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CHAPTER 5 EMERGENCY NOTIFICATION

5.1 INTRODUCTION

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CHAPTER 1 ........................................ INTRODUCTION

Part 1 contains the following chapters:

1. Introduction
2. Program Overview
3. Types of Inspections
4. Fundamentals of Bridge Inspection
5. Reporting Systems
6. Critical Findings

These chapters define the qualifications required to become a team leader and the procedures that the team leader must follow. The performance expectations and responsibilities are provided in part 1 of this manual. While other portions of the manual provide recommendations and guidance for the inspector, part 1 provides the regulatory guidance and outlines the requirements that must be performed in order to provide the documents in the format and timely manner necessary for INDOT to fulfill the requirements of the National Bridge Inspection Standards.
CHAPTER 2 ........................................ PROGRAM OVERVIEW

2.1 PROGRAM SUMMARY

It is important for the safety of the driving public that qualified personnel inspect Indiana’s bridges and small structures. The Bridge Inspector is required to render judgment on a daily basis pertaining to the safety and integrity of the structures inspected.

The individuals involved in the State Bridge Inspection Program have critical input on many issues, including the allocation of scarce rehabilitation funds and the decision to close major bridges. It is important that the Inspector is highly trained and proficient; he/she must understand the mechanics, behavior trends, and economics of a wide range of bridge types.

Indiana’s State Bridge Inspection Program operates under the directives of the Federal Highway Administration (FHWA) and the Indiana Department of Transportation (INDOT). The mission of the program is as noted below:

1. Ensure public safety.
2. Provide for the efficient use of resources in maintaining the serviceability of Indiana’s bridges and small structures.
3. Comply with all federal and state laws, rules, and policies.
4. The State is given the responsibility to accurately inventory and inspect all highway bridges on public roads. The State shall inspect the bridges on its highways and delegates this responsibility to the counties to accurately inventory and inspect their bridges on public roads.
5. The failure of a county to perform these responsibilities may cause a loss of funding. The State shall have the authority to take the appropriate action to assure bridge safety. These assurances will include that the bridge has been inspected at the proper frequency, that if necessary the bridge is posted, and that the posting in done in a timely manner. The State shall have the authority to close unsafe bridges.

2.2 INSPECTION PROGRAM

The State Bridge Inspection Program is federally mandated and has been in effect since 1971. The program policies are based on the National Bridge Inspection Standards (NBIS). Bridge inspection reports and records are kept by INDOT in its Central Database and the required bridge data is forwarded to the FHWA on an annual basis.

NBIS define a bridge as a structure, including supports, erected over a depression or an obstruction, such as water, highway, or railway. It has a track or passage way for carrying traffic or other moving loads, and has an opening measured along the center of the roadway of more than twenty feet between undercopings of abutments or spring lines of arches, or extreme ends of openings for multiple boxes. It may also include multiple pipes, where the clear distance between openings is less than half of the smaller contiguous opening.

This manual will address all bridges meeting this definition, as well as small structures spanning between 4 and 20 feet. Refer to Figures 1:2-1 and 1:2-2 for the defining bridge measurements.
Figure 1:2-1: Bridge and Small Structure Measurements
2.3 ORGANIZATION

The State Program Manager (SPM) is charged with administering the State Bridge Inspection Program. The INDOT Bridge Inspection Engineers (BIE), State/Toll Road/County/Local Bridge Inspection Consultants report to the SPM. Inspection Team Leaders report to the appropriate INDOT Bridge Inspection Engineer, the Toll Road Operating Engineer, or Bridge Inspection Consultant. Inspection Team Members report to their Inspection Team Leaders.

The organization of the State Bridge Inspection Program is shown in Figure 1:2-3 and described in detail later in this section. The review and quality assurance/quality control procedure is discussed in Part 2, Quality Assurance/Quality Control.

![Figure 1:2-3: State Bridge Inspection Program Organization](image-url)
2.4 QUALIFICATIONS AND RESPONSIBILITIES

2.4.1 State Program Manager (SPM)

The SPM is responsible for setting all bridge inspection policies and procedures, and for all bridge inspections and related reporting in the state.

The SPM must meet the following minimum qualifications:

1. Capable of overseeing the INDOT Bridge Inspection Engineers (BIE), all Bridge Inspection Consultants (BIC)
2. Sound background in bridge inspection
3. Specialized knowledge and skills in bridge design, construction, soils, construction materials, and emergency repair techniques
4. Successful completion of the Safety Inspection of In-Service Bridges (FHWA-NHI-130055) course
5. Successful completion of the Fracture Critical Inspection Techniques for Steel Bridges (FHWA-NHI-130078) course
6. Registered Professional Engineer (PE) in the state of Indiana.

As a part of the responsibilities of this position, the SPM shall:

- Oversee the INDOT BIE, all BICs
- Manage the statewide bridge inspection and inventory programs.
- Ensure all bridges in the state are inspected at a frequency and by a method consistent with the NBIS and state law.
- Ensure that bridge inspection data is uploaded to the Central Database within mandated time frames.
- Ensure load ratings are completed in accordance with all federal requirements.
- Oversee quality assurance and quality control of all bridge inspection programs.
- Coordinate with federal, state, toll road, county, and local governmental agencies.
- Formulate and monitor in-depth inspection programs for bridges with fracture critical members, underwater components, or unique or special features requiring additional attention during inspection to assure the safety of such structures.
- Conduct annual inspections of state border bridges in company with respective states’ personnel and district offices to determine required actions and lead the effort to accomplish Indiana’s portion of any required actions.
- Notify FHWA of all critical findings.
- Manage the state bridge posting and restriction program.
• Ensure proper signage is in place for bridges that require load posting or other restrictions.
• Ensure a system is in place that will notify INDOT BIE and BIC of required inspections and their due dates.
• Ensure a system is in place to upload all approved inspection data to the Central Database.
• Formulate and administer programs and policies.
• Develop, implement, and evaluate inspection and preservation policies, standards, procedures, and programs.
• Analyze federal and state legislation, administrative rules, and national and industry standards for incorporation in programs and policies.
• Recommend the revision of legislation and participate in new legislation development.
• Lead prompt, decisive, and effective responses to emergencies such as floods, earthquakes, and major bridge damage.
• Train bridge inspection personnel.
• Develop, monitor, and update training programs for state and consultant inspectors.
• Arrange or conduct inspection training programs and refresher programs throughout the state.
• Provide training on proper access, equipment operation, and safety procedures.
• Review and approve ATL and ATM qualifications. The SPM will have the final say on all questions of qualifications.
• Maintain a list of all qualified ATLs and ATMs in Indiana. The list will identify training required to keep the qualifications up to date.
• Evaluate ATLs and ATMs and require additional training as necessary.
• Advise on technical issues concerning problems or deficiencies discovered during inspections.
• Act as an ATL as needed.
• Monitor inspections and develop a good, general knowledge of all bridges in the state and their inspection records.
• Review all inspection reports for complex bridges performed on Indiana bridges.
• Manage state bridge inspection personnel and consultants to meet the needs of the State Bridge Inspection Program.
• Manage state-owned underbridge access equipment to assist in the inspection of bridges statewide.
2.4.2 Bridge Inspection Area Engineer (BIAE)

The BIAE is responsible for assisting the SPM as directed, for setting all bridge inspection policies and procedures, and for all bridge inspections and related reporting in the state.

The BIAE will meet the following minimum qualifications:

1. Capable of overseeing the INDOT BIE
2. Sound background in bridge inspection
3. Specialized knowledge and skills in bridge design, construction, soils, construction materials, and emergency repair techniques
4. Successful completion of FHWA-NHI-130055
5. Successful completion of FHWA-NHI-130078
6. Registered PE in the state of Indiana

As a part of the responsibilities of this position, the BIAE shall:

- Oversee INDOT BIE
- Assist the SPM in managing the state bridge posting and restriction program.
- Ensure proper signage is in place for bridges that require load posting or other restrictions.
- Ensure a system is in place that will notify INDOT BIE and BIC of required inspections and their due dates.
- Ensure a system is in place to upload all approved inspection data to the Central Database.
- Assist in the formulation and administration of programs and policies.
- Develop, implement, and evaluate inspection and preservation policies, standards, procedures, and programs.
- Analyze federal and state legislation, administrative rules, and national and industry standards for incorporation in programs and policies.
- Recommend the revision of legislation and participate in new legislation development.
- Lead prompt, decisive, and effective responses to emergencies such as floods, earthquakes, and major bridge damage.
- Train bridge inspection personnel.
- Develop, monitor, and update training programs for state and consultant inspectors.
- Arrange or conduct inspection training programs and refresher programs throughout the state.
- Provide training on proper access, equipment operation, and safety procedures.
• Assist in maintaining a list of all qualified ATLs and ATMs in Indiana. The list will identify training required to keep the qualifications up to date.
• Assist in the evaluation of ATLs and ATMs and require additional training as necessary.
• Advise on technical issues concerning problems or deficiencies discovered during inspections.
• Act as an ATL as needed.
• Monitor inspections and develop a good, general knowledge of all bridges in the state and their inspection records.
• Review all inspection reports for complex bridges performed on Indiana bridges.
2.4.3 INDOT Bridge Inspection Engineer (BIE)

The INDOT BIE is responsible for the inspection and reporting for all assigned state-owned bridges.

