LOUISIANA DEPARTMENT OF TRANSPORTATION AND DEVELOPMENT

ON-SYSTEM BRIDGE INSPECTION MANUAL

2024 Edition

LOUISIANA DEPARTMENT OF TRANSPORTATION & DEVELOPMENT

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Foreword

The safety of the traveling public is the ultimate purpose for all efforts toward an effective bridge management program, and specifically for this Bridge Inspection Manual. The State of Louisiana requires the comprehensive inspection of all bridges that carry public traffic and are publicly owned, operated, or maintained as defined under Louisiana Revised Statute 48:35 and as required by ***23 CFR 650.301*** of the *NBIS* and the *AASHTO MBE*. As per Section 1111 of the Moving Ahead for Progress in the 21st Century Act (MAP-21) modified 23 U.S.C. 144, each state is required to report bridge element level data to the Secretary of FHWA for all highway bridges on the National Highway System (NHS).

The intent behind the development of this document was to provide a sequential and intuitive manual for expeditious referencing of key procedures. Consistency is vital to an effective bridge management program. Program consistency among intergovernmental agencies, the bridge engineering community, and bridge owners will help achieve this manual's goals.

This manual replaces the following documents:

- Any technical memos regarding bridge inspection
- 2020 DOTD Bridge Inspection Manual

This manual complements the following documents:

- LADOTD *Coding and Field Guide*
- LADOTD Off-System Bridge Inspection Manual
- LADOTD *Policies and Guidelines for Bridge Rating and Evaluation*
- FHWA *23 Metrics for the Oversight of the NBIP*
- FHWA *Bridge Inspector's Reference Manual*
- FHWA *Specifications for the National Bridge Inventory*
- FHWA *Federal Aid Off-System Highway Bridge Program Guidelines*
- All relevant EDSMs and other references outlined in Section 7
- Bridge Maintenance UAS SOP

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Bridge Maintenance Administrator

Acknowledgments

This 2024 edition of the Bridge Inspection Manual is the result of an ongoing, collective effort of many people in the Louisiana Department of Transportation and Development (DOTD) bridge inspection community. The DOTD Bridge Maintenance Department provided oversight for Moffatt & Nichol during the development of this manual according to federal and state inspection policies, standards, directives, memos, and other documents. The bridge engineering community provided technical comments that were an integral step in creating this initial version of the DOTD Bridge Inspection Manual.

Thanks to the many individuals who provided comments and feedback throughout the development process. Special thanks to the following individuals for their direct involvement and dedication to the technical development and editorial feedback:

DOTD Lead Editors:

Chief Editor:

Contributing Subject Matter Experts:

1 Policies

1.1 INTRODUCTION

This manual describes the DOTD's organization, administration, and operational procedures of the State of Louisiana Bridge Inspection Program.

1.2 ACRONYMS

The following is an alphabetically ordered list of acronyms used in this manual:

AASHTO	American Association of State Highway and Transportation Officials
BIRM	Bridge Inspector's Reference Manual
CFR	Code of Federal Regulations
DOTD	Louisiana Department of Transportation and Development
EDSM	Engineering Directives and Standards Manual
FAA	Federal Aviation Administration
FHWA	Federal Highway Administration
HQ	Headquarters Bridge Inspection Office
JSA	Job Safety Analysis
MBE	AASHTO Manual for Bridge Evaluation
MUTCD	Manual on Uniform Traffic Control Devices
NBE	National Bridge Elements
NBI	National Bridge Inventory
NBIS	National Bridge Inspection Standards
NBIP	National Bridge Inspection Program
NDE	Nondestructive Evaluation
NHI	National Highway Institute
NHS	National Highway System
NSTM	Nonredundant Steel Tension Member (formerly fracture critical member)
OSHA	Occupational Safety and Health Administration
POA	Plan of Action
PPE	Personnel Protective Equipment
SNBI	Specifications for the National Bridge Inventory
UAI	Underwater Acoustic Imaging
UAS	Unmanned Aerial System
UAV	Unmanned Aerial Vehicle
UBI	Under Bridge Inspection
UBIT	Under Bridge Inspection Truck
UT	Ultrasonic Testing
UWI	Underwater Inspection

1.3 PROGRAM OVERVIEW

Bridge inspection is one of the most important roles that DOTD provides to ensure a safe public highway system for the traveling public. There are approximately 13,000 bridges in Louisiana - 8,000 state-owned and 5,000 locally owned. DOTD is responsible for the inspection program for all highway bridges located on public roads or private bridges that are connected to a public road on both ends of the bridge, including temporary bridges and bridges under construction with portions open to traffic that are fully or partially located within the State's boundaries, except for bridges that are owned by Federal or tribal agencies.

1.3.1 FHWA Metrics for NBIP

The State of Louisiana is reviewed annually on its adherence to the National Bridge Inspection Standards (NBIS), outlined in the Code of Federal Regulations (CFR) Title 23 CFR 650 Subpart C (refer to Section 7). During the compliance review process, the Federal Highway Administration (FHWA) considers 23 metrics to assess Louisiana's Bridge Inspection Program, determine the level of compliance met for each metric, and issue recommendations or suggested requirements to improve the compliance level. DOTD will consider the recommendations for improvement and develop either an Improvement Plan (IP) or a Plan of Corrective Action (PCA) when needed.

The following 23 NBIP Metrics provide guidance and direction to FHWA Division Bridge Engineers during their annual compliance reviews of the DOTD Bridge Inspection Program on March 15 of every year.

Metric	Section
Metric #1: Bridge Inspection Organization	1.4
Metric #2: Qualifications of Personnel – Program Manager	1.6
Metric #3: Qualifications of Personnel – Team Leader(s)	1.6
Metric #5: Qualifications of Personnel – UW Bridge Inspection Diver	1.6
Metric #New 1: Qualifications of Personnel – Damage, Special, and Service Inspections	1.6
Metric #6: Inspection Interval – Routine	4.2
Metric #8: Inspection Interval – Underwater	4.16
Metric #10: Inspection Interval – NSTM	4.3
Metric #New 2: Inspection Interval – Special, In-Depth, and Service	4.1
Metric #11: Inspection Interval – Frequency Criteria	4.2
Metric #12: Inspection Procedures – Quality Inspections	6
Metric #13: Inspection Procedures – Load Rating	4.8
Metric #14: Inspection Procedures – Post or Restrict	4.9
Metric #15: Inspection Procedures – Bridge Files	2

Metric #16: Inspection Procedures – NSTM 4.3
Metric #17: Inspection Procedures – Underwater 4.16
Metric #18: Inspection Procedures – Scour 4.14
Metric #19: Inspection Procedures – Complex Bridges 4.15
Metric #New 3: Inspection Procedures – In-Depth Special 4.15
Metric #20: Inspection Procedures – QC/QA 6
Metric #21: Inspection Procedures – Critical Findings 3.1.4
Metric #22: Inventory – Bridge Data Quality 2
Metric #23: Inventory – Timely Updating of Data 2.1

1.3.2 Qualifying Inventory Structures

A bridge is defined as a structure 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, and having an opening measured along the center of the roadway of more than 20 feet between undercopings of abutments or spring lines of arches, or extreme ends of openings for multiple boxes; including multiple pipes, where the clear distance between openings is less than half of the smaller contiguous opening.

