connected to a public road on both ends, the FHWA strongly encourages private bridge owners to follow the NBIS as the standard for inspecting their bridges. In instances where a privately owned bridge carries or crosses a public road, the FHWA has indicated that the agency with jurisdiction over the public road should encourage the private bridge owner to inspect the bridge in accordance with the NBIS or reroute the public road.

3.2.3 FHWA Oversight of Compliance with the NBIS

In response to a recommendation from the Office of the Inspector General (OIG) and Congressional direction, the FHWA developed a new systematic, data-driven, and risk-based oversight process for monitoring State compliance with the NBIS. The process established metrics that can be traced directly to the NBIS regulation. Annually, each metric is assessed at one of three intensity levels (Minimum, Intermediate, or In-Depth), based on risk. The FHWA then analyzes the results from the State reviews to identify nationwide bridge safety risks that may require closer review in future years.

3.2.3.1 Compliance Metrics

Metrics established by FHWA are used to assess each State's compliance with the NBIS. Each metric is assessed individually and with equal importance. Each of the metrics is related to a specific NBIS regulation. Specific criteria are established for determining the level of compliance with each metric.

3.2.3.2 Compliance Levels

Each of the compliance metrics is annually assessed by FHWA and assigned one of four compliance levels based upon specific measures and thresholds for each compliance level identified in each metric. The degrees of compliance and resulting actions are described here:

- ***Compliant*** – Adhering to the NBIS regulation.
- ***Substantially Compliant*** – Adhering to the NBIS regulation with minor deficiencies, as set forth in each of the metric requirements. These deficiencies do not adversely affect the overall

effectiveness of the program and are isolated in nature. Documented deficiencies are brought to the State's attention with the expectation that they are corrected within 12 months or less, unless the deficiencies are related to issues that would most efficiently be corrected during the next inspection. Per the Notice, an Improvement Plan describing corrective action(s) by the State is required (79 FR 27032).

- ***Non-Compliant*** – Not adhering to the NBIS regulation; in general, failing to meet one or more of the Substantial Compliance criteria for a metric. Identified deficiencies may adversely affect the overall effectiveness of the program. Failure to adhere to an approved Plan of Corrective Action (PCA) is also considered non-compliance. Metrics which remain non-compliant will invoke the penalty for non-compliance per 23 U.S.C. 144(h)(5).
- ***Conditionally Compliant*** – Taking corrective action in conformance with an FHWA-approved PCA to achieve compliance with the NBIS. Deficiencies, if not corrected, may adversely affect the overall effectiveness of the program. Metrics which are determined to be conditionally compliant will not invoke the penalty for non-compliance.

Actions taken to address findings of Substantially Compliant and Non-Compliant, respectively, are as follows:

- ***Improvement Plan (IP)*** – A written response by the State that documents the agreement for corrective action(s) to address deficiencies identified in a Substantial Compliance determination. The completion timeframe for such agreements is limited to 12 months or less, unless the deficiencies are related to issues that would most efficiently be corrected during the next inspection cycle.
- ***Plan of Corrective Action (PCA)*** – A written document prepared and submitted by the State and approved by FHWA describing the steps that are taken and timelines to take those actions in order to correct non-compliant NBIS metrics. An agreed-upon PCA for a non-compliant metric removes the possibility of a penalty based upon that metric.

3.3 Illinois Bridge Inspection Organization

3.3.1 Inspection Organization Responsibilities

Illinois complies with the NBIS program requirements for inspection and inventory data through the following responsible positions.

Statewide NBIS Program Manager (Statewide PM): The IDOT Bridge Management & Inspection Unit Chief within the Bureau of Bridges & Structures providing statewide oversight for all NBIS-related activities. The Statewide NBIS Program Manager is responsible for inspection policy and for ensuring the quality of the NBIS program.

IDOT District NBIS Program Manager: The IDOT District Bridge Maintenance Engineers providing oversight for all NBIS related activities for IDOT-maintained bridges within their designated area of responsibility.

IDOT District 1 Area NBIS Program Manager: The IDOT Area Bridge Inspection Engineers in District 1 providing oversight for all NBIS related activities for IDOT-maintained bridges within their designated area of responsibility.

Agency Designated NBIS Program Manager (Agency PM): For purposes of this section, an "Agency" is defined as any entity owning a bridge in Illinois. All entities with jurisdiction of a bridge in the NBI must designate an Agency NBIS Program Manager to ensure compliance with the NBIS and provide guidance and management of their bridge inventory. Entities may designate in-house staff or a consultant currently certified as an NBIS Program Manager. The consultant and agency must discuss and clarify the Program Manager duties such as responding to BridgeWatch® alerts, entering inspections into the ISIS, maintaining official bridge files, reporting and addressing critical findings, performing QC/QA activities, and responding to IDOT requests for additional NBIS information, and other NBIS-related activities.

The agency must complete IDOT Form BBS 3310 Agency NBIS Program Manager Designation to designate their Program Manager and submit it to the Bridge Management & Inspection Unit at DOT.BBS.BridgeMgmt@illinois.gov.

3.3.2 Illinois Structure Information System / Bridge Inspection System (ISIS / BIS)

The Illinois Structure Information System (ISIS) is the official database containing all Illinois bridge inventory and inspection information. The bridge data stored in ISIS for each structure includes an inventory record, inspection records, and information related to construction, reconstruction, highway routes, scour evaluations, microfilm, and design.

The web-based Bridge Inspection System (BIS) is utilized by bridge inspectors to record the results of bridge inspections for entry into the ISIS.

3.3.3 Structure Information and Procedure Manual (SIP)

The IDOT *Structure Information and Procedure Manual* (SIP Manual) is the official document describing ISIS, which includes the various data items it contains and coding of each item. This includes the criteria to be used by bridge inspectors when assigning condition ratings and appraisals. Use and knowledge of this manual is essential for all inspectors and others involved in the inventory and inspection of Illinois bridges. The manual is maintained by the IDOT Office of Planning and Programming, Data Management Unit.

3.3.4 Bridge Management System (BMS)

The Bridge Management System (BMS) contains element level inspection and condition state information. Element Level Inspections provide detailed quantitative condition data for each element of a bridge. This system provides IDOT with an enhanced capability of predicting future bridge programming needs. Guidance for Element Level Inspections is included in the AASHTO *Manual for Bridge Element Inspection (MBEI)* and the IDOT supplement to the MBEI.

3.3.5 Structure Information Management System (SIMS)

The Structure Information Management System (SIMS) provides personnel with access to information contained in the ISIS. SIMS provides a means to easily and quickly access NBIS information and to run data queries on the bridge inventory. For bridges not maintained by IDOT, the SIMS- database files for each county may be obtained from IDOT's website.

3.4 Qualifications of Personnel

The quality of a bridge inspection program is very much dependent on the performance of the NBIS Program Manager in charge of each agency's inspection program and on the NBIS Team Leaders of the inspection teams performing the field inspections. Per the NBIS and IDOT policy, prospective applicants must meet minimum requirements in order to be considered qualified to dispense the duties of Program Manager and Team Leader. IDOT has established a certification process to review, verify and approve the education, training and experience of an individual to function as a Program Manager or Team Leader in Illinois. A list of qualified personnel is maintained on IDOT's website.

3.4.1 Certified NBIS Program Manager

The NBIS provides minimum qualification requirements to be certified as a Program Manager. IDOT Form BBS 2610 Bridge Program Manager Application must be used for the purpose of documenting and submitting Program Manager applications to the Statewide PM for review and approval.

To satisfy NBIS and IDOT requirements to function as a Program Manager, an individual must have the following qualifications and training:

- Licensed as a Professional Engineer or Structural Engineer with 6 months minimum bridge inspection experience (limited to active participation in bridge inspection) or has 10 years of NBIS bridge inspection experience.
- Successful completion of a FHWA-approved comprehensive bridge inspection training course. NHI 130055 "Safety Inspection of In-Service Bridges" or NHI 130056 "Safety Inspection of In-Service Bridges for Professional Engineers" satisfies the comprehensive bridge inspection training requirement.
- Successful completion of a cumulative total of 18 hours of FHWA-approved bridge inspection refresher training over each 60-month period. NHI 130053 "Bridge Inspection Refresher Training" is available to satisfy NBIS bridge inspection refresher training requirements. The Illinois Bridge Inspection Refresher Training (when FHWA approved) will also satisfy this requirement.
- If the Program Manager is managing a bridge inventory with NSTMs or overseeing Team Leaders inspecting bridges with NSTMs, successful completion of FHWA-approved NSTM

inspection training is required. NHI 130078 Bridge Inspection Techniques for Nonredundant Steel Tension Members (NSTM) is available to satisfy these requirements.

- If the Program Manager is overseeing Element Level Inspections, successful completion of either the IDOT Element Level Bridge Inspection course or the FHWA 2-day Introduction to Element Level Inspections is required.

Individuals who have been certified by IDOT to function as NBIS Program Managers are also qualified to function as NBIS Team Leaders.

3.4.2 Certified NBIS Team Leader

The NBIS provides minimum qualification requirements for licensed engineers and for technical personnel to be certified as Team Leaders. IDOT Form BBS 2620 Team Leader Qualifications must be used for the purpose of documenting and submitting Team Leader applications to the Statewide PM for review and approval.

To satisfy NBIS and IDOT requirements to function as a Team Leader, an individual must have at least one of the following qualifications:

- Licensed as a Professional Engineer or Structural Engineer with 6 months of bridge inspection experience (limited to active participation in bridge inspection).
- 5 years of bridge inspection experience.
- Bachelor's degree in engineering from an ABET-accredited college or university, a passing score on the Fundamentals of Engineering Exam, and 2 years of bridge inspection experience.
- Associate's degree in engineering or engineering technology from an ABET-accredited college or university and 4 years of bridge inspection experience.
- Individuals who have been certified by IDOT to function as NBIS Program Managers are also qualified to function as NBIS Team Leaders.

In addition to the above qualifications, each Team Leader must have the following training:

- Successful completion of a FHWA-approved comprehensive bridge inspection training course. NHI 130055 "Safety Inspection of In-Service Bridges" and NHI 130056 "Safety

Inspection of In-Service Bridges for Professional Engineers" satisfy the bridge inspection training requirement.

- Successful completion of a cumulative total of 18 hours of FHWA-approved bridge inspection refresher training over each 60-month period. NHI 130053 "Bridge Inspection Refresher Training" is available to satisfy NBIS bridge inspection refresher training requirements.
- If the Team Leader is inspecting bridges with NSTMs, successful completion of FHWA-approved NSTM inspection training is required. NHI 130078 "Bridge Inspection Techniques for Nonredundant Steel Tension Members (NSTM)" is available to satisfy these requirements.
- The NBIS requirement for comprehensive bridge inspection training also extends to divers performing Underwater Inspections. NHI 130091 "Underwater Bridge Inspection" provides an overview of diving operations that will be useful to IDOT and Agency personnel responsible for managing Underwater Inspections. This course also fulfills the NBIS bridge inspection training requirement for all divers conducting Underwater Inspections.
- If the Team Leader is overseeing Element Level Inspections, successful completion of either the IDOT Element Level Bridge Inspection course or the FHWA 2-day Introduction to Element Level Inspections is required.

3.4.3 Bridge Inspection Experience

Per the NBIS, bridge inspection experience is defined as:

> Bridge Inspection Experience: Active participation in bridge inspections in accordance with the NBIS, in either a field inspection, supervisory, or management role. Some of the experience may come from relevant bridge design, load rating, bridge construction, and bridge maintenance experience provided it develops the skills necessary to properly perform a NBIS inspection.

To provide agencies with guidance and clarification of experience levels adequate to satisfy NBIS requirements, the FHWA has provided the following statement in regard to the "desired minimum bridge inspection experience level" for personnel engaged in bridge inspections:

> Minimum Bridge Inspection Experience Level: The predominate amount, or more than fifty percent, shall come from NBIS bridge safety inspection experience. Other experience

in bridge design, bridge maintenance, or bridge construction may be used to provide the additional required experience.

Based on the guidelines provided by FHWA, Engineering Personnel or Technical Personnel can function as Team Leaders after the Statewide PM has evaluated their training and experience and determined that they are qualified. The values, provided in the following table for Bridge Related Experience and Performance of NBIS Inspections, represent the minimum level of experience required to satisfy criteria requirements:

Personnel Type	Bridge Inspection Experience (months)	Performance of NBIS Inspections (months)
Engineering Personnel with PE	6	6 (min.)
Engineering Personnel with FE/EIT	24	12 (min.)
Engineering Personnel without FE/EIT	48	24 (min.)
Technical Personnel – Associate's Degree	48	24 (min.)
Technical Personnel	60	30 (min.)

Table 3.4-1 – Team Leader Bridge Inspection Experience Requirements

When the experience of personnel does not meet the "Minimum Bridge Inspection Experience Level", the Statewide PM must be contacted and will coordinate the review of the experience with the responsible NBIS Program Manager and the applicant. An individual having less than the shown number of months of bridge-related experience accumulated over the course of their career through the performance of bridge inspections, bridge design, bridge maintenance, or bridge construction activities, with a portion of their accumulated bridge-related experience obtained through the performance of NBIS Inspections, meets the experience requirements to qualify as a Team Leader only if both the Statewide PM and FHWA concur that the individual's experience is acceptable. This criterion should only apply to special situations involving highly qualified individuals performing NBIS bridge inspections that require specialized knowledge or training on unusual or complex bridges. If approved, additional stipulations may be placed on the applicant.

3.5 Inspection Interval

3.5.1 General

The following sections document NBIS and IDOT requirements for the required frequency of different bridge inspection types. Routine, NSTM, Underwater, Element Level, and Special Inspections (with intervals ≥ 12months) shall be completed by the end of the month in which the inspections are due. Special Inspections with intervals < 12 months must be completed by the due date.

Agency PMs must ensure the NBIS inspections do not become delinquent. For rare and unusual circumstances, such as extreme flooding, coordination with an uncooperative third party, or equipment availability, the Statewide PM, through coordination with the FHWA Division Office, may preapprove inspection delays when it is expected to cause a delinquency greater than 30 days. Notification of all bridge inspection delinquencies and delay requests must be sent by the Agency PM to the Bridge Management Group at DOT.BBS.BridgeMgmt@illinois.gov.

The email must include the inspection due date(s), reason for the delay, and date scheduled for follow-up attempt to inspect. If unable to perform the inspection by the scheduled follow-up date, notify the Bridge Management Group for further evaluation. A copy of all correspondence related to inspection delays must be provided to the Bureau of Bridges & Structures and shall be kept in the Bridge File.

3.5.2 Routine Inspection Interval

The Routine Inspection Interval will vary over the life of the bridge. The Initial Inspection of any new, rehabilitated, or structurally modified bridge must be completed within 3 months of opening to traffic. The first Routine Inspection must be within 24 months, but no sooner than 12 months, after the Initial Inspection. After the first Routine Inspection, the interval will remain at 24 months unless the bridge qualifies for a 48-month inspection interval as described in Section 3.5.2.1.

The NBIS allows bridges in good condition to be inspected at intervals greater than 24 months. The FHWA has concurred with IDOT's criteria for determining a maximum allowable interval for Routine Inspections. Based on the established criteria, the Routine Inspection interval is computer generated in ISIS for Routine Inspection Interval - Item 91 | B.IE.05.

The 48-month inspection interval represents the maximum allowable in Illinois for bridges/culverts with an AASHTO length greater than 20.0 feet and in no way precludes inspections at lesser intervals. The Agency PM may allow bridges to be inspected more frequently than policy requires.

3.5.2.1 48-Month Inspection Interval Criteria

Bridges with Main Span Material – Item 43A | B.SP.01, Main Span Type – Item 43B | B.SP.06, Near/Far Approach Span Material – Items 44AN/AF | B.SP.01, or Near/Far Approach Span Type – Items 44BN/BF | B.SP.06 indicated in the following Table 3.5-1 are not eligible for the 48-month inspection interval and must be inspected at a maximum of 24-month intervals.

Item 43 Item B.SP.01	Item 44 Item B.SP.06	Main Span Material	Main Span Type
All	03	All	Deck Girder
All	08	All	Orthotropic Deck
All	09	All	Deck & Truss
All	10	All	Thru & Pony Truss
All	12	All	Thru Arch
All	13	All	Suspension
All	14	All	Cable Stayed
All	15 - 17	All	Movable
All	24	All	Thru Girder
All	28	All	Segmental Box Girder
All	30 - 70	All	Specific Truss Types
All	00	All	Other
3	11	Steel	Deck Arch
3	19	Steel	Culvert
7	All	Timber	All
8	All	Masonry	All
9	All	Aluminum, Wrought Iron, Cast Iron	All
0	All	Other or Varied	All

Table 3.5-1 - Span Materials and Types not Eligible for 48-month Inspection Interval

For bridges not included in Table 3.5-1, the following conditions must be met in order to have an Inspection Interval of 48 months:

- Deck Condition - Item 58 | B.C.01 coded ≥ "6".
- Superstructure Condition – Item 59 | B.C.02 ≥ “7”.
- Substructure Condition - Item 60 | B.C.03 coded ≥ "7".
- Culvert Condition - Item 62 | B.C.04 coded ≥ "7".
- Field Scour Evaluation - Item B.C.11 must be ≥ 5.
- Channel Condition - Item 61 | B.C.09 must be coded ≥ “6”.
- Channel Protection Condition – Item B.C.10 must be ≥ “6”.
- Inventory Rating Factor ≥ 1.00 and must not have any weight restrictions (Bridge Posting Level - Item 70 must be coded “5”).
- Minimum Vertical Clearance On - Items 53A/B | B.H.13 and Minimum Vertical Highway Underclearance - Items 54B1/B2 | B.H.13 must be 14’-0”, or greater (if applicable).
- The Length of Longest Span - Item 48 | B.G.04 must not be greater than 100 feet.
- Estimated AADT Count - Item 29 | B.H.09 must be < 30,000 and Average Daily Truck Traffic ≤ 3,000. Culverts with 2 or more feet of fill are not subject to the AADT and Truck count criteria.
- The age of the bridge must not exceed 50 years (with reference to Construction Year – Item 27A | B.W.01 where Construction Type Indicator - Item 27 | B.W.03 = “O”) unless the bridge has been reconstructed within the past 30 years (with reference to Construction Year - Item 27A | B.W.02 where Construction Type Indicator - Item 27 | B.W.03 = “R”).
- All structural members are load-path redundant.
- Scour Critical Evaluation - Item 113 coding must be “5”, “8”, “9”, or “Blank” (for bridges not over waterways).
- Scour Vulnerability – Item B.AP.03 coding must be “A”, “AB-T”, or “Blank” (for bridges not over waterways).
- The bridge shall not carry an interstate route, interstate ramp, or any highway over an interstate. The Functional Classification - Item 26 | B.H.01 for highway on/under cannot be coded “10”.
- The bridge must not be on the Strategic Highway Network (STRAHNET) system as designated by Special Systems - Item 100 | B.H.05 coded “4”.
- No Category E or E’ fatigue details.

Bridges with repair histories indicating a substantial probability of future problems should not be eligible for the 48-month NBIS Routine Inspection Interval. Such a determination may be made at the discretion of the Agency PM or the Statewide PM.

The eligibility of each bridge is automatically reviewed by the ISIS following any revision of applicable inventory and inspection data. Any formerly eligible structures which no longer meet the 48-month inspection interval criteria have the Routine Interval reduced to a maximum of 24 months. The ISIS automatically changes a 48-month inspection interval to 24 months if:

1. The age of the bridge will reach 50 years from the Construction Year – Item 27A | B.W.01 before the next Routine Inspection is due: or
2. The age of the bridge will reach 30 years from the Reconstruction Year – Item 106 | B.W.02 before the next Routine Inspection.

Changes to Inventory items noted above may trigger an immediate change of a 48-month interval to a 24-month interval, causing a bridge to become “instantly delinquent”. When this occurs, every effort must be made to complete the inspection within 30 days. The Delinquency Reason must be properly documented in the Bridge File, on the inspection form(s), and in the ISIS.

3.5.2.2 12-Month Inspection Interval Criteria

IDOT maintained bridges satisfying one or more of the following criteria are required to have a Routine Inspection interval of 12-months:

- Deck Condition Rating – Item 58 | B.C.01 ≤ “3”.
- Superstructure Condition Rating - Item 59 | B.C.02, Substructure Condition Rating - Item 60 | B.C.03, or Culvert Condition Rating - Item 62 | B.C.04 ≤ “4”.
- Field Scour Evaluation – Item B.C.11 ≤ “3”.
- Bridge Posting Level - Item 70 is ≠“5” (No Posting or Legal Load Restrictions Required).
- Legal Load Only bridges do not require a 12-month interval if there is a Special Inspection requirement to monitor areas causing the restriction and the Inspection Interval is ≤ 12 months. Coordination with the Bureau of Bridges & Structures is required.
- After the Initial Inspection of Segmental Box Girders, Cable Stayed Superstructures, and Tied Arches, there shall be two 12-month inspection intervals before being considered for a 24-month inspection interval. After the first two 12-month inspections are completed with no

identified deficiencies or areas of concern, the Agency PM may request the Routine Inspection Interval be increased to 24-months. The request must be done in writing using IDOT Form BBS CBW1 Complex Bridge 12-Month Waiver Statement. This documentation must be approved and signed by the Bureau Chief of Bridges & Structures and the Statewide PM. The original "wet" signature copy must be kept in the official Bridge File and an electronic copy on file in the ISIS.

Non-IDOT maintained bridges are currently not subject to a 12-month Routine Inspection Interval. However, IDOT may require a Special Inspection with a 12-month Inspection Interval for non-IDOT bridges in poor condition (condition ratings coded "4" or less) and based on Load Rating Inspections conducted by qualified personnel to determine the safe load carrying capacity of bridges.

3.5.2.3 Routine Inspection Interval for Bridges over Waterways

For bridges over waterways not meeting the Basic Submergence Criteria specified in Section 3.6.4, the condition of substructure elements below the waterline and the surrounding streambed must be assessed during each Routine Inspection. Evaluation of site conditions is required to establish if the normal Routine Inspection Interval is adequate to monitor the parts of the substructure underwater and the streambed. More frequent monitoring can be done with a Special Inspection requirement.

- When only a portion of the substructure units require more frequent monitoring, a Special Inspection is appropriate over a reduced Routine Inspection Interval. Special Inspections can be staggered to efficiently monitor the bridge by having the Special Inspection performed between Routine Inspections.
- When a majority of the substructure units and/or the entire streambed require more frequent monitoring, a reduced Routine Inspection Interval is appropriate over a Special Inspection requirement. See Section 3.3.4 for more guidance on monitoring requirements and recommended intervals. In-Depth Inspection Interval

Every bridge in Illinois must receive an In-Depth Inspection at an interval not to exceed a multiple of the Routine Inspection Interval. See Table 3.6-1.

Routine Inspection Interval (Months)	In-Depth Inspection Interval (Months)
12	48
24	72
48	96

Table 3.6-1 Inspection Intervals

3.5.3 Underwater Inspection Interval

Bridges requiring Underwater Inspections as specified in Section 3.6.4 must have an Initial Inspection within 90 days of opening to traffic or from date of determined need. After the Initial Inspection has been performed, the Underwater Inspection Interval - Item 92B | B.IR.03 shall be set by the Agency PM. IDOT policy is to use an interval of 60 months unless site conditions indicate a need to monitor elements below the waterline more frequently. Alternatively, the Underwater Inspection Interval could be set at 60 months and a Special Inspection could be used to monitor a specific area of concern at a shorter interval.

When only a portion of the substructure units require more frequent monitoring, a Special Inspection may be appropriate rather than reducing the Underwater Inspection Interval. Special Inspections can be staggered to efficiently monitor the bridge by having the Special Inspection performed between Underwater Inspections.

When site conditions indicate the need to monitor a majority of the substructure units and/or the entire streambed require more frequent monitoring, a reduced Underwater Inspection Interval may be appropriate over a Special Inspection requirement. See 3.5.3.1 for more guidance on monitoring requirements and recommended inspection intervals.

3.5.3.1 Substructure and Channel Monitoring Requirements and Options

When site conditions warrant additional monitoring, refer to Figure 3.5-1 “Substructure Condition Assessment Method Below Waterline” to determine the monitoring requirements and Table 3.5-2

"Substructure and Channel Monitoring Options" to determine the appropriate inspection type and interval.

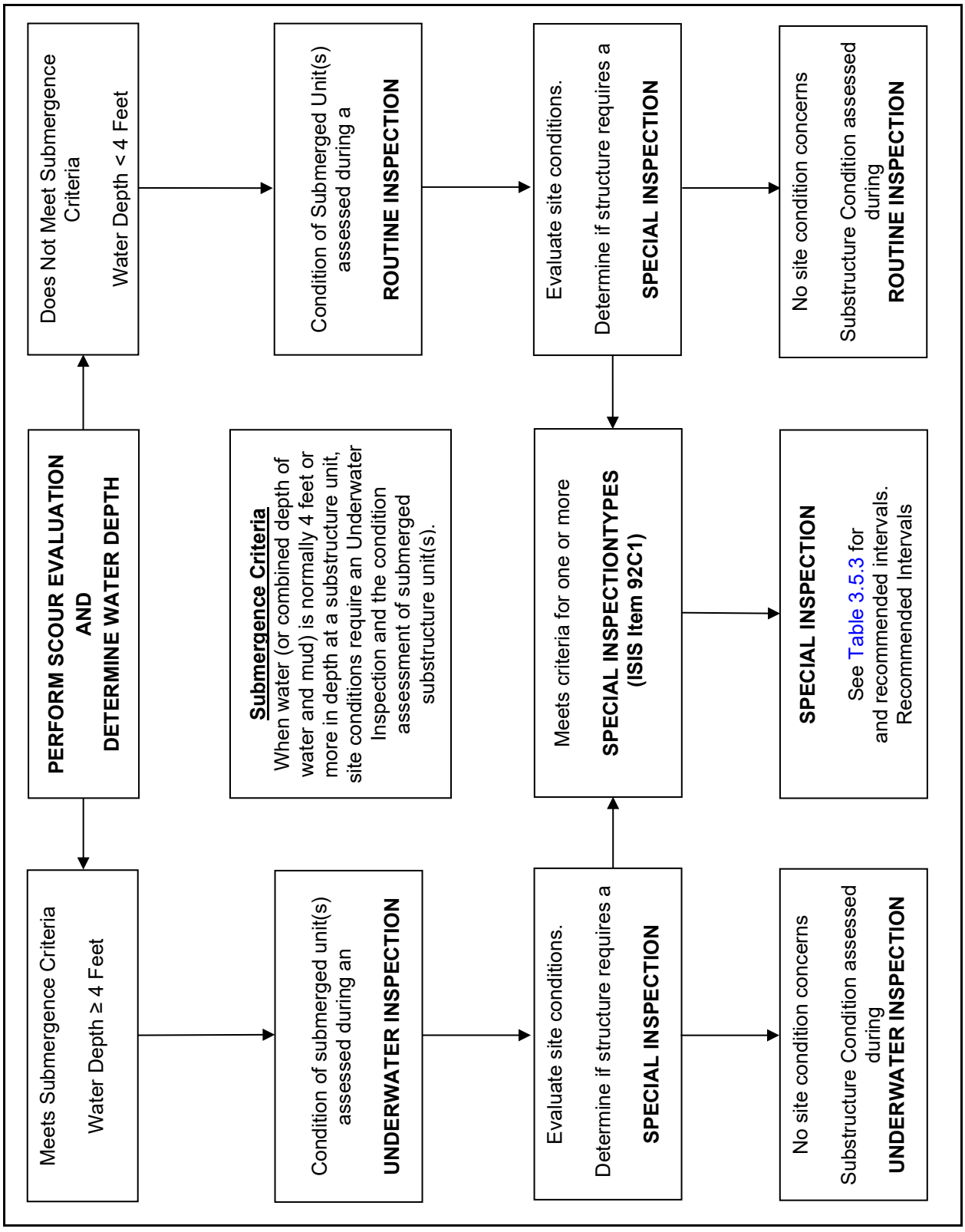


Figure 3.5-2 – Substructure Condition Assessment Method Below Waterline

<table>
<tr><th rowspan="2">Description</th><th colspan="3">Underwater Inspection</th><th colspan="3">Routine Inspection</th></tr>
<tr><th>Underwater Inspection Interval</th><th colspan="2">Special Inspection Type and Recommended Interval *</th><th>Routine Inspection Interval</th><th colspan="2">Special Inspection Type and Recommended Interval *</th></tr>
<tr><td>a) Known debris problem
b) Erodible soils
c) Channel Condition - Item 61 | B.C.09 ≤ 4</td><td>60 months</td><td>G</td><td>12 months</td><td>24/48 months</td><td>G</td><td>12 months</td></tr>
<tr><td rowspan="2">Substructure supported by Spread Footing foundation not adequately keyed into rock or protected from streambed scour or degradation. A Scour Plan of Action (POA) required</td><td rowspan="2">60 months</td><td rowspan="2">I</td><td>24 months (redundant)</td><td rowspan="2">24/48 months</td><td rowspan="2">I</td><td>24 months (redundant)</td></tr>
<tr><td>12 months (non-redundant)</td><td>12 months (non-redundant)</td></tr>
<tr><td>Scour Critical or Susceptible as determined by a Scour Critical Evaluation. A Scour Plan of Action (POA) required</td><td>60 months</td><td>K</td><td>Determined in Scour POA</td><td>24/48 months</td><td>K</td><td>Determined in Scour POA</td></tr>
<tr><td rowspan="3">Observed scour at one or more substructure units that has not been mitigated. A Scour Plan of Action (POA) required</td><td rowspan="3">60 months</td><td>L</td><td rowspan="3">Determined in Scour POA</td><td rowspan="3">24/48 months</td><td>L</td><td rowspan="3">Determined in Scour POA</td></tr>
<tr><td>M</td><td>M</td></tr>
<tr><td>N</td><td>N</td></tr>
<tr><td colspan="7">*Agency PM shall determine the required inspection interval(s) appropriate for site conditions</td></tr>
</table>

Table 3.5-3 – Substructure and Channel Monitoring Options

3.5.4 Nonredundant Steel Tension Member (NSTM) Inspection Interval

Bridges with NSTMs are subject to a hands-on inspection at the Fracture Critical Inspection Interval - Item 92B | B.IE.01 / B.IR.01. The intervals for NSTM Inspection are summarized as follows:

- Initial NSTM Inspections must be performed within 90 days of a new bridge opening to traffic or a bridge having undergone major rehabilitation. Bureau of Bridges & Structures suggest these inspections take place within 45 days.
- 24 months from the date of opening to traffic for all newly constructed or rehabilitated bridges. NSTM Inspections must be performed at 24-month intervals unless:
- Bridges with a Fracture Critical Appraisal Rating - Item 93A1 | B.C.14 coded ≤ “4” must be inspected at 12-month intervals.
    - Bridges with a history of fatigue cracking and/or with structural details susceptible to fatigue/fracture as specified by the BBS Bridge Management Inspection Unit.