The INDOT BIE must meet the following minimum qualifications:

1. Successful completion of FHWA-NHI-130055
2. Qualified as a Bridge ATL in the state of Indiana
3. Registered PE in the state of Indiana with appropriate training and experience
4. Capable of overseeing ATLs and ATMs
5. Successful completion of FHWA-NHI-130078
6. Demonstrate a strong background in such areas as structural engineering, structural behavior trends, and bridge rehabilitation techniques
7. Demonstrate management abilities
8. Demonstrate thorough familiarity with NBIS, this manual, and applicable INDOT guidelines
9. Good eye sight and the ability to walk and climb over uneven surfaces and be comfortable working at heights, near water, in confined spaces, and close to live traffic

As a part of the responsibilities of this position, the INDOT BIE shall:

- Coordinate inspections to ensure that all inspections are completed in compliance with this manual.
- Oversee ATLs and ATMs.
- Ensure that all assigned state-owned bridge inspection results are approved and uploaded to the Central Database within 30 days of the date of the inspection and within seven days for all closures and emergency inspections.
- Notify the SPM of all critical findings in accordance with section 7.2.
- Act as an ATL as needed.
2.4.4 Bridge Inspection Consultant (BIC)

The BIC is the individual in a prequalified consulting firm who is responsible for all contracted inspections.

The BIC must meet the following minimum qualifications:

1. Registered PE in the state of Indiana with appropriate training and experience.
2. Qualified as an ATL in the state of Indiana.
3. Successful completion of FHWA-NHI-130055
4. Successful completion of FHWA-NHI-130078
5. Capable of overseeing ATL and ATM.

The BIC shall:
- Oversee ATL and ATM.
- Accept responsibility for all contracted inspections.
- Inspect or ensure that qualified inspectors inspect all bridges and small structures included in their contracts in compliance with this manual.
- Ensure that all inspection results are approved and uploaded to the Central Database within 60 days of the completion of the inspection and within seven days for all closures and emergency inspections.
- Ensure that all quality control and quality assurance procedures are met for all team leaders.
- Fulfill requests for information from the SPM in an efficient and timely manner.
- Recommend load posting, restrictions, or bridge closings and ensure the related signage is in compliance with the applicable requirements.
- Notify the SPM of all critical findings in accordance with section 7.2.
- Assist the hiring agency in maintaining a perpetual inventory of all bridges and small structures in the Central Database. For toll road, county, or local agencies, provide the agency with a report for each bridge.
- For toll road, county, or local agencies, recommend a bridge repair and construction program to the agency.
- Forward a list of qualified ATL, ATM, and Load Rating Team Members in the firm to the SPM yearly before December 31st. Unless uploaded into BIAS, the list shall include:
  a) Proof of PE Registration in the State of Indiana for all professional engineer team leaders, state assigned inspection numbers for all team leaders and team members. This requirement applies to inspector and load rating teams.
  b) Certificates of training for FHWA-NHI-130055 for team leaders.
c) Certificates of training for the FHWA-NHI-130078 Fracture Critical Inspection Techniques for steel bridges for team leaders performing fracture critical.

d) Certificates of training for the underwater bridge inspection class and diver training listed in section 2.4.10
2.4.5 Inspection Team Leader (ATL)

The ATL is the person responsible for the field inspection work. Preferably, the inspection team should consist of two persons: an ATL and an ATM.

The ATL must meet the following requirements to be considered qualified:

1. Be responsible for field work and be on site during the inspection
2. Demonstrate a strong background in such areas as structural engineering, structural behavior trends, and bridge rehabilitation techniques
3. Demonstrate management abilities
4. Thorough familiarity with all NBIS, this manual, and applicable INDOT guidelines
5. Good eye sight, the ability to walk and climb over uneven surfaces, and the ability to work at heights, near water, in confined spaces, and close to live traffic
6. Meet one of the following:
   a. Successful completion of FHWA-NHI-130055
      AND
      Registered PE in the state of Indiana
   b. Successful completion of FHWA-NHI-130055
      AND
      Bachelor degree in Engineering from a college or university accredited by the Accreditation Board for Engineering and Technology or a substantially equivalent organization
      AND
      Successful completion of the National Council of Examiners for Engineering and Surveying Fundamentals of Engineering exam
      AND
      Two years of bridge inspection experience in a responsible capacity under the direction and supervision of a qualified ATL
   c. Successful completion of FHWA-NHI-130055
      AND
      Five years of Bridge Inspection Experience in a responsible capacity under the direction and supervision of a qualified ATL
   d. Successful completion of FHWA-NHI-130055
      AND
      Certified Level III or IV NICET Bridge Inspector
e. Successful completion of FHWA-NHI-130055
   AND
   Associate’s degree in Engineering or Engineering Technology from a college or university
   accredited by the Accreditation Board for Engineering and Technology or by a substantially
   equivalent organization
   AND
   Four years of bridge inspection experience in a responsible capacity, as determined by
   the SPM, under the direction and supervision of a qualified ATL

A request for ATL status shall be submitted on the Record of Qualifications form. Appendix
B contains a blank copy of this form. Each ATL is assigned an Inspection Team Leader Number
by the SPM.

To remain qualified, all Inspection Team Leaders:

- Must successfully complete Bridge Inspection Refresher Training (FHWA-NHI- 130053)
  or FHWA-NHI-130055 at least once every 10 years.

- Must have conducted a bridge inspection, where he/she has fully participated in the field
  inspection work and signed his/her name on the report in the last five years. ATLs who
  do not meet this requirement must successfully complete FHWA-NHI-130053 to become
  re-qualified.

- Maintain a current S-BRITE Bridge Inspection certification. The requirements to acquire
  and maintain the bridge inspection certification from the Purdue University Steel Bridge
  Research, Inspection, Training, and Engineering Center will be published in Bridge
  Inspection Memorandums and may also be found at the S-BRITE link:
  https://engineering.purdue.edu/CAI/SBRITE

The ATL who does not meet the ongoing qualifications outlined may conduct field inspections
during an emergency such as a flood, post-earthquake, or after a collision. He/she must be instructed
by, and under the supervision of, a qualified ATL. The inspections should be limited and should
not involve changing any NBI data without having their data reviewed by a qualified ATL.
2.4.6 Complex Bridge Inspection Team Leader

Inspection Team Leader for the inspection of a complex bridge is not a separate team leader classification. A complex bridge inspection is not a separate type of bridge inspection. A complex bridge inspection will follow the instructions outlined in the inspection plan. The inspection plan will outline the experience and skills necessary to perform the complex bridge inspection. The selection of a complex team leader will be based on experience and specific engineering qualifications for the specific complex bridge. A complex bridge may require engineering expertise in areas such as structural, mechanical, and electrical. The specific requirements will be listed in the design level three requirements of contract documents if contracted and the inspection plan. The team leader managing the multidisciplinary engineering specialties must meet the following requirements:

1. Qualified ATL
2. Successful completion of FHWA-NHI-130078 within the last 5 years
3. Licensed Professional Engineer in the state of Indiana, have specific experience on the type of complex bridge being inspected, and have qualified team members to cover all necessary Engineering disciplines to inspect all components of the complex structure.
4. Current certification from Purdue University Steel Bridge Research, Inspection, Training and Engineering Center.
5. SPM-approved credentials.

2.4.7 Fracture Critical Inspection Team Leader (ATL-F)

Inspection Team Leaders for the inspection of a fracture critical bridge must meet the following requirements:

1. Qualified ATL
2. Successful completion of FHWA-NHI-130078 within the last 5 years
3. Licensed Professional Engineer in the state of Indiana, or have 2 additional years of bridge inspection experience as a team leader.
4. Current certification from Purdue University Steel Bridge Research, Inspection, Training and Engineering Center.
5. The credentials must be approved by the SPM.
2.4.8 Underwater Inspection Team Leader (ATL-U)

An Inspection Team Leader for an Underwater Inspection will meet the following requirements:

1. Qualified ATL
2. Divers must meet the requirements listed in 2.4.10
3. Registered PE licensed in the State of Indiana
4. Experienced in Underwater and In-Water Bridge inspections
5. Experienced in stream bed profiles and cross sections
6. Experienced in underwater nondestructive testing techniques
7. Responsible for the inspection, data integrity, and report preparation for bridge inspection projects in the last five years

The Underwater Inspection Team Leader shall:

- Lead the inspection team in actively planning, preparing, and performing bridge inspections. The ATL-U must be at the bridge at all times during the inspection.
- Be on site leading in the inspection of each bridge and participating in all in-water activities.
- Ensure worksite safety compliance, including traffic control, ATMs’ safety procedures, equipment, and the proper use of access equipment.
- Sign each bridge inspection report and take full responsibility for all data and comments contained in the report.
- Approve all data in the Central Database.
- Train ATMs working under his/her supervision, and provide opportunities to further his/her knowledge and professionalism in this field.
- Report any condition which is dangerous to persons or property, or any structural condition that would likely increase the potential for structure or member failure, to the SPM and the INDOT BIE or BIC as soon as possible.
- Report any Critical findings to the appropriate individuals and agencies identified in Part 1, Chapter 7.
- Recommend load posting calculations be completed as needed.
- Recommend restrictions or bridge closings and ensure the related signage is in compliance with all applicable requirements.