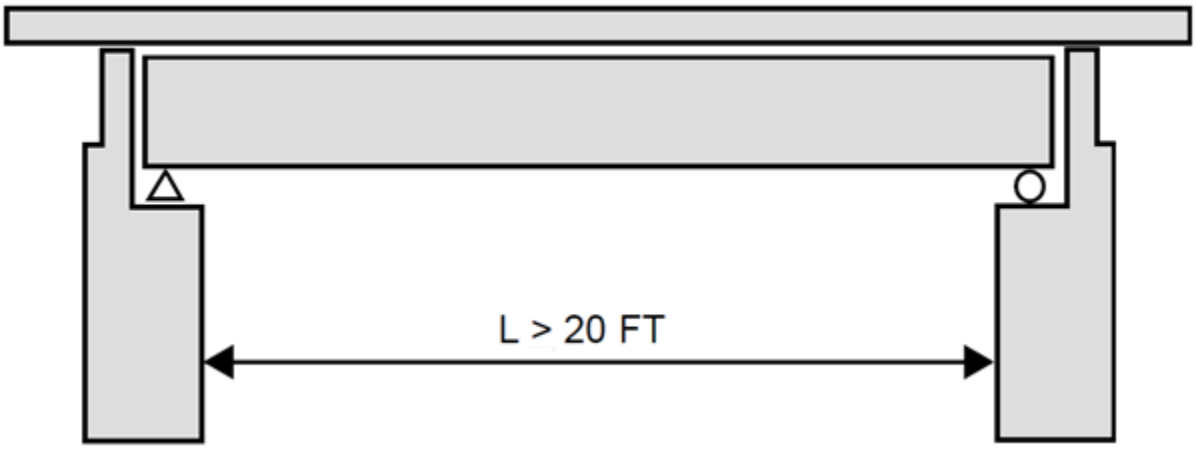
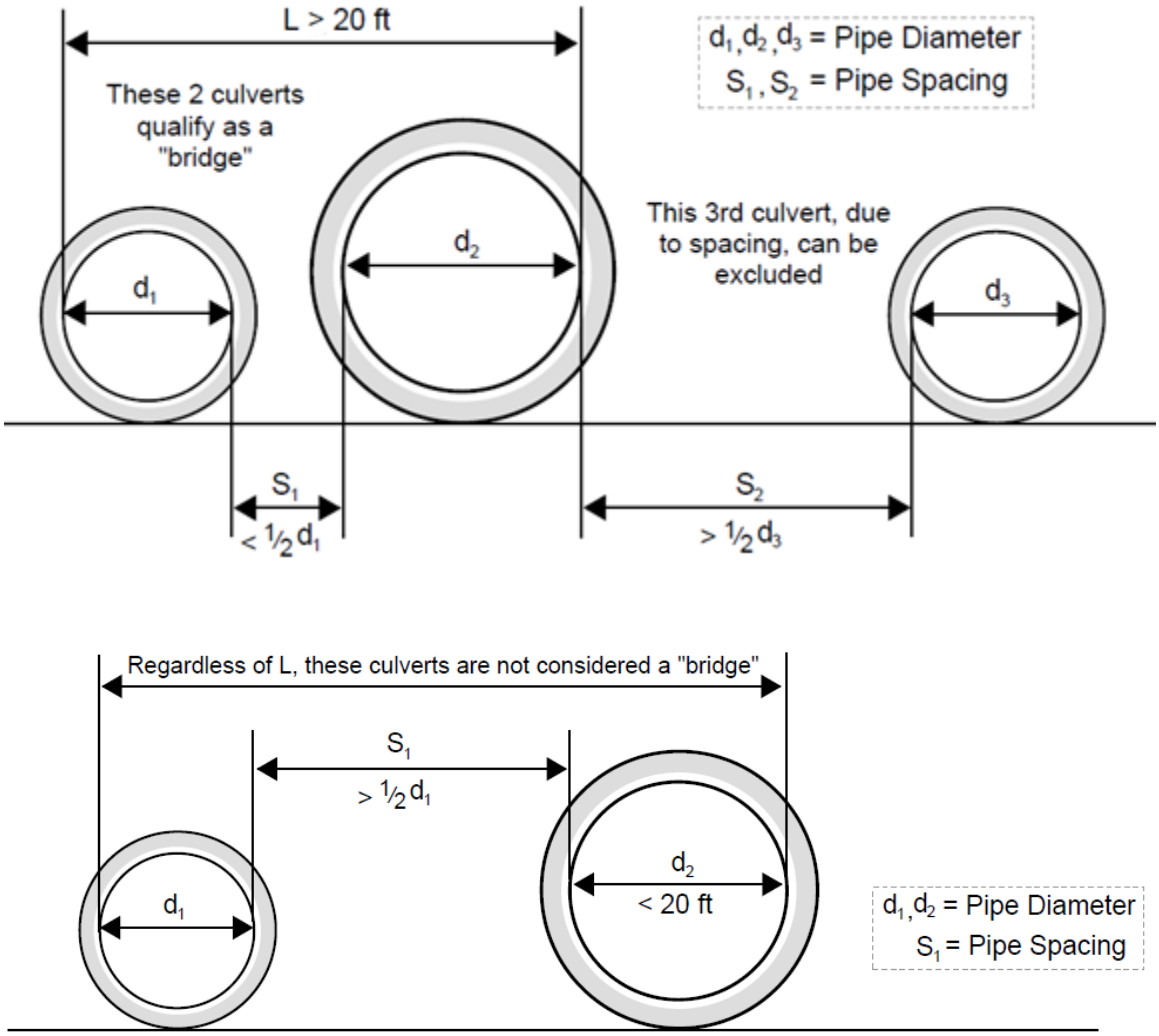


Figure 1-1: Measuring bridge span. Source: FHWA SNBI Manual

Note: Obtaining the measurements for NBIS Bridge Length (B.G.01) is not necessarily the same as obtaining measurements for Total Bridge Length (B.G.02*)*. Refer to the *DOTD Coding and Field Guide.*



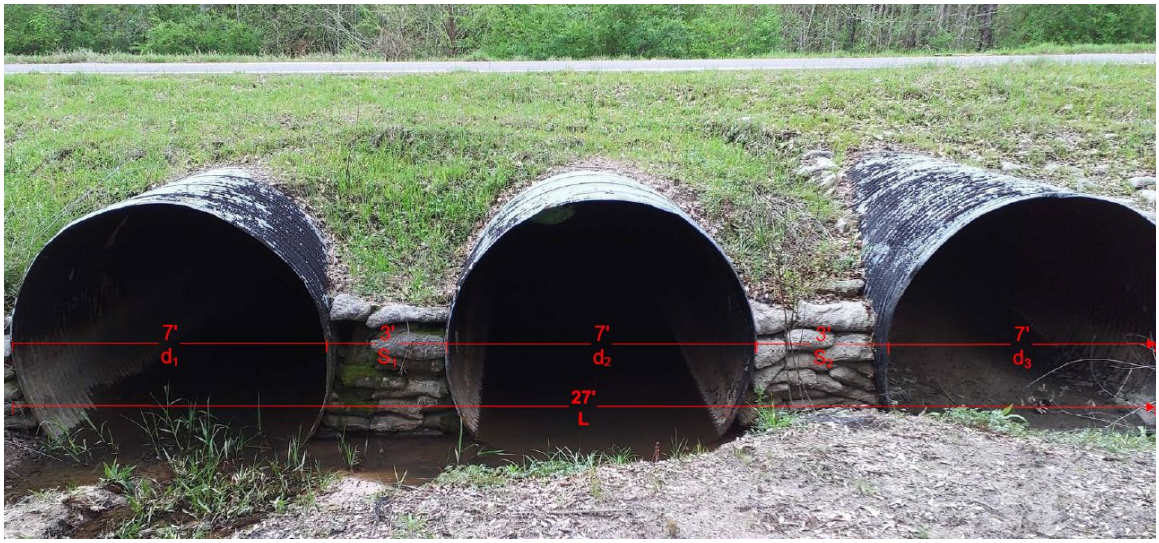


Figure 1-2: Measuring culvert span

Culverts that qualify as “bridges” must be inventoried and inspected. (see Figure 1-2 for schematics and examples for measuring culverts. Culverts are usually covered with embankment and the embankment depth must be measured. When considering a series of multiple pipe culverts, the total length shall only include pipes with spacings less than 1/2d and measurement “d” shall be the smallest diameter in the series.

Figure 1-3 illustrates the various parts of a bridge with common terminology for bridge components.