3.5.5 Element Level Inspection Interval

All IDOT maintained bridges with an AASHTO length (Item 112 | B.G.01) > 20.0 feet and non-IDOT-maintained bridges on the National Highway System (NHS) must have Element Level Inspections performed at an interval not to exceed 24 months. Element Level Inspections are typically performed in conjunction with the Routine Inspection.

3.5.6 Special Inspection Interval

Special Inspections are typically required to monitor known structural defects, problematic details, or members requiring special testing.

- For known structural defects, Special Inspections are required to monitor specific locations more frequently than the Routine Inspection Interval and may allow the bridge to have a less restrictive load posting.
- For problematic details or members requiring special testing, such as ultrasonic testing of multi-beam pins and links, Special Inspections are required at specific locations more or less frequently than the Routine Inspection Interval.

3.6 Inspection Procedures

3.6.1 General

There are various types of bridge inspections required by the NBIS and IDOT policy:

- Hands-On Inspection: Inspection within arm's length of the component/element using visual techniques supplemented by non-destructive testing.
- Element Level Inspection: Inspection of the individual elements of a bridge as defined by the AASHTO MBEI and the Illinois supplement to the MBEI. Element quantities are assigned for Condition States on a scale from 1 (no defects) to 4 (severely deficient).
- Initial Inspection: The initial inspection of a new bridge or a bridge having undergone rehabilitation to provide all Structure Inventory and Appraisal (SI&A) data and other relevant data.
- Routine Inspection: A regularly scheduled inspection consisting of observations and/or measurements needed to determine the physical and functional condition of the bridge, to identify any changes from initial or previously recorded conditions, and to ensure that the structure continues to satisfy present service requirements. Major components are assigned condition ratings from 9 (new) to 0 (failure).
- In-Depth Inspection: A close-up inspection of one or more members above or below the water level to identify any deficiencies not readily detectable using Routine Inspection procedures. This typically requires hands-on inspection at some locations.
- Underwater Inspection: Inspection of the underwater portion of a bridge substructure and the surrounding channel which cannot be properly assessed by wading and/or probing. This may require an underwater diving inspection or other specialized techniques.
- NSTM Inspection: A hands-on inspection of NSTMs including visual and other non-destructive evaluation methods.
- Special Inspection: An inspection scheduled at the discretion of the Bureau of Bridges and Structures or the Agency PM, used to monitor a particular known or suspected deficiency. Often used to avoid imposing weight restrictions or closure of the bridge.
- Load Rating Inspection: A scheduled inspection performed to investigate damage or deterioration in order to evaluate potential reductions in the live load carrying capacity. Typically initiated due to a drop in a major component Condition Rating for the Deck (Item 58 | B.C.01), Superstructure (Item 59 | B.C.02), Substructure (Item 58 | B.C.01), or Culvert (Item 62 | B.C.04), but they can be requested for other reasons.

- Damage Inspection: An unscheduled inspection performed to assess structural damage resulting from environmental factors or human actions.
- Complex Bridge Inspection: This is an in-depth inspection, requiring hands-on inspection procedures, to assess the unique or unusual characteristics of the bridge according to a pre-established, written Complex Bridge Inspection Plan. This is conducted as part of the Routine, Underwater, NSTM, and/or Element Level inspection of a complex bridge.

The various inspection types are performed at intervals based on major component condition, structure type, redundancy, site conditions, load capacity evaluation, and scour critical evaluation. The NBIS requires the SI&A data to be entered into the ISIS within 90 days of inspection. ***However, IDOT policy is SI&A data shall be entered into the ISIS within 30 calendar days.*** The 30-day allowance only applies to entering the data into the ISIS and shall not be used to extend the inspection intervals.

Bridge inspections must be performed and overseen by qualified personnel as per the NBIS and/or IDOT policy. A certified NBIS Program Manager or Team Leader must be present during the entirety of all Element Level, Initial, Routine, In-Depth, Underwater, NSTM, Special, Load Rating, and Complex Bridge Inspections.

Once a bridge inspection is completed, the NBIS Team Leader is required to enter the inspection into the ISIS. The Agency PM is then required to "approve" the information in the ISIS to finalize the inspection.

Inspection procedures may vary depending on the characteristics of the bridge, the inspection type, and the extent of bridge deterioration. Detailed inspection procedures, including guidance for taking and recording field measurements, are provided in FHWA *Bridge Inspector's Reference Manual (BIRM)*, AASHTO *The Manual for Bridge Evaluation (MBE)*, and this manual. Inspection procedures are provided for commonly encountered bridge types and elements.

3.6.1.1 IDOT Bridge Inspection Forms

The current applicable IDOT form must be used to document each bridge inspection. Traditionally, the form is signed/dated by the Team Leader performing or leading the inspection and then signed/dated by the Agency PM. The original document with "wet" signatures must be kept in the Bridge File and an electronic copy of the "wet" signature form must be uploaded to the

ISIS. For situations where the Team Leader and Program Manager are the same person, the form must be signed/dated in both places. The web-based ISIS has a workflow designed to eliminate the need for "wet" signatures. First, the Team Leader creates a new inspection in the ISIS and "submits" when ready for review. Next, the Program Manager reviews and "approves" in the ISIS, finalizing the inspection. The actions of "Submitted" by the Team Leader and "Approved" by the Program Manager are equivalent to electronic signatures.

For situations where the Program Manager and the Team Leader are employed by separate entities, such as a government agency and a consultant, the Program Manager still has ultimate responsibility for the quality of the inspection(s). The Program Manager may delegate Quality Control of the Team Leader's work to others, and it is recommended documentation of this be required for quality assurance purposes. This policy is in no way intended to discourage additional QC/QA measures by the Program Manager within an inspection program but to clarify ultimate responsibility for that program.

3.6.2 Initial Inspection – Applicable to New and Rehabilitated Bridges

The Initial Inspection shall include each inspection type applicable to the bridge. The Agency PM is responsible for ensuring:

- The inspection is performed in accordance with the NBIS and IDOT policy
- The inspection information is entered into the ISIS in a timely fashion.
- IDOT Form BBS 3400 Routine Inspection Report must be used to record the Initial Inspection. Additional forms will be required based on the applicable inspection types for each bridge.

3.6.3 Routine Inspection

The primary objective of a Routine Inspection is to ensure public safety. These inspections are also utilized to determine maintenance, preservation, and repair needs. Routine Inspection must be performed on all bridges on public roadways with an AASHTO Bridge Length – Item 112 | B.G.01 > 20.0 feet. Routine Inspections are performed using visual methods supplemented by various NDT methods and by taking sufficient measurements to determine:

- Assignment, verification, and updating of the various Condition Ratings and appraisal items pertaining to the physical condition and the functionality of the bridge.

- Identification and documentation of deterioration and other deficiencies via description of each defect type, size and location on the bridge component.
- Verification and subsequent update of the bridge inventory data. During Routine Inspections, inspectors are required to verify inventory data items. Bridge inventory data is updated using Form 3320 Bridge Inventory Report.
- Documentation of required maintenance work.

IDOT Form BBS 3400 Routine Inspection Report shall be used to record the Routine Inspection. Structure Inventory and Appraisal (SI&A) data items are coded in accordance with the IDOT SIP Manual.

The Inspector's Appraisal's section of IDOT Form BBS 3400 contains space for comments next to each Condition Rating item. A concise description of all notable deficiencies must be included for all Condition Ratings of "6 (Satisfactory)" or less and are strongly recommended for Condition Ratings > "6." Photographs of notable deficiencies are required for Condition Ratings of "6 (Satisfactory)" or less. In general, photographs are required for each inspection per the AASHTO MBEI. These include, but are not limited to:

- Roadway on top of the bridge
- Corners of the bridge showing traffic barrier terminals and guardrail
- Upstream view from the bridge
- Downstream view from the bridge
- Elevation view of the bridge
- Deck (Above and below)
- Superstructure
- Substructure
- Culvert
- Channel
- Channel Protection

When the Condition Rating for Superstructure Condition – Item 59 | B.C.02, Substructure Condition – Item 60 | B.C.03, or Culvert Condition – Item 62 | B.C.04 is judged to be ≤ "4 (Poor)", the Condition Rating for Deck Condition - Item 58 | B.C.01 is judged to be ≤ "3 (Serious)", or the Condition Rating for Bridge Bearings Condition – Item B.C.07 is judged to be ≤ "2 (Critical)", a Load Rating Inspection is required to evaluate load carrying capacity. Such a Condition Rating

is indicative of the primary load carrying members having deteriorated to a point where the load carrying capacity has been reduced. The Bureau of Bridges & Structures monitors the ISIS to determine when Condition Ratings are lowered to levels requiring a Load Rating Inspection and will schedule an inspection and perform a load rating based on the findings to determine the revised load carrying capacity of the bridge.

When Superstructure Condition - Item 59 | B.C.02 for a steel superstructure is dropped to ≤ "3" due to section loss of the web over the bearing, the Agency PM responsible for the structure shall ensure hardwood blocking is installed between beam flanges at the identified bearing locations to resist buckling or crushing of the web.

If an inspection reveals an imminent danger to the traveling public is likely, the inspector must immediately take the appropriate action to protect the traveling public, such as lane restrictions or complete closure of the bridge, prior to notifying the Agency PM responsible for the bridge and the Bureau of Bridges & Structures.

When the Bureau of Bridges & Structures is unable to provide a Load Rating Inspection, the agency having maintenance responsibility for the bridge will be notified to retain the services of a NBIS Team Leader to perform a Load Rating Inspection and an Illinois Licensed Structural Engineer to perform a Load Rating to evaluate the load carrying capacity of the bridge. The Structural Engineer's Load Rating documentation, analysis, models, IDOT Form BBS 2795 Structure Load Rating Summary, and recommendation **must** be submitted to the Bureau of Bridges & Structures for review, concurrence, and approval.

When the normal water depth at all substructure units for a bridge is less than 4 feet, typically referred to as "shallow water conditions," and the Underwater Inspection Required - Item B.IR.03 is coded "N", an Underwater Inspection is not required. **Supporting documentation including, but not limited to, channel cross sections, photographs, and/or plans must be included in the bridge file to confirm an Underwater Inspection is not required.** Condition of substructure units and the surrounding streambed below the waterline are typically determined by wading and probing during the Routine Inspection as required for the proper coding of Substructure Condition - Item 60 | B.C.03.

If site conditions at the bridge indicate there is a known deficiency or concern at one or more substructure units, the Agency PM must determine how best to monitor:

- During subsequent Routine Inspections at the normal interval; or
- By reducing the Routine Inspection Interval; or
- By initiating a Special Inspection to address the deficiency; or
- By closing the bridge or restricting traffic.

Information obtained during Special Inspections for substructure deficiencies will be used for the coding of Substructure Condition - Item 60 | B.C.03.

3.6.3.1 Element Level Inspection

The primary purpose of an Element Level Inspection is to provide a basis for a statewide Bridge Management System. Element Level inspections quantify the physical condition of individually identified elements of a bridge, such as decks, beams, beam ends, expansion joints, bearings, piers, abutments, etc. The Condition States assigned to the elements also indicate the level of action, if any, necessary to bring the element up to a “like new” condition.

Element Level Inspections are required on all IDOT-maintained bridges with a length > 20.0 feet. Element Level Inspections are required on non-IDOT bridges with an AASHTO bridge length > 20.0 feet on the National Highway System (NHS). However, IDOT encourages non-IDOT agencies to perform Element Level Inspections on their respective bridge inventories.

Element Level Inspections are typically performed in conjunction with the Routine Inspection. However, there is not a 12-month reduced interval for Element Level Inspections.

The Agency PM and Team Leader for all Element Level Inspections must have successfully completed either the IDOT Element Level Bridge Inspection course or the FHWA 2-day Introduction to Element Level Inspections.

IDOT Form BBS ELI Element Level Inspection Report must be used to report Element Level Inspections. A concise description of notable deficiencies (type, size, and location) must be included in the comment fields for any quantity in Condition State “2”, “3”, or “4”.

3.6.3.2 In-Depth Inspection

The NBIS defines an In-Depth Inspection as a close-up, detailed inspection of one or more bridge members above or below the water using visual or non-destructive evaluation techniques to identify any deficiencies not readily detectable using routine inspection procedures. Hands-on inspection may be necessary at some locations. Traffic control and special equipment such as under-bridge inspection equipment, manlifts, scaffolding, boats, and barges, should be provided for access, as needed. In addition, coordination with third parties, such as railroads, may be required.

In-Depth Inspections are to ensure areas of potential concern have received the proper level of inspection. Areas of emphasis include areas under expansion joints, web stiffeners, cross frame connections, lateral bracing connections, fixed bearings, accessible vaulted spans and all other areas of the bridge not normally visible during a Routine Inspection must be inspected. It is imperative the activities, procedures and findings be completely and carefully documented.

3.6.3.2.1 Inspection of Accessible Vaulted Spans

If vault doors and/or access panels are present, the portion of the bridge enclosed by the vault must be inspected as part of In-Depth Inspections.

3.6.3.2.2 Channel Cross Sections

Channel cross-sections, along the upstream and downstream fascias, shall be taken along the entire bridge length for comparison with initial baseline cross-sections at an interval equal to the In-Depth Inspection Interval as defined in Section 3.6.4 and after significant flood events. Additional cross-sections should be taken when conditions indicate significant changes from original construction or previous inspections.

Channel cross-sections, along the upstream and downstream fascias, shall be taken along the entire bridge length using the following guidelines. Additional cross-sections may be appropriate after significant flood events.

1. All vertical measurements must be taken from a reference datum line on the bridge that is not likely to change over time. Examples are top of parapet/rail; top of curb/deck; and top or bottom of abutment/pier cap.
2. All channel cross-sections should be taken and plotted with the orientation looking downstream at both fascias of the bridge.
3. Substructure Units should be labeled per the existing plans, if applicable, for consistency.
4. Vertical measurements must be taken at all substructure units. At abutments, measure where ground intersects the exposed face. At Piers/Intermediate Bents, measure at the centerline of the substructure unit.
5. Vertical measurements should be taken at regular longitudinal intervals in each span. The longitudinal interval can be a predetermined percentage of span length or at fixed points on the structure, such as side mounted rail posts.
6. Vertical measurements must be taken at: the beginning and end of a slope; beginning, low points, and end of a scour hole; edges of water; low streambed elevation and any other location(s) with a substantial change in elevation.
7. Vertical measurements should be taken, at a minimum, at the midpoint of a significant 'flat' area and the location(s) labeled.
8. Vertical measurements should be taken to the nearest one-half foot unless a scour hole is being measured. Scour hole measurements should be taken to the nearest tenth of a foot.
9. Horizontal measurements should be taken to the nearest foot.
10. If debris piles are present, suggest taking measurements at the ends of the debris pile and across the top of the debris pile to document the extent of the decreased structure opening.
11. If there is a set of twin bridges in close proximity, such as an interstate, and no appreciable difference in streambed elevation between the adjacent fascias, the measurements obtained from one fascia can be used for both bridges.
12. Additional channel cross-sections should be taken when conditions indicate significant changes from original construction or previous inspections. An elevation 'grid' may be established for tracking local scour around individual substructure units. Whether accomplished during Routine Inspection or by a Special Inspection, the condition of substructure units below the waterline and the streambed adjacent to those units must be determined to verify existing conditions do not compromise the safety of the bridge. This need

for inspection applies to all bridges over water, including those which may have been designed to structurally accommodate an established scour depth determined by analysis. See Figure 3.5-2.

13. Inputting the vertical measurements obtained through the above steps into an Excel Spreadsheet is one way to produce a neat and legible Stream Channel Cross-Section. This also allows additional information to be easily added/graphed in the future.

3.6.4 Underwater Inspection

When the normal water depth is ≥ 4 feet or the combined depth with mud makes it unsafe to wade at any substructure unit of a bridge, site conditions meet the "Basic Submergence Criteria" definition and an Underwater Inspection is required. The Underwater Inspection typically requires the use of a boat and sonar depth finder to properly map the streambed or underwater diving to determine conditions of the substructure units.

The procedures used for determining the need for an Underwater Inspection are the same for new structures which have been designed for anticipated scour and for older structures which were designed prior to the development of procedures for estimating scour. Figure 3.5-2 illustrates the use of the various inspection types referred to in this Section.

IDOT Form BBS BIR UW1 "Underwater Inspection Report" shall be used to record Underwater Inspections. For bridges requiring an Underwater Inspection, an Underwater Inspection Plan is required to document the inspection of each substructure unit. IDOT Form BBS UIP Underwater Inspection Plan must be used to develop the Underwater Inspection Plan. A typical Underwater Inspection Plan may include, but is not limited to, the following:

- A plan view of the bridge displaying each substructure unit requiring an Underwater Inspection.
- Detailed Underwater inspection procedure(s) for each substructure unit.
- All equipment required to properly complete the Underwater Inspection.
- Training/certification requirements for the dive team.
- Detailed description of what deliverables will be produced from the Underwater Inspection.

Underwater Inspection procedures may vary depending on weather, stream level, stream current, and debris collection. The Underwater Inspection Plan must include a detailed history of such variances for determining the optimal time of year when appropriate site conditions exist.

The objectives of an Underwater Inspection are to ensure public safety by determining the Condition Rating and to provide a history of the channel conditions under and adjacent to the bridge. Conditions such as channel opening width, depth at substructure elements, channel cross-sections, water flow velocity, channel constriction and skew must be noted and compared to historical records. Local scour conditions at or near substructure units can be monitored by establishing a streambed elevation "grid." Over time, vertical changes, due to either degradation or aggradation processes, or horizontal alignment changes, due to lateral migration of the channel, could result in foundation undermining, bridge overtopping, or partial/total collapse of the bridge.

For bridges/culverts located in low-flow or no-flow conditions, such as lakes, ponds, or lagoons, or in controlled pool conditions above locks and dams, channel cross sections are still required to be taken at the bridge/culvert.

3.6.4.1 Assessing Substructure Conditions Below Waterline

Bridges requiring an Underwater Inspection are identified in the ISIS by having the Underwater Inspection Interval - Item 92B | B.IR.03 coded with the appropriate value, and all Underwater Inspection Substructure Units - Item 93B8.

If site conditions at the bridge indicate there is a known deficiency or concern at one or more substructure units, the responsible Agency PM must determine how best to monitor:

- During subsequent Underwater Inspections at the normal interval; or
- By reducing the Underwater Inspection Interval; or
- By initiating a Special Inspection to address the deficiency or concern; or
- By closing the bridge or restricting traffic.

If the Agency PM elects to initiate monitoring with a Special Inspection, the appropriate Special Inspection Type - Item 92C1 | B.IE.56 and Special Inspection Interval - Item 92C must be

determined and entered in the ISIS. See Figure 3.5-2 for guidance on Special Inspection and Substructure and Channel Monitoring Options.

3.6.4.2 Procedures for Underwater Inspections

Procedures utilized for an Underwater Inspection may include, but are not limited to, the following:

- Visual observation of the channel at, and adjacent to, all substructure units.
- Manual probing of the channel bottom and/or substructure footing at, and adjacent to, the substructure units to identify areas of concern or to establish channel bottom elevations.
- Probing of the substructure walls below the waterline for damage.
- Recording of the channel bottom elevations with depth finding sonar or other means at, and adjacent to, the substructure units, as well as at channel cross sections upstream and downstream from the bridge.
- Visual observation of the substructure units to detect possible abnormalities in elevation, plumbness, or rotation.
- Observation of conditions below waterline by qualified personnel including properly trained certified divers.

When the water depth is too great or site conditions prohibit an inspector from adequately determining the condition of any of the substructure units by visual means, probing, or sonar, a diving inspection is required.

Procedures used for accomplishing the Underwater Inspection are recorded on IDOT Form BBS BIR UW1 and in ISIS as Underwater Inspection Method – Item 93B4 | B.IR.56. As bridge deficiencies are discovered or suspected, more thorough evaluation techniques should be employed. These may include surveying measurements to determine the elevation, plumbness, and possible rotation of substructure units or obtaining soil borings.

3.6.4.3 Substructure Condition Rating Based on Deficiencies Below Waterline

The findings from the Routine, Underwater, and, if applicable, Special Inspections should be taken into account when determining the Substructure Condition - Item 60 | B.C.03 coding. Condition of the substructure unit(s) below the waterline must be included during the evaluation of the substructure as part of each Routine Inspection. Inspectors are encouraged to take advantage

of low water conditions during Routine Inspections to observe elements below the waterline, especially those elements normally receiving an Underwater Inspection.

The rating for Substructure Condition – Item 60 | B.C.03 cannot be greater than the rating for Underwater Condition – Item 93B1 | B.C.15, but the Underwater Condition - Item 93B1 | B.C.15 rating can be greater than the Substructure Condition – Item 60 | B.C.03 rating.

The Scour Critical Evaluation is unrelated to Substructure Condition unless significant scour has actually occurred at the bridge. The Substructure Condition - Item 60 | B.C.03 shall match the Scour Critical Evaluation - Item 113 when the Scour Critical Evaluation - Item 113 is coded "2" or less.

3.6.4.4 Determining Safe Conditions for Standard Diving Inspections

- With IDOT approval, Underwater Acoustic Imaging may be performed at unsafe bridge sites to preliminarily evaluate the bridge prior to the Underwater Inspection Interval date. The approved types of Acoustic Imaging equipment are Sector Scanning Sonar, Mechanical Scanning Sonar, and Multibeam Sonar. The Underwater Inspection Remarks - Item 93B2 must include a comment stating Acoustic Imaging was done without diving until diving could be rescheduled due to unsafe diving conditions. The Dive Team shall reschedule the dive as soon as conditions are safe.
- FHWA does not accept sonar evaluations for Underwater Inspections as a substitute for diving, even in situations where the Underwater Inspection cannot be safely performed by divers. However, FHWA recognizes safety of the diving inspectors and adherence to policies are necessary when conditions are unfavorable. Full documentation of the conditions and reasons why sonar inspection was employed must be included in the Underwater Inspection Report.

A typical diving inspection team consists of the following:

- IDOT defines the Underwater Bridge Inspection Dive Team as those actively participating in the underwater diving inspection.
- Individuals solely responsible for safety of personnel and equipment operation are not considered part of the Underwater Bridge Inspection Dive Team.

- Dive Team Size: 3- or 4-person team and must include an Illinois Certified NBIS Team Leader having an Illinois Structural Engineer license on site for 100% of the inspection.
- Standard dive equipment (does not include hot-water suits or hyperbaric chamber)
- Commercial scuba or surface-supplied air in accordance with OSHA Dive Standards
- All dive team members are required to be certified divers and to have taken NHI 130091 Underwater Bridge Inspection.
- Appropriately sized boat (typically less than 25 feet in length)

3.6.4.4.1 Procedures for Underwater Diving Inspections

The following procedures must be performed during an Underwater Diving Inspection:

- If over navigable water, proper notification and inspection schedules must be sent to the Bureau of Bridges & Structures and the United States Coast Guard in advance of the inspection.
- Visual and tactile inspection of 100% of the underwater portions of the substructure units.
- Provide measurements of pitting and damage of each substructure unit.
- Provide a complete report with topside photographs, diagrams, and underwater photographs necessary to adequately describe conditions and deficiencies found at the water surface and below, and anything above the waterline that would be hidden from an inspector not diving.
- Reports will include scope of work, description of the bridge, method of investigation, existing site conditions, substructure conditions with elevation views of each unit detailing any damage or deterioration, streambed elevations, channel probing information at each unit, channel elevation grid at 25-foot intervals out to 50 feet from each unit, streambed cross-sections at both fascias and at 100 feet upstream and downstream, IDOT Form BBS BIR-UW1 Bridge Inspection Report - Underwater Inspection, and additional information as required by the Bureau of Bridges & Structures.
- The reports shall be signed and sealed by an Illinois Licensed Structural Engineer.

For non-IDOT maintained/inspected bridges, the Agency PM will determine the requirements of the Underwater Diving Inspection for each bridge and is responsible for coordination with the waterway authority and local law enforcement. However, IDOT recommends the above requirements be incorporated into the Underwater Diving Inspection.

3.6.5 Nonredundant Steel Tension Member (NSTM) Inspection

Per the NBIS, a Nonredundant Steel Tension Member (NSTM) is defined as:

> A primary steel member fully or partially in tension, and without load path redundancy, system redundancy or internal redundancy, whose failure may cause a portion of or the entire bridge to collapse.

NSTM Inspections must be performed on bridges having NSTMs inventoried in the ISIS. NSTM inspections consist of a 100% hands-on (within arm's length) investigation for the entire length of all NSTMs present on the bridge. Various nondestructive testing techniques are also employed to supplement the hands-on visual inspection.

A NSTM Inspection Plan must be developed which includes, but is not limited to, the following:

- IDOT Form BBS BIR FC1 Bridge Inspection Report - Fracture Critical Inspection
- NSTM Inventory Sketch identifying all NSTM types including brief descriptions and locations.
- Maximum Inspection Interval of 24 months for rating of NSTM Condition – Item 93A1 | B.C.14 ≥ "5"
- Maximum Inspection interval of 12 months for rating of NSTM Condition – Item 93A1 | B.C.14 ≤ "4"
- Description of NSTM inspection procedures including:
  - Specific inspection requirements including cleaning of critical areas prior to inspection
  - Specific measurements to be taken
  - NDT methods to be used
  - Access equipment required to see all sides of all NSTMs and all welds attaching the members
  - Where the fracture toughness of the steel is not documented, testing may be needed to determine the threat of brittle fracture at low temperatures. (Consult with the Bureau of Bridges & Structures before taking samples for testing.)
  - Maintenance of traffic plan
  - Detour/bypass information
  - Additional lighting and magnification needs
  - Critical Findings procedures
  - Emergency contact information

The NBIS requires an NSTM Inspection Plan be included in the Bridge File for each bridge having NSTMs. An example is available in Appendix A-5 to aid in the development of the NSTM Inspection Plan. It is the responsibility of the Agency PM to ensure the NSTM Inspection Plan is developed, submitted to the Bridge Management and Inspection Unit, included in the Bridge File, updated every three (3) years, and uploaded to the ISIS.

As part of the development and/or review of the NSTM Inspection Plan, the Agency PM shall verify any active FHWA Technical Advisories applicable to the bridge, or its components, are included. All FHWA Technical Advisories are located at the FWHA website.

When documenting and recording cracks or other deterioration during NSTM Inspections, several items of information should be noted:

- The precise location of the crack or deterioration with respect to the member must be recorded, as well as the exact location of the member with respect to the entire bridge. Any noticeable lengthening, opening and closing, and visible distortion of the crack when exposed to live load must be documented.
- The members must be labeled in the field using paint or other permanent markings. The ends of all cracks must be marked, and the date identified. It is important to compare the new markings with previous markings, if any.
- Detailed sketches and photographs of cracking and other deterioration must be provided showing the orientation, length, width, depth and end of crack. A close-up view should be provided, as well as a general view of the member from the same perspective to show context.
- The inspection team must document dimensions and details of the member containing the crack. The general condition at the location of the problematic detail must be noted, including section loss, dirt/debris, traffic impact, and steel type if available from existing plans or shop drawings.

For bridges with superstructures containing NSTMs, the rating for “Superstructure Condition - Item 59 | B.C.02” shall not be > the rating for NSTM Inspection Condition - Item 93A1 | B.C.14 for the superstructure NSTM, though it may be lower.

For bridges with substructures containing NSTMs, the rating for Substructure Condition – Item 60 | B.C.03 shall not be greater than the rating for NSTM Inspection Condition - Item 93A1 | B.C.14 for the substructure NSTM, though it may be lower.