Duties and responsibilities of the ATL are described in Part 1, Chapter 4, Section 4.2.
2.4.9 Inspection Team Member (ATM)

An ATM shall meet, as a minimum, all of the qualifications listed below:

- High School Degree or equivalent
- Familiarity with NBIS
- Familiarity with the FHWA Recording and Coding Guide
- Familiarity with appropriate parts of this manual

The ATM is encouraged to take FHWA-NHI-130055. The ATM is responsible for the following:

- Following all ATL instructions in a safe manner
- Assisting the ATL in the field
- Documenting his/her participation and experience
- Keeping a personal log of bridge inspection and related bridge experience
- Acting in a professional manner

2.4.10 Nondestructive Testing Specialists

Individuals performing nondestructive testing (NDT) shall be qualified in accordance with American Society for Nondestructive Testing (ASNT) Level II or III. For all NDT work, other than dye penetrant, the NDT personnel must work hand-in-hand with a professional engineer, licensed in Indiana, who is qualified as a Bridge ATL.
2.4.11 Divers

Diving operations shall be conducted in accordance with all applicable federal and state regulations. Each member of the team should be trained in accordance with Occupational Safety and Health Administration (OSHA) standards.

All divers shall have completed training accredited by the Association of Commercial Diving Educators to the appropriate level or documented evidence that the divers training meets the requirements specified by the national consensus standard published by the American National Standards Institute (ANSI) and the Association of Commercial Diving Educators (ACDE) (i.e. ANSI / ACDE-01-2009, American National Standard for Divers – Commercial Diver Training – Minimum Standard).

All divers shall have certification proving successful completion of the Underwater Bridge Inspection course (FHWA-NHI-130091). All proof of training and certifications must be on file with the INDOT Bridge Inspection Unit.

2.4.12 Load Rating Team Leader (ATL-R)

Routine load ratings of state-owned bridges are generally performed and maintained by INDOT’s Bridge Load Rating Engineer in the office of Structural Services. The load rating of some large or complex bridges is performed and maintained by the SPM under the Major Bridge Program. The load rating of toll road, county, and local bridges is generally done by the BIC of record for owner.

The ATL-R must meet the qualifications listed below:

1. Have experience calculating load ratings and knowledge of load capacity rating computer programs and posting policies in Indiana
2. Registered PE licensed in the state of Indiana, qualified to oversee, review, and certify all load capacity ratings performed under his/her supervision

It is preferred, but not required, that the ATL-R successfully complete FHWA-NHI-130055.

The ATL-R must:

- Provide engineering judgment to those performing the load ratings.
- Be actively involved in reviewing the quality and accuracy of all load ratings.
2.5 Bridge Inspection Database

INDOT’s Central Database includes data used for FHWA’s NBI File and supplemental information used by the state.

All inspection data shall be entered into the state’s Central Database and approved by the ATL. All materials considered to make up the bridge file are to be uploaded into the state’s Central Database. These materials include the following:

1. Structure Inventory and Appraisal information
2. Field inspection information including sketches and photographs showing typical and deteriorated conditions. This requirement includes a brief narrative to justify a change in condition rating. A NBI item rated below 5 or condition state 3 requires a picture or sketch in addition to narrative descriptions of the deteriorated condition. A plan of action is to be included if required.
3. Critical Findings in accordance with section 6.2
4. Waterway information in accordance with section 3.10
5. Significant Correspondence, these documents will include agreements regarding inspection responsibility, ownership, or other issues that have an impact on timely inspections.
6. Other Inspection Procedures, these items will include other required reports such as fracture critical and under water. These reports will be in accordance with chapter 3, part 1 of this manual.
7. Load Rating, a dated load rating along with identification of the analysis to determine capacity. Results must be included which clearly identify the loads and methodology used in the analysis. Identify controlling members. Include any updates that reflect changes in the condition of structural members. If calculating cannot be provided due to lack of information, provide documentation for justification of determined load rating.
8. Posting Documentation, in accordance with section 6.2
9. Scour Assessment, document the assessment conducted to determine the scour vulnerability of the bridge.
10. Scour Plan of Action; for scour critical bridges, provide a copy of the plan of action.
11. Plans and Drawings

INDOT inspectors and consultants working on state-owned bridges shall submit all approved data to the state within 30 days of an inspection unless the contract includes specific language due to the complexity of the inspection. Consultants for the toll road, counties, and local agencies will submit all approved data to the state within 60 days of an inspection. Data generated when a bridge is closed after a Damage or Disaster Inspection must be uploaded to the Central Database as soon as possible, but not later than 7 days after the Damage Inspection.
CHAPTER 3 ........................................ TYPES OF INSPECTIONS

3.1 INTRODUCTION

There are numerous types of inspections, each designed to obtain specific information. For example, an Initial Inspection is performed after a bridge is constructed to document the as-built conditions, whereas Routine Inspections are used to monitor the condition of a bridge at regular intervals. Damage Inspections are used to assess damage resulting from events such as impacts, fires, or floods. The inspections help create a complete picture of a bridge's condition and are described in detail in this chapter.

Visual inspection is the primary examination method for all inspections. Nondestructive testing (NDT) techniques may be required to identify internal flaws or hard-to-see external defects in critical members. NDT is detailed in Part 6 of this manual.

Figure 1:3-1: Arch Bridge near Spring Village, Indiana
3.2 INSPECTION TYPES

The Federal Highway Administration (FHWA) and the state of Indiana dictate the type of inspection each bridge requires, and the maximum interval between inspections. Figure 1:3-2 gives an overview of the types of inspections, the maximum interval between inspections, and the governmental unit responsible for the inspection policy.

<table>
<thead>
<tr>
<th>Inspection Type</th>
<th>Maximum Inspection Interval</th>
<th>Agency</th>
</tr>
</thead>
<tbody>
<tr>
<td>Initial</td>
<td>After Construction or Major Rehabilitation 90 Days</td>
<td>FHWA Mandate</td>
</tr>
<tr>
<td>Routine</td>
<td>24 months</td>
<td>FHWA Mandate</td>
</tr>
<tr>
<td>Fracture Critical* (92A)</td>
<td>24 months</td>
<td>FHWA Mandate</td>
</tr>
<tr>
<td>Underwater (92B)*</td>
<td>60 months</td>
<td>FHWA Mandate</td>
</tr>
<tr>
<td>Special (92C)</td>
<td>60 months</td>
<td>FHWA Mandate</td>
</tr>
<tr>
<td>In-Depth</td>
<td>96 months</td>
<td>INDOT Policy</td>
</tr>
<tr>
<td>Damage</td>
<td>As needed</td>
<td>FHWA Mandate</td>
</tr>
<tr>
<td>Channel Survey</td>
<td>72 months</td>
<td>INDOT Policy</td>
</tr>
<tr>
<td>Large Culvert</td>
<td>60 months</td>
<td>INDOT Policy</td>
</tr>
</tbody>
</table>

* Plan of action required

Figure 1:3-2: Bridge Inspection Types and Maximum Intervals
3.3 INITIAL INSPECTIONS

3.3.1 Purpose

An Initial Inspection is the baseline inspection that should be completed on every new bridge, after a major rehabilitation, or when the configuration or geometry of a bridge changes (e.g., when a bridge is widened). An Initial Inspection is a fully documented inspection using the bridge plans to determine basic data for entry into the Central Database. Initial Inspections are also used when a bridge is discovered that has not been previously inventoried. In this case, the bridge plans may not be available. As part of the Initial Inspection, inspectors evaluate the bridge and decide what other foreseeable inspections will be required throughout its life, including Fracture Critical, Special, or Underwater Inspections.

Figure 1:3-3: Inspector Performing an Initial Inspection
3.3.2 Precision

The Initial Inspection should be a fully documented investigation. Inspectors must be able to identify any deficiencies and verify the geometric data. All observed deficiencies, cracks, construction errors, and alignment problems should be documented.