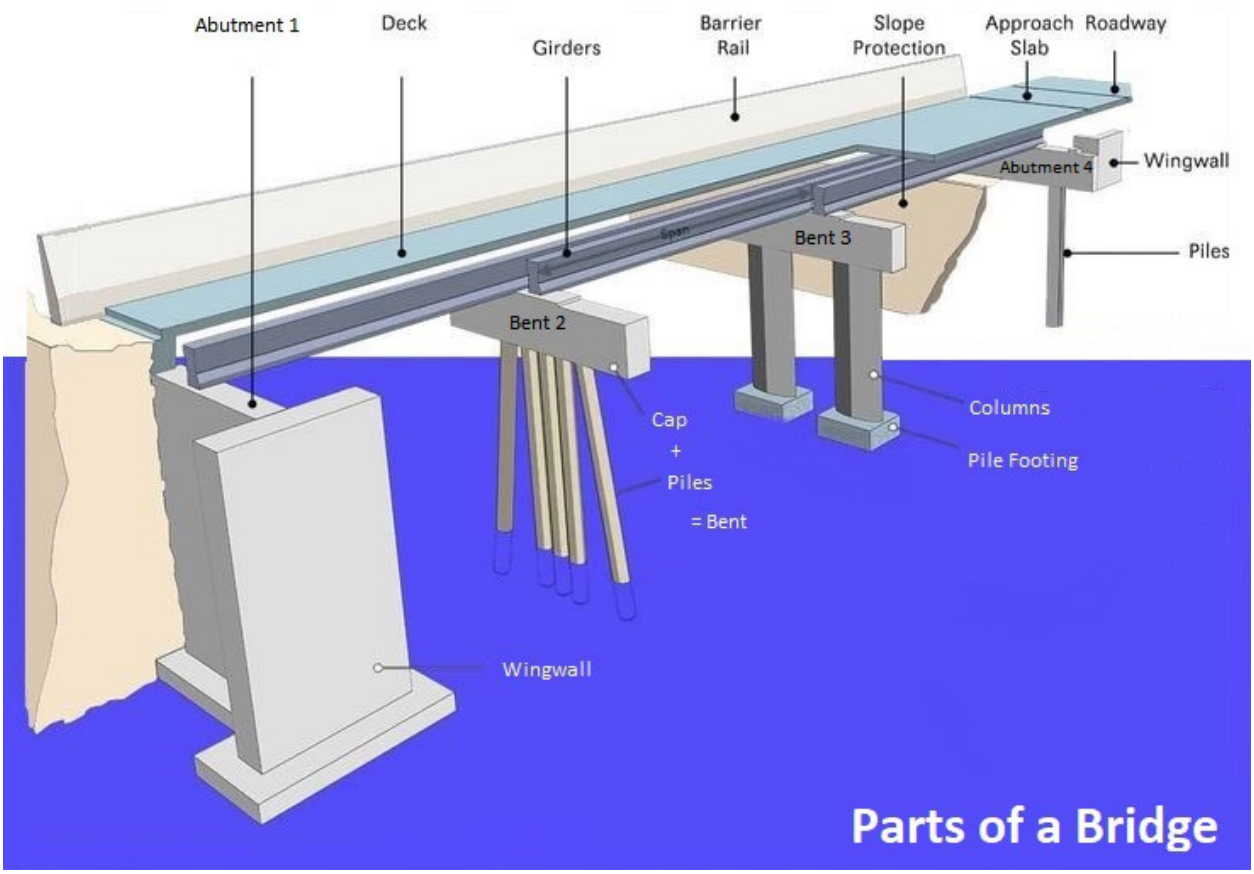


Figure 1-3: Parts of a bridge

1.4 BRIDGE INSPECTION ORGANIZATION

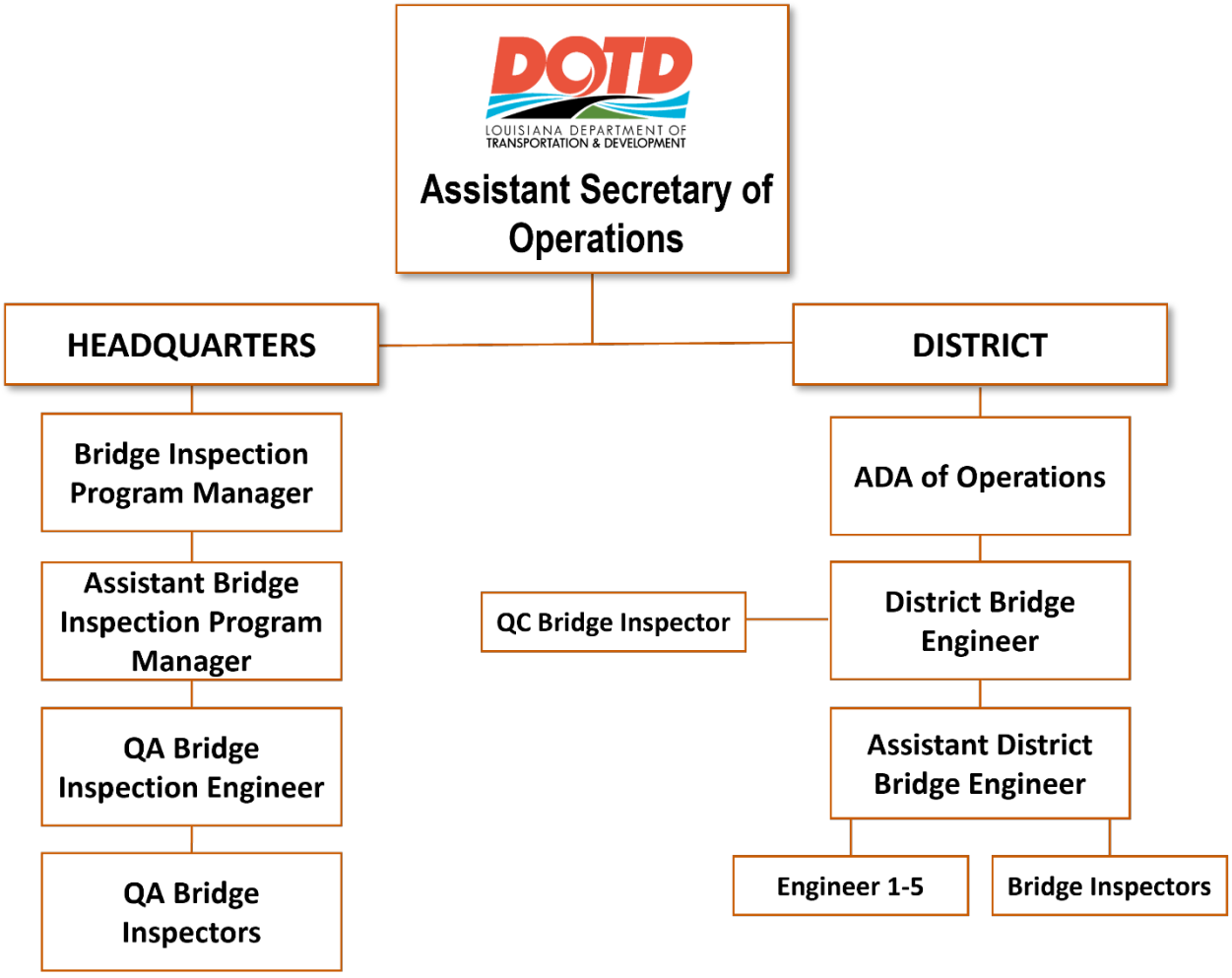


Figure 1-4: Organization chart

Contact information for bridge inspection, bridge maintenance, district offices, and load ratings can be found at http://wwwsp.dotd.la.gov/Inside_LaDOTD/Divisions/Operations/BridgeMaintenance/Pages/default.aspx.

1.5 PERSONNEL RESPONSIBILITIES

1.5.1 Program Manager

The NBIS Program Manager for the State of Louisiana is the Bridge Maintenance Administrator, DOTD Section 51. This position is responsible for establishing policies and procedures that affect the inventory and inspection of all bridges on publicly owned and operated roads in Louisiana to meet or exceed the compliance requirements of 23 CFR 650, Subpart C. The Program Manager certifies that bridge inspection program participants have the proper credentials and approves their experience justifications. The Program Manager can remove or reinstate a bridge inspection Team Leader if the inspection work performed is or has been deemed unacceptable. If individuals perform an inspection(s)

without the minimum proper credentials, the Program Manager will determine the acceptability or the need to have the structure(s) re-inspected by qualified staff.

To streamline the process, several duties are delegated to others in each DOTD district who meet the requirements for this position.

1.5.2 ADA of Operations

Minimum responsibilities include:

- Overall responsibility for the District Inspection Program
- Performs review and final approval of Bridge Inspection Reports when District Bridge Engineer position is vacant or performing Preliminary reviews

1.5.3 District Bridge Engineers

Minimum responsibilities include:

- Final Approval of Bridge Inspection Reports (must perform preliminary reviews when no other qualified Engineer is available)
- Compare District's QC Reports to Routine Inspection Reports
- Perform field Reviews with FHWA Engineer
- Develop District Bridge Inspection Policy and ensure HQ policies are followed
    - Communicate with District Construction Offices and Parishes to ensure that all bridges (ON/OFF and temporary detour or temporary configuration for phased construction) are inventoried in InspectX within 90 days of opening to traffic.
- Supervise Assistant Bridge Engineer and QC Inspector
- Notify HQ of bridge hits ASAP
- Notify HQ (Assistant Bridge Inspection Program Manager) at least six months in advance of inspection due date if Consultant Inspection is required
- Notify HQ (Bridge Inspection Program Manager and Assistant Bridge Inspection Program Manager) of On-System critical findings ASAP
    - Per NBIS 2022 Final Rule 650.313q: FHWA requires 24-hour notification of critical findings on the NHS

1.5.4 QC Bridge Inspector

- Perform QC field inspections
- Perform QC office reviews of inspection reports
- Assists with Off-System bridge compliance reviews
- Reviews Underwater Reports and HQ-QA Reports

1.5.5 Assistant District Bridge Engineer

- Supervise Bridge Inspectors and Engineer 1-5

- Provide preliminary approval of Bridge Inspection Reports
- Compares District's QC Reports and HQ's QA Reports to Routine Reports
- Review and incorporate Underwater Inspection Reports
- Submit Bridge Closure Notification forms
- Provide on-sire supervision of NSTM Inspections (if unavailable, Engineer 7 or ADA of Operations must attend)
- Notify HQ (QA Bridge Inspection Engineer) if inspection assistance is required (Ex. Drone or QA Inspector requests)

1.5.6 Engineer 1-5

- Reviews Off-System bridge compliance
- Assist with QC/QA Inspections
- Review of QC/QA Inspection Reports
- If Engineer 3+ and passed the NHI Safety Inspection of In-Service Bridge and NSTM training classes:
    - Assist with On-System supervision of NSTM Inspections
    - Provide preliminary approval of non-NSTM inspection reports

1.5.7 Team Leaders

A Team Leader is the lead inspector on initial, routine, underwater, NSTM, and in-depth inspections, and must always be onsite during the inspection.

The Team Leader is responsible for:

- Notify Supervisor of Critical Findings ASAP
- Review reports written by Bridge Inspectors
- Ensure proper documentation (element notes, photos, sketches, etc.) and proper condition rating was done in accordance with the MBE
    - General condition ratings should correspond with element level condition ratings
    - A routine inspection (photos, sketches, and notes) must provide enough information for a load rating to be performed

1.5.8 Load Rating Engineer

The Load Rating Engineer is responsible for creating policies and procedures for conducting and reporting the safe load-carrying capacity of all bridges on publicly owned and operated roads in Louisiana.

The load rating engineer for the State of Louisiana shall be a licensed registered professional engineer. Certification will be demonstrated by maintaining an active professional engineer license and having overall responsibility for load rating bridge policies.

1.6 PERSONNEL QUALIFICATIONS AND TRAINING

Before deploying bridge inspectors to the field, personnel qualifications must be verified.

The National Bridge Inspection Standards (NBIS) require personnel responsible for performing bridge inspection, approval, and load ratings to meet specific training and experience requirements. The DOTD's ADA of Operations and the District Bridge Engineer must meet the same qualifications as the NBIS "Program Manager."

Qualifications required for individuals (Program Manager, Team Leader, Diver) with specific responsibilities for evaluating bridge safety on public roads are set out in 23 CFR 650.309. Each field inspector will include their first and last name on the bridge inspection reports to match their certifications.

All persons with required or delegated duties of inspection duties, such as Team Leaders or Program Managers, must complete the initial FHWA-approved comprehensive bridge inspection training course (per 23 CFR 650.309(b)(2)) prior to performing inspections and the NSTM course prior to performing any NSTM inspections. .

Team Leaders and Program Managers are required to complete refresher training every five years. The deadline for completing any refresher course is set at the conclusion of the calendar year in which the training expires. Failure to meet the training requirements results in the forfeiture of position duties, and any work performed during the non-compliant period will be considered questionable and deemed invalid.

All underwater bridge inspection divers must complete FHWA-approved underwater bridge inspection training (per 23 CFR 650.309(e)).

The Headquarters Bridge Inspection Office will track all Bridge Inspector, Team Leader, Inspection Supervisor, ADA of Operations, District Bridge Engineer, and Program Manager training and minimum qualifications. They will also monitor other entities and the qualifications of consultant Team Leaders and divers that participated or will participate in a Louisiana Bridge Inspection Program during any portion of or the entire calendar year. All training certificates will be kept in HQ files along with a registry of all nationally certified bridge inspectors. Contact HQ to inquire about classes.