3.6.5.1 Identifying Bridges with NSTMs

NSTMs have either all or part of their cross section subject to tension and do not have load path redundancy.

When identifying bridges with NSTMs, only load path redundancy is to be considered. While the presence of structural redundancy and internal redundancy may reduce the consequences of the failure of a NSTM, these types of redundancy are not to be considered when identifying NSTMs.

The FHWA *Bridge Inspector's Reference Manual* (BIRM) defines redundancy as follows:

> Load Path Redundancy: Bridge designs that have three or more main load-carrying members or load paths between supports are considered load path redundant.
>
> Structural Redundancy: System redundancy is a redundancy that exists in a bridge system without load path redundancy, such that fracture of the cross section at one location of a primary member will not cause a portion of or the entire bridge to collapse (23 CFR 650.305). System redundancy cannot be determined in the field or from bridge plans. A refined analysis, with methodology and evaluation criteria reviewed by FHWA, is necessary to determine whether a bridge exhibits system redundancy.
>
> Internal Redundancy: Internal Redundancy exists when a bridge member contains three or more elements that are mechanically fastened to each other so that multiple independent load paths are formed.

The Bureau of Bridges & Structures ultimately determines if a bridge has NSTMs and will coordinate the NSTM Inventory and NSTM Inspection Plan with the Agency PM. The Bureau of Bridges & Structures is responsible for the NSTM Inventory entry into the ISIS.

Types of NSTM Bridges in Illinois

Common bridge types with NSTMs include, but are not limited to, the following:

- One- or two-girder systems (I-girder or box girder)
- Suspension systems with eyebar components

- Steel abutment/pier caps
- Deck/Through truss bridges
- Steel tied arches
- Pin and hanger connections on two- or three-girder systems
- Bascule/Lift bridges with two primary girders or trusses
- Floorbeams with spacing exceeding 15 feet or supporting other longitudinal members
- Ends of flared primary members attached to webs of other longitudinal members.
- Transfer beams/girders
- Steel columns/piles

NSTMs - Common Problematic Details

Problematic structural details, which may result in cracking, may exist on a variety of bridge superstructures and substructures. Problematic details may include, but are not limited to, the following:

- Triaxial constraint
- Welds – Intersecting; field welds on patch/splice plates; intermittent; tack; poor quality; plug
- Welded Cover plates
- Suspended spans
- Details prone to out-of-plane bending (small web gaps, diaphragm connection plates that are not attached to flanges)
- Improperly installed or spliced back-up bars
- Ship lap girders
- Dapped beam/girder ends.

Information on problematic details and procedures for proper inspection can be found in the following publications:

- FHWA *Bridge Inspector's Reference Manual (BIRM)*
- AASHTO *The Manual for Bridge Evaluation (MBE)*
- AASHTO Design Specification – LRFD Manual (for identification of fatigue categories)
- NHI-130078 "Bridge Inspection Techniques for Nonredundant Steel Tension Members (NSTM)"

Fatigue-prone details must be given special attention as part of the NSTM Inspection and may require non-destructive testing.

3.6.5.2 Recording NSTM Inspections

All NSTM Inspections must be reported using IDOT Form BBS BIR FC1 Bridge Inspection Report Fracture Critical Inspection. New and rehabilitated fracture critical bridges shall receive an initial NSTM Inspection within 90 days of opening to traffic to establish a baseline of the as-built conditions.

3.6.5.3 Identifying Misclassified Bridges

The Agency PM and Team Leader are responsible for identifying bridges that have not been classified as having NSTMs. If a bridge is identified as having NSTMs, the Agency PM must contact the Bridge Management & Inspection Unit at DOT.BBS.BridgeMgmt@illinois.gov for review and approval. Upon IDOT's confirmation of the bridge having NSTMs, IDOT Form BBS BIR FC2 Fracture Critical Member Inventory Report and an NSTM Inspection Plan must be completed and submitted to the Bridge Management Group at DOT.BBS.BridgeMgmt@illinois.gov for review, approval, and entry into the ISIS.

3.6.5.4 NSTM Inspection – Gusset Plates

While gusset plate assemblies are not a specific NSTM type, each gusset plate assembly must have a Hands-On Inspection as part of a NSTM Inspection. Detailed thickness measurements must be taken to document and assess any section loss on the gusset plates. Initiation or growth of cracks and development or increase in any gusset plate distortion must also be documented. The inspection record for each gusset plate must document all significant changes to previously identified areas of concern as well as any new areas identified with each new inspection.

The Agency PM shall determine if new inspection findings are significant enough to require structural analysis and load rating. Consultation with the Bureau of Bridges & Structures is required to determine the need for further analysis.

Copies of the inspection report, including a summary of all field measurements and photographs shall be kept in the Bridge File and uploaded to the ISIS. It is imperative that complete and

accurate records are kept to chronicle the initiation and progression of gusset plate deterioration and the steps taken to repair or mitigate those findings.

All repairs, retrofits and/or member replacements completed since the last NSTM Inspection must be documented in the Bridge File and uploaded to the ISIS. The condition of the work performed and a general assessment of its effectiveness in arresting or mitigating previous damage or deterioration must be noted.

3.6.5.5 NSTM Inspection – Non-Destructive Testing

Often, visual inspection alone is not sufficient to determine the Condition Rating of a NSTM. Non-destructive Testing (NDT) must be performed to fully ascertain the NSTM Condition Rating. The use of NDT methods is vital in determining the section remaining, the presence of cracking, and the extent of cracking. The NDT methods most frequently used by IDOT inspection personnel are ultrasonic testing, dye penetrant testing, and magnetic particle testing. Ultrasonic testing is used for the various measurements, including remaining thickness of plates, and for detection of defects/flaws in pins. Dye penetrant and magnetic particle testing are used for detecting the presence and limits of cracks. Personnel must have the proper training in the use and limitations of the various methods of NDT.

3.6.6 Special Inspection

Special Inspections are performed to monitor a specific structural feature, deficiency, or condition more frequently than at the Routine, NSTM, or Underwater Inspections.

Special Inspections are initiated for a variety of reasons at the discretion of the responsible Agency PM or the Bureau of Bridges & Structures (BBS). The BBS initiates Special Inspections through the Structures Ratings and Permits Unit for IDOT maintained bridges or the Local Bridge Unit for non-IDOT maintained bridges.

Procedures used during Special Inspections should be adopted in accordance with the specific deficiency or condition to be monitored, such as monitoring the propagation of cracks in steel or concrete members or the additional section loss to steel, concrete, timber, and other materials. The Special Inspection Type - Item 92C1 | B.IE.56 and the Special Inspection Interval - Item 92C are determined by the initiator and are inventoried in the ISIS. Failure to comply with the

inspection frequency and/or the established procedure for the required Special Inspection may result in posting, reduced posting, and/or partial or complete closure of the bridge.

3.6.6.1 Performing and Recording Special Inspections

IDOT Form BBS SI-1 Special Inspection Report must be used to record Special Inspections.

It is imperative the personnel performing Special Inspections must compare the conditions noted in the field to the initial conditions to determine the proper coding of Special Inspection Condition Status - Item 93C1 | B.IE.63.

Special Inspection Remarks - Item 92C5 | B.IE.60 are required for all Special Inspections.

For Special Inspections initiated by the BBS, the Agency PM must notify the BBS when the Special Inspection Condition Status – Item 93C1 | B.IE.63 is coded:

- 0 – Worsening Condition Indicative of Imminent Structural Failure (closure required until follow-up inspection by BBS staff)
- 1 - Progression of Deterioration or Worsening of Condition noted (immediate follow-up inspection by BBS staff or District Bridge Maintenance Engineer required)
- 3 - Corrected Condition Noted (Special Inspection no longer required after verification of adequacy of corrected condition by appropriate IDOT personnel)

The inspector must document the change in condition by providing adequate comments on the form, proper photographs, and updated sketches.

Personnel performing Special Inspections must be fully instructed on the specific members and locations required to be inspected and what signs could manifest indicating a worsening condition. A worsening of the condition could result in posting, reduced posting, and/or partial or complete closure of the bridge. The BBS strongly recommends consecutive Special Inspections be performed by the same inspection personnel to ensure sufficient site-specific knowledge.

3.6.6.2 Special Inspections for Multi-Girder Pin-and-Link Assemblies

Multi-girder/beam bridges with pin-and-link or pin-only assemblies that have been retrofitted with stainless steel pins and Teflon bushings as shown in Section 2.11 are required to have a Special Inspection with an Inspection Interval not to exceed 48 months. Multi-girder/beam bridges with pin-and-link or pin-only assemblies that have not been retrofitted as described above have a Special Inspection with an Inspection Interval not to exceed 24 months. Ultrasonic testing of the pins and hands-on inspection of the beam ends are required at each inspection. The link assemblies shall be visually observed to verify they are functioning as intended. The link plates shall be measured as required to verify any section loss or cracks. Any defect found in the pins or link plates must be reported to the Bureau of Bridges & Structures immediately for evaluation.

If a defect is found in a pin or a crack is found in a link plate, the Inspection Interval of the Special Inspection shall be changed by the Bureau of Bridges & Structures as noted below:

- If the assembly appears not to be functioning properly or section loss in the link plates is between 5% and 10%, the Inspection Interval shall be 24 months or less.
- If the loss is greater than 10%, the Interval shall not be greater than 12 months, and the Bureau of Bridges & Structures must be notified to perform a structural evaluation.

3.6.6.3 Special Inspections for Dapped Beams

Steel dapped beams in multi-girder/beam bridges are required to have a Special Inspection with an Inspection Interval equal to the interval of the Routine Inspection. This requirement is also strongly recommended for dapped concrete girders/beams. Each dapped girder/beam end must have a Hands-On Inspection as part of the Special Inspection. Detailed thickness measurements must be taken to document and assess any section loss for steel members. Initiation or growth of cracks and new development or increase in any section loss must also be documented. The inspection record for each dapped girder/beam end must document all significant changes to previously identified areas of concern as well as any new areas identified with each new inspection.

The Agency PM shall determine if new inspection findings are significant enough to require structural analysis and load rating. Consultation with the Bureau of Bridges & Structures is required to determine the need for further analysis.

3.6.7 Damage Inspection

Damage Inspections are performed on an emergency basis to assess a bridge for damage resulting from environmental factors or human actions causing a sudden change in the structural capacity or stability of a bridge. The inspection is typically performed by staff of the Agency PM, or an Illinois Licensed Structural Engineer who may or may not be an Illinois Certified NBIS Program Manager or Team Leader.

The primary objective of a Damage Inspection is to determine the need for immediate load restrictions or partial/complete closure of the bridge to traffic and/or to assess the need for temporary measures to remain open. The secondary objective is to assess the level of effort necessary to repair the damage. The inspection team performs in-depth hands-on inspection of the damaged members, determines the extent of section loss, takes measurements for misalignment of members, and checks for any loss of foundation support. Traffic control and special equipment are often necessary to accomplish these inspections.

Photographs, detailed sketches, and detailed descriptions documenting all notable deficiencies potentially impacting the load-carrying capacity and/or stability of the bridge must be submitted to the Bureau of Bridges & Structures as soon as possible for evaluation.

3.6.8 Load Rating Inspection

The primary objectives of a Load Rating Inspection are to document all areas of section loss greater than 10% and any other deficiencies affecting the load-carrying capacity of the bridge and to identify members/elements requiring additional monitoring through Special Inspections. Load Rating Inspections are required when a Routine Inspection results in the following:

- Superstructure, Substructure, or Culvert Condition Rating (Item 59 | B.C.02, 60, or 62) drops to “4 - Poor”, or less, and subsequent drops in Condition Rating.
- Deck Condition Rating (Item 58 | B.C.01) drops to “3 - Serious”, or less, and subsequent drops in Condition Rating.
- Bridge Bearings Condition Rating (Item B.C.07) drops to “2 – Critical”, or less.
- Or if 10 years have elapsed since the Last Rating Date (Item 66C | B.LR.03) and the Superstructure, Substructure, or Culvert Condition Rating (Item 59 | B.C.02, 60 | B.C.03, or 62 | B.C.04) ≤ “4 - Poor” or the Deck Condition Rating (Item 58 | B.C.01) ≤ “3 - Serious”

An Illinois Certified NBIS Program Manager or Team Leader must be present during the entirety of all Load Rating Inspections. and must be trained to collect and document the information necessary to conduct a load rating analysis. Detailed information in the form of photographs and sketches displaying field measurements of deteriorated areas and the precise locations are required to determine the load carrying capacity. Also measured/verified during the Load Rating Inspection are permanent loads such as wearing surface, railing attachments, and other sources of dead loads. Traffic control, under bridge inspection equipment, and specialized testing equipment are essential to accomplish a Load Rating Inspection.

3.6.8.1 Load Rating Inspection for IDOT-Maintained Bridges/Culverts

Load Rating Inspections are performed under the direction of the Bureau of Bridges & Structures, Structure Ratings and Permits Unit by IDOT District Bureau of Operations personnel or a consulting firm.

The Structure Ratings and Permits Unit monitors major component Condition Rating reductions for IDOT maintained bridges using the information in the ISIS and schedules load rating inspections for the applicable bridges. In addition, Districts Operations can request a Load Rating Inspection by contacting the Structure Ratings and Permits Unit

The findings of the Load Rating Inspection are reviewed by the Structure Ratings and Permits Unit, and a structural analysis is done to determine the load-carrying capacity. After completing the analysis, the Bureau of Bridges & Structures will provide the Region/District with documentation of the Load Rating Inspection and results of the structural rating. The documentation provided to the Region/District will include field data and photographs, revisions to major component Condition Ratings, updated Inventory and Operating Rating Factors, and, if necessary, required weight restrictions and/or Special Inspection requirements.

3.6.8.2 Load Rating Inspection for Non-IDOT Bridges/Culverts

Load Rating Inspections are performed by the Bureau of Bridges & Structures Local Bridge Unit of the Bureau of Bridges & Structures and consultants under the direction of the agency having maintenance responsibility.

Using the information in the ISIS, the Local Bridge Unit monitors major component Condition Rating reductions for Local Public Agency maintained bridges and automatically schedules Load Rating Inspections for the applicable bridges to be done by in-house forces. In addition, Local Public Agencies can request a Load Rating Inspection by submitting IDOT BLR Form 06510 Local Agency Load Rating Request to the Local Bridge Unit at DOT.LocalBridgeMgmt@Illinois.gov.

If the Local Bridge Unit is unable to provide a Load Rating Inspection, the Local Public Agency will be notified to retain the services of a qualified consultant firm to perform the Load Rating Inspection and subsequent Load Rating. The documentation for the Load Rating Inspection and Load Rating must be submitted to the Local Bridge Unit for review and concurrence with the Load Rating, required weight restrictions, and/or Special Inspection requirements. IDOT Form BBS 2795 Structure Load Rating Summary shall be included with the Load Rating calculations and submitted to the Bureau of Bridges & Structures for review and approval.

3.6.9 Complex Bridge Inspection

Complex Bridge Inspections are performed on bridges with Complex Features. The NBIS defines a Complex Feature as:

> Bridge component(s) or member(s) with advanced or unique structural members or operational characteristics, construction methods, and/or requiring specific inspection procedures. This includes mechanical and electrical elements of moveable spans and cable-related members of suspension and cable-stayed superstructures.

Complex bridges must receive a heightened degree of investigation and evaluation to preserve continued service to the travelling public and to protect the owner's investment. The inspection of complex bridges presents many unique challenges for an experienced bridge inspection team.

IDOT has determined the following types of bridges are considered Complex Bridges based on the NBIS definition of Complex Feature and must be inspected under the provisions and policies of this section:

- Suspension – Cables and Anchorages
- Cable-Stayed – Cables and Anchorages
- Moveable (Bascule, Swing, and Lift) – Mechanical and Electrical Elements

The NBIS requires each Complex Bridge to have a detailed Complex Bridge Inspection Plan. The plan must be kept in the official Bridge File, be uploaded to the ISIS, and be available for the inspection team prior to and during each inspection.

3.6.9.1 General Complex Bridge Inspection Procedures

A comprehensive Complex Bridge Inspection Plan must provide a detailed outline for all aspects of the inspection process. The following sections provide guidance for development of a Complex Bridge Inspection Plan. There may be additional information required for specific bridges.

3.6.9.1.1 Team Members

The Agency PM with direct oversight of the Complex Bridge must select a qualified and experienced bridge inspection team, trained for the specific tasks required for the Complex Bridge. The on-site Illinois Certified NBIS Team Leader is responsible for ensuring the quality and completeness of the inspection and is expected to provide guidance to the remainder of the inspection team. Inspection team members are required to be familiarized with a specific bridge's previously noted deficiencies and concerns. It is preferable if the inspection team members have previous experience inspecting the specific bridge or a bridge of similar type.

Traffic Control: Complex Bridge Inspections typically require an extensive Traffic Control Plan which may include, but is not limited to:

- Time restrictions imposed by the owner
- Detailed timing and sequence of lane restrictions/closures
- Traffic control devices (message boards, impact attenuators, signage, barrels, cones, etc.)
- Coordination with 3rd parties (railroads, utility providers, others)
- Movement and temporary storage of inspection access equipment

The Team Leader overseeing the inspection must initially develop the Traffic Control Plan with the Agency Traffic Operations, Maintenance, and Construction personnel for inclusion in the Complex Bridge Inspection Plan. Prior to new inspections, follow-up coordination is required to ensure the traffic control does not interfere with other transportation related activities in the area.

Typically, the agency having maintenance/inspection responsibility already has a Traffic Control Plan developed due to previous maintenance or repair activities. However, if a consultant is performing the inspection, coordination with the agency's appropriate personnel (operations, traffic, construction, or other) is required. The agency contacts must be provided for reference.

3.6.9.1.2 Navigable Waterways

For Complex Bridges crossing navigable waterways, the Agency PM must coordinate the inspection with the United States Coast Guard (USCG) prior to new inspections. The USCG contact information must be included.

3.6.9.1.3 Inspection Access Equipment

Complex Bridge Inspections typically require the use of a variety of access equipment which may include, but is not limited to:

- Under-bridge inspection crane (Snooper, towable inspection platform)
- Manlift or Bucket Truck
- Ladders
- Scaffolding
- Rope access equipment
- Boats
- Barges

Coordination of inspection access equipment and availability of operators through the use of in-house equipment or third-party vendors must be included. Access to enclosed restricted areas, such as gated portions of the undersides of the bridges, and confined spaces, such as box girders, tower entrances, anchorage pits, mechanical/electrical rooms, etc., must be detailed, documented, and the appropriate contact information provided for access.

3.6.9.1.4 Inspection Equipment

A Complex Bridge Inspection requires extensive use of inspection tools, testing devices, and other equipment in order to complete a thorough inspection of the bridge. The tools and equipment required may include, but are not limited to:

- Hand tools (hammers; scrapers; wire brushes; drills, grinders, etc.)
- Cameras
- Sonar depth finders
- NDT equipment
- Drones may be considered for specific cases. A proposal outlining the intended scope of the drone inspection must be submitted for approval prior to their use.

3.6.9.1.5 Documentation

A Complex Bridge Inspection requires detailed and comprehensive documentation when compared to the typical Routine Inspection, and the findings must be compiled into a formal Inspection Report. The report must contain, but is not limited to, the following:

- Overall description of bridge
- IDOT forms (signed/dated)
- Detailed inspection notes
- Organized narrative
- Photographs with descriptions and locations
- Table or listing of all notable deficiencies
- Recommendations for general maintenance, prevention activities, and required repairs

The notable defects should be prioritized by importance and severity. Any defect of a primary load carrying member with > 10% section loss likely has reduced load carrying capacity and must be reported immediately to the Agency PM and the Statewide PM.

3.6.9.2 General Inspection Requirements for Suspension Bridges

A suspension bridge is typically comprised of a steel superstructure of beams, girders, and floorbeams supporting a riding surface, all suspended by cables or wires from two large multi-

wire cables stretched over high towers and anchored in large concrete structures. The general inspection requirements for a suspension bridge are as follows:

3.6.9.2.1 Deck

The deck, including any wearing surface should be inspected for signs of distress using appropriate procedures, such as chain drag, infrared thermography, ground-penetrating radar, etc. Deck elevations should periodically be surveyed and compared to original as-built plans and previous inspection reports for any marked changes. An inspection of the traffic barriers, joints, and deck drainage system should be included.

3.6.9.2.2 Cable

The main cables of a suspension bridge are usually comprised of hundreds of individual wire strands, combined together to form the main cable. The cable is usually protected from the elements by a system of wire wrapping and a barrier coating of paint. The cables can also be wrapped in special waterproof fabric material. Inspection of the cables is typically restricted to a visual, hands-on procedure, concentrating on identification of any signs of potential problems with the protection system. Any signs of tearing or gouges that could allow intrusion of water should be documented. Areas surrounding the cable bands, areas around tower saddles, and entrances to the anchorages should be inspected thoroughly. The cable inspection should also document the condition of the safety handhold cable and its connections to the main cables.

A schedule shall be documented in the Complex Bridge Inspection Plan and followed for an In-Depth Inspection involving the use of Non-Destructive Evaluation (NDE) techniques and/or intrusive inspection, where a portion of the cable wrapping is removed and the wire strands are wedged apart allowing for both a visual and borescope inspection of individual wires.

3.6.9.2.3 Cable Anchorage

Consult the Confined Space Entry Plan before entering the anchorage structure. The inspection should note the overall condition of the anchorage house. The inspector should document the temperature and humidity both inside and outside the anchorage and should also document any sources of water intrusion into the anchorage building. The inspector should carefully inspect the

condition of the cables as they pass through the anchorage walls and into the splaying (cable spreading) structure noting any signs of rust or deterioration.

3.6.9.2.4 Hangers

Hangers or suspenders should be thoroughly inspected for any signs of wear or fraying. Note any signs of rust, pitting, or section loss of the wires. Connections to the cable, typically at cable bands should be carefully inspected for signs of rust staining or water intrusion. Hanger cable connections to the superstructure, usually through lead filled sockets and mechanically fastened brackets should also be thoroughly inspected for signs of rust, pitting, section loss, or distortion.

3.6.9.2.5 Towers

Typically comprised of massive steel legs and bracing members, towers can rise hundreds of feet above the deck surface. A detailed plan for access and inspection of the tower members should be part of the Complex Bridge Inspection Plan. This may require hiring an experienced inspection team, trained in rope and free climbing techniques in order to gain access to the external components of the tower. A typical suspension bridge tower will have an internal system of ladders or stairs that gain access to the top of the tower. The inspection should include a complete documentation of the condition of all tower members, including the competence of the access ladder or stair structures. Proper operation of the tower aviation lighting and condition of their supports should also be noted.

3.6.9.2.6 Miscellaneous

The inspection report should include a complete inspection of the structure's expansion joints, noting the opening and air temperature and any out-of-tolerance movements. Superstructure wind-tongue structures should be inspected, noting any areas of deterioration or section loss, and any defects in the operation of the system. Proper operation of navigation lighting and condition of their supports should also be noted.

3.6.9.3 General Inspection Requirements for Cable-Stayed Bridges

A cable-stayed bridge is typically comprised of a steel or concrete box or girder superstructure supporting a deck structure, all supported by a series of fanned or splayed high strength multi-

strand cables, spanning from anchorages near the top of tall concrete or steel towers to the superstructure near deck level. The general inspection requirements for a cable-stayed bridge are as follows:

3.6.9.3.1 Deck

The deck of a cable-stayed bridge is typically concrete, either cast in place or comprised of precast concrete panels with a bituminous or concrete overlay wearing surface. In most designs, the deck of a cable-stayed bridge is always in compression. The inspection should note any distressed areas in the deck, including any signs of compressive force damage or any notable transverse cracks that could indicate a loss of deck compression and a potential sag in the superstructure. The deck, including any wearing surface should be inspected for signs of distress using appropriate procedures, such as chain drag, infrared thermography, ground-penetrating radar, etc. A deck survey should be completed periodically to document elevations against original as-built plans and past inspection surveys. The inspection should include an inspection of the deck drainage system.

3.6.9.3.2 Cable

A typical cable-stayed bridge cable is comprised of a series of multi-wire, high strength steel strands inside a steel or plastic pipe encasement. The encasement pipe will usually have a secondary protection system such as a fabric wrap and/or paint. The cable protection system should be visually inspected for any signs of distress or areas of possible water intrusion. Areas near cable anchorages in the towers, areas where the cable typically passes through the deck structure, and areas near the connection to the superstructure should be inspected thoroughly. Any cable damping system should be inspected to ensure that it continues to provide proper damping of wind-induced cable vibrations. A schedule shall be developed and followed for an In-Depth Inspection involving the use of Non-Destructive Evaluation (NDE) techniques and/or intrusive inspection of the cables.

3.6.9.3.3 Cable Anchorages

If possible, the cable anchorages at the superstructure connections and at the towers should be inspected for signs of moisture intrusion. Signs of trapped water and any leaching should be

noted. Anchorage protective end caps can usually be removed for a close inspection of the strand ends and wedge condition.

3.6.9.3.4 Tower

Cable-stayed bridge towers are usually massive, hollow, concrete structures. The inspection should include a visual assessment of the outside of the towers, noting any cracks, rust staining, leaching, or significant deterioration. The Confined Space Entry Plan shall be followed before entering the inside of the tower. A system of ladders, stairs, or elevators is available for access to the top of the towers, including access to cable anchorages near the top of the tower. Proper operation of tower aviation lighting and condition of their supports should be noted also. The access door should be inspected for proper security locks.

3.6.9.3.5 Miscellaneous

The inspection report should include a complete inspection of the structure's expansion joints, noting the opening and air temperature and any out-of-tolerance movements. Proper operation of navigation lighting and condition of their supports should also be noted.

3.6.9.4 General Inspection Requirements for Movable Bridges

A movable bridge presents unique challenges. Dynamic loadings are induced into structural members of the bridge as the bridge is operated. Inspectors should observe the operation of the bridge in order to identify any unusual vibrations or noises or irregular movement of the structure. The bridge operators and bridge mechanics should be interviewed to discuss any operational issues identified.

In addition to structural aspects of the bridge, movable bridge owners usually employ bridge mechanics and electricians to oversee the routine inspection, maintenance, and repair to the mechanical and electrical elements of the bridge. These employees are usually responsible for the inspection and maintenance of the power supply, wiring, motors, control panels, trunnions, rack castings, gears, and counterweights. Although the NBIS inspection is the prime responsibility of the Illinois Certified NBIS Team Leader, he/she should discuss operation of the bridge with the mechanic and electrician. Mechanical / electrical issues can lead to improper

operation of the bridge and induce unusual forces into members, potentially causing severe buckling or torsion. The general inspection requirements for a moveable bridge are as follows:

3.6.9.4.1 Deck

Most movable bridges have an open steel grid deck system in order to reduce the overall dead load of the span. The steel grid shall be inspected for potential member breakage, weld failures, and deterioration of connection details to the steel superstructure. The open grid design allows deicing salts and water to fall directly on the steel superstructure members below the deck.

3.6.9.4.2 Superstructure

The superstructure inspection shall follow the Complex Bridge Inspection Plan for the bridge.

3.6.9.4.3 Mechanical Systems

The inspection of the mechanical systems of the bridge shall include any operational reports from the bridge operators and mechanics. In addition, the inspector shall observe the operation of the span, noting any unusual sounds or vibrations. The lift system shall periodically be scheduled for a span balancing procedure to ensure efficient and safe operation of the structure.

3.6.9.4.4 Electrical Systems

The inspection of the electrical systems of the bridge shall include any operational reports from the bridge operators and electricians. In addition, the inspector shall observe the operation of the span, noting the proper function of traffic gates and signals.

3.6.10 Critical Findings

Per the NBIS, a Critical Finding is defined as a structural or safety related deficiency that requires immediate action to ensure public safety.

3.6.10.1 Automatic Critical Finding Per NBIS

The instances below are considered Critical Findings, regardless of the circumstances:

- Bridges requiring partial/complete closure of a bridge lasting > 24 hours.
- Deck Condition – Item 58 | B.C.01, Superstructure Condition – Item 59 | B.C.02, Substructure Condition – Item 60 | B.C.03, or Culvert Condition – Item 62 | B.C.04 coded ≤ "2 - Critical"
- Channel Condition - Item 61 | B.C.09 or Channel Protection Condition – Item B.C.10 coded ≤ "2 – Critical"
- Scour Critical Evaluation - Item 113 | B.AP.03 coded ≤ "2 - Critical"
- Nonredundant Steel Tension Member Appraisal Rating - Item 93A1 | B.C.14 coded ≤ "3 - Serious"
- Special Inspection Condition Status - Item 93C1 | B.IE.63 coded "0"
- Bridges requiring immediate load restriction or posting, or immediate repair work to a bridge, including shoring, to remain open

3.6.10.2 Potential Critical Finding

Potential Critical Findings include bridges sustaining damage from extreme events including, but not limited to, the following:

- Vehicle impact
- Barge impact
- Fire
- Flood
- Earthquake

When a potential Critical Finding is identified, the safety of the traveling public is the priority. The Illinois Certified NBIS Program Manager or Team Leader on-site must take the necessary steps to ensure the safety of the travelling public. If the identified deficiency or defect seriously reduces the load carrying capacity of the bridge, traffic must be restricted to isolate the area in question, or the bridge must be closed within 24-hours pending further evaluation by the Bureau of Bridges & Structures. Simple shoring, such as timber blocking, must be installed within 72 hours. All relevant information regarding the deficiency or defect must be provided to the Agency PM. As the immediate risk to public safety has been addressed, additional follow-up actions may be

required, such as a Load Rating Inspection, structural analysis to determine if a weight restriction below legal loads is required, or the development of repair plans.