An Initial Inspection should include:

- Record all Structure Inventory and Appraisal (SI&A) data required by federal and state regulations.
- Complete an inspection and evaluation of all required data identified in the Indiana Coding Guide in accordance with relevant chapters of this manual.
- Complete a Basic Channel Survey, in accordance with Section 3.10 of this chapter.
- Complete a Scour Inspection for a bridge with substructure units in water in accordance with Part 4, Chapter 7.
- Complete an Underwater Inspection for a bridge with substructure units in water if unable to perform a Scour Inspection.
- Gather relevant information required to maintain an accurate bridge file.
- Determine and evaluate the baseline structural condition.
- Assess scour susceptibility.
- Identify the location and condition of any fracture critical members or details.
- Identify the location and condition of any details that may require a Special Inspection.
- Identify any substructure components requiring Underwater Inspection.
- Verify that all clearances and geometric dimensions are correct in the Central Database.
- Verify that any protection required to shield the bridge from traffic on navigable waters is in place.
- Identify any critical findings and notify the appropriate individuals and agencies identified in Part 1, Chapter 7, report the findings as directed in Part 1 Chapter 7.

All inspection results should be fully documented in the Central Database.

3.3.3 Repairs

Rehabilitation repairs are permanent repairs that are intended to improve the structural condition of a member and/or component. Access to the repair plans is needed to determine if and to what extent rehabilitation improves any specific rating number. Bridges used to maintain traffic must be inspected in the month the biannual inspection is due.
3.3.4 Frequency

For state-owned bridges, an Initial Inspection should be completed before the new construction or rehabilitation construction contract is finalized and the bridge is open to traffic. These inspections are often performed in conjunction with the construction department’s Pre-Final Inspection. Approved Initial Inspection data, including the SI&A data, must be entered in the Central Database within 90 days of the completion of the construction.

For toll road, county, and local agency bridges, Initial Inspections should be completed as soon as reasonable. Approved Initial Inspection data, including the SI&A data, must be entered in the Central Database within 90 days of the opening of the bridge.

A bridge not previously documented in the Central Database shall receive an Initial Inspection within 90 days of the discovery of the bridge. The data must be entered in the Central Database within 90 days of the discovery of the bridge.

Figure 1:3-4: Steel Girder Bridge
3.4 ROUTINE INSPECTION

3.4.1 Purpose

Routine Inspections are regularly scheduled inspections consisting of observations and/or measurements needed to determine the physical and functional condition of the bridge, and to identify any changes from previously recorded conditions. The Routine Inspection also ensures that the bridge continues to satisfy present service requirements.

3.4.2 Precision

Routine Inspections will follow a Plan of Action, documented in the Central Database if the bridge has unique issues such as difficult access, polluted water, requires access equipment or traffic control.

Routine Inspections are generally conducted from the deck, ground, water-level, or from permanent work platforms and walkways, if present. A complete walk-around visual inspection of all components of the structure, channel, and adjacent roadway is required.

If the water is not safe for wading access, the inspection team should return when the flow conditions allow safe access. The inspection team may probe the underwater portion of the bridge using a boat. If the bridge cannot be inspected using these options then an Underwater Inspection (92B) is necessary. The conditions that mandate an Underwater Inspection are listed in Section 3.6. The ATL must send a written request to the SPM to add, modify, or remove a bridge from the list of bridges needing an Underwater Inspection.

A Routine Inspection should include the following:

- Complete an inspection and evaluation of all required data identified in the Indiana Coding Guide in accordance with this manual.
- Complete a Basic Channel Survey for bridges with substructure units in water every 72 months in accordance with Section 3.10 of this chapter.
- Complete a Basic Channel Survey for bridges with substructure units in water in accordance with Section 3.10 of this chapter if required by the Scour Plan of Action, or if probing indicates a changed condition in the stream bed.
- Complete a Scour Inspection for bridges with substructure units in water in accordance with Part 4, Chapter 7, if the bridge does not receive Underwater Inspections.
- Verify SI&A data.
- Gather other relevant information required to maintain an accurate bridge file.
- Note any existing problems or components.
- Note the condition of fracture critical members or details.
- Identify the location and condition of details that may require a Special Inspection.
- Note signs of bats and cliff swallows.
□ Report significant debris or drift to the bridge owner.

□ Take alignment photos from both ends of the bridge. Closing, posting, and/or restriction signs should be visible and legible in the photos.

□ Take elevation photos, preferably for both sides of the bridge, as a minimum on one side of the bridge. If only one elevation photo is taken, a picture of an important detail must be taken.

□ Take photos of all bridge National Bridge Inventory (NBI) Items with a condition rating of 4 or less.

□ If needed to complete the bridge file, take one clear photo under each superstructure type, clearly showing details.

□ If needed to complete the bridge file, take one clear photo of each substructure unit in the water.

□ If needed to complete the bridge file, take one photo looking at the upstream channel.

□ If needed to complete the bridge file, take one photo looking at the downstream channel.

□ If needed to complete the bridge file, take one photo of any fracture critical member or details.

□ If needed to complete the bridge file, take one photo of any detail that requires a Special Inspection.

□ Take photos of significant collision damage.

□ Note if a new load rating is warranted.

□ Verify that the protection required to shield the bridge from traffic on navigable waters is in place.

□ Identify any Critical Deficiencies and notify the appropriate individuals and agencies identified in Part 1, Chapter 7.

3.4.3 Frequency

Bridges must receive a Routine Inspection every 24 months unless widespread deterioration dictates more frequent inspections. If only a portion of a bridge needs more frequent inspections, a Special Inspection is required.

Bridges with a rating of 4 or less for the deck, superstructure, substructure, or culvert rating shall have a reduced interval between Routine Inspections. A maximum inspection interval of 12 months will be used.
3.5 FRACTURE CRITICAL INSPECTIONS

3.5.1 Purpose

Fracture Critical Inspections (92A) are regularly scheduled inspections to examine the fracture critical members or member components of a bridge. Fracture critical members are steel tension members or steel tension components of members, whose failure would probably cause all, or a portion of, the bridge to collapse. Fracture critical members require more thorough and detailed inspections than the members of non-fracture critical bridges. Fracture Critical Inspections are explained in detail in Part 4, Chapter 11.

3.5.2 Precision

Every Fracture Critical Inspection must follow a Plan of Action. The Plan of Action must include:

1. A time table for conducting the inspection.
2. The personnel requirements for the inspection.
3. A list detailing what is required to be inspected.
4. The required access equipment.
5. The required traffic control.
6. A sketch showing the location of all fracture critical members
7. A table listing the locations of the fracture critical members and connections with comments regarding the condition of the member

A Fracture Critical Inspection is a hands-on inspection. “Hands-on” means a visual/manual inspection made at a distance no greater than arm’s length of the entire member or member component surface, including gusset plates. The observations and measurements are used to determine the structural capacity of the member or member component, identify critical findings, identify any changes from previous inspections, and ensure that the bridge continues to satisfy present safety and service requirements. Under-bridge access equipment may be required to move the inspector within arm’s length of the critical members. There may be permanent work platforms and walkways available on some larger bridges to aid in inspection work or the members may be reached by climbing.

Critical findings shall be reported to the appropriate individuals and agencies identified in Part 1, Chapter 7.

All inspection results should be fully documented in the Central Database.

If a bridge is scheduled for a Fracture Critical Inspection, but the road is closed to traffic, the inspection team should follow the steps outlined in Section 3.12 of this chapter.
3.5.3 Frequency

A Fracture Critical Inspection is required at regular intervals not to exceed 24 months. A fracture critical member with a rating of 4 or less shall have the frequency of inspection reduced to no greater than 12 months.
3.6 UNDERWATER INSPECTIONS

Underwater Inspections are a necessary part of an effective State Bridge Management Program, and are mandated by the FHWA on routine intervals for bridges with substructure units in water that cannot be waded or probed.

![Inspector Conducting a Wading Inspection](image)

**Figure 1:3-5: Inspector Conducting a Wading Inspection**

3.6.1 Purpose

Because most problems that occur under water do not become visible from the surface until they are critical, bridges with substructure units in water must be inspected to ensure they are sound.

Underwater Inspections are called for if scour and the condition of elements below water cannot be assessed because:

1. The substructure unit is in deep water during the entire year. Inspectors are expected to visit the site at various times to find a time when the water level and current are low enough to safely gather the necessary data as a part of the Routine Inspection; and,

2. At the lowest flow during the year, the water is too deep. Generally, if the velocity times depth is equal to or greater than 10, inspectors should not attempt wading,

3. The channel bottom is too soft for safe wading, or


5. At the lowest flow during the year, the water is too deep for probing from a boat.
3.6.2 Precision

Every Underwater Inspection must follow a Plan of Action. The Plan of Action must include:

1. A time table for conducting the inspection.
2. The personnel requirements for each portion of the inspection.
3. A list detailing what is required to be inspected.
4. The required access equipment.
5. The required traffic control.