Copies of all NHI training course completion certificates must be submitted to the Headquarters Bridge Inspection Office immediately upon course completion.

1.7 SAFETY PRACTICES

The DOTD Bridge Inspection Program encompasses inspection activities that are potentially hazardous to inspectors and the public. Specific hazards associated with each site and inspection task may differ; however, potential hazards should be identified and mitigated to protect the health and safety of inspectors and the public. For further guidance, refer to the DOTD Loss Prevention Safety Manual and the FHWA BIRM, Chapter 2.

References

Due to the complexity of occupational health and safety and public safety, a variety of references may be needed. Listed are some of the references that may be associated with bridge inspections:

- DOTD Temporary Traffic Control
- DOTD Loss Prevention Safety Manual
- Manual on Uniform Traffic Control Devices for Streets and Highways

The DOTD Loss Prevention office at HQ or the district safety officer in each District can be contacted for more information.

2 Bridge Records

Bridge records for all state-owned, locally owned, and any other inventoried bridge structure are maintained by the Headquarters Bridge Inspection Office in InspectX. Bridge records are kept in accordance with Section 2 of the AASHTO MBE (per 23 CFR 650.315(a)) and monitored in accordance with FHWA Metric #15. The following is a brief timeline of the DOTD's Bridge record system:

- Prior to 12/31/2007 - FileNet
- 1/1/2007-5/14/2016 - Bridge Inspection Drive
- 5/15/2016-Present - InspectX

All bridges on public roads must have a bridge file stored in the bridge inspection collector software.

All bridges on public roads must have a bridge file. Per FHWA Metric #15, the bridge files will be reviewed to ensure they contain at least the following items as applicable:

- Inspection reports
- Waterway information
- Special inspection procedures or requirements
- Load rating documentation, including load testing results
- Posting documentation
- Critical findings and actions taken
- Scour appraisal
- Scour plan of action (POA) for scour critical bridges and those with unknown foundations
- Documentation of post-event inspections
- SNBI inventory and evaluation data with collection/verification forms
- Significant correspondence
- Bridge maintenance records

In addition, each bridge file will contain the following, if applicable:

- Construction or as-built drawings, including technical specifications
- Photographs
- Flood data
- Inspection requirements
- Traffic data/Average Daily Traffic
- Accident records
- Load test data
- Coating history

- Additional applicable data useful for maintaining the structure and ensuring the safety of the traveling public

2.1 UPDATING BRIDGE DATA

This section establishes a formal procedure for adding, deleting, and updating bridge inventory and condition information in the inspection software that conforms to CFR, Title 23, Part 650.

2.1.1 Adding/Deleting a Bridge to the Inventory

Once a new bridge is constructed (On and Off System), perform an initial inspection in accordance with Section 4.1 for each new, replaced, rehabilitated, and temporary bridge as soon as practical, but within three months of the bridge being open to traffic. All related forms will be submitted via email to the Headquarters Bridge Inspection Office along with the other documents, photographs, and sketches that will become part of the bridge file. Refer to Appendix A-1 for example of the Add/Delete Form.

2.1.2 Deleting an On-System Bridge

On-System bridges may be deleted under the following circumstances:

1. The old bridge was removed and replaced with a bridge that does not meet NBIS Federal Bridge Definition criteria (i.e. less than 20 feet opening).
2. The old bridge was removed and a new bridge (replaced, phased construction (split slab), or temporary) has been inventoried.
3. The route has been abandoned.

Two photographs of each location must be submitted with the Delete Form, one showing the roadway in the direction of travel and one showing the profile (end view) of the pipe(s), box culvert, arch, or bridge.

2.1.3 Closed Bridge Inventory Procedure

Full Route Closures

1. When a bridge has been closed for a replacement project (i.e. condition ratings of the bridge does not require closure), No condition ratings will be changed. Posting Status Update will be submitted coding:
   - B.PS.01 = Closed (Item 41 = K),
   - B.PS.02 = date closed, Posted Load = CL---,
   - Reason for Closure (new state code) = Replacement Project
   - Update Inspection Remarks with the H.# of the replacement project

2. If the bridge has been closed due to specific defects, Do not “0” all condition ratings, code the correlating NBI condition rating to “1” (if the condition will be repaired) or “0” (if the condition

requires closure until replacement) and leave all other condition ratings as is. Posting Status Update will be submitted coding:

- B.PS.01 = Closed (Item 41 = K),
- B.PS.02 = date closed, Posted Load = CL---,
- Reason for Closure (new state code)= Condition
- Update Inspection Remarks with explanation of the defect causing the closure

3. When a Route is closed for a Road Project or Route closure that is not bridge related (ex. Traffic Safety, route closures, etc.). No condition ratings will be changed. Posting Status Update will be submitted coding:

    - B.PS.01 = Closed (Item 41 = K),
    - B.PS.02 = date closed, Posted Load = CL---,
    - Reason for Closure (new state code) = Route Closure/Other
    - Update Inspection Remarks with explanation of the defect causing the closure

Replacement Projects (On-System or Off-System) with Detour or Phased Construction (Route Remains Open)

For the temporary situation where the detour bridge or new split slab portion (phased construction) is open to traffic:

- No coding changes are required until traffic shifts to the new structure/portion. Within 3 months of traffic moving to the new bridge,
- Submit an Add/Delete sheet to add the new bridge and **delete the old** (For detour bridges, the recall number will be the new bridge recall +T, example 000000T)
- Complete Initial Inspection and provide all data required to inventory the bridge (Contractor shall provide the load rating, scour analysis, and plans for detour bridges) (see Initial: (Section 4.1))
- For the new bridge, code the following in the Initial Inspection: B.PS.01 = Temporary-Open, B.PS.02 = date opened to traffic.

Full Completion of Phased Construction:

- Within 3 months of traffic moving to the new bridge (final configuration),
- Complete a second Initial Inspection to update all data required (see Initial: (Section 4.1))
- Code the following in the Initial Inspection: B.PS.01 = Permanent-Open, B.PS.02 = date fully opened to traffic.

Full Completion of Replacement Project with Detour Bridge:

- Within 3 months of traffic moving to the new bridge,
- Submit an Add/Delete sheet to add the new bridge and delete temporary detour
- Complete an Initial Inspection and provide all data required to inventory the bridge (see Initial: Section 4.1))

Code the following in the Initial Inspection: B.PS.01 = Permanent-Open, B.PS.02 = date opened to traffic.

3 Bridge Inspection Procedures

3.1 GENERAL INFORMATION

3.1.1 Documentation

DOTD maintains a complete, current, and historical record of each bridge. Proper documentation is imperative. The inspection report is a record of the bridge's observed condition and must be clear, concise, accurate, and thorough. Sufficient information should be gathered in the field to allow for a comprehensive and complete report. This information should be supported by photos, notes, sketches, etc.

Inspection Reporting Timeline

All reports must receive final approval within 90 days (with the exception of Posting Updates which are 30 days), the following timeline must be followed to ensure compliance with 23 CFR 650.315. Refer to Table 3-1 for a summary of deadlines for every inspection requiring two levels of approval. See Table 3-1 for additional information for all report types.

Table 3-1: Report deadlines

Milestone	Deadline (days)
Report submitted for preliminary approval (including Team Leader approval, if necessary)	30
Report submitted for final approval	60
Final approval	90

3.1.2 Delayed Inspections

Should an inspection be delayed due to "unusual circumstances, " HQ may issue a waiver for up to a 30-day grace period after a review of specific requests. FHWA defines "unusual circumstances" as "…severe weather, concern for bridge inspector safety, concern for inspection quality, the need to optimize scheduling with other bridges, or other unique situations…." Every effort should be made to avoid a delay in the scheduled inspection. Should this occur, the following steps must be taken for proper documentation:

- As soon as practical, and preferably prior to the inspection(s) becoming delinquent, the District Bridge Engineer shall email HQ with details on which bridges will be delayed, the specific "unusual circumstance" causing the delay, and expected date of actual inspection.
- HQ will make a formal request to FHWA for approval of any inspections that are delayed and forward the approval(s) back to the districts.
- Upon completion of the inspection, the inspector will include in the Inspection Notes the specific cause for every inspection delayed (i.e., "the bridge site was in a hurricane-damaged area that was inaccessible for 3 weeks" – not just "severe weather" or "Hurricane Isaac").

- Where FHWA has approved the inspection delay, the approval letter will be attached to the inspection report media content and annotated within the report's inspection notes.

It should be noted that any inspection performed past the 24th month for routines or the 60th month for underwater will count against the department's compliance with NBIS Metrics 6 & 7 or 8 & 9. Only those delayed inspections that received a concurrence from FHWA for an "unusual circumstance" AND were inspected no later than the 25th or 61st month will be exonerated from the tally during the compliance review.

If a structure becomes overdue, immediate action will be taken to inspect it, and the reason for the inspection being overdue will be documented.

3.1.3 Element Level Data Collection

Condition States and Associated Defects

Once the NBEs and Agency Defined Elements have been identified and an overall quantity for each has been established by means of reviewing as-built drawings and field verification, defect types and associated condition states can be assigned to these elements. The condition state is defined by four categories: good (CS1), fair (CS2), poor (CS3), and severe (CS4). The four condition states correlate to the severity of inherent, minor, moderate, and major damage. Refer to Appendix A-6 for examples of different defects and their condition states. The AASHTO Manual for Bridge Element Inspection identifies (in detail) the defect associated with each NBE and provides guidelines to the inspector for determining the defect severity.

Notes for each element level defect observed must include defect type, size, location, and condition state. (Refer to Appendix A-6).

With the incorporation of the SNBI coding, FHWA has adopted general guidelines to help inspectors correlate element-level condition states to bridge condition ratings. Table 3-2 provides a basic guide for correlating defect severity to condition ratings.