Once the Agency PM has reviewed, the information must be submitted to the Statewide PM to determine if the Critical Finding is warranted. The Agency PM completes IDOT Form BBS CF 1 Critical Finding Report with all supporting documents, signs/dates the form, and submits it to DOT.BBSBridgeMgmt@Illinois.gov.

For LPA bridges, also send to DOT.LocalBridgeMgmt@Illinois.gov.

The Bureau of Bridges & Structures will coordinate with the Agency PM to determine if there is a need for a Damage Inspection or Load Rating Inspection, follow-up structural analysis, Special Inspection, and to develop a plan of action to mitigate the deficiency.

3.6.10.3 Critical Finding Reporting Requirements

All Critical Findings reported to, or generated by, the BBS are submitted to the FHWA Illinois Division. The Agency PM must submit IDOT Form BBS CF 1 Critical Finding Report to the BBS as soon as possible to meet the timeframes in Section 3.6.10.4. The Agency PM must provide sufficient detailed information on the form; sign as Agency PM and submit it to the Bridge Maintenance & Inspection Unit for review and signature by the Statewide PM. The Statewide PM will upload the Critical Finding documentation to the ISIS. The Agency PM can download the information for the Bridge File.

If the Statewide PM determines the deficiency or defect does not constitute a Critical Finding, the Agency PM will be notified by email with a detailed explanation of the determination and any recommendations for follow-up action.

3.6.10.4 FHWA Notification of a Critical Finding

Per NBIS regulation §650.313(q)(2)(i), the Bureau of Bridges & Structures - Bridge Management & Inspection Unit will report Critical Findings to the Illinois Division Office of the FHWA within 24 hours for bridges on the NHS that require full or partial closure and/or have an NSTM that is to be rated in serious or worse condition, as defined in the NBIS (see §650.315) by the NSTM

Inspection item, coded three (3) or less. All other critical findings shall be reported to FHWA within 30 days.

IDOT will provide monthly status reports of open Critical Findings to the FWHA in accordance with 23 CFR 650.313 (q)(2)(ii).

3.6.11 Inspection of Bridges/Culverts under Construction

When a bridge/culvert, or any portion of a highway bridge, is open to the traveling public, it is subject to the requirements of the NBIS and must be inspected.

3.6.11.1 Bridge/Culvert Replacement, Repair, or Rehabilitation – Staged Construction

For staged construction projects, the portion of the bridge open to the traveling public must be inspected at regular intervals to ensure safety. Routine, Underwater, NSTM, Element Level, and Special Inspections are to be completed in accordance with the NBIS. The NBIS Initial Inspection is required within 90 days of the bridge being opened to each stage of traffic. However, the Bureau of Bridges & Structures considers 30 days to be more than sufficient time to perform the NBIS Initial Inspection.

3.6.11.2 Bridge/Culvert Replacement – New Bridge/Culvert on New Alignment

When an existing bridge is being replaced with a new bridge located on a new alignment, the existing bridge is to be inspected in accordance with the NBIS until the bridge is closed. The NBIS inspection for the new bridge must be completed within 90 days of opening to traffic.

3.6.11.3 Bridge Replacement/Rehabilitation – Closed to Traffic During Construction

For an existing bridge that is closed to public traffic during total replacement or rehabilitation work, an NBIS inspection is to be completed, and SI&A data must be updated, within 90 days of completion of the work (all lanes open to public travel).

3.6.11.4 Temporary Structures – Open to Traffic for > 24 Months

If a temporary bridge is being utilized to carry the traveling public for more than 24 months during the construction of the permanent bridge, the temporary bridge must be inventoried in the ISIS and inspected in accordance with the NBIS. Generally, the bridge being rehabilitated or replaced remains in the inventory and appropriate SI&A data are to be coded. The existing bridge will be "deleted" with Status "D" when it is removed.

3.6.12 Inspection of Closed Bridges

Bridges closed to the travelling public are not subject to the requirements of the NBIS. However, IDOT policy is to continue to monitor all closed bridges.

The annual IDOT Local Posting and Closure Reviews by District Operations in District 1, and by the Bureau of Local Roads and Streets for Districts 2 thru 9, satisfy the IDOT requirement to monitor closed bridges maintained by Local Public Agencies. However, IDOT encourages bridge owners, including IDOT districts, to monitor all closed bridges as well. The monitoring is conducted to verify the closure is per the MUTCD and IL-MUTCD and is not being violated. Any potential or suspected hazards from falling debris must be noted and reported immediately to the Agency PM.

For bridges suspected of continued use by trespassers, additional measures may be warranted to prevent access to the bridge such as a more permanent means of closure or removal of the deck/superstructure.

The following codes in the ISIS for Bridge Status – Item 41 represent closed bridges in the inventory:

- A – Closed, replacement/repairs under contract
- B – Closed, replacement/repair anticipated within next 5 years
- C – Road Closed, closure not related to condition of the structure
- E – Closed, permanent closure due to bridge condition, repair/replacement not anticipated within the next 5 years or closed for more than 5 years

A closed bridge in the inventory may pose undue liability to the agency having maintenance responsibility. IDOT recommends scheduling the bridge for demolition if the bridge continues to be a source of use by trespassers, concern for partial/total collapse, or is a hazard to the public.

Once a bridge closure has been mandated by IDOT and implemented in the field, the bridge cannot be reopened without approval from the Department.

3.7 Non-Destructive Testing

3.7.1 General

Non-Destructive Testing (NDT) is often an essential tool used during the inspection of steel bridge members to determine the remaining thickness of various deteriorated elements, presence and/or extent of defects when visual inspection suggests the existence of a defect or is not sufficient to verify the internal integrity of structural members, such as pins. The most frequently used NDT methods by IDOT Inspection personnel are:

- D-Meter Thickness Measurement (DM) – Used to measure steel thickness
- Dye Penetrant Testing (PT) – Used to determine presence and extent of cracks
- Magnetic Particle Testing (MT) – Used to determine presence and extent of cracks
- Ultrasonic Testing (UT) – Used to confirm internal integrity of bridge pins

Inspection personnel responsible for the inspection of steel bridges must be familiar with the use and limitations of the various NDT methods. The information in the Appendix provides basic guidance on the most frequently used NDT methods by IDOT inspection personnel. To ensure knowledge of the proper application of the testing procedures, limitations, and interpretation of results, inspection personnel require additional training by certified instructors and extensive hands-on experience.

3.8 Inspection of Pins, Links, and Hangers

3.8.1 Inspection of Pin & Link Assemblies

3.8.1.1 General

The information provided in this section provides an expedient method for evaluating in-place double-pin and link or single-pin moment release joints on multi-beam/girder and 2-girder bridges. Region/District inspectors are trained by IDOT employees previously certified by outside agencies in the use of ultrasonic testing (UT) equipment and evaluation methods. UT and visual inspection (VT) shall be utilized for a Preliminary Pin Inspection (PPI), based on pass-fail criteria related to the detection of defects or discontinuities within the length of the pin. This procedure, although based on industry practices, is an IDOT method developed to provide basic condition information, and neither intends nor purports to identify all irregularities within a pin.

3.8.1.2 Inspector Qualifications

Bridge Inspection personnel utilizing UT for the inspection of pins must be adequately trained. IDOT District Inspection personnel performing a PPI to detect significant defects/discontinuities are trained by IDOT Central Office Bridge Inspection personnel. At a minimum, the training provides:

- Familiarization with operating principles of UT;
- Calibration methods, using American Society for Testing Materials/American Society for Nondestructive Testing (ASTM/ASNT) standard UT reference blocks; and an IDOT UT reference standard for preliminary pin evaluation.
- Initial VT and subsequent UT scanning methods for various situations and configurations, including assessments and reporting of results.
- IDOT pin scanning methods, result interpretation, testing documentation and recommendations for follow-up inspection or immediate action.
- Potential problems with access and interpretation, and alternative tests or methods.
- Field exercise or classroom mock-up.
- Additional discussion, questions and answers, etc.

The training includes extensive hands-on and interactive participation, encouraging participants to critically examine the methodology and propose modifications and improvements. Upon the successful conclusion of the training, inspectors will be considered qualified to conduct preliminary pin and link inspections. During a PPI, if results indicate the presence of anomalies or are inconclusive, a Supplemental Pin Inspection (SPI) must be scheduled for additional nondestructive testing (NDT) to be performed by IDOT District or BBS personnel or outside testing agency personnel qualified to at least ASNT UT Level II criteria.

3.8.1.3 Link Inspections

All accessible surfaces of link plates shall be visually inspected (VT) for corrosion; paint deterioration; distortion due to misalignment or seizure; and cracking, paying particular attention especially at the critical sections near the pins. Any confirmed or suspected cracks shall be immediately reported to the Agency PM, to schedule further NDT and/or the implementation of temporary measures such as shoring lane restrictions; or weight restriction. Other defects shall be documented for future reference or for directing follow-up NDT.

UT or DM may be used during link inspections to verify remaining material thickness, but they are not typically used for crack evaluation and detection in link plates. Magnetic particle inspection (MT) or dye penetrant testing (PT) may also be used to assess possible cracks if the inspector is equipped and trained for their use.

The inspector should attempt to determine if the pins are “frozen” within the girder webs and/or link plates or are free to rotate due to temperature changes or the passage of vehicles across the bridge. A continuous layer of paint or corrosion across the interface with no interruption caused by rotation may indicate seizure. Single pins in moment release joints may undergo sufficient motion under live load to disclose the absence of seizure. Dual pins in hanger links usually rotate gradually due to temperature changes and do not show perceptible motion under live load, so seizure is difficult to assess.

3.8.1.4 Pin Inspections

If pins are found to have no defects, based on the criteria herein, no additional NDT is required. If anomalies or non-conforming pins are detected, the Agency PM must schedule for a SPI to provide additional UT evaluation by IDOT District, or BBS personnel or outside testing agency

personnel qualified to at least an ASNT UT Level II. Based on the results of the SPI, recommendations can be made for replacement or subsequent inspection criteria for suspect pins. If the PPI indicates the actual (or potential) failure of one or more pins, the Agency PM, and the Statewide PM must be notified immediately and temporary measures, such as shoring and/or lane restrictions, weight restrictions, or complete bridge closure may be required until further inspections, pin replacement or supports can be implemented.

An actual or suspected pin failure is considered a potential Critical Finding. Once steps have been taken to ensure the safety of the traveling public, a "Critical Finding Report" must be submitted to the Bureau of Bridges & Structures Bridge Maintenance & Inspection Unit as specified in Section 3.6.11 .

3.8.1.4.1 Preliminary Pin Inspections (PPI)

The objective of a PPI is to detect the presence of significant defects or discontinuities within the length of a pin. A method for a Preliminary Pin Inspection is as follows:

- If issues arise in evaluating the far end of long and/or small diameter pins, the 3.5 MHz transducer may be more accurate with its smaller beam spread. The greater beam spread of the 2.25 MHz transducer may be preferred for pins with cotter pin holes near the contact end, and to access areas behind threads or step-down diameter reductions at ends.
- Calibrate the equipment before beginning work, using the transducer and IDOT test specimen. For pins up to 10" (250 mm) long, adjust the display so horizontal screen increments represent 1" (25mm). For longer pins, adjust screen increments to represent convenient units (for example: 1 ¼", 1 ½", 2"), while keeping the pin's far end back signal on the screen.
- At the first pin to be tested, verify there are no unexpected reflectors (not including threads, cotter pin holes, etc.) are present between the transducer and far end. If any appear, go to another pin until a satisfactory pin is found. Adjust the gain so the back reflection of the pin's far-end is 50% of the screen height (use this value as the reference level on IDOT Form 2760 Preliminary Pin and Link Inspection Journal) and record the transducer and dB reading on the inspection form. For inspection scanning of that pin and all similar pins, increase that gain by 10 dB.
- Distance calibration should be periodically verified by checking the IDOT test specimen after each two hours of work; at each new work location, measuring the pins at one deck joint; for significant changes in pin lengths or condition; or if the pin's temperature rises or falls more

than about 30°F, which could affect couplant behavior. The IDOT test specimen should be at approximately the same temperature as the tested pins.

- Scan one end of each pin, using a circular motion and positioning the transducer so near-end threads do not degrade the image while evaluating the far end of the pin. Compare results to the pin geometry, so diameter changes, cotter pin holes or far-end threads are not mistaken for defects. If the "shelf" or "shoulder" (change in diameter of the pin) is more than ¼ inch, scanning should be done from both ends.
- Indications, especially in bearing contact areas, producing an image more than 20% screen height at reference level (50% of screen height at end of pin) requires the pin to be scanned from the opposite end as well. The results shall be recorded for future reference, indicating the location (distance from each end); gain; signal height and transducer position to maximize the signal for each reflector. The transducer's positions when the defect initially appears and finally disappears or is minimized on the screen shall also be noted. "Transducer position" shall be described by its circumferential location, based on a theoretical clock face with 12 at the top of the pin, and radial distance from the center of the pin. For consistency, pins requiring additional inspections shall have the 12 o'clock position center punch marked on both ends near the periphery, and "clockwise" shall be considered independently for each end.
- Scanning from both ends may provide sufficient data to characterize the type, size, orientation and criticality of defects. If any reflector produces a signal more than 50% of screen height at reference level, or if a pin's far end response is completely lost while scanning from either end, the results for both ends must be immediately reported to the Designated Certified NBIS Agency Program Manager and the Statewide NBIS Program Manager. Large internal discontinuities may prevent most of the pulse from reaching the far end or redirect the reflected signal, resulting in loss of far end back reflection.

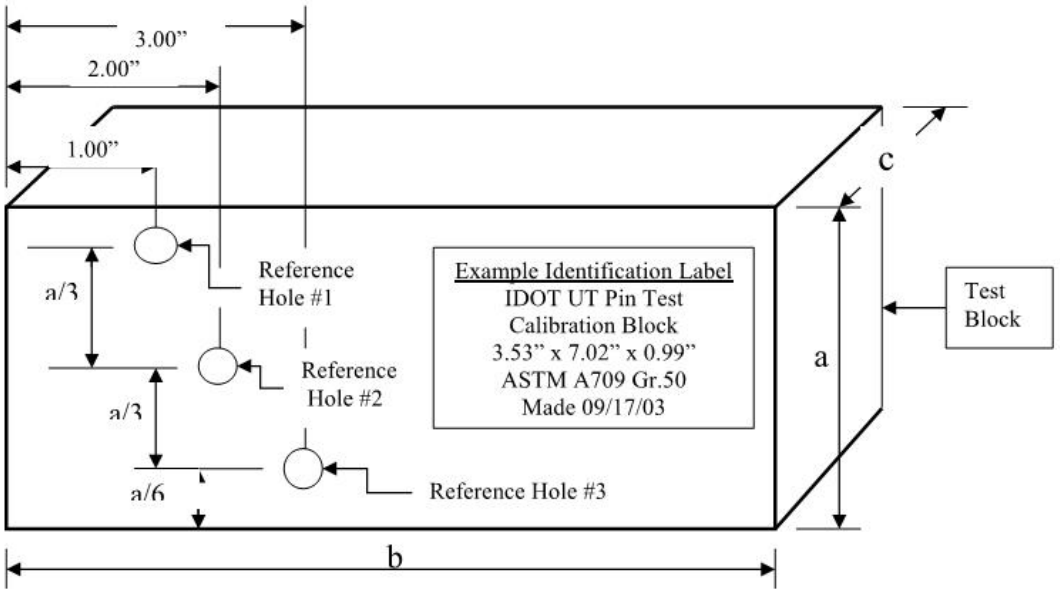


FIGURE 1: IDOT UT Pin Test Calibration Block

Based on pins inspected and material available, select a, b & c as follows:

a (height): nearest ½" from 3" to 6"
b (length): nearest whole inch from 6" to 12"
c (thickness): nearest ¼" from ¾" to 1¼"

Accurately determine all dimensions (± 0.01") and place label on specimen.
Reference Holes (RH) #1, #2 and #3 are 1/16" (0.0625") diameter, through-thickness of test block, and perpendicular to face within ± 0.5 degrees.
Material for test block must be ultrasonically "clean", and either low alloy, carbon steel or stainless steel may be used. All surfaces are milled and polished, and all corners are perpendicular (within 0. 5º).

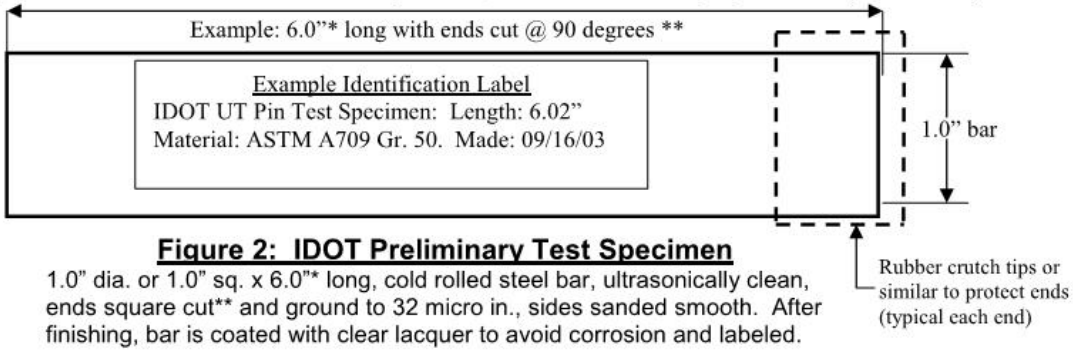


Figure 2: IDOT Preliminary Test Specimen

1.0" dia. or 1.0" sq. x 6.0"* long, cold rolled steel bar, ultrasonically clean, ends square cut** and ground to 32 micro in., sides sanded smooth. After finishing, bar is coated with clear lacquer to avoid corrosion and labeled.

Notes: *Test specimen length of 6" is arbitrary. Convenient lengths representative of typical pin lengths may be used. Even inch increments (7", 8", 9", 10") are recommended for ease of calibration.
** Ends of specimen cut square to within 0. 5 degrees, length tolerance ± 1/8"

Figure 3.8-1 – Diagram "A" – IDOT Test Block & Specimen

3.8.1.4.2 Supplemental Pin Inspections (SPI)

The equipment and procedures used to conduct a Supplemental Pin Inspection (SPI) are the same as used for performing the PPI. The SPI is, however, performed by personnel qualified to be at ASNT Level II.

3.8.1.5 Inspection Records

Permanent inspection records must be maintained for pins and links. Forms for documenting the condition of pins and links during PPIs and SPIs are provided by IDOT Form BBS 2760, "Preliminary Pin and Link Inspection Journal" and IDOT Form BBS 2780 Supplemental Pin / Link Inspection Journal. Pins and links with no structurally significant anomalies detected by the PPI only require stating "No Defects Noted", along with the item's location, the pin end(s) scanned, and any pertinent remarks to assist future inspections. Note that "location" for pins and links includes span and girder/beam number, distance to nearest identified support, pin location (upper or lower) and link position, such as "east side". Other comments regarding field conditions; paint condition; possible seizure; excessive rust staining; etc. or recommended maintenance actions must be reported to the Agency PM.

A copy of the permanent inspection records for each pin and/or link with reportable anomalies, indicating all pertinent field observations and recommendations for additional investigations, shall accompany the preliminary inspection report submitted to the Agency PM. The permanent record documents the initiation and subsequent growth of defects and will be maintained in the Bridge File even after the item is replaced. If reported indications are proven to be non-significant or "spurious", caused by technique or other causes, but not actual internal defects, the record shall include possible explanations and verification testing results.

Pins requiring additional investigation, due to a reflector exceeding 20% of screen height during the PPI, shall have the location of all reflectors exceeding 20% of screen height at the reference level documented, as described in Item 6 of the "Preliminary Pin Inspection Method" in Section 3.8.1.4.1 .

Additional investigation required for links to quantify potential structural problems noted during the PPI may employ UT, MT, PT, DM or radiographic testing (RT), as directed by the Agency PM. The additional test results shall be recorded on a separate form for each link and included in the

link's permanent inspection record for future reference, even if the indications prove to be non-significant or "spurious." The record shall include possible explanations and verification of the testing results. Additional information, test reports, photos or other pertinent information shall be attached to the permanent record and stored in the Bridge File.

If paint, rust and/or other foreign material is removed from links, nuts and non-stainless-steel pins for VT, MT, UT or PT, bare steel shall be protected after the inspection is complete. UT couplant, PT residue and moisture shall be removed and then a zinc-rich primer or other owner-approved coating may be spray-applied. For pins to be inspected on a regular interval, the exposed ends may be coated with grease.

Copies of each bridge's overall evaluation, together with copies of the permanent records for each pin and/or link and additional testing recommended to evaluate anomalies, shall be signed by the Team Leader and submitted to the Agency PM, as soon as possible after the inspection. Reports, including summaries, photos and additional investigations of PPI-revealed deficiencies, along with inspection personnel's suggestions or comments applicable to the particular location and similar installations, shall be compiled by the Team Leader and submitted to the Agency PM.

Inspector suggestions and comments may include initial and follow-up investigation methods, preventative maintenance actions, inspection documentation, employee safety considerations, and methods to improve inspection efficiency.

3.8.2 Inspection of Cantilever Truss Suspended Span Pins & Hanger Members

3.8.2.1 General

Continuous cantilever trusses typically have suspended simple span trusses in the main span, which are supported by large steel pins and hanger members. The pins can be up to 30" in length and 12" in diameter. Hangers are typically built-up members or rolled sections with additional reinforcement plates at the pin locations. The pins and hangers in suspended truss spans are typically considered NSTMs.

3.8.2.2 Pin Inspections

In general, suspended truss pins and hangers are to be inspected by the same criteria as beam/girder pin and links. A PPI shall be completed at each location. A detailed access and pin preparation plan may be required. Suspended truss pins may have center bore holes with steel threaded rods and end cap plates requiring removal before a PPI can be completed. Consult previous inspection records and procedures or discuss potential limitations of cap or retention plate removal before the inspection. In some instances, test pins, fabricated to the same specifications as the existing pins, may be available for calibration of UT equipment.

As with pin and link inspections, the objective of the PPI is to detect the presence of significant defects or discontinuities within the length of the pin. If anomalies or non-conforming pins are detected, Agency PM must schedule a Supplemental Pin Inspection (SPI).

Any actual or suspected pin failure is considered a potential Critical Finding. Once steps have been taken to ensure the safety of the traveling public, a Form BBS CF 1 Critical Finding Report must be submitted to the Bridge Management and Inspection Unit as specified in Section 3.6.11.

3.8.2.3 Hanger Inspections

Suspended span truss hangers are typically large vertical members consisting of built-up members or rolled sections with additional reinforced plates at the pin locations. The entire hanger, a NSTM coded in the ISIS, must be hands-on inspected for the full length of the member. Any suspected cracks, distortions, or other potential defects must be recorded on the appropriate inspection form. Further investigation may require specialized NDT methods by qualified personnel.

3.8.3 Inspection of Pins and Eyebars in Eyebar Trusses

3.8.3.1 General

Eyebar trusses are no longer used in modern bridge construction, but several remain in the Illinois bridge inventory. These are typically located on low traffic volume routes. Eyebar trusses are typically light, relatively short, simple-span trusses but can reach major bridge lengths and span major waterways.

3.8.3.2 Pin Inspections

Eyebar truss pins are to be inspected by the same criteria as beam/girder pins. A PPI shall be performed on each pin and the results recorded on the appropriate inspection forms. Eyebar truss pins are considered NSTMs and must be inspected during each scheduled NSTM Inspection.

In many instances, excessive pack rust between eyebars at pin locations may have totally seized any movement of the pins. Excessive pack rust should be carefully removed, if possible, without causing any damage to the eyebars. In addition, the inspector should verify that there is sufficient pin length beyond the outside eyebars or that the end caps, retainer nuts, or cotter pins are functioning properly. Excessive pack rust can exert enough force to push eyebars off their pins in extreme cases.

3.8.3.3 Eyebar Inspections

Eyebars are to be inspected by the same criteria as links. Most eyebars are typically cast, forged, or cut from rolled steel plate material and are rectangular in cross-section and transition to a wider section with an opening to receive a steel pin. The “eyes” in round eyebars are generally flattened by forging. The “eye” can also be formed by creating a loop that is forged or welded to close the loop. The entire eyebar is a NSTM and must be hands-on inspected for the full length of the member.

As with links and hangers, the eyebar shall be visually inspected for any cracks, gouges, section loss, or distortions. Particular attention shall be paid to the forged or formed “eye” areas. Any anomalies or potential defects shall be reported immediately to the District/Area or Agency PM. Any major flaws or suspected fractures shall be immediately reported to the District/Area or Agency PM and the Statewide PM after taking all necessary procedures to safeguard public safety. IDOT Form BBS CF 1 Critical Finding Report must be completed and submitted to the Bureau of Bridges & Structures as specified in Section 3.6.11.

3.9 Bridge/Culvert Scour Critical Evaluation (SCE) and Scour POA

3.9.1 General

In 1988, the FHWA initiated the National Scour Evaluation Program. The NBIS specifies all bridges over waterways must be assessed for scour susceptibility and to determine the required protection in the form of countermeasures to ensure the stability of the bridge. The quantification of scour susceptibility is by the Scour Critical Evaluation - Item 113. The NBIS further specifies the agency having maintenance/inspection responsibility for bridges determined to be scour critical or scour susceptible must prepare, implement; and periodically update a Scour Plan of Action (POA) to monitor known and potential deficiencies.

Only item numbers associated with the Coding Guide are used in this section. SNBI items will be added upon completion of policy updates related to the coding of Scour Critical and Scour Susceptible bridges and the use of BridgeWatch® software.

The following definitions are applicable to terms used in this section:

> Scour: Erosion of streambed or bank material due to flowing water; often considered as being localized around piers and abutments of bridges.
>
> Scour Critical Bridge: A bridge with a foundation unit that is theoretically unstable, or may become unstable, as determined by the scour appraisal or has experienced actual scour below the design scour depth.
>
> Scour Susceptible Bridge: A bridge with Scour Critical Evaluation – Item 113 coded “4” or “7”.

All bridges in the inventory over waterways with an AASHTO length greater than 20 feet must have a Scour Critical Evaluation. A Scour POA is required for bridges with a Scour Critical Evaluation – Item 113 coding of “2”, “3”, “4”, “7”, or “U”. The Scour POA is maintained in each Bridge File and must be uploaded to the ISIS. See Section 3.9.4 regarding monitoring scour critical and scour susceptible bridges.

Bridges over waterways have the potential for severe scour. Heavy rainfall events producing stream flows beyond design levels, buildup of debris against one or more substructure units; pressure flow; or other factors. Once the actual scour progresses beyond the limits of the Scour Critical Evaluation - Item 113, the bridge must be closed until the stability of the bridge can be re-evaluated. This will very likely require a new Scour Evaluation Study and structural analysis.

3.9.2 Scour Evaluation and Stability Assessment (SES) of New/Rehabilitated Bridges over Waterways

New bridges/culverts and rehabilitation projects reusing the foundations must have a SES, determination of estimated scour depths, and a Scour Critical Evaluation - Item 113 rating completed during the preliminary planning phase.

- For IDOT maintained bridges, the Bureau of Bridges & Structures must review and approve the SES for each bridge.
- For other state agency and LPA bridges, the designer must provide the SES, estimated scour depths, and Scour Critical Evaluation - Item 113 rating when submitting IDOT Form BLR 10210 Preliminary Bridge Design and Hydraulics Report.

See the IDOT *Bridge Manual* for design guidance.

3.9.3 Scour Evaluation and Stability Assessment of Existing Bridges Over Waterways

When scour has occurred exceeding the assessed or calculated scour depths, a SES is required to re-evaluate these characteristics. The study must determine:

- A revised calculated estimated scour depth
- If additional scour is likely to occur, due to rainfall events, before scour countermeasures can be implemented
- If the bridge is stable for the observed scour and for additional scour in the interim

A SES is also required for existing bridges not previously having a Scour Critical Evaluation and requires the following information:

- Information relative to the current rainfall event (estimated flood frequency)

- Historic site conditions including streambed and channel stability as well as previously observed scour
- Soil borings or other data indicating the type and properties of the material present at, and below, the elevation of the streambed
- Hydraulic data (current and historic flood events)
- Structural information related to the substructure units of the bridge (existing plans, as built plans, pile driving records, etc.)

The Bureau of Bridges & Structures and the District/Agency will coordinate to determine if the study and stability analysis are required and agency having maintenance/inspection responsibility is to provide. The completed study and stability analysis along with IDOT Form BBS SCE must be submitted to the Bureau of Bridges & Structures for review and approval. If approved, the Scour Critical Evaluation - Item 113 coding will be entered into the ISIS by the Bridge Management & Inspection Unit.