An Initial Underwater Inspection should include the items listed below. The subsequent inspections may be modified based on field conditions. For example, the number of cross sections may be reduced if the inspector is confident that the stream is stable.

1. A detailed listing of the divers participating in the inspection complete with duties performed and a complete listing of credentials. This will include diving credentials and Bridge ATL and ATM numbers issued by the Bridge Inspection Unit. This information must be placed on the first section of the inspection report.
2. A detailed Channel Survey as described in Section 3.10 of this chapter, including channel soundings and waterline elevations.
3. A Scour Inspection as described in Part 4, Chapter 7.
4. Photographs including:
   a. Overall views of the Bridge.
   b. General views of each substructure unit (both sides and noses).
   c. Significant defects.
   d. Typical material condition at the water line.
5. Sketches showing:
   a. The substructure layout, including overall bridge length and each substructure unit length and width.
   b. The shoreline limits upstream and downstream of the bridge.
   c. A north arrow.
   d. The width of the channel at the bridge.
6. A record of the water velocity at the deepest point in the channel.
7. A record of the channel bottom material adjacent to all submerged substructure units.
8. A record of the shoreline conditions and material.
9. A check of the foundation type to ensure it has been correctly coded in Item 113.
10. Complete pre-dive and post-dive checklists.
11. A record of defects, noting section loss and dimensions.
12. Notifying owner of any significant deficiencies.
13. Reviewing available plans against the current condition for changes.

All inspection results should be fully documented in the Central Database. Critical findings shall be reported to the appropriate individuals and agencies identified in Part 1, Chapter 7.

![Figure 1:3-6: Diver at Pier](image)

Due to limited underwater visibility, the inherent access restrictions of the underwater environment, and the presence of marine growth, the required underwater inspection precision depends on the level of effort. Three underwater diving inspection levels of effort are defined by the FHWA. A standard Underwater Inspection in Indiana requires a Level I effort on 100 percent of all underwater elements. A Level II or III effort shall be conducted only if defects or advance deterioration are found or suspected, and then only at the direction of the SPM.
A summary of the Inspection Levels and typical detectable defects is provided in Figure 1:3-10. A narrative description of each level follows.

<table>
<thead>
<tr>
<th>Level</th>
<th>Purpose</th>
<th>Typical Detectable Defects</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>General visual/tactile inspection to confirm as-built condition and detect severe damage</td>
<td>Steel: Extensive corrosion and holes&lt;br&gt;Concrete: Major spalling and cracking&lt;br&gt;Timber: Major loss of section&lt;br&gt;Composite: Permanent deformation&lt;br&gt;</td>
</tr>
<tr>
<td>II</td>
<td>To detect surface defects normally obscured by marine growth</td>
<td>Steel: Moderate structural damage&lt;br&gt;Concrete: Surface cracking, spalling, erosion&lt;br&gt;Timber: External pile damage due to marine borers&lt;br&gt;Composite: Cracking&lt;br&gt;</td>
</tr>
<tr>
<td>III</td>
<td>To detect hidden or interior damage, evaluate loss of cross-sectional area, or evaluate material homogeneity</td>
<td>Steel: Remaining thickness of material&lt;br&gt;Electrical potentials for cathodic protection&lt;br&gt;Change in material properties&lt;br&gt;</td>
</tr>
</tbody>
</table>

Figure 1:3-7: Summary of Inspection Intensity Levels
LEVEL I EFFORT

A Level I Inspection is a visual or tactile examination using large sweeping motions of the hands where visibility is limited. A Level I effort must be detailed enough to detect obvious major damage or deterioration due to overstress or other severe deterioration. It should confirm the full-length continuity of all members and detect undermining or exposure of normally buried elements. A Level I effort also includes limited probing of the substructure and adjacent channel bottom.

LEVEL II EFFORT

The Level II effort is intended to detect and identify damaged and deteriorated areas that may be hidden by surface biofouling. A Level II inspection requires marine growth to be removed from portions of the bridge. The thoroughness of cleaning should be governed by what is necessary to discern about the condition of the underlying material. A detailed inspection of a representative sample of the components is required. For piles, a 12-inch high band should be cleaned at designated elevations, generally near the waterline, at the mudline, and midway between the waterline and the mudline. On an H-pile, marine growth should be removed from both flanges and the web. On a rectangular pile, the marine growth removal should include at least three sides; on an octagonal pile, at least six sides; and on a round pile, at least three-fourths of the perimeter. On piles with a diameter of three feet or greater, one-foot squares should be cleaned at four locations spaced approximately equally around the perimeter, at each designated elevation. On large, solid-faced elements such as pier shafts, one-foot squares should be cleaned at four random locations, at each designated elevation. The Level II effort should also focus on typical areas of weakness such as attachment points and welds. Figure 1:3-11 shows a view of a typical Level II effort.

Figure 1:3-8: Inspector Conducting a Level II Inspection Effort
LEVEL III EFFORT

The Level III effort is generally limited to key structural areas which are suspect or areas which may be representative of the underwater structure. A Level III Inspection typically involves NDT or partially-destructive testing (PDT) to detect hidden or interior damage, or to evaluate material homogeneity. Testing techniques typically include the use of ultrasonic, coring or boring, and in-situ hardness testing. Refer to Part 6 of this manual for additional information on NDT and PDT. Refer to Figures 1:3-12 and 1:3-13 for views of inspectors conducting Level III efforts.

The SPM and the FHWA Liaison should be notified of all Critical Deficiencies identified in this inspection, as detailed in Part 1, Chapter 7 of this manual. Critical Deficiencies should be noted in the Central Database for all bridges.

All inspection results should be fully documented in the Central Database.

Figure 1:3-9: Inspector Using a D-Meter to Conduct a Level III NDT Inspection

Figure 1:3-10: Inspector Using a Drill in a Level III Inspection
3.6.3 Frequency

The standard interval for Underwater Inspections is 60 months. This interval is for bridges that are in good condition underwater, located in passive, nonthreatening environments, and have not had any significant changes in the submerged substructure units or channel bottom since the previous Underwater Inspection. If warranted due to deficiencies or deterioration, the inspection interval may be reduced to less than 60 months. Counties and local agencies generally use 48 months as their standard interval for Underwater Inspections.

A frequency of 48 months is to be used when there have been changes in the submerged substructure units or channel bottom since the previous inspection that are serious enough to warrant tighter scrutiny, but not serious enough to require corrective action.

A 36-month frequency is to be used when there have been substantial changes in the submerged substructure units or channel bottom since the previous inspection, or problems have developed that require corrective action.

A 24-month frequency is to be used when serious submerged substructure unit deterioration or scour/channel problems exist. The deficiencies should be immediately addressed, or the bridge should be rehabilitated or replaced in the very near future.

A 12-month frequency is to be used when very critical submerged substructure unit deterioration or scour/channel problems exist. The deficiencies should be immediately addressed or the bridge should be rehabilitated or replaced in the very near future.

An Underwater Inspection may be required as part of an Initial Inspection for bridges with substructure units in water that cannot be inspected safely while wading. Underwater Inspections are scheduled, modified, or deleted as a requirement by the SPM. When the current frequency is out of compliance to the frequencies outlined above, the ATL shall write the SPM requesting a change in frequency citing the reasons as listed above.

Increasing frequency: The inspection frequency may be increased from a reduced frequency if the situation that required the reduced frequency has been properly addressed or if it has been observed over several inspections the situation has stabilized. The increase in frequency will be made in writing and must have the approval from the SPM.
3.7 SPECIAL INSPECTIONS

3.7.1 Purpose

Special Inspections (92C) are scheduled to examine a portion of a bridge in more detail or at a greater or lesser frequency than is standard for Routine Inspections. Special Inspections may provide follow-up after a Routine, Damage, or Initial Inspection. The Special Inspection mandates the component being inspected is at arm’s length.

Details and bridges that require a Special Inspection include the following:

- Cover plates
- Fatigue category E and E’ details
- Hangers of all types
- Hinge or pin connections
- Triaxial Constraint
- Intermittent Welds
- Field Welds on tension members
- Known defects or damages severe enough to warrant extra scrutiny
- Unique or problematic details as determined by the SPM

Complex Bridges that require a Special Inspection include the following:

- Bridges designated by the SPM
- Cable-stayed bridges
- Movable bridges
- Suspension bridges
Every Special Inspection may include a Plan of Action if required. The Plan of Action may include:

1. A time table for conducting each inspection.
2. The personnel requirements for each portion of each inspection.
3. A list detailing what is required to be inspected under each inspection.
4. The required access equipment needed for each inspection.
5. The required traffic control for each inspection.