Table 3-2: Codes and descriptions for component condition ratings

Code	Condition	Description
N	Not Applicable	Component does not exist.
9	Excellent	Isolated inherent defects.
8	Very Good	Some inherent defects.
7	Good	Some minor defects.
6	Satisfactory	Widespread minor or isolated moderate defects.
5	Fair	Some moderate defects; strength and performance of the component are not affected.
4	Poor	Widespread moderate or isolated major defects; strength and/or performance of the component is affected.
3	Serious	Major defects; strength and/or performance of the component is seriously affected. Condition typically

Code	Condition	Description
		necessitates more frequent monitoring, load restrictions, and/or corrective actions.
2	Critical	Major defects; component is severely compromised. Condition typically necessitates frequent monitoring, significant load restrictions, and/or corrective actions in order to keep the bridge open.
1	Imminent Failure	Bridge is closed to traffic due to component condition. Repair or rehabilitation may return the bridge to service.
0	Failed	Bridge is closed due to component condition, and is beyond corrective action. Replacement is required to restore service.

Condition Ratings		Defect Severity					
		Inherent (CS1)	Minor (CS2)	Moderate (CS3)	Major (CS4)	Affects Strength and/or performance	Bridge Closed
Good	9 - Excellent	Isolated					
	8 - Very Good	Some					
	7 - Good		Some				
Fair	6 - Satisfactory		Widespread or	Isolated			
	5 - Fair			Some			
Poor	4 - Poor			Widespread or	Isolated and	Yes	
	3 - Serious				Some and	Yes	
	2 - Critical				Some and	Yes	
	1 - Imminent Failure				Some and	Yes and	Yes
	0 - Failed				Some and	Yes and	Yes

Notes:
1. Isolated defects affect approximately 10% or less of the bridge component
2. Some defects affect approximately 10% to 40% of the bridge component
3. Widespread defects affect approximately 40% or more of the bridge component

Figure 3-1: SNBI component rating guidance

Overlapping Defects

Defects will often overlap. The most obvious case is where two defects occur in the same place, such as a spall with exposed rebar within the same footprint of the element. To provide an accurate representation of the inspection findings, we cannot code this under two different defects. The worst defect should be chosen. In many instances, several defects may be within the same footprint and fall into the same Condition State. In this case, the inspector must decide which defect dominates and code it accordingly. For all situations where more than one defect occurs within a unit of an element, the non-dominating defects shall still be noted in the narrative. See example in Table 3-3 below.

Table 3-3: Example defect notes and condition states

Condition State	Element	Example Note	Example Photo
CS3 (14sf)	1080 (Spall)	Panel 6, left side is spalled, 77"L x 13"W x 4"D) with 120" of # 8 rebar exposed with 1/8" section loss.	

3.1.4 Critical Findings

All critical findings will require a 6-month interim inspection to inspect and document the status of the critical finding until resolved. Assistant Bridge Inspection Program Manager must be alerted within 24 hours for critical findings on the NHS via email and phone.

Definition

A critical finding is a structural or safety-related deficiency that requires immediate follow-up action when any of the following in Table 3-4 are true.

Table 3-4: Critical finding criteria

SNBI Item	Name	Value
B.C.01, B.C.02, B.C.03, B.C.04, B.C.15	Deck, Superstructure, Substructure, Culvert, or Underwater Condition Rating	2 or less
B.C.14	NSTM Condition Rating	3 or less
B.C.09, B.C.11	Channel, or Scour Condition Rating	2 or less
-	Bridge status	Fully or partially closed

SNBI Item	Name	Value
-	"Critical deficiency"	Immediate load restriction or load posting, or immediate repair work to a bridge, including shoring, in order to remain open
-	Observed hazardous or flammable material stored under or adjacent to the bridge	

FHWA Reporting

Per FHWA memorandum "ACTION: Documentation and Treatment of Materials Stored Under a Highway Bridge" dated 11/15/2023, bridge owners should direct inspectors, during their routine inspections, to be observant of materials, including flammable, explosive, or hazardous materials, stored under bridges, document any such materials stored in the ROW in the inspection report, and, if concerns exist, to communicate those concerns appropriately to the bridge inspection program manager. The discovery of such materials stored underneath a highway bridge should be treated as a critical finding requiring immediate follow-up action in accordance with our regulations and guidance (NBIS Regulations and Guidance) to ensure public safety, and must be reported to the FHWA (23 CFR 650.313(q)).

The Headquarters Bridge Inspection Office (HQ) is responsible for preparing a monthly summary report of all structures recently determined to have critical findings. HQ will also update the status of any structure already on the critical finding list that is being monitored or awaiting action to be performed. HQ relies on the District ADA of Operations and District Bridge Engineer to provide recommended actions and status updates. The District should send an email to HQ immediately (no later than 24 hours) containing the following when reporting a critical finding:

- Recall No.
- NBI Structure No.
- Condition ratings for SNBI Items B.C.01-04
- Date of finding
- Brief finding explanation with photos (if available)
- Recommended action
- Status of recommended actions and estimated date of completion
- Date action completed, if accomplished

The critical findings status report will be formally submitted to FHWA via email during the first week of each month.

3.1.5 Bridge Closure Procedures

When a Critical Finding results in bridge closure, the Bridge Closure Notification form found on the DOTD Bridge Maintenance Website under "DOTD Access Only" and a Posting Change Update (refer to Section 4.10) must be submitted by the District immediately (within 24 hours of closure).

Closure is defined as placing a physical barrier that prevents vehicular access until a bridge is removed, repaired, or replaced. If a DOTD routine inspection uncovers a situation requiring immediate bridge closure because of imminent danger to the public, the Bridge Owner must be notified. Bridge Inspectors may need to physically block/stop traffic to protect the traveling public**.** The Owner should immediately evaluate the situation and take necessary steps to safeguard the traveling public.

All traffic control devices should conform to current MUTCD standards, including traffic barriers, signs, barricades, and gates.

Closures include locked gates, deep beam barriers, or other similar devices capable of preventing traffic from using the bridge. Closures do not include piles of dirt, sawhorse barricades, timbers across the roadway, or signs alone. It must be a physical positive barrier. When a bridge is closed to traffic but still in the inspection software, inspections will still be performed with photos documenting adequate bridge closure installation and signs. Below are examples of correct and incorrect bridge closures.

Figure 3-2: Correct closure with Type 3 barricade and concrete barrier

Figure 3-3: Correct closure with a locked gate

Figure 3-4: Correct closure using guardrail. NOTE: Proper signage should be used

Figure 3-5: Incorrect closure with only Type 3 barricade. NOTE: Signage should not be mixed

Figure 3-6: Incorrect closure, no positive barrier. NOTE: STOP signs cannot be used for closures.

Figure 3-7: Incorrect closure using dirt pile

Bridge Closure requires the district to submit the Bridge Closure Notification form and Posting Change Update Inspection Report immeadiately (within 24 hours).

3.1.6 Load Ratings

Load Rating Frequency

All On-System and Off-system bridges shall have a current load rating on file. Please see Appendix A-8 for guidance on Engineering Judgement Load Ratings. The frequency of re-rating/reviewing due to condition change is as follows:

Table 3-5: Load rating frequencies

	Structural Condition	Re-Rating/Review Frequency
Lowest SNBI Structural Condition Rating	Rating 0-1 (Closed)	Before opening to traffic and upon notification from the Bridge Maintenance Section or District Bridge Engineer.
	Rating 2-4	Within 90 days of notification of structural condition rating drop.
Other Conditions	Overlay	As part of the design project and upon request from the project manager or district bridge engineer.

	Structural Condition	Re-Rating/Review Frequency
	Structural Rehabilitation	As part of the design project and upon request by the Project task manager or District Bridge Engineer.
	Timber Structure	Upon finding significant changes during the inspection or every four (4) years.
	Primary Load Carrying Element in Condition State 4	Within 90 days of notification of structural condition rating drop.

Documenting Defects for Load Ratings

During each inspection, the inspector will note any changes in the structural elements that may warrant a change in load rating, such as new significant defects (condition state 4) or recent repairs. The inspector is required to document the defects with enough detail to allow the load rating engineer to properly load rate the bridge. Table 3-6 shows example notes with enough detail to enable the Load Rating Engineer properly re-rate the structure.

Table 3-6: Example defect notes and condition states

Condition State	Example Note	Example Photo
CS4	Pile 2-1 has severe fungal decay 6-feet below the cap with a 3-inch diameter core remaining. The timber pile exhibits signs of buckling and should be considered failed in a structural analysis. Pile 2-1 is located under Stringer 2 and spaced 65-inches on-center from Pile 2-2. The timber cap extends 107-inches south from the center of Pile 2-2. Two intermediate bents have been installed approximately 8.5-ft to the west and east of Bent 2. Refer to sketch for more information.	

CS4	The Bent 2 Cap has severe external and internal decay and crushing around all four piles. The timber cap has an estimated remaining cross-sectional area of 20% on the north side of Pile 2-4. The pile cap was checked for settlement and was found to be level at the time of inspection. Refer to sketch for more information.	
CS4	Span 2, Stringer 17 is fractured with an overload failure. Span 2, Stringer 16 has severe decay with less than 10% cross-sectional area remaining at the east end and is not considered to be bearing load. The on-center spacing from Stringer 15 to Stringer 18 is 43.25-inches. Refer to sketch for more information.	

3.1.7 Inspections Coinciding with Repairs

Documenting Defects Requiring Repairs

When documenting defects that may require repairs, note the following:

- Document the **remaining section**, as well as the **original section**
- Photograph(s) to sufficiently observe the surrounding conditions
- Sketches, which include
  - Remaining and original section properties of components in the load path
  - The size and location of deterioration along the length of the member
  - The defect location measured from a common location (i.e. centerline of bearing)

Documenting Repairs and Rehabilitation

If a bridge was temporarily closed for major rehabilitation or repair, a Special Inspection should be performed to document the work performed and a load rating review must be conducted prior to the bridge re-opening.