If the study determines the bridge is not stable for the depth of scour observed or the potential future scour, the bridge must be closed immediately and can be reopened once engineered scour countermeasures are designed, installed per plans/specifications, and functioning as intended. The bridge will require future monitoring through a Scour POA and IDOT's scour monitoring program BridgeWatch®.

The Agency PM must contact the Bureau of Bridges & Structures immediately for consultation and to determine the proper course of action. If further analysis is required before the stability of the bridge can be determined, the bridge must remain closed or must have designed temporary countermeasures installed. The Agency PM and the Statewide PM will determine the appropriate temporary measures on a case-by-case basis.

3.9.4 Reporting Field-Observed Scour

3.9.4.1 Scour Critical Bridges

Observed scour meeting either of the criteria below must be reported to the Agency PM and the Statewide PM immediately for further direction:

- Observed scour ≥ 25% of the as-built overburden above the top of footing has occurred; or
- Observed scour exposing the top of a spread footing or > six (6) feet at a pile supported footing or pile bent substructure unit.

The IDOT Form BBS SCE must be completed immediately and submitted to the BBS for entry into the ISIS. The Scour Critical Evaluation - Item 113 must be coded "2".

3.9.4.2 Scour Susceptible Bridges

For bridges with Scour Critical Evaluation - Item 113 coding of "4" or "7," observed scour meeting one of the criteria below must be reported to the Agency PM and the Statewide PM as soon as possible for further direction:

- Observed scour ≥ 50% of the as-built overburden above the top of footing has occurred; or
- Observed scour exposing the top of a spread footing or > six (6) feet at a pile supported footing or pile bent substructure unit; or
- Scour countermeasures have been damaged and are partially or completely ineffective.

IDOT Form BBS SCE Scour Critical Evaluation Report must be completed immediately and submitted to the BBS for entry into the ISIS. The Scour Critical Evaluation - Item 113 must be coded "2".

3.9.4.3 Non-Scour Critical/Susceptible Bridges

For bridges with Scour Critical Evaluation - Item 113 coding of "5", "8", or "9", observed scour meeting one of the criteria defined in Section 3.9.4 must be reported to Agency PM and the Statewide PM for further direction.

The IDOT Form BBS SCE must be completed immediately and submitted to the BBS for entry into the ISIS. The Scour Critical Evaluation - Item 113 must be coded "2".

3.9.5 Revising the Coding of Scour Critical Evaluation – Item 113

The Bridge Management & Inspection Unit in the Bureau of Bridges & Structures is responsible for updating the Scour Critical Evaluation - Item 113 coding for all bridges in the Illinois Bridge Inventory. The following various situations when the Scour Critical Evaluation coding is inconsistent with the inspection information, coded "Blank" or "6" due to the Scour Evaluation Study and Scour Critical Evaluation form not received, or in need of re-evaluation:

- To revise the Scour Critical Evaluation – Item 113 coding from "4" (or less), a new Scour Evaluation Study is required for review and approval by the Bridge Management Unit in the Bureau of Bridges & Structures.
- In order to change the Scour Critical Evaluation – Item 113 coding from "Critical" ("2", "3", or "4") to "7", the scour countermeasures must be engineered per HEC-23, installed according to specifications, and functioning as intended. The Bureau of Bridges & Structures must review and approve the scour countermeasure design and installation.
- In order to change the Scour Critical Evaluation – Item 113 coding from "7" to "5" or "8", the previously installed scour countermeasure (engineered per HEC-23) must have performed adequately through two documented design storm events with little to no damage or the engineered countermeasures are in place functioning as intended for at least 15 years and documentation (channel cross sections, photographs, and/or documented flood events) is provided. The Statewide PM must concur.
- When scour is observed during an inspection which meets or exceeds the scour limits based in the current Scour Critical Evaluation - Item 113 coding, the Agency PM must contact the Statewide PM immediately for further direction. Scour Critical Evaluation - Item 113 should be changed to "2".
- When the Substructure Condition Rating - Item 60 is coded ≤ 5 due to scour, the Scour Critical Evaluation requires re-evaluation.

3.9.6 Scour Plan of Action (POA)

Bridges with Scour Critical Evaluation – Item 113 coded "0" thru "3" are considered Scour Critical. Those with Scour Critical Evaluation – Item113 coded "4" or "7" are considered Scour Susceptible.

Each scour critical or scour susceptible bridge must have a Scour POA. The Scour POA must be submitted to the BBS for review and approval.

Bridges with unknown foundations require a Scour POA. The Scour POA must be submitted to the BBS for review and approval.

IDOT Form BBS 2680 Scour Critical Bridge Plan of Action (POA) must be used, or as the basis for, when developing a Scour POA. While IDOT Form BBS 2620 is applicable to most bridges, Major River Bridges or certain unique bridges may require additional activities, documentation, and requirements not found in the standard form.

The Scour POA must include, but is not limited to:

- Contact information for the Agency PM and backup contact.
- Description of bridge including each substructure element and foundation type.
- Description of substructure elements covered by the Scour POA.
- Summary of the coding of Scour Critical Evaluation – Item 113 for each substructure unit.
- Information related to the type of countermeasures in place.
- Detailed guidance regarding the type and frequency of inspections required to ensure adequate monitoring at the bridge site including monitoring after BridgeWatch® notifications.
- Identification of fixed scour monitoring devices or reference points installed at the site.
- Reference data for use by inspection personnel when assessing site conditions.
- Guidance for reporting site deficiencies.
- Guidance for initiating or recommending bridge closure. The following are examples of when the bridge / roadway shall be closed; other site-specific items will be included in the POA.
  - Bridges experiencing pressure flow which is water to the bottom of the superstructure.
  - Bridge approach roadways overtopping.
- Detour route information.
- Guidance for reopening the roadway.
  - Information related to proposed engineered scour countermeasures to mitigate existing or potential scour concerns.

The Scour POA must be maintained within the Bridge File and uploaded to the ISIS. The Scour POA must be updated after changes in conditions are observed, changes in contact information,

changes to Agency PM, or other reason. At a minimum, the Scour POA must be reviewed and revised every 3 years.

Channel cross-sections must be taken, at a minimum, along the upstream and downstream fascia after each rainfall event as defined by a BridgeWatch® "Alert" for:

- Scour Critical Bridges (Scour Critical Evaluation - Item 113 coded "1", "2", or "3")
- Scour Susceptible Bridges (Scour Critical Evaluation – Item 113 coded "4" or "7")
- Bridges with Scour Critical Evaluation – Item 113 coded "5" requiring an Underwater Inspection

Additional cross-sections may be taken as needed or as required in the Scour POA.

3.9.7 Bridge Scour Monitoring System - BridgeWatch®

IDOT utilizes a third-party bridge scour monitoring system to monitor scour critical bridges, scour susceptible bridges, and select bridges that are stable for scour. The system notifies the agency having maintenance/inspection responsibility when a forecasted rainfall event meets or exceeds certain thresholds. BridgeWatch® monitors the National Oceanic and Atmospheric Administration (NOAA); National Weather Service (NWS); NEXRAD rainfall accumulation products, and the United States Geological Survey (USGS) network of stream flow gages to determine when Warnings and/or Alerts are necessary.

A Warning is provided as advance notification of a potential Alert, and no immediate action is required. An Alert is a notification to users that a scour critical or scour susceptible bridge has experienced a forecasted rainfall event exceeding the thresholds in Table 3.9-1 and the Scour POA. The bridge must be inspected in accordance with the Scour POA to determine if the rainfall event has adversely impacted the structure.

Table 3.9-1 details the Warning and Alert rainfall events for the various Scour Critical Evaluation Item113 | B.AP.03 coding levels and is based on a specific rainfall event having occurred.

Scour Critical Evaluation (Item 113)	Rainfall Event			
	10-Year	25-Year	50-Year	100-Year
0 - 4, 7	Warning	Alert	Alert	Alert
5	---	Warning	Alert	Alert
8	---	---	Warning	Alert
9	---	---	---	---

Table 3.9-1 BridgeWatch® Scour Monitoring Schedule

BridgeWatch® Warnings and Alerts are based on the Scour Critical Evaluation – Item 113 coding for the bridge and the corresponding rainfall event. If a Warning or Alert threshold is exceeded, notification is sent via e-mail and text message to cell phone numbers provided by the users. Upon notification, a Certified NBIS Program Manager or Team Leader will assess the current condition of the bridge and determine if any immediate action is required. The following information will then be documented for the site conditions:

- Date
- Time
- Water level
- Bridge condition
- Debris accumulation
- Approach roadway site condition
- Photographs

The information must be entered into the BridgeWatch® System to clear the Warning/Alert. Each Agency PM is responsible for determining who receives notifications when a Warning and Alert occurs.

The Bridge Management & Inspection Unit maintains and updates users' contact information in BridgeWatch®. The Agency PM should notify the Bridge Management & Inspection Unit when critical information changes to ensure up-to-date records in BridgeWatch®. The Bridge Management & Inspection Unit must be contacted to add, modify, and delete the user contact information.

Table 3.9-2 details the required response time to inspect after the BridgeWatch® Alert for various codings of Scour Critical Evaluation – Item 113.

Scour Critical Evaluation (Item 113)	Response Time to BridgeWatch® Alert (Hours)
4 or Less	4
5	24
7	48
8	96

Table 3.9-2 BridgeWatch® Alert Response Time

Due to the range of conditions that can cause a structure to have Scour Critical Evaluation - Item 113 coded “4” or “5”, the storm event triggering an alert or warning can be modified for site specific conditions upon approval of the Statewide PM.

If a given bridge experiences multiple storm events and does not produce scour concerns, the specified storm event triggering a warning/alert can be modified with approval of the Statewide PM.

If it is determined BridgeWatch® has not adequately estimated the predicted rainfall event or a stream gage has generated data inconsistent with observed or actual rainfall for a given rainfall event, the Statewide PM must be contacted in order to calibrate the BridgeWatch® or to contact USGS to verify the stream gage is functioning properly.

3.9.8 Countermeasures

FHWA *Bridge Scour and Stream Instability Countermeasures* (HEC 23 (Vol 1 / Vol 2)) is required for the selection and design of scour countermeasures. This publication provides the following definition:

> Countermeasure: Measure intended to prevent, delay or reduce the severity of hydraulic problems.

Since monitoring is included within the definition of countermeasures, a properly developed and implemented Scour POA may be considered a countermeasure, but Scour Critical

Evaluation – Item 113 cannot be raised to "7" unless there are engineered scour countermeasures installed and functioning as intended.

When considering scour countermeasures and the effect on the coding of Scour Critical Evaluation - Item 113, only those utilizing HEC-23 to select and design the countermeasures will be considered. Only engineered scour countermeasures installed per the specifications and functioning as intended are considered to have a positive effect when coding Scour Critical Evaluation - Item 113.

3.10 Inspection Safety

During bridge inspection, the safety of the inspection team and traveling public is of paramount importance. All members of the bridge inspection team must be familiar with the safety policies and guidelines set forth by the Occupational Safety and Health Administration (OSHA) and the agency having maintenance responsibility. The FHWA *Bridge Inspector's Reference Manual* (BIRM) is recommended for bridge inspection safety precautions.

IDOT safety policies and rules are included in Departmental Order 5-1: Employee Safety Code. All IDOT personnel engaged in bridge inspection activities must read and be familiar with the Employee Safety Code, paying particular attention to Chapters 1 & 8.

3.10.1 Bridge Inspection Safety Training

All bridge inspection personnel must complete the appropriate training based on the type of inspection to be performed and be familiar with and follow applicable OSHA, Illinois Department of Labor, and other Federal, State, and local laws pertinent to bridge inspection and roadway safety. All personnel must consult the safety policies of the entity having maintenance responsibility before conducting any bridge inspection activities.

3.10.1.1 Personal Protection Equipment (PPE)

All bridge inspection personnel must be equipped with the appropriate personal protection equipment based on the inspection type. Refer to the BIRM for guidance.

3.11 Quality Control and Quality Assurance

3.11.1 General

The NBIS (23 CFR 650.313(p)) states quality control and quality assurance must:

- Assure systematic Quality Control (QC) and Quality Assurance (QA) procedures identified in Section 3.2.1 - Documents Included by Reference (23 CFR 650.317) are used to maintain a high degree of accuracy and consistency in the inspection program.
- Document the extent, interval, and responsible party for the review of inspection teams in the field, inspection reports, NBI data, and computations, including scour appraisal and load ratings. QC and QA reviews are to be performed by personnel other than the individual who completed the original report or calculations.
- Perform QC and QA reviews and document the results of the QC and QA process, including the tracking and completion of actions identified in the procedures.
- QC findings will be documented in ISIS as part of the inspection report approval process. Inspection reports shall not be approved unless all QC findings are resolved.
- QA findings are documented in the annual QA reports as described in Section 3.11.3.2. Findings from QA reviews performed by IDOT Districts and LPAs shall be documented on IDOT Form BBS 2790 Bridge Inspection Procedures Review.
- QA reviews shall not be closed out until all findings have been addressed.

In conjunction with these statements regarding QC/QA, the NBIS provides the following definitions:

> Quality Control: Procedures that are intended to maintain the quality of a bridge inspection and load rating at or above a specified level.
>
> Quality Assurance: The use of sampling and other measures to assure the adequacy of Quality Control procedures in order to verify or measure the quality level of the entire bridge inspection and load rating program.

Established and documented Quality Control and Quality Assurance (QC/QA) procedures are essential for ensuring the Illinois Bridge Inspection Program is compliant with the NBIS regulations. In addition, IDOT's QC/QA procedures ensure bridge inspections performed in

Illinois are done in an appropriate, consistent, and uniform manner ensuring bridge inspection staff are adequately trained and experienced to readily identify conditions adversely affecting the safety of the traveling public. Through the QC/QA procedures, the agency having maintenance responsibility has the ability to obtain accurate bridge inspection information required for determining load capacity and bridge maintenance, preservation, repair, rehabilitation and replacement needs.

3.11.2 Quality Control (QC)

The Quality Control (QC) procedures established by IDOT are to define, monitor, and document the certification and performance of personnel responsible for the management of inspection programs, the performance of field inspections, inspection procedures, and bridge load rating. IDOT has QC procedures in place for the following elements to ensure compliance with the NBIS.

3.11.2.1.1 Bridge Inspection Organization Responsibilities (23 CFR 650.307)

3.11.2.1.1.1 Bridge Inspection Organization

NBIS Reference: 23 CFR 650.307 – Bridge inspection organization responsibilities

Compliance Criteria

- An organization is in place to perform or cause to be performed the proper inspection and evaluation of all highway bridges that are fully or partially located within the State's boundaries, except those owned by Federal agencies or Tribal governments.
- Organization roles and functions are clearly defined, documented, and carried out for each of the following aspects of the NBIS:
  - statewide bridge inspection policies and procedures
  - registry of nationally certified bridge inspectors
  - criteria for inspection intervals for all inspection types (Required by June 6, 2024)
  - roles and responsibilities of personnel
  - bridge inspection reports and files
  - quality control and quality assurance
  - bridge inventory data
  - load rating
  - posting and other restrictions

  - managing activities and corrective actions taken in response to critical findings
  - scour appraisals and scour plans of action
  - other requirements of these standards
- For those functions that are delegated, the State has documented the roles and functions of all individuals, agencies, and other entities involved.
- The State has the necessary authority to take actions needed to ensure NBIS compliance.
- A Program Manager (PM) is assigned the responsibility for the NBIS.
- Each bridge that crosses a border between a State, Federal agency, or Tribal government, has a joint written agreement that determines the NBIS responsibilities of each agency, including the designated lead State for reporting NBI data.

3.11.2.1.2 Qualifications of Personnel (23 CFR 650.309)

3.11.2.1.2.1 Program Manager

NBIS Reference: 23 CFR 650.309(a) – Program manager
23 CFR 650.313(p) – Quality control and quality assurance

Compliance Criteria

- The Program Manager (PM) has the following qualifications:
  - Is a registered Professional Engineer or has 10 years of bridge inspection experience.
  - Has successfully completed FHWA-approved comprehensive bridge inspection training.
  - Has completed periodic bridge inspection refresher training according to State policy. (Completion of a cumulative total of 18 hours of FHWA-approved bridge inspection refresher training over each 60-month period.)
- The PM maintains documentation supporting the satisfaction of the above requirements.

3.11.2.1.2.2 Team Leader(s)

NBIS Reference: 23 CFR 650.307(e)(2) – Registry of nationally certified bridge inspectors
23 CFR 650.309(b)(c) – Team leader
23 CFR 650.313(p) – Quality control and quality assurance

Compliance Criteria

- Each Team Leader (TL) has at least one of the following qualifications:
  - PE registration (and six months of bridge inspection experience).
  - Five years of bridge inspection experience.
  - Bachelor's degree in engineering from ABET-accredited college or university, and a passing score on the Fundamentals of Engineering Exam, and two years of bridge inspection experience.
  - Associate's degree in engineering or engineering technology from ABET-accredited college or university, and four years of bridge inspection experience.
- In addition to the above qualifications, each TL has all the following training:
  - Successful completion of FHWA-approved comprehensive bridge inspection training.
  - Completion of periodic bridge inspection refresher training according to State policy. (Completion of a cumulative total of 18 hours of FHWA-approved bridge inspection refresher training over each 60-month period.)
- A registry of nationally certified bridge inspectors (NCBI) that are performing the duties of TL in the State is maintained.
- In addition to the above qualifications, each TL performing NSTM inspections has successfully completed FHWA-approved NSTM inspection training.
- Each TL has provided documentation to the Program Manager that the above requirements (as applicable) are satisfied.

3.11.2.1.2.3 Underwater Bridge Inspection Diver

NBIS Reference: 23 CFR 650.309(e) – Underwater Bridge Inspection Diver

Compliance Criteria

- Underwater bridge inspection divers have successfully completed one of the following training courses:
  - FHWA-approved underwater bridge inspection training
  - FHWA-approved comprehensive bridge inspection training (if completed prior to June 6, 2022)

3.11.2.1.2.4 Damage, Special, and Service Inspection Types

NBIS Reference: 23 CFR 650.309(f) – Damage and special inspection types
23 CFR 650.309(g) – Service inspection type

Compliance Criteria

- State has established documented personnel qualifications for:
  - Damage and Special inspection types
  - Service inspection type, when routine inspection intervals exceed 48 months
- Personnel performing these inspection types meet the State's qualifications.

3.11.2.1.3 Inspection Interval (23 CFR 650.311)

3.11.2.1.3.1 Routine

NBIS Reference: 23 CFR 650.311(a) – Routine inspection intervals
23 CFR 650.311(e) – Bridge inspection interval tolerance
23 CFR 650.313(b) – Initial inspection

Compliance Criteria

- Each bridge designated for inspection at regular intervals of 24 months is inspected within that interval, plus the acceptable tolerance of up to 3 months.
- Each bridge designated for inspection at extended intervals of up to 48 months is inspected within that interval, plus the acceptable tolerance of up to 3 months, and adheres to FHWA-approved extended interval criteria.
- Exceptions to the inspection interval tolerance due to rare and unusual circumstances are approved by FHWA in advance of the inspection due date plus acceptable tolerance.
- Each bridge designated for inspection at reduced intervals of less than 24 months is inspected within that interval, plus the acceptable tolerance of up to 2 months.
- An initial inspection is performed for each new, replaced, rehabilitated, and temporary bridge within 3 months of the bridge opening to traffic.

3.11.2.1.3.2 Underwater

NBIS Reference: 23 CFR 650.311(b) – Underwater inspection intervals
23 CFR 650.311(e) – Bridge inspection interval tolerance

Compliance Criteria

- Each bridge designated for underwater inspection at regular intervals not to exceed (NTE) 60 months is inspected within that interval, plus the acceptable tolerance of up to 3 months.
- Exceptions to the inspection interval tolerance due to rare and unusual circumstances are approved by FHWA in advance of the inspection due date plus acceptable tolerance.
- Each bridge designated for underwater inspection at reduced intervals of 24 to 59 months is inspected within that interval, plus the acceptable tolerance of up to 3 months.
- Each bridge designated for underwater inspection at reduced intervals of less than 24 months is inspected within that interval, plus the acceptable tolerance of up to 2 months.

3.11.2.1.3.3 Nonredundant Steel Tension Member (NSTM)

NBIS Reference: 23 CFR 650.311(c) – NSTM inspection intervals
23 CFR 650.311(e) – Bridge inspection interval tolerance
23 CFR 650.311(f) – Next Inspection

Compliance Criteria

- Each bridge with NSTMs designated for inspection at regular intervals not to exceed (NTE) 24 months is inspected within that interval, plus the acceptable tolerance of up to 3 months.
- Each bridge with NSTMs designated for inspection at extended intervals of up to 48 months is inspected within that interval, plus the acceptable tolerance of up to 3 months, and adheres to approved extended interval criteria.
- Exceptions to the inspection interval tolerance due to rare and unusual circumstances are approved by FHWA in advance of the inspection due date plus the acceptable tolerance.
- Each bridge with NSTMs designated for inspection at reduced intervals of less than 24 months is inspected within that interval, plus the acceptable tolerance of up to 2 months.

3.11.2.1.3.4 Special, In-Depth, and Service

NBIS Reference: 23 CFR 650.311(a)(3) – Service inspection
23 CFR 650.311(d) – In-depth and special inspections

Compliance Criteria

- Each bridge designated for a Special, In-Depth, and/or Service inspection is inspected within the coded interval, plus the acceptable tolerance.
- Exceptions to the inspection interval tolerance due to rare and unusual circumstances are approved by FHWA in advance of the inspection due date plus acceptable tolerance.

3.11.2.1.3.5 Interval Criteria

NBIS Reference: 23 CFR 650.311 – Inspection interval

Compliance Criteria

- Criteria are established to determine level of inspection and interval for all the following inspection types where appropriate:
  - Routine inspections – for less than 24-month intervals
  - Underwater inspections – for less than 60-month intervals
  - NSTM inspections – for less than 24-month intervals
  - Damage inspections
  - In-depth inspections
  - Special inspections
- All coded bridge inspection intervals as reported to the NBI are consistent with established criteria.
- For each bridge that received an in-depth or special inspection, the interval and level of inspection are consistent with established criteria.
- Each bridge coded in the NBI for reduced interval less than 24 months for routine or NSTM, or less than 60 months for underwater, is inspected within the coded interval plus the acceptable tolerance.

3.11.2.1.4 Inspection Procedures (23 CFR 650.313)

3.11.2.1.4.1 Quality Inspections

NBIS Reference: 23 CFR 650.313(a) through (j) – Inspection procedures

Compliance Criteria

- Each bridge is inspected to determine condition, identify deficiencies, and document results in an inspection report in accordance with the MBE, as measured by the following criteria:
  - Deck, Superstructure, Substructure, and/or Culvert component condition codes have documented justification and are accurate within the acceptable tolerance,
  - All notable bridge deficiencies are identified and include supporting photographic documentation. Notable bridge deficiencies are those leading to an NBI component condition rating of 5 or less, or those requiring some kind of immediate action.
  - Condition codes are supported by narrative that appropriately justifies and documents the component/element condition rating.
  - All notable deficiencies are quantified in element CS3 or CS4 and properly documented. Non-NHS bridges are not required to use national elements but must document to the MBE standard.
  - Inspection reports document the use of special equipment or techniques, and/or traffic control as necessary for inspections in circumstances where their use provided the only practical means of accessing and/or determining the component/element condition.
- A qualified team leader is at the bridge and actively participates at all times during each initial, routine, in- depth, NSTM, underwater, and special inspection.

3.11.2.1.4.2 Load Rating

NBIS Reference: 23 CFR 650.313(k) – Load rating

Compliance Criteria

- All bridges are rated for their safe load carrying capacity in accordance with the incorporated articles of Sections 6 and 8 of the MBE, for all legal vehicles and State routine permit loads.
- Load ratings were completed within a reasonable timeframe (no later than 3 months) after the initial inspection and if a change in condition that warranted re-rating was identified.

- Load ratings are performed by, or under the direct supervision of, a licensed structural engineer.
- All bridges are analyzed for routine and special permit loads which cross those bridges.
- Procedures for completion of new and updated bridge load ratings are developed and fully documented.

3.11.2.1.4.3 Post or Restrict

NBIS Reference: 23 CFR 650.313(l) – Load posting
23 CFR 650.313(m) – Closed bridges

Compliance Criteria

- Bridges are posted or restricted in accordance with the incorporated articles of Section 6 of the MBE or in accordance with State law, when the maximum unrestricted legal loads or State routine permit loads exceed that allowed under the operating rating or equivalent rating factor.
- Posting deficiencies are resolved within 30 days. Posting deficiencies are resolved within the timeframe established by the procedures but no later than 30 days.
- Any bridge with a gross live load capacity less than three tons is closed.
- Procedures to ensure that bridges are posted in a timely manner, but no more than 30 days, have been developed and fully documented.
- Criteria for closing bridges have been developed and fully documented.
- All bridges that meet the criteria for closure are appropriately closed.

3.11.2.1.4.4 Bridge Files

NBIS Reference: 23 CFR 650.313(n) – Bridge files

Compliance Criteria

- Bridge files are prepared and maintained in accordance with Section 2.2 of the MBE. The bridge file contains the following specific bridge information per the MBE:
  - General file information
  - Field inspection information
  - Critical findings and actions taken
  - Waterway information – channel cross-sections, soundings, stream profiles
  - Significant correspondence

- Bridge-specific inspection procedures or requirements (i.e., NSTM, underwater, in-depth, complex feature) and reference to general inspection procedures where they are used
- Load rating documentation, including load testing results
- Posting documentation
- Scour appraisal
- Scour Plan of Action (POA) for scour critical bridges and those with unknown foundations

3.11.2.1.4.5 Nonredundant Steel Tension Member (NSTM)

NBIS Reference: 23 CFR 650.313(f) – NSTM inspection
23 CFR 650.313(g) – NSTM, underwater, in-depth, and complex feature inspections

Compliance Criteria

- All bridges with NSTMs have been identified.
- Each bridge with NSTMs has documented inspection procedures in the bridge file developed in accordance with Section 4.2 of the MBE. The procedures, whether general or bridge specific:
  - Require a qualified inspection team leader with NSTM credentials be present during the entire NSTM inspection.
  - Identify for each bridge the location of each NSTM and require each NSTM location to be also identified in the inspection report.
  - Require hands-on inspection of the entire NSTM or member component, plus identify additional specialized inspection methods and procedures needed to fully ascertain condition for any of the members, including NDE and NDT.
  - Specify the interval between inspections.
- Inspections of NSTMs are performed in accordance with the procedures developed.
- All NBI data related to NSTMs is properly reported.
- A State that chooses to demonstrate a member is not considered an NSTM due to system or internal redundancy has developed appropriate formal written policy and procedures that have been approved by FHWA and include:
  - Identification of the nationally recognized method used to determine system or internal redundancy.
  - Baseline condition of the bridge(s) to which the policy is being applied.

- Description of design and construction details on the member(s) that may affect the system or internal redundancy.
- Routine inspection requirements for bridges with system or internally redundant members.
- Special inspection requirements for the members with system or internal redundancy.
- Evaluation criteria for when members should be reviewed to ensure they still have system and internal redundancy.

- Bridge members demonstrated not to require NSTM inspection due to system or internal redundancy are inspected in accordance with the approved procedures for routine and special inspections.

3.11.2.1.4.6 Underwater

NBIS Reference: 23 CFR 650.313(e) – Underwater inspection
23 CFR 650.313(g) – NSTM, underwater, in-depth, and complex feature inspections

Compliance Criteria

- Each bridge requiring an underwater inspection has documented inspection procedures developed in accordance with Section 4.2 of the MBE. The procedures, whether general or bridge specific:
  - Require a qualified inspection team leader be present during the entire underwater inspection.
  - Ensure an appropriate level of pre-inspection preparation occurs, including review of the bridge inspection file.
  - Identify for each bridge the specific underwater elements to be inspected, including any underwater scour countermeasures present.
  - Require that the underwater inspection:
    - Is performed in accordance with methods and techniques contained in the MBE, as well as State requirements.
    - Evaluates the waterway under and adjacent to the bridge, taking into account its unique characteristics.
  - Specify the interval between inspections.
  - Ensure the underwater inspection follows the scour POA requirements as it pertains to directions for underwater inspections.
- Underwater inspections are performed in accordance with the procedures developed.

- Underwater inspections are recorded as such in the bridge inventory, with NBI items updated accordingly.

3.11.2.1.4.7 Scour

NBIS Reference: 23 CFR 650.313(o) – Scour

Compliance Criteria

- All bridges over water have a scour appraisal and the process and results are documented in the bridge file.
- Scour appraisal procedures are consistent with HEC-18 and HEC-20.
- All bridges determined to be scour critical or with unknown foundations have a scour plan of action (POA) which has been prepared and documented consistent with HEC-18 and HEC-23 for deployment of scour countermeasures for known and potential deficiencies, and which addresses safety concerns. The POA addresses a schedule for repairing or installing physical and/or hydraulic scour countermeasures, and/or the use of monitoring as a scour countermeasure.
- Scour countermeasures identified in the POA are being deployed for each bridge determined to be scour critical or having unknown foundations.
- For bridges with changed scour conditions, re-appraisals have been performed.