For bridges that require a Special Inspection because of unique or problematic details, the inspector must make sufficient measurements and observations to quantify the deficiencies to allow for future monitoring. Inspectors should document:

1. The physical and functional conditions of the known or suspected deficiency.
2. Any developing problems such as deterioration, foundation settlement, scour or erosion of the slopes, scour at the supports, ice damage, or other problems that, if left unchecked, would degrade the load-carrying capacity of the bridge.
3. Signage is in place and visible for load-posted or restricted bridges.
4. The ability of the bridge to satisfy its present service requirements.

Inspection results must be recorded in the Central Database. The date of the inspection and a list of the deficiencies investigated must be included. If any deficiency has become more severe, it
may be necessary to notify the owner and re-evaluate the bridge load rating. Critical findings shall be reported to the appropriate individuals and agencies identified in Part 1, Chapter 7.

Some Special Inspection tasks need not be performed with an ATL on site. ATMs can be sent out to perform specific inspection or measurement tasks under the direction of an ATL. Such tasks might include measuring a crack, photographing a weld, or measuring section loss on specific members. These tasks must be clearly documented in the Special Inspection Plan of Action. The ATL is still required to review and sign off on all inspection data entered into the Central Database.

For state-owned complex bridges that require a Special Inspection, a lead ATL is assigned by the SPM. The Plan of Action will be developed and modified by the lead ATL in consultation with the SPM.

The lead ATL for state-owned complex bridges may or may not be the ATL for any individual inspection performed as a part of the Special Inspection. The ATL for each individual inspection will approve the inspection results entered in the Central Database for that inspection. The lead ATL must review all individual inspections performed as a part of the Special Inspection, as well as generate/approve a summary of the Special Inspection. This summary must be entered in the Central Database.

Inspection teams for state-owned complex bridges may consist of state personnel, consultants, or a combination. The lead ATL will ensure that each team is working within the scope of its professional ability. The INDOT District Inspectors normally assigned to the bridge will generally be assigned to complete the Routine Inspection of the bridge; but, they must also assist in any additional inspections, as directed by the lead ATL.

For toll road, county, and local agency complex bridges that require a Special Inspection, a lead ATL is assigned by the BIC.

The Plan of Action will be developed and modified by the lead ATL in consultation with the SPM.

The lead ATL must review all individual inspections performed as a part of the Special Inspection, as well as generate/approve a summary of the Special Inspection. This summary must be entered into the Central Database.

Depending on the extent of the damage or deterioration, a Special Inspection may include a recommendation for a load rating to assess the capacity of damaged or deteriorated members. Nondestructive tests and/or other material tests may be needed to assist in determining the safe load-carrying capacity.

Critical findings shall be reported to the appropriate individuals and agencies identified in Part 1, Chapter 7.

All inspection results should be fully documented in the Central Database.
3.7.3 Frequency

Special Inspections for unique and problematic details are completed in addition to Routine Inspections. The maximum inspection interval for a Special Inspection is 60 months. A problematic detail that is performing well on a structure can have an inspection interval of 60 months. A structure with a problematic detail that has a rating of 4 or less shall be inspected on a 12 month interval.
A written request should be sent to the SPM requesting the Special Inspection be removed if the detail has been retrofit or rehabilitated.

The inspection frequency of each component inspection of a Special Inspection for a complex bridge may be identified in the Plan of Action. It may be most efficient to conduct all of the inspections at one time, using the same inspectors. However, it may not be practical to schedule inspections requiring different types of traffic control, access equipment, or NDT at the same time.

Figure 1:3-13: Inspectors Performing a Special Inspection
3.8 IN-DEPTH INSPECTION

3.8.1 Purpose

An In-Depth Inspection is a close-up inspection that allows for the detection of deficiencies that aren’t readily identifiable during a routine inspection. The term close-up is used which indicates this is not a hands-on inspection but is still well within visual range so that defects can be seen.

An In-Depth Inspection is a scheduled inspection which is scheduled at a maximum 96 month interval for structures that meet the following criteria:

- The structure is of the type that does not require a scheduled hands on inspection
- The structure contains elements not easily inspected during a routine inspection
- The structure has been selected by the SPM

3.8.2 Precision

The scope of an In-Depth Inspection should be to inspect the entire structure close-up. This is a relatively infrequent inspection scheduled for structures that typically do not require a scheduled inspection beyond the routine inspection. This inspection will give the inspector the opportunity to make sure that all of the components of the structure are performing as intended.

3.8.3 Frequency

The maximum frequency of an in-depth inspection is 96 months.
3.9 DAMAGE INSPECTIONS

3.9.1 Purpose

A Damage Inspection is an unscheduled inspection to assess structural damage resulting from environmental factors or human actions. Flood damage, fire damage, barge impact, and vehicle impact are examples of events that may call for a Damage Inspection.

![Impact Damage to a Concrete Girder Bridge](image)

**Figure 1:3-14: Impact Damage to a Concrete Girder Bridge**

3.9.2 Precision

The scope of a Damage Inspection should be sufficient to determine whether there is a need for emergency load restriction, or closure, of part or all of the bridge to traffic. Inspectors of state-owned bridges should also assess the level of effort necessary to repair the damage. The amount of effort expended on this type of inspection may vary significantly and depends on the extent of the damage. If major damage has occurred, the inspector shall document the damage, including measuring section loss or misalignment, and any loss of foundation support.

Inspection data and pictures shall be entered into the Central Database as soon as possible, and no more than seven days after the inspection. This inspection may be supplemented by a timely Special Inspection to more fully document the extent of damage and the urgency and scope of repairs. A more refined analysis, to establish or adjust interim load restrictions, may also be required as follow-up for a Damage Inspection. A structural engineer may need to be consulted for the inspection or analysis. If the inspection identifies a Critical finding, the inspector must follow the notification procedures outlined in Part 1, Chapter 7.
A damage inspection is required for all bridges in which the event has left permanent physical evidence. The damage inspection data and pictures shall be entered into the Central Database as soon as possible and no more than seven days after the inspection.

The Inspector of state-owned bridges should gather data on the vehicles and drivers involved and any police report after a crash. This information will be used to bill the appropriate insurance company for damages.

3.9.3 Frequency

A Damage Inspection is an unscheduled inspection that is performed to determine if significant damage has been done to the bridge. Based on the findings of the damage inspection, the inspector will determine if the damage warrants placing the structure on a special detail inspection. Pictures of any damage will be uploaded to the bridge file with a complete description of the event. Generally, a law enforcement officer on the site of an accident involving a bridge will notify the owner who will request a Damage Inspection be performed to determine if the bridge should be closed. Damage Inspections are also needed after flooding or earthquakes.
3.10 CHANNEL SURVEYS

3.10.1 Purpose

Scour is the movement of channel bed material by the action of moving water. This movement may result in degradation (i.e., erosion of material), as well as aggradation (i.e., accumulation of material). These changes in the channel bed may lead to bridge instability and are generally identified by profiling the channel bottom. Comparison of previous profiles is typically needed to detect and assess scour. Plotting the underwater measurements of the stream bottom and probing bridge foundations are two of the most important aspects of inspecting a bridge for scour.

Channel cross section data is used to evaluate trends in channel bottom movement and to compare channel bottom elevations to footing elevations. Indiana has two levels of Channel Survey: basic and in-depth.

3.10.2 Precision

For all Channel Surveys, the elevation of the waterline must be determined and referenced to a known elevation on the bridge.

For a basic Channel Survey, bottom elevations are required:

- At the upstream fascia, locate enough points between substructure units to identify any problems or deficiencies. Typically the elevations are taken at locations spaced between 10 and 25 feet depending on the contours of the channel. The notes of how to layout the survey must be kept in the bridge file. Once the survey method and points are determined, the process must be repeated so that the profiles can be compared. Create a profile sketch and plot the profile on the sketch. Future profiles data will be added in a tabular form as well as adding to the sketch which will have each profile entry dated.

For an in-depth Channel Survey, bottom elevations are required:

- Around each substructure unit in the water at enough points to identify any problems or deficiencies.

- Between substructure units along the centerline of the bridge, or between twin bridges at enough points between substructure units to identify any problems or deficiencies. A minimum of three points between each substructure and one point at each substructure is required.

- At the upstream fascia, at enough points between substructure units to identify any problems or deficiencies. A minimum of one point at each substructure and three points between each substructure is required.

- At the downstream fascia at enough points between substructure units to identify any problems or deficiencies. A minimum of one point at each substructure and three points between each substructure is required.
100 feet upstream at enough points between substructure units to identify any problems or deficiencies. A minimum of one point at each substructure and three points between each substructure is required.

200 feet upstream at enough points between substructure units to identify any problems or deficiencies. A minimum of one point at each substructure and three points between each substructure is required.

100 feet downstream at enough points between substructure units to identify any problems or deficiencies. A minimum of one point at each substructure and three points between each substructure is required.

200 feet downstream at enough points between substructure units to identify any problems or deficiencies. A minimum of one point at each substructure and three points between each substructure is required.

At additional locations, if required, to adequately determine the thalweg of the waterway.