After repairs or rehabilitation projects are complete, dimensions and quantities can be determined from the project plans and used to revise the element-level quantities and SNBI item documentation.

For temporary repairs, all previous defects and ratings will be carried forward. Sketches with a numbering scheme shall be provided.

For repairs or rehabilitation under a design project, a revised load rating should be completed for the rehabilitated structure based on the as-built plans and the reported inspection findings.

If repair plans do not exist, sketch the modification with enough detail to facilitate the determination of load demand and capacity of all members in the load path.

When recording repairs, the following data should be collected when applicable:

All repair documentation must include the date of the repair or the date that it was first documented. Provide the month/year when possible.

- Revised element notes on the repaired or rehabilitated members (including date of repair, sizes, spacing, and materials for added or replaced components).
- Revisions to the element-level inspection quantities for the rehabilitated elements.
- Updates to the condition ratings of the repaired or rehabilitated structural elements.
- Verify SNBI items on the rehabilitated structure.
- Update the Maintenance Tab to include SNBI work items B.W.02 & B.W.03 (For more information, refer to the Coding and Field Guide).

3.1.8 Bridge Posting

In accordance with the FHWA Memo *Timeframe for Installing Load Posting Signs at Bridges*, dated April 17, 2019, the DOTD's policy holds that "bridge load postings are to be made as soon as possible but no later than 30 days after a load rating determines a need for such posting." Photo documentation is required within 30 days. Refer to (*Traffic Engineering Manual, Section 2B.4 "Use of Weight Limit Signs.)*

DOTD is responsible for installing and maintaining weight limit signs at each bridge approach for bridges that require weight limit restrictions. Proper weight limit signage should be documented during every inspection. Photographic proof of posting is required during every inspection

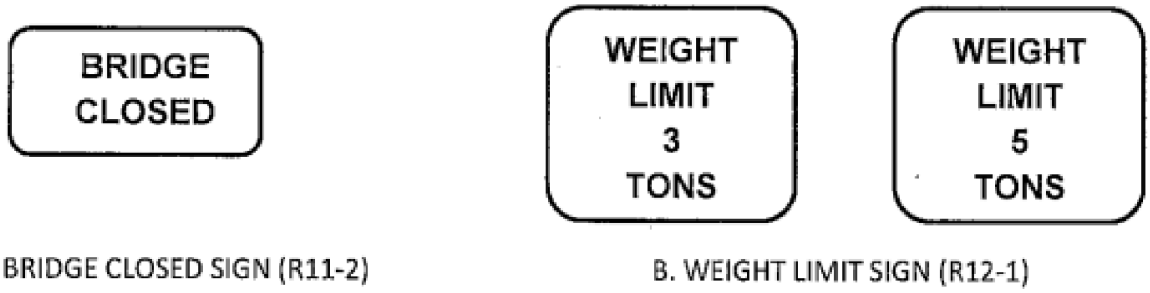
Each time a bridge posting changes, a new Posting Change Update (see Section 4.9) must be created to document the details of the posting change. This creates a historical record of all posting changes as required by the SNBI.

For compliance purposes, a properly posted or restricted bridge is defined as follows:

1. The required weight limit posting, as determined by a load rating analysis, is reflected at the bridge structure.
    a. A bridge will not be posted at a higher load limit than the maximum required weight limit; if this is encountered, it should be categorized as a critical finding.

2. Weight limit posting signs must comply with the Manual for Uniform Traffic Control Devices. See Figures 3-7 and 3-8 below.

On-system bridges cannot be conditionally posted at lower loads without prior approval by Headquarters.



A. BRIDGE CLOSED SIGN (R11-2) B. WEIGHT LIMIT SIGN (R12-1)

Figure 3-8: Bridge weight limit signs (R11-2 and R12-1)

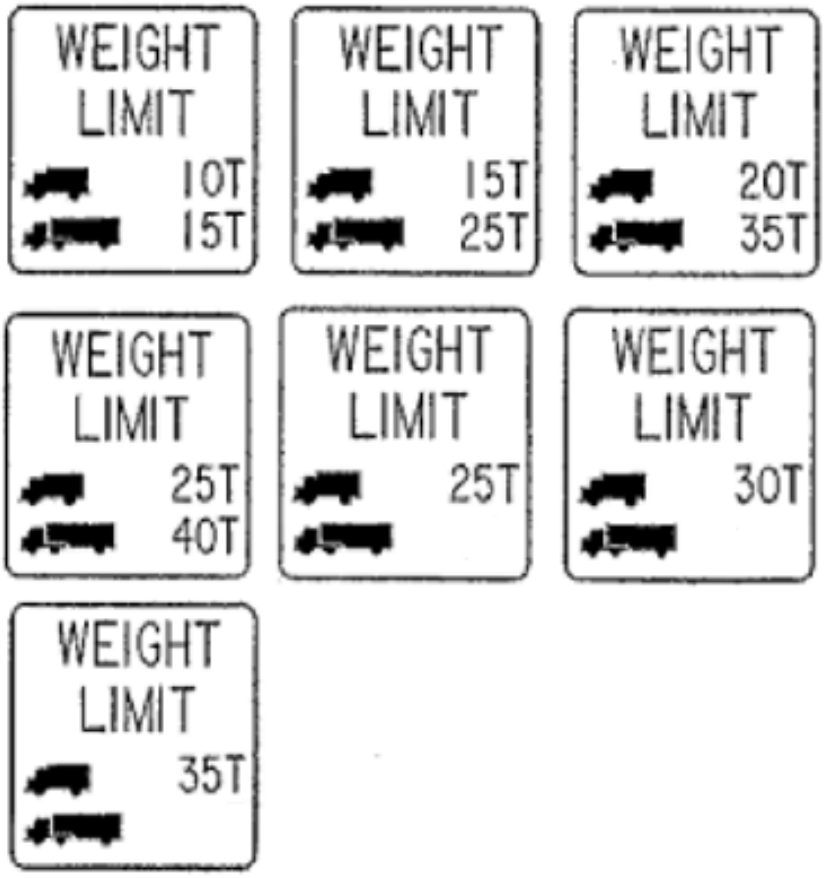


Figure 3-9: Bridge weight limit signs (R12-5)

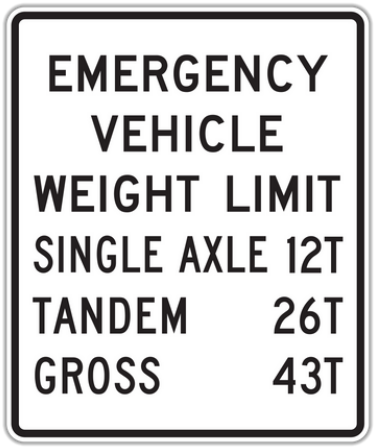


Figure 3-10: EV weight limit sign (R12-7)

3.1.9 Weight Limit Sign Inspection Procedures

All On-System signs are inspected by the DOTD District Sign crews. However, bridge inspectors must also document weight limit signs in the following ways:

- Refer to the most recent inspection report for the required weight limit signs and record the "posted load" on-site.
- Photograph the bridge approaches to include each weight limit sign. These photographs will show the sign, its post, and the adjacent roadway/bridge; a close-up of the front face of the sign; any issues affecting the sign, such as legibility, damage, or obstruction.
- If a required weight limit sign is missing at a bridge approach, a photograph should be taken to illustrate the deficiency. Missing weight limit signs are considered a critical finding, and any procedures outlined in Section 3.1.4 are to be implemented.

Figure 3-11: Correct weight limit sign

Below are examples of weight limit signs that require replacement:

Figure 3-12: Damaged and improper weight limit sign per MUTCD (See Figure 3-8)

Figure 3-13: Illegible weight limit sign

Observed School Bus or Truck Traffic Violations

Districts should maintain a list of agencies to contact for observed violations of weight limit posting. It is recommended to photo-document violations, if possible, during a field inspection and that a comment be added in the inspection remark section within the inspection software. For truck violations, the District is to email HQ requesting mobile scale enforcement at the bridge.

Figure 3-14: School bus violation

3.1.10 Streambed Field Documentation

All bridges over waterways [rivers, creeks, drainage areas, floodplains (wet or dry)] require streambed profiles as part of the regular bridge inspection process. Refer to the AASHTO MBE Third Edition – 2017, Section 2.2.4. A streambed profile will be taken during every routine inspection.

Always note the reference feature that readings were taken from (i.e. top of rail, top of cap, etc.). The locations of profile readings are measured from the beginning of the bridge in the direction of inventory. Elevations of the bottom of the stream will be plotted. Figure 3-14 shows an example of the data required to correctly document the channel bed feature reference.