3.11.2.1.4.8 Complex Feature

NBIS Reference: 23 CFR 650.313(g) – NSTM, underwater, in-depth, and complex feature inspections

Compliance Criteria

- All bridges with complex features have been identified and are so coded in the NBI.
- Each bridge with complex features has documented inspection procedures in the bridge file developed in accordance with Section 4.2 of the MBE. Procedures are bridge specific and:
  - Require a qualified inspection team leader be present during the complex feature inspection.
  - Ensure an appropriate level of pre-inspection preparation occurs, including review of the bridge inspection file.
  - Identify for each bridge the specific complex feature(s) to be inspected.

- Identify any additional qualifications, or specialized training or experience, required of the inspection team leader or specific bridge inspectors (i.e., mechanical or electrical systems inspectors) for the complex feature being inspected.
- Identify additional specialized inspection methods and procedures appropriate for the specific complex feature.
- Specify the interval between inspections.

- Inspections of complex features are performed in accordance with the procedures developed.

3.11.2.1.4.9 In-Depth

NBIS Reference: 23 CFR 650.313(g) – NSTM, underwater, in-depth, and complex feature inspections

Compliance Criteria

- All bridges requiring in-depth inspections have been identified and are so coded in the NBI.
- Each bridge requiring in-depth inspections has documented inspection procedures in the bridge file developed in accordance with Section 4.2 of the MBE. The procedures, whether general or specific:
  - Require a qualified inspection team leader be present during the entire in-depth inspection.
  - Identify each bridge member requiring an in-depth inspection and document each location.
  - Detail advanced inspection methods or techniques to be used to fully ascertain the existence of or extent of a deficiency not readily detectable using routine inspection procedures.
  - Specify the interval between inspections.
  - Specify any additional qualifications, or specialized training, required of the inspection team leader or specific bridge inspectors (divers, riggers, NDE certified, etc.).
  - Specify needed special access equipment or traffic control.
- In-depth inspections are performed in accordance with the documented procedures.
- Inspection reports document actual members inspected, and inspection methods utilized during the inspection. Findings are documented to the level of detail needed, which may be significantly more detailed than a normal routine inspection.

3.11.2.1.4.10 Inspection Procedures – Quality Control (QC) and Quality Assurance (QA)

NBIS Reference: 23 CFR 650.307(e)(6) – Quality control and quality assurance activities
23 CFR 650.313(p) – Quality control and quality assurance

Compliance Criteria

- Systematic, documented QC and QA procedures identified in Section 1.4 of the MBE are used to maintain a high degree of accuracy and consistency in the inspection program. These include:
  - Periodic field review of inspection teams
  - Periodic bridge inspection refresher training for program managers and team leaders
  - QC/QA measures for inventory data
  - Independent review of inspection reports and computations
- The extent, interval, and responsible parties for the QC and QA activities are documented.
- QA measures include the overall review of the inspection and rating program – including inspection teams in the field, inspection reports, NBI data, and computations including scour appraisals and load ratings – to ascertain that the results meet or exceed the standards established by the PM.
- QC and QA reviews are performed by personnel other than the individual who completed the original report or calculations.
- The findings of the QC and QA reviews are addressed.
- The procedures for QC and QA include organizational tracking to verify completion of actions identified in the procedures.
- The results, findings, corrective action recommendations, and resulting corrective actions that address the findings from QC and QA reviews are documented. (Assessed in PY25)

3.11.2.1.4.11 Critical Findings

NBIS Reference: 23 CFR 650.313(q) – Critical findings

Compliance Criteria

- Procedures are in place and documented to address critical findings in a timely manner:
  - The procedures define critical findings considering the location and redundancy of the member affected and the extent and consequence of a deficiency.
  - The procedures provide timeframes for addressing critical findings.

- FHWA is notified of all critical findings and the actions taken to resolve them:
  - FHWA is notified within 24 hours of the discovery of all critical findings on the NHS that meet either of these criteria:
    - Full or partial closure of any bridge
    - An NSTM to be rated in serious or worse condition
  - FHWA is notified monthly, in a written report, of all critical findings and the actions planned, undertaken, or completed to resolve the critical findings.
  - The monthly report contains the following information:
    - Owner
    - NBI Structure Number
    - Date of finding
    - Description and photos (if available) of critical finding
    - Description of completed, temporary and/or planned corrective actions to address critical finding
    - Status of corrective actions: Active/Completed
    - Estimated date of completion if corrective actions are active
    - Date of completion if corrective actions are completed

3.11.2.1.5 Inventory (23 CFR 650.315)

3.11.2.1.5.1 Bridge Data Quality

NBIS Reference: 23 CFR 650.303 - Applicability
23 CFR 650.305 - Definitions
23 CFR 650.307(e)(7) – Bridge inspection organization responsibilities
23 CFR 650.315(a) - Inventory
23 CFR 650.317 – Incorporation by reference

<u>Compliance Criteria</u>

- An inventory of all bridges subject to the NBIS is prepared and maintained by the State. The inventory includes:
  - Private bridges that are connected to a public road on both ends of the bridge.
  - Temporary bridges open to traffic greater than 24 months.
  - Bridges under construction with portions open to traffic.

- Inventory (NBI) data are collected, updated, and retained by the State, and reported in accordance with the Coding Guide.
- Inventory data include element level bridge inspection data for bridges on the NHS, reported in accordance with the SNBI.

3.11.2.1.5.2 Timely Updating of Data

NBIS Reference: 23 CFR 650.315 – Inventory

Compliance Criteria

- Inventory data, as defined in 23 CFR 650.305, are updated by the State and submitted to FHWA on an annual basis or whenever requested, using FHWA established procedures.
- Changes to the NBI data are entered into the State's inventory within 3 months for the following events:
  - For all inspection types (initial, routine, in-depth, NSTM, underwater, complex features, and special inspections), within 3 months after the field portion of the inspection is completed.
  - For modifications to existing bridges that alter previously recorded NBI data and for newly constructed bridges, within 3 months after the bridge is opened to traffic.
  - For changes in load restriction or closure status of the bridge, within 3 months after the change is implemented.
- A process has been established and documented that ensures and can verify the time constraint requirements are fulfilled.

3.11.2.2 Review of Bridge Inspection Reports

To ensure the completeness and quality of a Team Leader’s inspection reports, all reports must be reviewed and approved by the Agency PM. At a minimum, the review must verify the Condition Ratings are appropriate, including notes with sufficient detail (defect type, size, and location) to justify the condition ratings, the documentation is complete and accurate, and the number and content of photographs are sufficient.

Agency PMs should monitor the number of bridges inspected per day by each inspector to ensure that each inspection is of high quality. The Bridge Management & Inspection Unit monitors the number of bridges inspected per day during the annual QA reviews and will discuss with each

agency. IDOT considers four (4) to eight (8) inspections per day to be realistic. There may be instances where ten (10) or more can be done, but this should not be the norm.

3.11.2.3 Inspector Performance

Agency PMs must conduct in-depth reviews of the field procedures of all Certified Illinois NBIS Team Leaders under their supervision to ensure inspections are being performed in accordance with the NBIS and are done in an appropriate, consistent, and uniform manner. If an agency only has an NBIS Program Manager, it is required by the NBIS regulation to coordinate with other adjacent agencies or a consultant in order to have proper QC of each agency's inspections.

At least once every twenty-four (24) months, Agency PMs are required to accompany each Certified Illinois NBIS Team Leader to observe the performance of NBIS bridge inspections on at least three (3) bridges, preferably over the course of a thirty (30)-day period. The Agency PMs are required to complete IDOT Form BBS 2790 Bridge Inspection Procedures Review for each Illinois Certified NBIS Team Leader. The forms must be kept in the inspector's files. If the Agency PM or Team Leader desires, the forms can be sent to the BBS at DOT.BBS.BridgeMgmt@Illinois.gov and kept with the inspector's records.

Due to the complexity and duration of the major bridge inspections the Statewide PM, the Bridge Inspection Group Leader, or the Bridge Inspection Group Technician must accompany each Illinois Certified NBIS Team Leader to observe the performance of NBIS bridge inspections on at least two (2) bridges over a 12-month period.

Agency PMs must choose inspections of different bridge types, verifying major component Condition Ratings, and include an Element Level, Underwater, NSTM, and Special Inspection, if applicable. The Agency PM must increase the number of bridge inspections monitored, or reduce the period of time between field reviews, as needed to address concerns with Certified Illinois NBIS Team Leader performance. If the Agency PM determines a Certified NBIS Team Leader is not capable of performing inspections at an appropriate level to ensure adequate inspection procedures, the individual must be reported to the Statewide PM for final resolution up to and including revocation of certification, and the individual should not be used as a Certified Illinois NBIS Team Leader in the interim.

3.11.2.4 Illinois Certified NBIS Program Manager/Team Leader - Supporting Documentation

The Bridge Management and Inspection Unit maintains the official records of all Illinois Certified NBIS Program Managers and Team Leaders in the State of Illinois. This includes any records of performance deficiencies for Illinois Certified NBIS Program Managers and Team Leaders.

Agency Program Managers and Team Leaders must also maintain a file containing certifications and all supporting documents.

In addition, the file must contain records of the Bridge Inspection Performance Reviews as noted in Section 3.9.3.2. This documentation should be located in a central location and be readily accessible by the Agency PM.

3.11.2.5 Review of Bridge Files

The NBIS requires the preparation and maintenance of Bridge Files in accordance with Section 2.2 of the MBE. A Bridge File is a cumulative record with information representing a complete history of a bridge, including details of any damage and all strengthening and repairs made to the bridge. The bridge file should report data on the capacity of the bridge. The computations substantiating reduced load-carrying capacity, if applicable is kept at the Central BBS Structural Ratings and Permitting Unit. The Bridge File shall contain, as applicable:

- NBI data
- Design plans and specifications
- Hydraulic report
- Geotechnical report
- Construction records
- As-built plans
- Maintenance and repair records
- All NBIS bridge inspection records
- Bridge specific inspection procedures as applicable
- All channel cross sections, if applicable
- Scour critical evaluation
- Border Bridge Agreements
- Scour POA, as applicable

- Load rating/load posting information
- NSTMs, if applicable
- Critical Findings, as applicable
- Photographs/ sketches
- Bridge File Checklist
- Any other pertinent information.

Bridge Owners shall maintain a complete, accurate, and current record of each bridge under their jurisdiction. Complete information, in good usable form, is vital to management of the Illinois bridge inventory and for NBIS compliance. Furthermore, such information allows the owner to properly program bridges for maintenance, preservation, repair, rehabilitation, or replacement.

A separate Bridge File must be maintained for each Structure Number in the bridge inventory. IDOT Form BFC Bridge File Checklist must be completed, updated as required, and stored with each Bridge File. The Bridge Files for all bridges maintained by an Agency must be located in a central location, maintained, and readily accessible by the Agency PM and Certified NBIS Team Leader.

It is not practical or necessary to physically store all required documents in the Bridge File. However, the actual location of each item must be referenced on the Bridge File Checklist.

3.11.2.6 Inventory Data Verification

An extremely vital part of NBIS inspections is the verification and updating of the inventory data. When the Certified Illinois NBIS Program Managers and Team Leaders sign/date the inspection form, or submit/approve in the ISIS, they are indicating the bridge's inventory data has been verified and updated as necessary. Utilizing IDOT Form S-114 Inspector's Inventory Report, from the ISIS or SIMS, during the inspections provides an accounting of the bridge's current ISIS inventory and areas to provide updates. Existing plans can be used for many of the static inventory items such as structure length, deck structure width, design load, etc. Inventory data changes are done by the following IDOT District Bureaus:

- IDOT-maintained bridges
  - Bureau of Operations – Bridge Maintenance

- Non-IDOT-maintained bridges
  - Bureau of Local Roads and Streets for LPAs
  - BBS for IDNR, ISTHA, other

For rehabilitated, replaced, and new bridges, IDOT Form S-114 Inspector's Inventory Report must be reviewed to verify consistency with the information provided on the as-built bridge plans or design plans.

3.11.2.7 Bridge Inspection Refresher Training

All Certified Illinois NBIS Program Managers and Team Leaders must successfully complete eighteen (18) hours of FHWA-approved and nationally recognized bridge inspection refresher training over the course of sixty (60) months.

The following classes satisfy the requirement for bridge inspection refresher training:

- NHI 130053 Bridge Inspection Refresher Training
- Illinois Bridge Inspection Refresher Training (When FHWA approved)

The content of the IDOT-developed IL Bridge Inspection Refresher Training will be reviewed and updated as necessary before each offering. The training is reviewed by the Bridge Management & Inspection Unit and the consultant under contract to deliver the training to determine if additional materials are necessary or new areas of emphasis have been identified related to the annual quality assurance review of bridge inventory data. The Bridge Management Group will annually update the IDOT Inspection Refresher Training to incorporate annual data quality findings identified during their quarterly SI&A data QA reviews. Annual IDOT Inspection Refresher Training updates will be coordinated, at a minimum, through the FHWA IL Division Bridge staff to ensure the content and implementation meets the intended requirements of the National Bridge Inspection Program oversight process.

There are currently no refresher training requirements for Nonredundant Steel Tension Member or Underwater inspections.

3.11.3 Quality Assurance (QA) – Bridge Inventory / Bridge Files / Inspection

QA measures are required to ensure established Quality Control (QC) procedures are effective and being adhered to in order to ensure bridge inspections are done in accordance with the NBIS. QA Reviews are performed annually to ensure the quality of bridge inspections and bridge load ratings. The Statewide PM conducts or oversees the QA Review and may delegate these duties as necessary.

The bridges reviewed vary in regard to Main Span Material – Item 43A | B.SP.01 and Main Span Type – Item 43B | B.SP.06. An effort is made to include bridges with Condition Ratings ranging between "8" (Very Good) to "2" (Critical) for Deck Condition – Item 58 | B.C.01, Superstructure Condition – Item 59 | B.C.02, Substructure Condition – Item 60 | B.C.03, or Culvert Condition – Item 62 | B.C.04. When applicable, the QA Review will include a bridge with Scour Critical Evaluation - Item 113 coded "3" (Scour Critical) "7" (Scour Countermeasures). When applicable, the QA Review will include bridges requiring Underwater, NSTM, or Special Inspections.

The Agency PM must be present during the QA Review.

3.11.3.1 IDOT NBIS Reviews

IDOT performs annual NBIS QA Reviews on two (2) IDOT Districts and seventeen (17) County Highway Departments. Other non-IDOT agencies, such as IDNR and ISTHA, are also subject to IDOT QA Reviews. IDOT Districts have an NBIS QA Review every five (5) years whereas County Highway Departments are reviewed every six (6) years. The interval between NBIS QA Reviews may be reduced in response to agency personnel changes or to address issues identified by the BBS.

3.11.3.1.1 Bridge Inventory and File Review - Virtual

NBIS QA Reviews include, at a minimum, an extensive review of the agency's Bridge Inventory, inspection personnel, inspection procedures, and the Bridge Files for seven (7) bridges. The agency being reviewed is contacted and instructed to upload all applicable files to the ISIS if not already done. IDOT reviews the Bridge Inventory for each inspection type and tabulates each, including numbers having various intervals, delinquencies in the last three (3) years, and how agency is progressing with NBIS Metric IP/PCA initiatives. The Bridge Files are reviewed for

completeness and the two (2) most recent Routine Inspections along with the most recent of other inspection types associated with the sample. The inventory and files are checked for adherence to the NBIS. The final step is to have a virtual meeting with agency inspection personnel to review the findings, inquire about procedures, and ultimately determine compliance with all applicable metrics.

3.11.3.1.2 Bridge Inspection Review - Field Visit (at IDOT's Discretion)

Based on the findings of the inventory and Bridge File review, IDOT will decide if a field review of the sample is necessary. Personnel conducting the field review perform an independent inspection and compare the results to the agency's inspection reports. IDOT Form S-107 Master Structure Report may be utilized for reference by NBIS QA Review personnel during the field review of each bridge to verify various inventory data items and note any errors or omissions. Conditions affecting the load carrying capacity of major components will be noted during the NBIS QA Field Review and follow-up must occur to ensure the noted conditions have been taken into account in the load rating. The NBIS QA Review personnel may perform a Load Rating Inspection while on-site to document the deficiencies.

3.11.3.2 NBIS QA Review Report

A final NBIS QA Review Report noting commendable practices, areas needing correction, specific review findings, NBIS metric determination for applicable metrics, and actions required to address deficiencies noted during the review will be provided to the Agency PM for review and comment. Once review is completed and parties agree, the Statewide PM and Agency PM will sign and date.

IDOT will provide the agency with an electronic copy of each final NBIS QA Review Report. In addition, each report will be posted on the Bridge Management & Inspection Unit website.

IDOT will assemble a NBIS QA Review Summary Report summarizing the findings of each agency NBIS QA Review and will post it to the Bridge Management & Inspections Unit website.

3.12 Inspection of Non-NBIS Bridges/Culverts

3.12.1 General

IDOT is responsible for establishing policies and procedures to ensure the safety of bridges carrying public traffic, including those not subject to the NBIS. The NBIS requires bridges on public roadways, with an AASHTO Bridge Length – Item 112 | B.G.01 > 20.0 feet, to be included in the National Bridge Inventory. Bridges not meeting those conditions are "Non-NBIS Bridges."

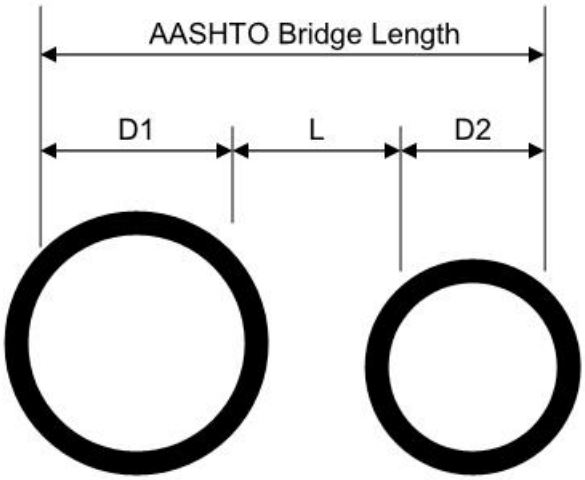
In order to track the condition of Non-NBIS Bridges which could affect the safety of the travelling public, SI&A information is maintained for select bridges in the ISIS. This section provides information related to the Non-NBIS Bridges to be tracked in the bridge inventory and inspected.

3.12.2 Small Bridge/Culvert Inspection Program

In the early 2000's, IDOT developed the Small Bridge Inspection Program (SBIP) to address the safety of bridges not meeting the AASHTO Bridge Length – Item 112 | B.G.01 requirement of the NBIS. IDOT defines a "Small Bridge" as:

> Small Bridge: A bridge on a public roadway with an AASHTO Bridge Length – Item 112 | B.G.01 ≥ 6.0 feet and ≤ 20.0 feet, including supports, erected over a depression or an obstruction, such as water, highway, or railway, and having a track or passageway for carrying traffic or other moving loads. This includes multiple pipes where the clear distance between openings is < ½ of the diameter of the smaller contiguous opening and at least one of the pipes has an inside diameter ≥ 60 inches.

Figure 3.12-1 provides guidance for measuring the AASHTO Bridge Length for multiple-pipe culverts.



When determining the AASHTO Bridge Length (ISIS Item 112) for multiple pipe installations, the value used for the distance between pipes cannot be greater than half of the smaller opening on either side (L ≤ ½ x D2).

Figure 3.12-1 – AASHTO Bridge Length – Item 112 | B.G.01 for Multi-Pipe Culverts

The SBIP is only applicable to IDOT-maintained bridges carrying the public with an AASHTO Bridge Length – Item 112 | B.G.01 ≥ 6.0 feet and ≤ 20.0 feet. IDOT strongly recommends non-IDOT agencies should inventory and inspect their bridges and culverts with an AASHTO Bridge Length – Item 112 | B.G.01 ≥ 6.0 feet and ≤ 20.0 feet to ensure the safety of the traveling public.

3.12.2.1 Inventory and Appraisal

IDOT maintained bridges/culverts in the SBIP must be inventoried in the ISIS. The SIP Manual must be used for guidance when entering SI&A information. The bridges/culverts in the SBIP must be inventoried in the same manner as bridges/culverts with an AASHTO Bridge Length Item 112 | B.G.01 > 20.0 feet.

Records related to bridges in the SBIP must be maintained similar to those for bridges/culverts with AASHTO Bridge Length – Item 112 | B.G.01 > 20.0 feet and uploaded to the ISIS. The Bureau of Bridges & Structures maintains the official version of bridge plans, including small bridges/culverts, and routinely updates the archive by obtaining plan information prior to the award

of contract for the construction of new bridges. When a small bridge/culvert is constructed as part of a roadway project rather than a stand-alone bridge contract, the Bureau of Bridges & Structures relies on the Regions/Districts to identify the small bridges/culverts included in the roadway contract. Regions/Districts must review the contract plans for roadway projects to identify bridges/culverts meeting the definition of a small bridge, and information must be forwarded to the Bureau of Bridges & Structures for inclusion in bridge plan archives.

3.12.2.2 Routine Inspection of Small Bridges/Culverts

Routine Inspections must be performed for IDOT-maintained small bridges/culverts to ensure highway safety. Since many of the small bridges/culverts are culverts which are typically buried and protected from direct contact loading and de-icing agents, extended inspection intervals may be appropriate for small bridges/culverts with Culvert Condition Rating - Item 62 | B.C.04 ≥ 6 - Satisfactory. Small bridges/culverts not classified as culverts have inspection intervals consistent with bridges having an AASHTO Bridge Length - Item 112 | B.G.01 > 20.0 feet. Inspection intervals for small bridges are provided in Tables 3.11-2 and 3.11-3.

A Buried Structure is defined as follows:

> A culvert having ≥ 2.0 feet of fill including pavement and subgrade material over the culvert located within the travel way and shoulders of the roadway.

Main Structure Type – Item 43B | B.SP.06 coded 19 – Culverts or 91 – Culvert - Rigid Frame and Structure Fill Depth – Item 62E | B.G.57 coded: ≥ 2.0 feet	
Culvert Condition - Item 62 | B.C.04	Maximum Inspection Interval (Months)
7 - Good, 8 – Very Good. or 9 - New	72
5 - Fair or 6 - Satisfactory	48
4 - Poor	24
3 Serious	12
2 Critical	12*

Table 3.12-2 – Routine Inspection Interval for Buried Structures

** Special Inspection may be required at a more frequent interval.*

Main Structure Type – Item 43B | B.SP.06 not coded 19 - Culvert or 91 – Culvert – Rigid Frame OR Main Structure Type – Item 43B | B.SP.06 not coded 19 - Culvert or 91 – Culvert – Rigid Frame and Structure Fill Depth- Item 62E | B.G.57 coded < 2.0-Feet	
Lowest Condition Rating of: Superstructure Condition - Item 59 | B.C.02 Substructure Condition - Item 60 | B.C.03 or Culvert Condition - Item 62 | B.C.04	Maximum Inspection Interval (Months)
5 - Fair, 6 - Satisfactory, 7 - Good, 8 – Very Good, or 9 - New	48
4 - Poor	24
3 - Serious	12
2 - Critical	12*

Table 3.12-3 – Routine Inspection Interval for Non-Buried Structures

** A Special Inspection may be required at a more frequent interval.*

3.12.3 Ancillary Bridges

There are many bridges/culverts maintained by various agencies with an AASHTO length Item 112 | B.G.01 < 6.0 feet. These are referred to as Ancillary Bridges/Culverts and are defined as follows:

> Ancillary Bridge: A bridge on a public roadway with an AASHTO Bridge Length Item 112 | B.G.01 < 6.0 feet. This may also include multiple pipes where the clear distance between openings > ½ of the diameter of the smaller contiguous opening.

IDOT does not have policies and procedures for the inspection of Ancillary Bridges/Culverts. Agencies are responsible for the maintenance of the Ancillary Bridges/Culverts under their respective jurisdictions. The policies and procedures employed for addressing Ancillary Bridge issues must adequately address safety to the traveling public, and each owner must evaluate how to apply available resources to the task of inspecting, maintaining, repairing, and replacing these assets.

3.12.4 Bridges Not Carrying Public Roadways

It is not uncommon for a bridge not carrying a public roadway to be located over a public roadway. Examples are bridges carrying a railroad or pedestrian-only traffic over a public roadway. Since

these bridges do not carry public roadways, the NBIS is not applicable. However, all bridges crossing public roadways must be included in the Illinois bridge inventory record to document the vertical and horizontal clearances provided by the underpass for the movement of oversize permit loads and NBI reporting requirements.

NBIS Inspections are not required for bridges not carrying public traffic. However, the agency having maintenance responsibility of the bridge is responsible for ensuring the safety of the bridge and of the traveling public under the bridge. The following guidance is provided to address bridges not carrying public roadways, but crossing a public roadway:

3.12.4.1 Bridges Not Carrying Public Roadway Over Public Roadway – Both Maintained by Same Agency

The bridge must be inventoried in the Illinois Bridge Inventory and inspected per NBIS with an interval per Table 3.11-3. A hands-on inspection is not typically required unless deemed necessary by the agency having maintenance/inspection responsibility.

Several agencies, IDOT included, own and maintain bridges carrying private railroad traffic over public roadways. These bridges must be in the Illinois Bridge Inventory and must be inspected in the same manner as bridges subject to the NBIS. Coordination with the railroad is required for obtaining right of entry and for scheduling flaggers.

3.12.4.2 Bridges Not Carrying Public Roads Over Public Roadway – Maintained by Different Agencies

The agency with maintenance responsibility of the bridge not carrying public roadway is responsible for having policies and procedures in place to ensure the safety of the bridge, the traffic crossing the bridge, and the traffic under the bridge. If, during the course of normal operations, the agency with maintenance responsibility for a public roadway under the bridge notes a safety concern, the agency with maintenance responsibility for the bridge must be notified immediately and necessary measures must be taken to protect the traveling public under the bridge until the agency having maintenance responsibility for the bridge has taken action.

3.12.4.3 Bridges Not Carrying Public Roadway Over Private Roadway

If a situation should be presented in which an agency has maintenance responsibility for a bridge not carrying a public roadway crosses a private roadway, the bridge should be included in the Illinois Bridge Inventory and inspections should be conducted per the NBIS with an interval per Table 3.11-3.

3.13 Bridge/Culvert Inventory

3.13.1 The National Bridge Inventory (NBI)

Illinois National Bridge Inventory data, Element Level Inspection data are submitted to the FHWA on an annual basis by the Office of Planning and Programming (OP&P) with the assistance of the BBS. The data becomes part of the National Bridge Inventory (NBI) which is defined by the FHWA as:

> National Bridge Inventory: An aggregation of State transportation department, Federal agency and Tribal government bridge and associated highway data maintained by the Federal Highway Administration (FHWA). The NBIS requires each State transportation department, Federal agency, and Tribal government to prepare and maintain a bridge inventory, which must be submitted to FHWA in accordance with these specifications on an annual basis or whenever requested. (23 CFR 650.315)

3.13.2 Recording Bridge Inventory Information

Directions for recording structure inventory information are provided in the IDOT *Structure Information and Procedure Manual* (SIP Manual).

Each bridge carrying or crossing a public roadway and having an AASHTO Bridge Length – Item 112 | B.G.01 > 20.0 feet, including temporary bridges open to traffic greater than 24 months, must be included in the Illinois bridge inventory and be inspected in accordance with NBIS regulations. Bridges not carrying public traffic but crossing over a public road, such as pedestrian bridges or railroad bridges, must also be included in the Illinois bridge inventory. Bridges are typically added to the Illinois bridge inventory during the planning phase and then completed once the bridge is opened to traffic.

Structure Inventory and Appraisal (SI&A) data must be entered into the ISIS within 3 months of changes occurring.

In general, the bridge inventory data is entered by Region/District personnel. Data entry for some items, such as load rating, NSTM inventory, most Special Inspection inventory, scour critical input, and hydraulics, are the responsibility of the Bureau of Bridges & Structures.

The agency with maintenance/inspection responsibility of the bridge is responsible for submitting the initial inventory information and subsequent changes to IDOT. For bridges not carrying a public roadway, but passing over a public road, the agency with maintenance responsibility of the roadway under the bridge is responsible for submitting the initial inventory information and subsequent changes to IDOT.

3.13.3 Updating Structure Inventory & Appraisal (SI&A) Information

A general review of bridge inventory items is required during each Routine Inspection with errors/omissions promptly reported to appropriate parties to ensure the bridge data in the ISIS is accurate and up-to-date. It is recommended the inspector utilize IDOT Form S-114 Inspector's Inventory Report or IDOT Form S-107 Master Structure Report during the Routine Inspection and record any errors or omitted information on the report for follow-up and correction.