As needed when an unusual change in the channel has been identified.

Where the bridge length is less than 100 feet, the upstream and downstream profiles should be taken at locations equal to the bridge length and twice the bridge length.

Every in-depth Channel Survey Inspection will follow a Plan of Action. The Plan of Action must include:

1. A time table for conducting the survey.
2. The personnel requirements for the survey.
3. A list detailing what is required to be surveyed.
4. The required access equipment.
5. The required traffic control.

Water depth measurements should be recorded to the nearest tenth of a foot. Scour evaluations are typically based on changes in elevations greater than 0.5 foot since most channel bottoms are irregular surfaces with random cobbles, debris, and sand ripples.

The water surface elevation should be referenced to a known elevation or reference point on or near the bridge.

The individuals taking the profiles need not be bridge inspectors. However, the profiles must be reviewed and compared to known substructure elevations and past profiles by the ATL.
3.10.3 Frequency

Channel Surveys are performed concurrently with many of the required inspections of a bridge over water. A basic Channel Survey is required every 72 months and as required in the Scour Plan of Action for Scour Critical Bridges. A basic Channel Survey is required for all Initial Inspections, all Underwater Inspections, and as required in the Scour Plan of Action for Scour Critical Bridges.

Figure 1:3-15: Aggradation and Vegetation in Channel
3.11 LARGE CULVERT INSPECTION

Large culverts are bridges and culverts with spans greater than four feet and less than or equal to 20 feet.

3.11.1 Purpose

Large Culvert Inspections are Routine Inspections for small structures. They are regularly scheduled inspections consisting of observations and measurements needed to determine the physical and functional condition of the structure to identify any changes from previously recorded conditions. The Large Culvert Inspection also ensures that the structure continues to satisfy present service requirements.

3.11.2 Precision

These inspections should be conducted with the same precision and attention to detail outlined for Routine Inspections in Section 3.4.

The SPM should be notified of all Critical Findings identified in this inspection as detailed in Part 1, Chapter 7 of this manual. Critical Findings should be noted in the Central Database for all bridges.

All inspection results should be fully documented in the Central Database.

3.11.3 Frequency

All state-owned large culverts should be inventoried. State-owned large culverts with a condition rating of 6 or above may be scheduled for a large culvert Inspection not to exceed 60 months.

State-owned large culverts with a condition rating of 5 should be scheduled for a Large Culvert Inspection every 24 months. State-owned large culverts with a condition rating of 4 or less should be scheduled for a Large Culvert Inspection every 12 months as a minimum.

All Indiana Toll Road large culverts should be inventoried. Indiana Toll Road large culverts should be inspected as described above for INDOT large culverts.

County and local agency large culverts should be inspected at the discretion of the owner in consultation with the BIC. It is recommended that all counties inventory all large culverts.

Large Culvert Inspections may be scheduled in conjunction with any other inspection type.
Figure 1:3-16: Large Culvert
3.12 BRIDGES CLOSED TO TRAFFIC

If a bridge is closed for construction when an inspection is due, the inspection team shall:

- Document the bridge is properly closed with photos. If the bridge is being used to maintain traffic, the bridge must be inspected.
- Code NBI #41 as “G” (new structure not yet open to traffic) or “K” (closed to traffic), as appropriate, in the Central Database.
- Code the appropriate NBI Date Item(s) with the date the inspectors were at the bridge.
- Note that the inspection date was changed in the Central Data base.
- Verify the estimated date of completion of the construction.
- Schedule a new Initial Inspection and all other required inspections for the estimated completion date. All rescheduled inspections must be completed within 90 days of being opened to traffic.
- Leave other NBI data items unchanged.

If a bridge has been closed permanently when inspection is due, the inspection team shall:

- Document the bridge is properly closed with photos. No other inspection work is required. If the bridge is not properly closed, a critical finding must be immediately submitted.
- Code NBI #41 as “K” (closed to traffic) in the Central Database.
- Code the appropriate NBI Date Item(s) with the date the inspectors were at the bridge.
- Note that the inspection dates were changed in the Central Database.
- Leave other NBI data items unchanged.
- Recommend the removal of the bridge be scheduled as soon as possible.
3.13  COMPLEX BRIDGE

3.13.1  Complex Bridge

A complex INDOT bridge consists of one of the structure types as follows:

- Cable stayed
- Movable
- Suspension
- Bridges designated by the SPM

The Code of Federal Regulations, Section 650.313, Inspection procedures, paragraph (f), stipulates that specialized inspection procedures and additional inspector training and experience require identification. This chapter outlines the procedures, training, and experience required to meet these requirements.

Any firm presenting a letter of interest for an RFP containing a complex bridge will stipulate their qualifications to produce the required Complex Bridge Inspection Manual. The LOI must document the firm’s (or firm’s subcontractor’s) qualifications to perform the type of inspection defined in the manual.

An inspector, qualified to perform the inspection documented in the Manual, will be the primary author (or at minimum approver) of the manual.

3.13.2  Qualifications Required to Write a Complex Bridge Inspection Manual

The complex bridge inspection manual will be written under the direction of an experienced team leader with documented experience inspecting similar complex structures.

The qualifications of the inspector will meet the requirements of level 3 design in accordance with the Consultant Prequalification Manual, subject to the criteria outlined in the RFP.

Sections of the manual pertaining to the operating systems, such as mechanical and electrical, will be written by an engineer meeting the level 3 design criteria for that particular engineering specialty.

3.13.3  Writing a Complex Bridge Inspection Manual

The objective of writing the manual is to instruct future inspectors as to the defined requirements of future inspections. The following are requirements:

1. Determine what types of inspections are to be performed. This may include fracture critical inspection, underwater inspection, or in-depth inspection. The specific inspections will contain items outlined in the AASHTO Manual for Bridge Evaluation.

2. Document the inspector qualifications. The qualifications may change for the various systems and types of inspections required for the structure and will be in compliance with the INDOT Bridge Inspection Manual.
3. Determine what parts of the structure need special attention. These written directions to the inspector will include which elements can be dismantled for inspection and which cannot. The instructions will include problems encountered during construction, what changes were made, and how the changes may affect the structure.

4. Instruct the inspector how to safely and effectively accomplish the task of inspecting the bridge. The instructions should include, but are not limited to:

- Methods for accessing each specific area of the structure: ladder, man lift, under bridge unit, rope access, etc
- Suggestions for the maintenance of traffic schemes, lane closures, policy exceptions, etc.
- Outline of time requirements and how they are affected by access methodologies (i.e. mechanical access vs. rope access)
- User cost analysis of permanent access methods vs. equipment/climbing.

The initial submission of the inspection manual will be delivered with the stage-3 plan submittal for the design/bid/build project(s), and intermediate completion for design/build. The manual is to be delivered to the SPM for review. The manual must be approved by the SPM prior to the intermediate submission of the inspection manual.

The intermediate submission of the inspection manual will be delivered to the SPM at the tracings submission for design/bid/build and at contract completion for design build.

The final submission of the manual will include revised drawings and revisions to the manual based on the as-build drawings. The manual must be accepted by the SPM. If the structure under consideration is jointly owned, the SPM will not approve the manual until the manual has been reviewed and approved by all owners.
CHAPTER 4 ........................................ REPORTING SYSTEMS

4.1 BRIDGE FILE

Indiana uses a Central Database to collect the information required by National Bridge Inspection Standards (NBIS). The database allows the bridge owner to manage all inspection records electronically for the life of each structure.

The Central Database is the only official bridge file for all inventoried bridges in Indiana. This file shall include all National Bridge Inventory (NBI) data and supplemental data including the following as a minimum:

1. Structure Inventory and Appraisal information
2. Field inspection information including sketches and photographs showing typical and deteriorated conditions. This requirement includes a brief narrative to justify a change in condition rating. A NBI item rated below 5 or condition state 3 requires a picture or sketch in addition to narrative descriptions of the deteriorated condition. A plan of action is to be included if required.
3. Critical Findings in accordance with section 5.2
4. Waterway information in accordance with section 3.10
5. Significant Correspondence, these documents will include agreements regarding inspection responsibility, ownership, or other issues that have an impact on timely inspections.
6. Other Inspection Procedures, these items will include other required reports such as fracture critical and under water. These reports will be in accordance with chapter 3, part 1 of this manual.
7. Load Rating, a dated load rating along with identification of the analysis to determine capacity. Results must be included which clearly identify the loads and methodology used in the analysis. Identify controlling members. Include any updates that reflect changes in the condition of structural members. If calculating cannot be provided due to lack of information, provide documentation for justification of determined load rating.
8. Posting Documentation, in accordance with section 6.2
9. Scour Assessment, document the assessment conducted to determine the scour vulnerability of the bridge.
10. Scour Plan of Action, for scour critical bridges, provide a copy of the plan of action.
11. Plans and Drawings
4.2 STRUCTURE IDENTIFICATION

4.2.1 NBI Item 8 Structure Number

NBI Item 8, Structure Number, is called Item 8, Structure Number (NBI number) in the Central Database. This number is assigned by the BIC for county bridges and by the SPM for state bridges. This number is seven digits long for county bridges. The first two digits are the county number. State bridges use up to six digit numbers. The NBI number is unique and remains unchanged throughout the life of a bridge. When a bridge is replaced, the new bridge gets a new NBI number.