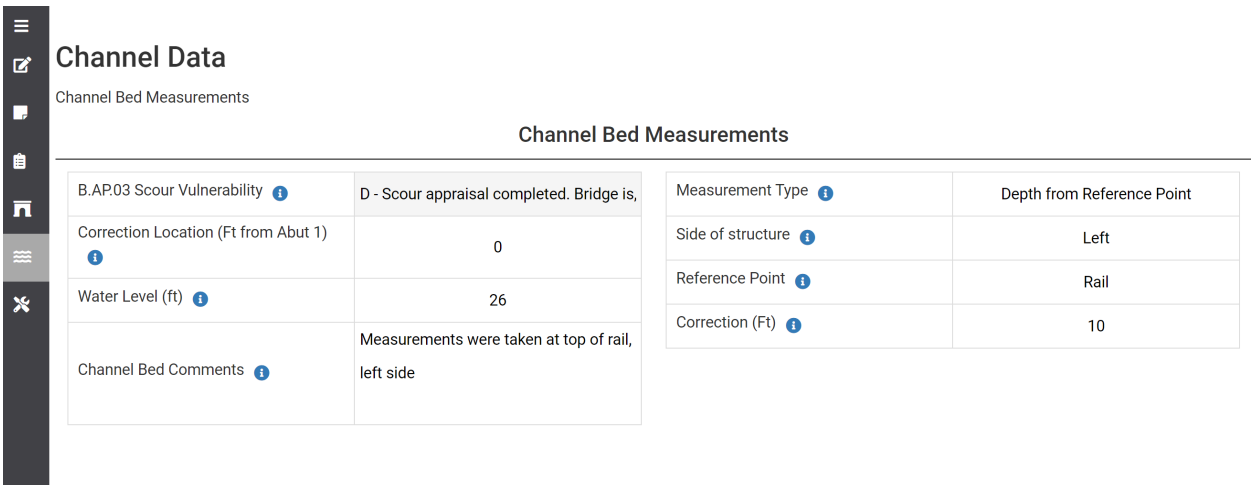


Figure 3-15: InspectX channel bed measurement example

The streambed profile is normally measured manually by dropping a weighted tape from the bridge deck at uniform intervals, beginning at the abutment, each bent, and at the midspan for spans 40 feet or longer. Measurements will be taken along the upstream fascia of the bridge at a minimum as follows (other intervals are allowed as long as their distance is properly referenced):

- At each abutment face
- At each bent
- At each midspan for each span 40 feet or longer

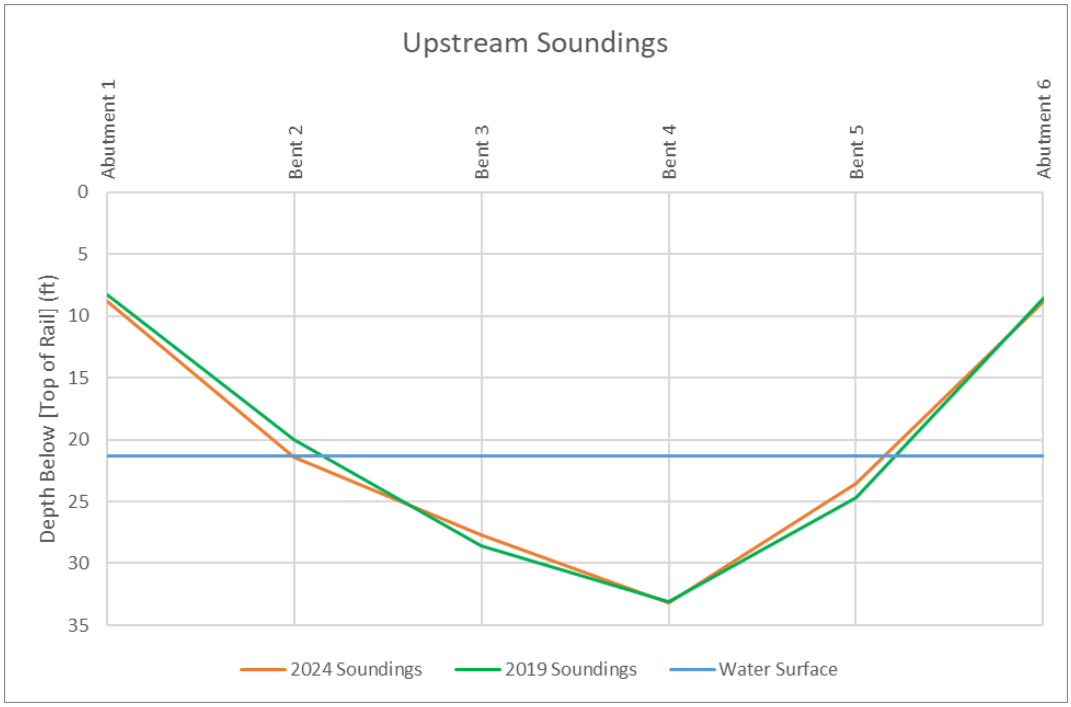


Figure 3-16: Example soundings

For major bridges over large waterways where a weighted tape (or other easily deployable measurement system) is impractical, hydrographic surveys will be performed periodically by the Location & Survey Section. An electronic version of the hydrographic surveys will be added to the bridge file.

Scour critical bridges and bridges with unknown foundations (bridges meeting any of the criteria in Table 3-7) will have the POA reviewed and a streambed profile performed during every Interim, Routine, and High-Water inspection. The stream cross-section will be recorded and compared with the previous profile, as well as any critical elevations noted in the POA. The results of the comparison will be documented in the inspection notes. If the channel bottom at a bridge falls below a critical elevation noted in the POA, HQ is to be notified immediately per the critical finding protocol.

Table 3-7: Criteria for scour critical bridge

SNBI Item	Name	Value
B.AP.03	Scour Vulnerability	C, D, or U
B.C.11	Scour Condition Rating	3 or less

4 Inspection Types and Frequencies for On-System Bridges

Each bridge in Louisiana will be inspected at a maximum interval established by the NBIS and the DOTD.

This section outlines when various inspection types are required, who will perform them, and what must be recorded. The following table outlines each inspection and who is responsible for conducting the inspection.

Types below not requiring a team leader will instead require an inspector with a minimum of 1 year of bridge inspection experience for District, HQ, and Consultant inspectors.

Table 4-1: Inspection types

Inspection Type	Responsible Party	Requires NHI Certified Team Leader?	Approval Levels/Timelines (Days from Inspection Date)			
			Report Creation	TL	Prelim	Final/ Admin
Initial	District	Yes	7	30	60	90
Routine	District	Yes	7	30	60	90
Special (In Lieu of Routine)	District	Yes	7	30	60	90
NSTM	District	Yes	7	30	60	90
Interim	District	No	7	30	60	90
Special (non-Recuring)	District	No	7	30	60	90
Damage	District	No	7	30	60	90
Highwater Event	District or Local Owner	No		60*	-	90
District QC	District	Yes		60*	-	90
Posting Change Update* **	District	NA**	7	14*	-	30
District Inventory Update	District	NA**	-	30*	-	90
Railroad Pedestrian	District	No	-	30*	-	90
HQ QA	HQ	Yes		60*	-	90
Scour Analysis	HQ	NA**	-	30*	-	90
Load Rating	HQ	NA	-	60*	-	90
Inventory Update	HQ	NA	-	30*	-	90
Routine (Consultant)	Consultants	Yes	-	60*	-	90
Underwater	Consultants	Yes	-	60*	-	90
In-Depth	Consultants	Yes	-	60*	-	90
NDE Consultant Inspection	Consultants	No	-	60*	-	90
Parish Inspection	Local Owner	No	7	60*	-	90

Inspection Type	Responsible Party	Requires NHI Certified Team Leader?	Approval Levels/Timelines (Days from Inspection Date)			
			Report Creation	TL	Prelim	Final/ Admin
Parish Special (non-Recuring)	Local Owner	No	-	60*	-	90
Parish Load Rating	Local Owner	NA	-	60*	-	90

*Submitted for Final Approval

**NA TL due to not being a field report

*** Posting Change Update for Closure due to a Critical Finding must be submitted within 24 hours and receive final approval within 7 days.

For more information on Parish Inspection types, please see the LADOTD Off-System Bridge Inspection Manual.

4.1 INITIAL

The initial inspection will be completed and approved within 90 days of opening to traffic.

The initial inspection is the first routine inspection and requires the presence of an NBIS Team Leader. In addition to the requirements of a routine inspection (Section 4.2), it also provides the following:

- Specifications for the National Bridge Inventory (SNBI) data
- Baseline condition assessment for the bridge
- Development of the element inventory and condition states
- Verification of as-built plans
- Add/Delete Form with UWI determination
- Load rating documentation
- Scour analysis documentation

4.1.1 Structure ID

DOTD identifies bridge structures by a six-digit numerical recall number. Recall numbers are generated by the DOTD Headquarters Bridge Inspection Office upon request from the DOTD Project Manager.

4.1.2 Bridge Type Codes

Bridge type codes are identified by a six-letter code. See Appendix A-2 for the list of available Bridge Type Codes. This code should be selected based on the most complex or main span of the structure.

4.1.3 Inventory Direction and Numbering

The inventory and numbering of all bridges will be in the direction of control.

All bridge elements will be numbered from left to right in the inventory direction, as shown below in Figure 4-1. A detailed and descriptive sketch shall be provided for any uncommon configuration.

Figure 4-1: Typical element numbering

4.1.4 Initial Inspection Documentation

When adding a new bridge or culvert to the inventory, the following minimum documents are required:

- **Initial Inspection Report** consisting of a complete inspection and including all inventory data and SNBI collection (collected in software). Refer to the Routine Inspection Section 4.2 and the Coding & Field Guide for further information.
- **Add/Delete Sheet** (refer to Appendix A-1)
- **Plan Sheets (or if unavailable, Sketches) showing:**
    - Geometric layout of the area showing the approach roadway, bridge deck, number of traffic lanes on and under the structure, and alignment of the feature crossed.
    - Cross-section of the bridge (through the deck) with measurements indicating roadway width, rail-to-rail clearance, curb-to-curb width, out-to-out width, layout of the bent(s) and/or piers, and vertical clearance over the bridge deck.

- Profile of the bridge showing total length of the structure, length and type of each span, under-passing roadway(s) vertical and horizontal clearances, and width of the opening and the location and distance between the backwalls for all one-span bridges less than 25 feet long.
- All movable and fixed bridges over navigable waterways will have their navigation vertical and horizontal clearance field-checked and sketched. Measurements for movable bridges will be taken in both the fully open and fully closed positions.

- **Timber Rating Form**
  - For all timber bridges or bridges with timber spans, a Timber Rating Form (refer to the DOTD's internal website) will be completed by the District. Sketches including and identifying the specific location of all deficiencies or other sub-standard conditions shall also be provided. Refer to Section 5.2 for further information.