Contents

5.1 Purpose and Scope....3
5.1.1 National Tunnel Inspection Standards....3
5.1.2 Illinois Tunnel Inspection Organization....4
5.1.3 Illinois Structure Information System....5
5.1.4 Bridge Inspection System....5
5.2 Tunnel Inventory....6
5.2.1 Reporting Inventory Information....6
5.2.2 Updating Inventory Information....6
5.2.3 The National Tunnel Inventory....6
5.3 Tunnel Inspections....7
5.3.1 General....7
5.3.1.1 Inspection Forms....9
5.3.2 Initial Inspection....9
5.3.3 Routine Inspection....10
5.3.4 Special Inspections....13
5.3.5 Damage Inspections....14
5.3.5.1 Damage Inspections for State Maintained Tunnels....15
5.3.5.2 Damage Inspections for Public Agency Structures....15
5.3.6 Load Rating Inspections....15
5.3.6.1 Load Rating Inspections for State Maintained Structures....16
5.3.6.2 Load Rating Inspections for Public Agency Maintained Structures....17
5.3.7 Complex Tunnel Inspections....17
5.3.7.1 General Complex Tunnel Inspection Procedures....18
5.3.8 Critical Findings....19
5.3.8.1 Identifying a Potential Critical Finding....19
5.3.8.2 Critical Finding Determination....20
5.3.8.3 Critical Finding Reporting....20
5.3.8.4 Submitting a Critical Finding to FHWA....20
5.3.9 Inspection of Structures under Construction....21
5.3.9.1 Existing Structure Rehabilitation....21
5.3.10 Inspection of Closed Structures....21
5.3.11 In-depth Inspections....22
5.4 Tunnel Inspection Intervals....23
5.4.1 General....23

5.4.2 Routine Tunnel Inspection Interval 23
5.4.2.1 Routine Inspection 12-Month Interval Criteria 23
5.4.3 In-depth Inspection Interval 24
5.4.4 Special Inspection Interval....24
5.5 Tunnel Load Rating, Posting or Restrictions....25
5.5.1 Assignment of Responsibility....25
5.5.1.1 State Tunnels 25
5.5.1.2 Non-State Tunnels.....25
5.5.2 Load Rating Frequency 26
5.5.2.1 Initial Load Rating....26
5.5.2.2 Revised Load Ratings....27
5.5.3 Weight Restrictions 27
5.5.4 Overweight Permit Evaluation 27
5.5.5 Construction Load Rating 27
5.6 Quality Control and Quality Assurance....29
5.6.1 General 29
5.6.2 Personnel Qualifications....30
5.6.2.1 Statewide NTIS Program Manager / Program Manager (Tunnel)....30
5.6.2.2 Team Leader (Tunnel) 31
5.6.2.3 Discipline Specific Specialists....31
5.6.2.4 Tunnel Inspection Training....32
5.6.2.5 Tunnel Inspection Refresher Training 32
5.6.3 Quality Control....33
5.6.3.1 Review of Tunnel Inspection Reports....33
5.6.3.2 Inspector's Performance....34
5.6.3.3 Personnel Documentation....34
5.6.3.4 Tunnel File....35
5.6.3.5 NTIS Data Verification 35
5.6.3.5.1 Recognizing Errors, Omissions, or Changes in the Field....35
5.6.3.5.2 Resolution of Inspection Errors or Omissions....36
5.6.3.6 Identifying Special Skills, Training, and Equipment....36
5.6.4 Quality Assurance 37
5.6.4.1 Quality Assurance Reviews 37
5.6.4.1.1 Office Reviews....37
5.6.4.1.2 Field Reviews 37
5.6.4.2 Final Quality Assurance Review Report....38

Section 5 Tunnel Inspection

5.1 Purpose and Scope

The highway bill *Moving Ahead for Progress in the 21st Century Act* (MAP-21) required the Federal Highway Administration (FHWA) to establish national standards for tunnel inspections. The National Tunnel Inspection Standards (NTIS) (23 CFR 650 Subpart E – National Tunnel Inspection Standards) contains the regulatory requirements for the tunnel inventory and inspection program. The NTIS can be obtained from the Federal Registrar using the link below:

https://www.govinfo.gov/content/pkg/CFR-2019-title23-vol1/xml/CFR-2019-title23-vol1-part650.xml

This section of the IDOT *Structural Services Manual* provides documentation of the official tunnel inspection policies for the State of Illinois.

A tunnel is defined as: "an enclosed roadway for motor vehicle traffic with vehicle access limited to portals, regardless of type of structure or method of construction, that requires, based on the owner's determination, special design considerations to include lighting, ventilations, fire protection systems, and emergency egress capacity. The term "tunnel" does not include bridges or culverts inspected under the National Bridge Inspection Standards (23 CFR 650 Subpart C – National Bridge Inspection Standards)."

5.1.1 National Tunnel Inspection Standards

The FHWA administers the NTIS under the guidelines outlined in the FHWA *Specifications for the National Tunnel Inventory* (SNTI) and the FHWA *Tunnel Operations, Maintenance, Inspection and Evaluation Manual* (TOMIE). The inventory and inspection information collected, as required by the NTIS, is reported to the FHWA and recorded in the National Tunnel Inventory (NTI).

The SNTI contains information on conducting inspections and for submitting the inventory and inspection data to the FHWA. The TOMIE provides uniform and consistent guidance on the operation, maintenance, inspection, and evaluation of tunnels.

The NTIS, SNTI, TOMIE, and NTI were developed to ensure tunnels continue to provide safe, reliable, and efficient levels of service for the traveling public.

To maintain full compliance with the NTIS, the Illinois Department of Transportation (IDOT) will adhere to all policies, procedures, and regulations established by the FHWA. The Statewide NBIS Program Manager or the District One Bridge Maintenance Engineer will act as the Statewide NTIS Program Manager overseeing the NTIS Program for all tunnels in the state.

The primary purpose of this section is to provide information pertaining to tunnel inventory and inspection activities. The information provided in this section summarizes IDOT inspection policies and guidelines for the effective and efficient management of the tunnel inspection program. The information provided regarding inspection types and frequencies is also applicable to structures under the jurisdiction of agencies other than IDOT, where the oversight for inspections is the responsibility of the agency having jurisdiction.

The primary function of the tunnel inspections performed in accordance with the NTIS is to ensure tunnels serving roadways in Illinois remain safe for all users of the highway system. The results of the inspections are also used as a tool to assist in determining maintenance and improvement needs.

5.1.2 Illinois Tunnel Inspection Organization

Illinois complies with the NTIS program requirements for inspection and inventory data through the following responsible positions.

Statewide NTIS Program Manager: The IDOT Bridge Management & Inspection Unit Chief within the Bureau of Bridges & Structures or the District One Bridge Maintenance Engineer, acting as the Statewide NBIS Program Manager, shall provide statewide oversight for all NTIS related activities. The Statewide NTIS Program Manager is responsible for inspection policy and to ensure the quality of the NTIS program.

District NTIS Program Manager: A IDOT District Bridge Maintenance Engineer may be designated as a District NTIS Program Manager as needed. A District NTIS Program Manager is responsible for providing oversight for all NTIS related activities within their designated area of responsibility which may include tunnels in other Districts.

IDOT District 1 Area NTIS Program Manager: The IDOT Area Bridge Inspection Engineers in District 1 providing oversight for all NTIS related activities for IDOT-maintained tunnels within their designated area of responsibility.

Agency Designated NTIS Program Manager: All public agencies with jurisdiction of a tunnel in the National Tunnel Inventory (NTI) shall designate a Program Manager to ensure compliance with the NTIS and provide guidance and management of their tunnel inventory. Public agencies may designate in-house staff or a consultant who is an approved Program Manager. The consultant and agency should discuss and clarify the program manager duties such as submitting inspection reports to IDOT, maintaining official tunnel files, responding to IDOT requests for additional NTIS information, and other NTIS related activities.

NTIS Team Leader: The team leader is the person on-site who is responsible for the entire inspection team of initial, routine, complex, or in-depth inspections. This person is responsible for inspection planning, preparation, performance, and reporting: including coordination of field work. The team leader is responsible for evaluating the deficiencies, reporting inspection data, and ensuring inspection reports are complete, accurate, and legible. The team leader shall provide recommendations for the repair of defective items and communicate to the responsible program manager when critical findings are discovered.

5.1.3 Illinois Structure Information System

The Illinois Structure Information System (ISIS) is the official database containing all Illinois bridge and tunnel inventory and inspection information. The data stored in ISIS for each tunnel includes an inventory record, current and previous inspection records, and information related to construction, reconstruction, highway routes, microfilm, and design.

5.1.4 Bridge Inspection System

The web-based Bridge Inspection System (BIS) is utilized by tunnel inspectors to record the results of the tunnel inspections.

5.2 Tunnel Inventory

5.2.1 Reporting Inventory Information

Each tunnel involved with a public road, shall be included in the tunnel inventory. In accordance with NTIS, tunnels carrying a public roadway shall be inspected and reported to FHWA. Directions for recording tunnel inventory information is provided in the FHWA *Specifications for the National Tunnel Inventory* (SNTI).

https://www.fhwa.dot.gov/bridge/inspection/tunnel/snti/hif15006.pdf

Tunnel inventory information, or changes to the tunnel affecting the inventory, shall be recorded in ISIS, within 90 days of opening to traffic or within 90 days of completion of inspection, completion of rehabilitation/repair work, or a change in status of the tunnel. In general, the inventory data is entered by Region/District personnel. Data entry for some items, such as load rating, is the responsibility of the Bureau of Bridges & Structures.

5.2.2 Updating Inventory Information

A general review of inventory items shall be a part of each Routine Inspection, with any needed corrections promptly reported to appropriate personnel, so the tunnel data in ISIS can be kept as accurate as possible. This general review of inventory information during the Routine Inspection does not necessarily require the inspector to take physical measurements but should include an effort to identify obvious errors in existing inventory information. The Statewide Program Manager will review the Federal Submittal for all tunnels in advance of the submittal.

5.2.3 The National Tunnel Inventory

ISIS data is submitted to FHWA annually. The data becomes part of the National Tunnel Inventory (NTI) which is defined by FHWA as:

National Tunnel Inventory: The NTI is a collection of information (database) covering over 500 of the Nation's tunnels located along public roads, including Interstate Highways, U.S. highways, State, County or Local roads. It presents a State-by-State summary analysis of the number, location, and general condition of highway tunnels within each State.

5.3 Tunnel Inspections

5.3.1 General

There are various types of tunnel inspections derived directly from the NTIS and other FHWA referenced publications and technical documents as follows:

Initial Inspection: The first inspection of a new tunnel or a tunnel that has undergone rehabilitation to provide all Structure Inventory and Appraisal (SI&A) data and other relevant data and to determine baseline tunnel conditions.

Routine Inspection: A regularly scheduled inspection consisting of observations and/or measurements needed to determine the physical and functional condition of the tunnel, to identify any changes from initial or previously recorded conditions, and to ensure the structure continues to satisfy present service requirements.

Special Inspection: An inspection scheduled at the discretion of the Statewide NTIS Program Manager or the responsible Program Manager, used to monitor a particular known or suspected deficiency, typically at a more frequent interval than the routine inspection allows.

Damage Inspection: An unscheduled inspection performed to assess structural damage resulting from environmental factors or human actions.

Complex Inspection: When a tunnel is complex, the Statewide NTIS Program Manager shall determine whether special procedures, increased training, or additional qualifications and experience are necessary to lead the inspection. In accordance with the NTIS, the type of construction, functional systems, history of performance, and the physical and operating condition of the tunnel shall be considered when determining the inspection requirements for complex tunnels.

In-depth Inspection: A close-up inspection of one, several, or all tunnel structural elements or functional systems to identify any deficiencies not readily detectable using routine inspection procedures; hand-on inspection may be necessary at some locations. In-depth inspections may occur more or less frequently than routine inspections, as outlined in the tunnel-specific inspection procedures.

Load Rating Inspection: A scheduled inspection performed to investigate damage or deterioration to evaluate potential reductions in the live load carrying capacity. The load rating analysis shall be prepared and reported in accordance with Section 4. Tunnels shall be posted or restricted, as appropriate, after conducting the load rating in accordance with the NTIS.

These various inspections are performed at intervals controlled by such things as structural condition, structure type and details, site conditions, and load capacity evaluation. SI&A data shall be entered into ISIS within 90 days of inspection for all tunnels regardless of jurisdiction.

NTIS related inspections shall be coordinated and performed by qualified personnel as stated in the NTIS requirements. The individuals with overall responsibility for controlling the quality of the NTIS inspection program in a specific area, designated as Program Managers, and the individuals leading field inspection teams, designated as Team Leaders, shall meet the qualifications specified in Section 5.6.2. An approved Team Leader shall be present during Initial, Routine, In-Depth, Damage, Load Rating, and Complex Tunnel Inspections.

NTIS requires all Routine Inspections, Special Inspections, In-Depth Inspections, and Complex Tunnel Inspections be performed within the inspection interval specified in Section 5.4. Program Managers shall ensure their NTIS inspections do not become delinquent.

Inspection procedures vary greatly depending on the characteristics of the tunnel, the inspection type, and the extent of deterioration. Detailed inspection procedures including guidance for taking and recording field measurements are provided in FHWA *Tunnel Operations, Maintenance, Inspection and Evaluation Manual* (TOMIE), AASHTO *The Manual for Bridge Evaluation*, and in this manual inspection procedures are provided for commonly encountered tunnel types and elements.

When taken as a whole, the element level data collected during the tunnel inspection will provide information on the overall safety and reliability of the structural, civil, and functional systems. The structural elements contained in the NTI database include tunnel liners, roof girders, columns and piles, cross passageways, interior walls, portals, ceiling slabs, ceiling girders, hangers and anchorages, ceiling panels, invert slabs, slabs on grade, invert girders, joints, and gaskets. The civil elements included in the NTI database are roadway wearing surfaces, traffic barriers, and pedestrian railings. The functional systems contained in the NTI database include the mechanical, electrical and lighting, fire and life safety, security, systems, sign, and protective systems.

If possible, tunnels should be observed during the passage of heavy vehicular loads to assess the presence of excessive vibration, deflection, or noise. If detected, further investigations shall be made to determine their cause. Complex tunnels require specific inspection procedures that are documented in an inspection plan for each Complex Tunnel as specified in Section 5.3.7.

5.3.1.1 Inspection Forms

The applicable IDOT forms shall be used to document each inspection. The latest IDOT inspection forms, available on the date of the inspection, shall be used. If the inspections are entered into BIS by the Team Leader and approved by the Program Manager no hard copy signature will be required. If not entered into BIS by the Team Leaders, the form shall be signed.

For situations where the Program Manager and the Team Leader are employed by separate entities, the Program Manager has ultimate responsibility for the quality of the inspections. The Program Manager may delegate quality control of the Team Leader's work to others but shall require documentation of this for quality assurance purposes. This policy is in no way intended to discourage additional QC/QA measures within an inspection program but to clarify ultimate responsibility for that program.

5.3.2 Initial Inspection

An initial inspection shall be performed on rehabilitated highway tunnels within 90 days of the completion of all significant repair activities. If the tunnel was closed to complete the rehabilitation, the inspection shall be completed prior to reopening the tunnel to traffic. On new tunnels, the initial inspection shall be conducted after the completion of construction activities and the testing of functional systems but prior to opening the tunnel to traffic.

At a minimum, the initial inspection shall consist of a sufficient number of observations and measurements to determine the physical and functional condition of the tunnel. These inspections are intended to be comprehensive covering the structural, civil, mechanical, electrical and lighting, fire and life safety, security, signs, and protective systems. The results are to be recorded in accordance with the instructions contained in the SNTI.

The initial tunnel inspection establishes the baseline conditions of the tunnel; and it is used to field verify the initial tunnel inventory data. The baseline results can be used to evaluate changes over time to the tunnel systems and to help identify trends. The tunnel owner is responsible for

performing the inspection in accordance with NTIS requirements and reporting the information to IDOT, allowing sufficient time for data entry by IDOT. Agencies should coordinate the timing of submittal of inspection data with IDOT.

Documents, including photographs, drawings (design, as-built, and shop), foundation information, pile driving records, and field changes shall be included in the Tunnel File as applicable. See Section 5.6.3.4 for Tunnel File content requirements.

5.3.3 Routine Inspection

Although commonly used to also determine tunnel maintenance and repair needs, the primary focus of the Routine Inspection is public safety.

Following the initial inspection, routine inspections are conducted within the intervals specified in the NTIS. (See Section 5.4) Routine inspections are regularly scheduled inspections that help to ensure continued safe, reliable, and efficient service. These inspections are similar in scope to the initial inspection. Routine tunnel inspections record the changes to the tunnel over time and can be used to help identify trends and predict future life expectancy of components.

Inspectors should understand how defects impact the function and capacity of tunnel systems. Tunnel inspectors shall be able to recognize the common deficiencies that impact the structural, civil, and functional systems. The observations and measurements used to carry out the inspection should be comprehensive. For each NTI tunnel element, the SNTI defines the general extent of deficiencies for each of the four condition states: good, fair, poor, and severe.

Inspection procedures are the written documentation of policies, methods, considerations, criteria, directions, and other conditions for planning and conducting tunnel inspections. Written procedures are used to enhance the overall effectiveness of the tunnel inspection program and to formalize the inspection process. Procedures should be developed to ensure adequate planning and scheduling takes place prior to conducting the inspection. The written inspection procedures shall also capture inspections for functional systems as appropriate for the tunnel.

Written procedures shall describe the requirements for:

Inspection documentation, forms, and reports
Record keeping and documentation requirements.

Planning and scheduling to include unique structural or functional system characteristics.

Inspection “best practices” and inspection techniques.

Requirements for functional system testing, direct observation of critical system checks, and testing documentation.

General, tunnel-specific, and specialized instructions.

Specialized procedures, training, and experience for complex tunnels.

Components to disassemble or clean.

Measurements and survey control.

Use of current technology and practices.

Addressing critical findings and reporting to FHWA within 24 hours.

Maintenance and protection of traffic during the inspection.

Parking and staging areas during the inspection.

Contact information for delegated maintenance / inspection responsibility

Quality assurance and quality control implementation plans

Examples of tunnel specific procedures include identification of:

Interval of Non-destructive Testing (NDT) or In-Depth inspections

Tunnel elements, especially for Agency Defined Elements

Examples of specialized inspection procedures:

Level of effort required to inspect certain unique tunnel components

Certain details about accessing portions of the tunnel and/or tunnel equipment

At a minimum, routine inspections consist of a sufficient number of observations and measurements that are used to determine the physical and functional condition of the tunnel. These inspections are intended to be comprehensive covering the structural, civil, mechanical, electrical and lighting, fire and life safety, security, signs, and protective systems. The results are to be recorded in accordance with the instructions contained in the SNTI. The inspection shall accomplish the following functions:

Verification and updating element ratings assigned to various items pertaining to the physical condition and the functionality of the tunnel.

Identification and documentation of potential problems that may affect tunnel safety.

Correction of inaccuracies in the tunnel inventory data. During Routine Inspections, inspectors are required to verify inventory data items.

Determination of need for the Bureau of Bridges & Structures, or an Illinois Licensed Structural Engineer retained by an agency, to evaluate load carrying capacity or repair needs.

Documentation of required maintenance work.

IDOT Form BBS-TIR, "Tunnel Inspection Report" contains “Comments” fields for all elements inspected during the Tunnel Inspection. A concise description of deficiencies is required to be included in the comment fields for elements with a Condition State of 2, 3 or 4, and encouraged for Condition State 1. The BBS-TIR for each Routine Inspection is kept in the official Tunnel File at the headquarters of the District or the Agency responsible for inspection. If entered directly into BIS, no hard copy of the inspection is required.

If a tunnel includes any members which meet the definition of “Non-Redundant Steel Tension Member (NSTM)” as stated in Section 3.6.6, that member shall receive a hands-on inspection during each routine inspection. Routine Inspection interval shall not exceed 24 months for any tunnel with Nonredundant Steel Tension Members. The inspection of those members shall be documented in the inspection plan for the tunnel, similar to the Nonredundant Steel Tension Members Inspection plan for bridges as shown in Appendix A-4.

Tunnels with any significant quantity of critical structural elements (i.e. tunnel liners, roof girders, columns and piles, cross passageways, interior walls, portals, ceiling slabs, ceiling girders, hangers and anchorages, ceiling panels, invert slabs, invert girders) deemed to be in severe condition, a subsequent Load Rating Inspection as specified in Section 5.3.6 may be required to evaluate load carrying capacity. Such a condition rating is an indication that a main structural member may have deteriorated to a point where its load carrying capacity has been reduced.

After approving any tunnel inspection with any significant quantity of critical structural elements deemed to be in severe condition, the responsible Program Manager shall advise the Statewide NTIS Program Manager that a Load Rating Inspection will be required. The Statewide NTIS Program Manager will schedule an inspection and perform analysis as needed to determine the revised load carrying capacity of the deteriorated structure.

If an inspection reveals an imminent danger to the travelling public is likely, the inspector shall immediately take necessary action to protect the travelling public prior to notifying the Program Manager responsible for the structure and the Bureau of Bridges & Structures.

When the Bureau of Bridges & Structures cannot provide a Load Rating Inspection for an Agency within 90 days, the responsible Agency will be notified to retain the services of an Illinois Licensed Structural Engineer to evaluate the load carrying capacity of the affected tunnel. If the inspection findings are deemed urgent and require an immediate load rating, the Bureau of Bridges & Structures will require the evaluation of the load carrying capacity be expedited. The Structural Engineer's recommendation shall be submitted to the Bureau of Bridges & Structures for concurrence and approval.

5.3.4 Special Inspections

A special inspection is typically performed after an initial, routine, damage, or in-depth inspection when significant deficiencies have been discovered and need to be monitored. Special inspections are scheduled based on the needs of the tunnel facility, inspection findings, and established written procedures. These types of inspections continue, but perhaps at adjusted intervals or durations, until the deficiency is repaired, the component is removed from service, or further study determines the conditions are no longer deteriorating at accelerated levels. For example, a light fixture built of dissimilar metals and installed over traffic might have problems with excessive corrosion. As such, this light fixture may be monitored on a regular basis to ensure it remains securely anchored and safe until repairs can be made.

Special Inspections are performed to monitor a specific structural feature, deficiency or condition that must be monitored more frequently than the Routine Inspection Interval. Special Inspections may be initiated by structural damage or deterioration, conditions affecting the stability of the structure, or for other reasons at the discretion of the responsible District or Agency Program Manager or the Bureau of Bridges & Structures. Some examples of concerns that may be cause for a Special Inspection are damage/deterioration to main load carrying members, existing or structural details with histories of poor performance. Procedures used during these inspections should be adopted in accordance with the specific deficiency or condition to be monitored.

Special Inspections for public agency tunnels are typically initiated by or after consultation with the Statewide NTIS Program Manager. Failure to comply with the inspection frequency and/or the established procedure for the required Special Inspection may result in posting, reduced posting, or closure of the tunnel.

See Section 3 and IDOT *Structure Information and Procedure Manual* (SIP Manual) for information regarding recording and performing Special Inspections.

5.3.5 Damage Inspections

Damage inspections are performed in response to natural disasters or human activities that damage the tunnel. Damage may occur by motor vehicle impact, fire, flood, earthquake, vandalism, or explosions. When severe damage occurs, the tunnel should remain closed until a damage inspection has been completed. Structural analysis and follow-up emergency repairs may be needed. Structural materials may need further evaluation as identified in the Tunnel Operations, Maintenance, Inspection, and Evaluation Manual for (TOMIE).

Safety is of paramount importance after an incident. Devices such as breathing apparatus, protective clothing, and specialized equipment may be necessary. Inspection work shall be coordinated with emergency responders. It is important the tunnel owner develop detailed plans and conduct training exercises with tunnel facility personnel in advance of these events.

Damage Inspections are performed on an emergency basis. The inspection shall be performed by District staff, Agency staff, Bureau of Bridges & Structures staff, or an Illinois Licensed Structural Engineer who is an Illinois certified Team Leader or Program Manager, for tunnels.

The scope of a Damage Inspection shall be enough to determine the need for emergency load restrictions or closure of the tunnel to traffic, and to assess the level of effort necessary to repair the damage. The level of effort required for a Damage Inspection may vary significantly, depending upon the extent of the damage. If major damage has occurred, the inspection team must evaluate the damaged members, determine the extent of section loss, take measurements for misalignment of members, and check for any loss of foundation support. It may be desirable to make on-site calculations to establish emergency load restrictions.

Photos, sketches, and detailed description documenting defects that potentially impact the load carrying capacity of the tunnel shall be transmitted from the field immediately to the Bureau of Bridges & Structures.

Any calculations or analysis performed as a result of a Damage Inspection shall be sealed by an Illinois Licensed Structural Engineer and submitted to the Bureau of Bridges & Structures for review and concurrence. A Damage Inspection may be supplemented by a timely Load Rating Inspection to document verification of field measurements and calculations. In addition, a more refined analysis may be warranted to establish or adjust interim load restrictions or required follow-up procedures.

5.3.5.1 Damage Inspections for State Maintained Tunnels

Damage Inspections are typically conducted by the Bureau of Bridges & Structures for state owned structures. However, the inspection may be performed by District personnel, at the direction of the Statewide NTIS Program Manager, for the measurement and recording of existing conditions. These inspections include measurement of main structural members to obtain detailed documentation of member size, section loss, structural defects, and member deflections/distortions.

Traffic control and special equipment are often necessary to accomplish these inspections. These elements of the inspection are described in the tunnel specific inspection procedures.

The results of these inspections, for state owned structures, are reviewed by the Structural Ratings and Permits Unit in the Bureau of Bridges & Structures, which performs an analysis to determine the load carrying capacity of each inspected structure. After completing the analysis, the Bureau of Bridges & Structures will provide the Region/District with documentation of the inspection and the results of the structural rating. The documentation provided to the Region/District will include field data and photographs, recommended revisions to condition ratings, updated Inventory and Operating Ratings, and recommendations for load restrictions and/or Special Inspections.

5.3.5.2 Damage Inspections for Public Agency Structures

For public agency tunnels, Damage Inspections should be performed by trained agency staff, or consultants.

Public agencies also have the option of employing the services of a qualified Illinois Licensed Structural Engineer to perform Damage Inspections, calculate the load ratings and provide posting recommendations. The Structure Load Rating Summary sheet (Form BBS 2795) shall be included with the Load Rating and submitted to the Bureau of Bridges & Structures for review and approval.

5.3.6 Load Rating Inspections

Load Rating Inspections are performed to confirm and document the variables affecting the safe live load carrying capacity of the tunnel. A Load Rating Inspection shall be scheduled whenever

a ‘critical’ structural element is assigned a significant portion of the element into Condition State 4. Such a condition rating is an indication that a main structural member may have deteriorated to a point where its load carrying capacity as been reduced.

A critical structural element will be any element which, if deteriorated, will impact the load carrying capacity of the tunnel. These elements shall include but not be limited to: tunnel liners, roof girders, columns and piles, interior walls, portals, ceiling slabs, ceiling girders, hangers and anchorages, ceiling panels, invert slabs, and invert girders.

Expansion joints in the driving surface, slabs on grade and cross passageways are not considered as critical structural elements.

Load Rating Inspection personnel are required to be Illinois Tunnel Team Leaders and shall be qualified by training and/or experience to collect and document the information necessary to conduct a quality load rating analysis.

5.3.6.1 Load Rating Inspections for State Maintained Structures

Load Rating Inspections are typically conducted by the Bureau of Bridges & Structures, Structural Ratings and Permits Unit for state owned structures. The inspections may be performed by District personnel with guidance from the Statewide NTIS Program Manager, for the measurement and recording of existing conditions. These inspections include measurement of main structural members to obtain detailed documentation of member size, section loss, structural defects, and member deflections/distortions. Traffic control and special equipment are often necessary to accomplish these inspections.

The results of these inspections are reviewed by the Structural Ratings and Permits Unit in the Bureau of Bridges & Structures, which performs an analysis to determine the load carrying capacity of each inspected structure. After completing the analysis, the Bureau of Bridges & Structures will provide the Region/District with documentation of the inspection and the results of the structural rating. The documentation provided to the Region/District will include field data and photographs, recommended revisions to element level condition ratings, updated Inventory and Operating Ratings, and recommendations for load restrictions and/or Special Inspections.

5.3.6.2 Load Rating Inspections for Public Agency Maintained Structures

Load Rating Inspections are performed by the Bureau of Bridges & Structures Local Bridge Unit of the Bureau of Bridges & Structures. The inspections may also be performed by District personnel, public agency staff or consultants with guidance from the Statewide NTIS Program Manager,

If the Local Bridge Unit is unable to provide a Load Rating Inspection within a reasonable time frame or due to the complexity of the bridge, the Local Public Agency is notified to retain the services of a qualified consultant firm to perform the Load Rating Inspection and subsequent Load Rating. The documentation for the Load Rating Inspection and Load Rating must be submitted to the Local Bridge Unit for review and concurrence with the Load Rating, required weight restrictions, and/or Special Inspection requirements. IDOT Form BBS 2795 Structure Load Rating Summary shall be included with the Load Rating calculations and submitted to the Bureau of Bridges & Structures Local Bridge Unit for review and approval.

5.3.7 Complex Tunnel Inspections

A Complex tunnel is defined as a tunnel characterized by advanced or unique structural elements, or advanced functional systems.

- Extensive electrical systems such as switchgear, electrical distribution panels, computer and control systems/rooms, etc.
- Mechanical and ventilation systems such as pumps, fans, air monitors, etc.
- Fire suppression systems - such as sprinklers, hydrants, standpipes, fire alarm boxes, heat and smoke sensors, etc.
- Emergency Egress facilities – such as exit lighting/signage, exit corridors/passageways, refuge rooms, etc.
- Communication, monitoring, and security systems such as cameras, access restricted areas, phones, etc.
- Difficult inspection access methods
- Constructed of complex material or design methods.