4.2.2 INDOT Bridge Number

The state uses an alpha-numeric numbering system to identify an Item 8S, Indiana Department of Transportation (INDOT) Bridge Number. Up to 19 digits are reserved for this number, excluding parentheses and dashes, and for new bridges it is generally in the form “A (123)456-789-12345 BCDE.” The following describes each part of the INDOT Bridge Number:

- A: Up to one letter to indicate property designation:
  - I for Interstate bridges
  - P for state properties including parks, prisons, and hospitals
  - Blank for bridges on a designated United States (U.S.) or state route

- (123)456: Up to six digits to designate the road number. Parentheses are required only if the road number has changed. For these situations, indicate the current road number within the parentheses and indicate the old road number to the right of the parenthesis. Do not include leading zeros if the road number is less than three digits (e.g., use 8 and not 008 for Route 8). If the bridge is carrying multiple routes, as in the example, (123) is the current route with the highest status and 456 is the route with the second highest status.

- 789: Up to three digits to designate log mile or county number, depending on the bridge. If the bridge is located on an interstate, this number is up to three digits long, with no leading zeros, and designates the mile post rounded to the nearest whole mile. If the bridge is located on any other type of road, this is always a two-digit number, with a leading zero if necessary, that designates the county number. There are 92 counties in Indiana. County number 93 is used for border bridges that are inventoried by Kentucky or Illinois, or are Indiana’s inventoried bridges located south of the state line on US 41.

- 12345: Five digits to designate the Structure Number. It is a consecutively assigned number assigned by the State and is not related to Item 8, the Structure Number (NBI Number). Leading zeros are required to ensure five digits. Typically, the 02000 series bridges are reserved for bridges over or under a railroad.
• BCDE: Up to four letters to designate the structure designation.
  o The first letter indicates:
    • J Parallel, but different bridge
    • A First contract rehabilitation
    • B Second contract rehabilitation
    • C Third contract rehabilitation, etc.
  o The remaining three letters complete the structure designation as follows:
    • EBL Eastbound Lane
    • WBL Westbound Lane
    • NBL Northbound Lane
    • SBL Southbound Lane
    • ADJ Adjacent to Mainline
    • CD Collector Distributor
    • DR Directional Ramp
    • R Ramp
    • NC Northbound Collector
    • NWE Northwest-to-East Ramp
    • SC Southbound Collector
    • DRN Directional Ramp North
    • RWN Ramp West to North

When a bridge is both a parallel bridge and has been rehabilitated, use the first two letters of BCDE to show this and drop the third letter describing the structure designation. For example; JCNB would indicate that the bridge is one of two parallel structures, has been rehabilitated three times, and serves northbound lanes.

Many older bridges within Indiana do not adhere to these guidelines. Bridges along state borders may have special agreements that determine the ownership of the bridges and the bridge number.

4.2.3 Toll Road Bridge Numbers

The Indiana Toll Road uses a numbering system similar to the state bridge numbering system for item 8S that is generally in the form “A(123)456-78-91234 BCD.” The following describes the state bridge numbering system:

• A: One letter coded I for all toll road bridges.
• (123): Current road number. The leading zero is sometimes omitted.
• 456: Original road number. This number is omitted if the road number has never changed.
• 78: Two-digit county code.
• 91234: Five-digit structure number assigned by the Toll Authority according to the mileage east of the Illinois state line. The Toll Authority does not utilize any special conventions for bridges over or under railroads.
• BCD: Structure designation similar to the state bridge numbers except the Indiana Toll Road does not assign letters to identify parallel structures or the number of rehabilitations a structure has undergone.
There are several Indiana Toll Road-owned and maintained bridges that were designed and built by the State which have bridge numbers similar to those used by the State.

4.2.4 County and Local Agency Bridge Numbers

When a County/local agency bridge numbers is followed by one letter, in general “A” indicates that the bridge is the first replacement bridge at a particular location. A “B” indicates the bridge is the second bridge at this location, etc. Some counties use a numbering system similar to the state bridge numbering system, but most systematically number bridges by route or location.

4.3 COUNTY BORDER INVENTORY

For state bridges, inventory all bridges along or crossing the north and west borders of a county as being in that county. Inventory all bridges along or crossing the south and east borders of a county as being in the adjacent county.

For county bridges, inventory all bridges along or crossing the south and east borders of a county as being in that county. All bridges along or crossing the north and west borders of a county are inventoried in the adjacent county. See Indiana Code IC: 8-17-1-45(a).

For bridges along the state borders, special agreements may determine the ownership of the bridges.
5.1 INTRODUCTION

The procedures in this chapter set forth a uniform method for timely notification of serious bridge deficiencies that require an immediate response. They also document the baseline requirements for ensuring that appropriate corrective or protective measures have been taken within a reasonable timeframe and that established documentation protocol has been followed. Counties and other local government agencies may have additional guidelines for alternate route information, public relations, and information dissemination procedures that should be followed.

The procedures outlined in this chapter should be used to report conditions posing danger to persons or property or conditions that, if left unattended, would likely become such a danger.

This chapter outlines the responsibilities of the ATL, BICs, BIAE, and the SPM in an emergency. Any ATL may close a bridge if it appears to be unsafe.

5.2 CRITICAL FINDINGS

A critical finding is a structural or safety related deficiency that requires immediate follow-up inspection or action.

A structure-related deficiency can interrupt the load path, not allowing the loads to be transferred as designed. This can cause surrounding elements to become overstressed or unstable, potentially leading to partial or total collapse of the structure. Critical findings may also be non-structural deficiencies which jeopardize the safety of motorists or pedestrians.

The follow-up action may be a structural review to determine the strength or serviceability of an element or bridge.

5.2.1 Procedures for Inspectors

Upon identifying a potential critical finding, immediately report the deficiency to the appropriate agency officials. For non-state owned bridges, the finding is to be first reported to the employee of responsible charge (ERC). The finding for state owned bridges and the second reporting for non-state owned bridges is to be the SPM.

The immediate actions taken by the ATL/ATM will vary with the circumstance. The ATL/ATM may close all or part of the structure until further analysis can be performed to determine the structural integrity of the structure. Alternatively, the ATL/ATM may recommend that remedial work be performed within a short time frame. Even if no immediate action is taken, it is still required to report the potential critical finding immediately, even in situations where the structural review will ultimately resolve the structure as having adequate strength.

In addition to the initial reporting of the potential critical finding, which may be verbal notification, a written notification is required within 24 hours. The notification will include complete identification of the structure, the structure location, and a plan of action indicating how the critical finding will be remedied. The electronically written notification serves to document the critical finding by describing the extent of the deficiency complete with notes, photographs, sketches and drawings, measurements, possible causes, and recommendations for repair. Temporary actions may also be
taken to safeguard the public until repairs can be completed. These actions may include:

- Load posting
- Traffic restrictions from the damaged area
- Speed restrictions
- Temporary lane closure
- Temporary shoring
- Complete bridge closure

The SPM will record the critical finding for tracking and will notify the FHWA in a timely manner. The ATL/ATM must submit electronically a written explanation of the actions taken to close the critical finding file with the SPM. This written explanation may include calculations which demonstrate the structural capacity of the structure, pictures which show the structure has been properly closed, or pictures showing the structure has been structurally fortified.

**The following information will be included in the critical finding notification:**

1. Name of Bridge Inspection Team Leader and Team Leader Number:
2. Bridge Structure Number:
3. Bridge NBI Number:
4. County:
5. Route:
6. Location of structure measured from the nearest intersection:
7. Date of finding:
8. Date of notification:
9. Reason for Critical Finding Report: This portion of the report shall include pictures and sketches to support the report. The date of the finding shall be included.
10. Inspector’s Immediate Recommendations: If these recommendations include actions that must be taken by others, a time necessary to take these actions will be given.
11. Follow-up Actions: Give a complete description of the actions taken and when these items were complete.
12. Close out document: Describe how the critical finding was resolved and when. This item may include picture, sketches, plans, or calculations to fully explain how the critical finding was resolved. The close out document will be sent to the SPM to officially close the critical finding.
5.2.2 Documentation

Critical Deficiencies must be documented in the Central Database within 24 hours for all bridges. The Critical Deficiency should be described in the comment box. Note, in the comment box, each person notified of the Critical Deficiency. Reference the INDOT Coding Guide, Bridge Reporting for Appraisal and Greater Inventory (BRAGI) for coding instructions.