The Statewide NTIS Program Manager is responsible for determining whether a tunnel is complex and for deciding what special procedures, increased training, or additional qualifications and experience are necessary to lead the inspection. When determining the inspection requirements for complex tunnels, the type of construction, functional systems, history of performance, and the physical and operating condition of the tunnel shall be taken into account in accordance with the NTIS.

5.3.7.1 General Complex Tunnel Inspection Procedures

A comprehensive Complex Tunnel Inspection Plan shall provide a detailed outline for conducting all aspects of the inspection process. The following is a brief outline for a detailed plan.

Team Members: The Program Manager shall select an experienced inspection team, trained for the specific tasks required for the unique structure. The Team Leader shall provide experience and guidance to the remainder of the inspection team. It is preferable that members of the team have previous experience inspecting the subject tunnel type and are familiar with any past issues and concerns. The Team Leader shall assign specific tasks for each member in order to conduct an efficient and thorough inspection.

Discipline Specific Specialists – When complex civil/structural, mechanical, or electrical systems need to be inspected, the team leader should assign discipline specific specialists with suitable training and experience to help conduct these inspections. Ideally, these specialist individuals should be licensed engineers.

Traffic Control: The inspection of a Complex Tunnel may require an extensive Traffic Control Plan. The responsible Program Manager / Team Leader shall coordinate the Complex Tunnel Inspection Plan with IDOT or Agency Traffic Operations, Maintenance, and Construction personnel to ensure the inspection operation, lane closures, or lane width restrictions do not interfere with other activities in the area. The plan should detail timing and sequence of operations, including lane closure sequences, signage, flagman responsibilities, and coordination with movement of inspection access equipment.

Access Equipment: A Complex Tunnel Inspection will typically require use of a wide variety of access equipment, including bucket trucks, manlifts, and ladders. The Complex Tunnel Inspection Plan should coordinate availability of equipment and operators for the entire inspection.

Access to enclosed areas should be documented, including box girder access doors, tower entrance doors, etc.

Documentation: A Complex Tunnel Inspection will typically require a greater extent of documentation and shall therefore be compiled into an Inspection Report. The report shall contain all inspection notes, photos, and findings in an organized narrative. It should contain an overall description of the structure, a table or listing of significant findings, and recommendations for both general maintenance and any needed repairs. The findings should be prioritized by importance and severity. Any defect of a structural member that could potentially affect the load carrying capacity of the structure shall be reported immediately to the Statewide NTIS Program Manager Tunnel. See Section 5.3.8 for details and requirements for a Critical Finding.

5.3.8 Critical Findings

A Critical Finding is defined as a structural or safety related deficiency that may pose an imminent threat to the safety of the traveling public.

5.3.8.1 Identifying a Potential Critical Finding

Any of the following will be considered a potential critical finding:

- Damage from significant vehicle impacts, fire, severe flooding or other natural disaster
- Significant quantity of structural elements (i.e. tunnel liners, roof girders, columns and piles, cross passageways, interior walls, portals, ceiling slabs, ceiling girders, hangers and anchorages, ceiling panels, invert slabs, and invert girders.) deemed to be in severe condition
- Failure of mechanical, electrical, ventilation or other functional systems that may endanger the public
- Any unforeseen event the inspector considers to be a threat to the safety of the traveling public

When a potential critical finding is identified, the safety of the traveling public shall be the initial focus. The Team Leader shall take all necessary steps to ensure the tunnel is secured. If the Team Leader determines the identified defect may seriously reduce a tunnel's load carrying capacity, the Team Leader shall, if feasible, isolate the defect from traffic by closing lanes. If the defect is extensive enough where lane closures may be inadequate, the tunnel shall immediately be closed to traffic until further analysis can be performed.

5.3.8.2 Critical Finding Determination

When a potential critical finding is identified, information regarding the conditions that contributed to a potential critical finding shall be immediately provided by the Team Leader to the responsible District or Agency Designated NTIS Program Manager.

The responsible Program Manager shall provide sufficient, detailed information to allow the Statewide NTIS Program Manager to make an initial determination of the severity of the finding. The Statewide NTIS Program Manager will then work with the responsible Program Manager to determine if there is a need for a Damage Inspection, Load Rating Inspection, follow-up structural analysis, Special Inspection, submission of IDOT Form BBS CF 1, "Critical Finding Report" and to develop a plan of action to mitigate the deficiency.

If the Statewide NTIS Program Manager determines submission of a "Critical Finding Report" is not required, the responsible Program Manager shall follow the initial plan of action, unless conditions change or additional deficiencies are subsequently found.

5.3.8.3 Critical Finding Reporting

If the Statewide NTIS Program Manager determines the deficiency will require FHWA notification, the responsible Program Manager shall submit IDOT Form BBS CF 1, "Critical Finding Report" within 24 hours. The responsible Program Manager shall provide in sufficient detail all required information on the form and submit it to the Statewide NTIS Program Manager, retaining a copy for the Tunnel File. This shall include basic structure inventory and location information, a description of the deficiency, the immediate steps taken to ensure public safety, and a summary of the initial plan of action to mitigate the finding.

5.3.8.4 Submitting a Critical Finding to FHWA

The Statewide NTIS Program Manager shall report each Critical Finding to the Illinois Division Office of the FHWA within 24 hours of receiving the "Critical Findings Report" with updates on a regular basis until it is resolved. A complete file, containing all pertinent data, will be retained by the Bureau of Bridges & Structures for each Critical Finding.

The Statewide NTIS Program Manager shall send an annual report to the FHWA summarizing each critical finding identified during the cycle year inspection and update any existing unresolved

critical findings from previous inspections. The report shall indicate the status and resolution of each critical finding. An annual report shall be filled regardless of whether or not a new critical finding has occurred.

5.3.9 Inspection of Structures under Construction

When a highway tunnel is open to public travel, it shall be inspected per the NTIS.

5.3.9.1 Existing Structure Rehabilitation

For an existing tunnel closed to public traffic during rehabilitation work, an NTIS inspection is to be completed prior to reopening the tunnel and the tunnel inventory data is to be updated within 90 days of completion of the work (all lanes open to public travel).

For an existing tunnel open to public traffic during rehabilitation work, regularly scheduled NTIS inspections are to be performed. If an NTIS inspection cannot be conducted due to reasonable circumstances such as a hazardous project site or conditions unfavorable to complete an inspection, then those circumstances shall be documented, in a written notice to the Statewide NTIS Program Manager for concurrence by the FHWA. The inspection is to be rescheduled at the earliest date possible. Once all risks have been mitigated, an NTIS inspection is to be completed and updated SI&A data is to be input within 90 days.

5.3.10 Inspection of Closed Structures

For a tunnel to be considered closed, it must be closed to traffic travelling through the tunnel, as well as traffic of any variety traveling over the tunnel. NTIS requirements do not extend to tunnels closed to traffic, however, all closed tunnels shall be inspected according to the NTIS unless the closure is permanent and approved by the Statewide NTIS Program Manager.

The following “Tunnel Status” (SNTI Item L4) code represent closed tunnels in the inventory:

Tunnel Status	Description
K	Tunnel Closed to all traffic

5.3.11 In-depth Inspections

In-depth inspections are close-up, hand-on inspections conducted on one, several, or all of the elements or functional systems. These inspections are used to identify deficiencies not readily detectable during initial, routine, or damage inspections. In-depth inspections may involve testing of tunnel system, components, and materials. More extensive disassembly and cleaning of equipment parts may occur. This type of inspection may be used to support a structural analysis or a functional system evaluation where more information is needed. In-depth inspections are scheduled based on the needs of the tunnel facility, inspection findings, and established written procedures.

5.4 Tunnel Inspection Intervals

5.4.1 General

The following sections document IDOT policy for the required frequency of different types of tunnel inspections.

Every tunnel shall receive periodic routine inspections. Those inspections shall be completed within 2 months (before or after) of the tunnel's assigned Routine Inspection Date (RID). In the case of a Special Inspection with an interval of twelve months or less, the inspection shall be completed by the due date.

5.4.2 Routine Tunnel Inspection Interval

The Routine Tunnel Inspection Interval may vary over the life of the structure. After the first routine inspection, a RID will be assigned by the Statewide NTIS Program Manager and the inspection interval will remain at 24 months until the tunnel requires a 12-month inspection interval as described in Section 5.4.2.1.

Each tunnel has an established NTIS Routine Inspection Date (RID) for determining timing of future inspections. Subsequent routine inspections are conducted within 2 months before or after the established RID, typically on 24-month intervals. The Statewide NTIS Program Manager can approve a modification to the RID with adequate justification, after notification to the FHWA Division office.

The NTIS recognizes certain tunnels in poor condition should be inspected at lesser intervals

5.4.2.1 Routine Inspection 12-Month Interval Criteria

Tunnels with the following characteristic shall receive a Routine Inspection at 12-month maximum intervals.

Tunnels with a significant quantity (i.e. greater than 50%) of structural elements (i.e. tunnel liners, roof girders, columns and piles, cross passageways, interior walls, portals, ceiling slabs, ceiling girders, hangers and anchorages, ceiling panels, invert slabs, and invert girders) or essential functional systems deemed to be in Condition State 3 or 4. The Statewide NTIS Program Manager

shall make the final determination of when the inspection interval shall be reduced to 12-months, based on a review of the routine inspection reports.

5.4.3 In-depth Inspection Interval

In-depth inspections are scheduled based on the needs of the tunnel facility, inspection findings, and established written procedures. See Section 3 for more information. Intervals are determined by the Statewide NTIS Program Manager.

5.4.4 Special Inspection Interval

Special inspections shall be performed to monitor specific details, deficiencies, or conditions. Intervals shall be selected at the discretion of the Statewide Tunnel Program Manager.

5.5 Tunnel Load Rating, Posting or Restrictions

A load rating is required for all tunnels that have a structurally supported roadway system to carry vehicles within the tunnel bore or that are subjected to live load force effects from a roadway located above the tunnel. At-grade roadways in tunnels are exempt from load rating, however any roadway over the tunnel shall be evaluated for live load carrying capacity. The NTIS requires all tunnels to be load rated in accordance with the Sections 6 or 8, AASHTO Manual for Bridge Evaluation (MBE). References in the MBE to the AASHTO LRFD Bridge Design Specification should be understood to instead refer to AASHTO *LRFD Road Tunnel Design and Construction Guide Specifications* 1st Edition, 2017, LRFDTUN-1. In addition, pertinent information related to tunnel load rating may be found in the FHWA's *Reference Guide for Load Rating of Tunnel Structures Publication No. FHWA-HIF-19-010,* Infrastructure Office of Bridges and Structures.

Load rating vehicles, procedures, documentation, reporting and subsequent postings, if required, shall be in accordance with applicable portions of Section 4 except as noted.

5.5.1 Assignment of Responsibility

5.5.1.1 State Tunnels

State tunnels are those under the jurisdiction of IDOT. Design and legal load ratings for state tunnels are typically completed by IDOT staff. When load ratings are completed by consulting engineers, IDOT must concur with the load rating and any subsequent weight restrictions.

5.5.1.2 Non-State Tunnels.

Non-state tunnels include those under the jurisdiction of counties, townships, road districts, municipalities, park districts, forest preserve districts, tollways, conservation districts, private owners and border states.

Design and legal load ratings for all new construction, rehabilitations, and other work affecting the safe load capacity of a non-state tunnel must be completed by the tunnel owner or their designated representative.

IDOT typically will not assist non-state tunnel owners in completing design and legal load ratings for damaged or deteriorated tunnels. When a Load Rating Inspection is required, the non-state tunnel owner shall have the inspection completed by the owner or their designated representative.

Except for tunnels owned by border states or federal agencies, IDOT must concur with load ratings and any subsequent weight restrictions submitted by the tunnel owner. Load ratings and weight restrictions for tunnels not serving state or local highways do not require IDOT concurrence.

Regardless of the owner or the highway system, all load ratings and any weight restrictions must be submitted to IDOT for inclusion in ISIS.

All non-state owned tunnel load ratings shall be submitted to the LBU at 'dot.localbridgeunit@illinois.gov'. This submittal shall include:

- AASHTOWare BrR model (.xml file) or model from another program if AASHTOWare BrR is not capable of load rating the specific structure type
- Design Plans
- Shop Drawings, if available
- Rehab Plans, if applicable
- PDF of Analysis Output
- Inspection Sketches and Photographs, if model includes deterioration
- BBS 2795: Structure Load Rating Summary (SLRS)

5.5.2 Load Rating Frequency

5.5.2.1 5.5.2.1 Initial Load Rating

All new tunnels in the NTI require an initial analytical load rating. For practical reasons, the initial load rating is typically performed as part of the design process. The variables used in the initial load rating must then be verified with the as-built tunnel. If variations are noted affecting the safe load capacity of the tunnel, a new load rating must be completed, documented, submitted to the BBS if applicable, and ISIS information updated.

For non-state tunnels, the initial load rating should be completed in conjunction with the Final Design Plans. if there were changes during construction that affects the load carrying capacity of

the structure, an as-built load rating submittal is required. An as-built load rating shall be submitted to the LBU prior to the structure being open to traffic.

5.5.2.2 5.5.2.2 Revised Load Ratings

When the safe load capacity of a tunnel has changed, a load rating must be completed, documented, submitted to the BBS if applicable, and ISIS information updated.

5.5.3 Weight Restrictions

Weight restrictions, when required, shall be in accordance with Section 4, Article 4.4.5 except the word “tunnel” shall be substituted for “bridge”.

5.5.4 Overweight Permit Evaluation

Overweight permit evaluation, when required, shall be in accordance with Section 4, Article 4.5 except the word “tunnel” shall be substituted for “bridge”.

5.5.5 Construction Load Rating

Construction load rating, when required, shall be in accordance with Section 4, Article 4.6 except the word “tunnel” shall be substituted for “bridge”.

5.6 Quality Control and Quality Assurance

5.6.1 General

The National Tunnel Inspection Standards (NTIS) states agencies shall "Use systematic quality control and quality assurance procedures to maintain a high degree of accuracy and consistency in the inspection program. Include periodic field review of inspection teams, data quality checks, and independent review of inspection reports and computations." Quality in the inspection and the resulting documentation is an important aspect that must be considered to ensure the safety of the traveling public in tunnels. The definitions for QC and QA are as follows:

QC refers to quality related activities associated with the creation of project deliverables, i.e. the inspection results. QC is used to verify deliverables are of acceptable quality, complete and correct. Examples of QC activities include peer reviews of deliverable products from the inspection documentation and verifying the findings in the field are as recorded by the inspector.

QA refers to the process used to create a quality product or deliverable, (or in this case inspection) and may be performed by a manager, client, or even a third-party reviewer. Examples of QA for tunnel inspections include the establishment of guidelines or checklists that would lead to quality inspections, creating minimum inspector qualifications, establishing condition state requirements that yield consistency between inspection periods, requiring equipment be calibrated, having testing personnel submit certifications on the equipment being used, developing standard inspection forms with data fields included, and following standard processes/procedures for performing inspections.

Both QC and QA shall be performed to ensure the inspections conducted and deliverables produced meet the tunnel owner's quality requirements, while ultimately ensuring the public's safety.

IDOT recognizes established and documented Quality Control and Quality Assurance (QC/QA) procedures are essential for ensuring tunnel inspections are performed in an appropriate, consistent, and uniform manner by all Program Managers and Team Leaders employed by various agencies having tunnel inspection responsibilities throughout the state. Through the application of QC/QA procedures, agencies enhance their ability to obtain accurate inspection information required for determining load capacity and tunnel maintenance, repair, rehabilitation

and replacement needs. Of utmost importance is the role QC/QA plays for ensuring tunnel inspection staff are adequately trained and experienced to readily identify conditions that adversely affect public safety.

5.6.2 Personnel Qualifications

The quality of an agency's bridge inspection program is very much dependent on the performance of the Program Manager in charge of the agency's inspection program, and on the Team Leaders leading the inspection teams. These individuals shall be qualified to perform their duties. IDOT has established procedures for reviewing, verifying and approving the acceptability of the education, training and experience of an individual to function as a Program Manager or Team Leader. IDOT Form BBS 2611, "Tunnel Program Manager Qualifications" and IDOT Form BBS 2621, "Tunnel Team Leader Qualifications" shall be used for documenting the qualifications of Program Managers and Team Leaders.

5.6.2.1 Statewide NTIS Program Manager / Program Manager (Tunnel)

The Statewide NTIS Program Manager is the individual in charge of the tunnel inspection program for a State with one or more tunnels in their jurisdiction. This person shall be capable of leading the tunnel inspection organization and ensuring the requirements of the NTIS are fulfilled. The Statewide NTIS Program Manager may delegate duties and responsibilities to qualified delegates, i.e. program managers, who take charge of a particular subset of tunnels; however, the Statewide NTIS Program Manager remains responsible for ensuring compliance. The delegated program managers shall remain in close communication with the Statewide NTIS Program Manager on all issues concerning compliance with the NTIS.

On behalf of the tunnel inspection organization, the program manager develops written procedures, schedules inspections, procures inspection and safety equipment, coordinates with tunnel facility staff, and advises the team leader as necessary. Ideally, the program manager has a general understanding of all aspects of tunnel engineering including design, construction, operation, maintenance, inspection, evaluation, load rating, and rehabilitation. Good judgment is essential for this position to respond appropriately to safety and structural concerns within the tunnel.

Refer to the NTIS for the complete requirements of this position. The program manager must be a registered professional engineer or have at least 10 years of tunnel or bridge inspection experience. This individual must also be a Nationally Certified Tunnel Inspector, which requires comprehensive training, end-of-course assessment, and periodic refresher training. Delegate program managers must be familiar with the requirements of the SNTI and TOMIE Manual, and will be included in the IDOT registry of Nationally Certified Tunnel Inspectors.

5.6.2.2 Team Leader (Tunnel)

The team leader is the person on-site in charge of the inspection team. This person is responsible for inspection planning, preparing, performing and reporting to include coordinating the field work. The team leader is responsible for evaluating the deficiencies, quality checking of the inspection data, and making sure the inspection reports are complete, accurate, and legible. The team leader shall also conduct safety briefings as needed. The team leader should be able to provide recommendations for the repair of defective items and must initiate appropriate actions when critical findings are discovered.

Refer to the NTIS for the complete requirements. A team leader must be a nationally certified tunnel inspector which requires comprehensive training, end-of-course assessment, and periodic refresher training. Additionally, the team leader is expected to meet at least one of the following:

Licensed Professional Engineer and at least 6 months of tunnel or bridge inspection experience.

5 years of tunnel or bridge inspection experience.

Appropriate combination of education and experience as described in the NTIS.

5.6.2.3 Discipline Specific Specialists

Discipline-specific specialists shall be qualified through education, training, experience, certification, and licensure as required by industry standards and norms for the systems being evaluated.

Specialists must demonstrate mastery of requirements set by trade organizations and code-writing bodies, including the National Fire Protection Association (NFPA), the American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE), the National Electrical Code,

the American National Standards Institute (ANSI), and the American Association of State Highway and Transportation Officials (AASHTO).

Additionally, specialists shall be proficient in using inspection tools and software, and they must possess strong analytical and communication skills to effectively report findings and collaborate with engineering teams.

5.6.2.4 Tunnel Inspection Training

Federal regulations require all personnel, including registered (note the term is "licensed" in Illinois) professional or structural engineers, managing tunnel inspection programs or directing inspections in the field, to have successfully completed the Federal Highway Administration (FHWA) Tunnel Safety Inspection (FHWA-NHI-130110). The course is primarily directed at members of Federal, State, local (Authority or Commission) and Tribal highway agency employees, who are involved with tunnel design, inspection and maintenance, as well as consultants involved in inspecting tunnels or in tunnel inspection management and leadership positions.

Prior to taking this course, individuals shall be a Certified Illinois NBIS Team Leader or Program Manager.

5.6.2.5 Tunnel Inspection Refresher Training

All Program Managers and Team Leaders shall receive 18 hours of NTIS tunnel inspection refresher training at intervals not to exceed 60 months. However, each Program Manager shall evaluate the performance and experience level of each Team Leader performing field inspections within their designated area of responsibility and, if necessary, establish an interval for tunnel inspection refresher training that is less than the maximum allowed to maintain inspection quality.

The "Tunnel Safety Inspection Refresher Training" (FHWA-NHI-130125) class is available through the NHI and satisfies NTIS tunnel inspection refresher training requirements.

5.6.3 Quality Control

Quality control and quality assurance programs are used to promote accuracy, ensure consistency, facilitate improvement, and help maintain a high level of reliability. Periodic field reviews of inspection team and their work, quality checks on data, and independent reviews of the inspection results shall also be part of the program. The use of checklists is recommended practice. Quality control refers to observations, monitoring, and performance testing to maintain the quality of the tunnel inspections and load ratings; these practices are usually performed continuously by the teams performing the work. Quality assurance is associated with a systematic approach to improve the overall program effectiveness, verify the accuracy of the quality control procedures, and ensure established standards are met; these procedures are performed independent of the inspection and load rating teams performing the work.

The quality control (QC) procedures established by IDOT are intended to define, monitor, and document the qualifications and performance of personnel engaged in the management of inspection programs, the performance of field inspections, and the load rating of tunnels.

Factors related to the maintenance of effective QC procedures are:

Review of tunnel inspection reports
Inspector's performance
Personnel qualifications
NTIS data verification
Tunnel inspection refresher training
Identifying special skills, training or equipment

5.6.3.1 Review of Tunnel Inspection Reports

To ensure the quality of a Team Leader's inspection reports, all reports shall be reviewed by the Tunnel Program Manager prior to final acceptance of the reports and subsequent data being entered into ISIS. Any inconsistencies or potential errors will result in rejection of the report with a required resubmission of a corrected report with updated NTI and element data within a reasonable timeframe. The depth of review shall be determined by the Tunnel Program Manager based on the experience level of the Tunnel Team Leader as well as the type, age and typical

exposure of the tunnel. At a minimum, the review shall verify the element condition states are appropriate and the documentation meets the requirements of Section 5.3.3.

5.6.3.2 Inspector's Performance

The District NTIS Program Manager or Agency Designated NTIS Program Manager shall conduct in-depth reviews of the field procedures of all Team Leaders functioning under their supervision to ensure inspections are being performed in an appropriate, consistent, and uniform manner.

At least once every 48 months, the responsible program manager shall accompany each Team Leader to observe the performance of NTIS tunnel inspections on at least one (1) tunnel inspection. The program manager shall document the results of their observations for each Team Leader.

5.6.3.3 Personnel Documentation

The Bridge Management and Inspection Unit maintains documentation of the qualification approvals issued for all Program Managers and Team Leaders employed by IDOT and by other agencies. The Bridge Management and Inspection Unit also maintains documentation of performance deficiencies reported by the Statewide NTIS Program Manager for resolution.

Approved Tunnel Program Managers and Approved Tunnel Team Leaders shall be documented in the BIS Program.

The Statewide Tunnel Program Manager shall maintain a file containing documentation of education, professional registrations, training, and certifications received from each Program Manager, Team Leader and Nationally Certified Tunnel Inspector (NCTI) functioning under their direction.

In addition, the file shall contain documentation of Tunnel Inspection Performance Reviews performed to monitor the tunnel inspection procedures used by the Team Leader. The documentation for all inspection personnel functioning in a District or Agency should be located in a central location and readily accessible by the Statewide NTIS Program Manager.

5.6.3.4 Tunnel File

The available records for each tunnel facility shall be kept in the official Tunnel File. Important records that are normally part of the Tunnel File include the construction plans, shop drawings, working drawings, as-built drawings, specifications, cost-estimates, correspondence, photographs, material certifications, material test data, load test data, specific inspection procedures, and specific emergency response procedures. The history of the operating, inventory, maintenance, inspection, and repair records shall also be maintained. Also included are accident records, posting, and permit loads.

A separate file shall be maintained for each tunnel. The documentation for all tunnels in a District or Agency should be located in a central location that is readily accessible by the Team Leader.

Tunnel Operations, Maintenance, Inspection, and Evaluation (TOMIE) Manual Section 4.3.3 provides the following guidance for the contents of a Tunnel File:

Construction Plans
Correspondence
Photographs
Maintenance, Inspection, and Repair records
Accident Reports
etc.

It is recognized that it is not practical or necessary to physically store all required items in the file. However, the actual location of each item may be referenced on the File Checklist. This can include separate file locations, plan stacks, electronic files, databases, and data in document storage systems, where applicable.

5.6.3.5 NTIS Data Verification

5.6.3.5.1 Recognizing Errors, Omissions, or Changes in the Field

The Tunnel Inventory data shall be reviewed in the field during each inspection and any errors brought to the attention of the Tunnel Statewide NTIS Program Manager.

5.6.3.5.2 Resolution of Inspection Errors or Omissions

During the review of inspection reports or the monitoring of field tunnel inspection procedures, the District or Agency Assigned NTIS Program Manager must note data errors or omissions and provide personnel responsible for their occurrence with directions that will eliminate similar incidents in the future. For minor reporting deficiencies, the initial resolution of the findings may be in the form of verbal instructions by the Program Manager to the Team Leader with a note to the Team Leader's file, if considered necessary by the Program Manager.

For major deficiencies, such as those resulting in the assignment of inappropriately high element condition state ratings to deteriorated tunnel elements or the omission of data concerning critical structural or functional deficiencies from an inspection report, the Program Manager must provide documentation to the Team Leader's file describing the inspection report deficiency and the measures taken to both correct the inspection deficiency and to prevent the reoccurrence of the inspection deficiency.

If the Team Leader continues to provide inspection reports or to perform field inspections in a manner that does not address a previously noted major deficiency, the Program Manager shall no longer utilize the Team Leader for NTIS tunnel inspection purposes, and the situation must be reported to the Statewide NTIS Program Manager for final resolution.

5.6.3.6 Identifying Special Skills, Training, and Equipment

Inspection teams performing Complex Tunnel or Functional System Inspections shall have skills, training, and equipment suitable for the inspection being performed. Discipline specific specialists are to be used when complex civil/structural, mechanical, or electrical systems require inspection. The team leader, with approval from the responsible program manager, shall assign discipline specific specialists with suitable training and experience to conduct these inspections. These specialist individuals should be licensed professional and structural engineers and shall have the education, training and experience put forth in the FHWA TOMIE Manual Sections 4.3.3 and 4.4.4.

5.6.4 Quality Assurance

Quality Assurance (QA) measures are required to ensure established Quality Control (QC) procedures are being followed and are effective for ensuring tunnel safety on all public roadways. Quality Assurance reviews of all agencies with highway tunnels are performed to assure the quality of tunnel inspections and tunnel load ratings. The Statewide NTIS Program Manager will oversee the Quality Assurance review which includes review of the tunnel inspection procedures and inspection reports prior to final approval.

5.6.4.1 Quality Assurance Reviews

Due to the limited number of tunnels in the state of Illinois, IDOT will conduct quality assurance reviews on a four - year basis to determine the adequacy and effectiveness of the quality control procedures utilized for tunnel inspections and load ratings. Depending on the cycle, this may mean no tunnel inspections are due every year. In these years, the tunnel will receive a cursory inspection to verify ratings. Reviews shall be performed on both the state tunnels and public agency tunnels in subsequent reviews. The intervals between these reviews may be reduced in response to agency personnel changes or to address findings from previous quality assurance reviews.

5.6.4.1.1 Office Reviews

Quality Assurance reviews include a review of the office files and procedures used to document inspections, to track personnel performance and qualifications, and to schedule follow-up inspections or repairs to address NTIS tunnel inspection findings. The procedures used to establish inspection schedules and to select Team Leaders and inspection personnel will be included in the Quality Assurance review. During the office review, the District and Agency Designated Program Managers and member of their staff included in the review process, will be requested to provide information describing the procedures employed within their designated area of responsibility to ensure tunnel safety and compliance with NTIS.

5.6.4.1.2 Field Reviews

Quality Assurance reviews include field observations of at least one tunnel within the Agency's jurisdiction.

The Statewide NTIS Program Manager or a delegated substitute shall be present during the Quality Assurance field review. Personnel conducting the Quality Assurance field review will refer to the Tunnel Files maintained by the Program Manager to compare the inspection information contained in the files to the conditions observed during the Quality Assurance field review. The most recent NTI data shall be obtained and comprehensively reviewed for accuracy. The Quality Assurance staff shall note inventory data errors or omissions as well as observed element level condition state-related discrepancies. Conditions that could affect load ratings will be noted during the Quality Assurance field review. Follow-up must occur to ensure the noted conditions have been considered in the current load rating. Any inventory data errors or omissions and element level discrepancies must be corrected and updated in ISIS in a timely manner prior to the next data submission to FHWA.

5.6.4.2 Final Quality Assurance Review Report

A “Final Quality Assurance Review Report - Tunnel” noting commendable practices, review findings, and the measures to be taken to address Quality Control deficiencies will be provided to the Program Manager. When requested and noted in the “Final Quality Assurance Review Report”, the reviewed Program Manager shall provide the Statewide NTIS Program Manager with documentation verifying corrective measures described in the report have been implemented.

IDOT will provide FHWA with a copy of every “Final Quality Assurance Review Report - Tunnel”.