Load Rating documentation

- As-designed load rating from the plans shall be added by HQ using a "Load Rating" Report type (Refer to Section 4.8)
- When the as-designed rating is not provided on the plans, or the as-built load rating varies from the as-designed rating, the stamped load rating report, including a summary sheet and calculations, shall be provided prior to opening the bridge and conducting the initial inspection.

- **Scour Analysis documentation**
  - Pile length information, pile driving records, and hydraulic information shall be provided prior to opening the bridge and conducting the initial inspection when not available on the plans.

4.2 ROUTINE

4.2.1 Routine Interval Criteria

The NBIS requires routine bridge inspections at a frequency not exceeding 24 months (48 months for NBIS-FHWA approved structures as defined below) and annual monitoring by the District Bridge Engineer for compliance by verifying that inspections are done in the **same month** every two years (or 4 years for pre-approved bridges). **Strict adherence to the NBIS routine bridge inspection cycle is required.** Late inspections will be performed immediately once they are discovered to be late. Refer to Section 3.1.2 for procedures concerning requests for "delayed inspections."

The 23 CFR 650.311(a)(1)(ii): Inspection interval Method 1 requires a 12-month routine inspection for certain bridges. Effective January 1, 2025, DOTD follows Method 1 with the addition of Timber Bridges** where the deck, superstructure, or substructure have SNBI Condition Ratings of 4 or less as shown in Table 4-2.

Table 4-2: Reduced routine inspection intervals

Inspection Interval	SNBI Condition Rating
24 Month Routine	• Deck, Superstructure, Substructure, or Scour = 4 or Greater • NSTM = 5 or Greater
12 Month Routine*	• Deck, Superstructure, Substructure= **4 for Timber**** or 3 for all other bridge types • NSTM = 4 • Scour = 3

** Special inspection can be conducted to inspect localized deficiencies.*

*** Timber Bridge Types = TTTRES, TTTCOF, TTTLAM, CIBTTF, and CIBTCF (see Appendix A-2)*

Where condition ratings meet criteria for 12-month routine due to localized deficiencies, a special inspection limited to those deficiencies, as described in 23 CFR 650.313(h), can meet this requirement in lieu of a complete routine inspection. In such cases, a complete routine inspection must be conducted at the original 24-month interval. If a partial inspection is conducted, it should be recorded as a Special (In Lieu of Routine) and include the following wording in the Inspection Comment when scheduling the inspection in InspectX: "A special inspection limited to XX deficiencies was conducted in lieu of a routine."

After a bridge has completed an initial 24-month routine inspection, it may qualify for an extended routine inspection interval of 48 months if all the following in Table 4-3 are met, (per 23 CFR 650.311(a)(1)(iii)(A)).

Table 4-3: Criteria for extending routine inspections to 48 months

SNBI Item	Name	Value
B.C.01, B.C.02, B.C.03, B.C.04	Deck, Superstructure, and Substructure Condition Rating, or the Culvert Condition Rating	6 or higher
B.C.09, B.C.10	Channel Condition and Channel Protection Condition	6 or higher
B.AP.03	Scour Vulnerability	A or B
B.C.11	Scour Condition Rating	6 or higher
B.LR.05	Inventory Load Rating Factor	Greater than or equal to 1
B.LR.08	Routine Permit Loads	A or N
B.IR.02	Fatigue Details	No E/E' details
B.H.13	Highway Minimum Vertical Clearance	Greater than or equal to 14 feet
B.SP.04	Span Material	Steel or concrete
B.SP.06	Span Type	Any multi-beam box girder, 3- or 4-sided frame, any girder (except for girder & floor beam or through girder), any slab, or any pipe.

4.2.2 Routine Inspection Procedure

Routine inspections involve a full assessment of all areas at a distance acceptable to identify any condition changes. All elements of the bridge must be inspected. If any area is not accessible, proper documentation, including photos, is required, and a follow-up inspection will need to be performed within the original inspection timeframe.

Bridge elements in less than 4 feet of water will be inspected as part of the routine inspection by wading and probing for signs of deterioration or during periods of low water flow. If any submerged substructure element cannot be inspected by wading and probing, those elements will be identified in the element notes and the structure notes per Metric 17, documenting the need for an UWI along with a notation of how much of the element was visible for surface inspection. For structures that need to be added to the underwater list, the District Bridge Inspection Office will notify HQ.

Structures requiring special UBIT access equipment will be inspected as a group over a period of a few weeks each year. This will allow adequate scheduling of UBITs around the state. Within the inspection software, the Inspection Equipment field (B.IE.12) should be filled out with the equipment required to complete the inspection.

For all bridges containing NSTM, The NSTM inspection is to be performed concurrently with the routine inspection and identified as Routine/NSTM.

A typical NBIS routine field inspection will focus on the following components:

- Traffic safety features
- Deck
- Superstructure
- Substructure
- Roadway approaches
- Channel and slope protection, and
- Load postings or physical restrictions

The typical approach for routine field inspections includes the following actions:

- Identify any critical findings (refer to Section 3.1.4).
- Complete a visual inspection of bridge components and document the summary of conditions, findings, and deficiencies for each component (include NSTM hands-on inspection assurance, if performed).
- Verification of SNBI inventory data
- Determine if previous NBI ratings and element condition states are still applicable based on current conditions

4.2.3 Documenting Inspection Notes

- Executive Summary
  - Repair Recommendations, Major Findings
- Inspection Remarks
  - Temperature
  - Any element or portion of an element(s) not able to be inspected
  - Summary of element(s) being closely monitored
  - Inventory Photos (see below)
  - School bus or truck violations of Posted Bridges
  - Findings not associated with Elements
  - Project numbers and letting dates for upcoming or completed rehab/repair/replacement
- Structure Notes
  - Metric 17 note for Underwater Inspection
  - Metric 19 note for Complex Structures for movable or cable stayed bridges
- Underwater Notes
  - For reference only, Provided by the most recent UWI (if applicable)
- Parish Inspection Notes
  - For reference only, Provided by the most recent Parish Inspection (if applicable)

Refer to the example report found on the DOTD Bridge Maintenance Website under Documents and Manuals.

4.2.4 Documenting Conditions

Routine inspections will fully document the condition of the bridge with the following:

- Current SNBI condition ratings
  - **If condition ratings change, notes are required stating why**
- Element notes
  - Current element condition states and element notes clearly stating all defect types/sizes/locations/condition states. Refer to Appendix A-6 for examples.
  - Maintenance or repair recommendations
  - Written details of repairs made (refer to Section 3.1.7)
  - Deficiency photos
    - Widespread/typical defects should have a few representative photos
    - Isolated defects should have specific photos of each defect
- Verification of load posting requirements (refer to Section 3.1.6)
  - Photo required at bridge ends in each travel direction.
- Sketches

- For CS4 deficiencies as needed
- For clarification of repairs and element orientation
- For updates and monitoring in subsequent reports

All repair documentation must include the date of the repair or the date that it was first documented. Provide the month/year when possible.

- Streambed profile (for bridges with substructure elements in water). Refer to Section 3.1.10.
- **Inventory Photographs** required for each Routine Inspection Report:

	
Recall number: Recall numbers must be affixed to the bridge rail or painted with stencils to clearly contrast with the background at the beginning of the bridge in the direction of control.	Roadway approaching the structure in the direction of inventory
	
Roadway approaching the structure from the direction opposite to inventory	Roadway leaving the structure in the direction of inventory (taken from on the deck) if the entire structure cannot be seen.

	
Roadway leaving the structure in the direction opposite to inventory (taken from the deck) if the entire structure cannot be seen.	Full width of both abutments and any revetment (if applicable)

	
Full height of a typical substructure unit. • If the substructure type varies, then a photo of each type is needed	Entire profile of the structure whenever possible • This will be taken from a sufficient distance away to show most, if not all, spans (perpendicular or oblique to the bridge). **For bridges over waterways or roadways, the profile photograph(s) must show the feature crossed, i.e. the waterway or the roadway.** • If all spans of the bridge cannot be captured in one photo, take photos of each superstructure type

- If the bridge is over a waterway, two additional photographs are required:

	
Upstream view of the waterway • This should be taken with a portion of the rail or substructure to show the skew of the waterway to the substructure units.	Downstream view of the waterway

- If the bridge is over a roadway or roadways, two additional photographs per roadway are required:

	
Each under-passing roadway as it approaches the structure from its direction of inventory	Each under-passing roadway as it approaches the structure from the direction opposite to its inventory

Each span that crosses a railroad

- If a UAV is available during the inspection, three additional photos may be added to the report. A UAV photo may be used for multiple inventory photos if the UAV photo clearly shows the individual inventory items (Ex. combined photo of the downstream elevation with the upstream channel).

Entire deck (looking straight down)

Upstream channel with entire bridge profile shown

Downstream channel with entire bridge profile shown

Additional photographs showing special details, such as pin and hanger assemblies or connections, curved girders, other new details, special/different main span types, etc., must also be submitted if the special details are not clearly shown in the above photographs.

	
Pin and hanger assembly (detail still requires a hands-on inspection)	E' detail (detail still requires a hands-on inspection)

4.2.5 Safety Features

Two bridge safety features are coded in the SNBI: Bridge Railing Condition Rating (B.C.05) and Bridge Railing Transition Condition Rating (B.C.06).

Other typical safety features in which damage should be noted can include, but are not limited to:

- Approach guardrail
- Pedestrian rails and fencing
- Signing (object markers, and clearance)
- Lighting (drawbridge lights, navigation lights, and traffic control gate/lights)
- Hardware connections for the above items

4.3 SPECIAL (IN LIEU OF ROUTINE)

Where condition ratings meet criteria for 12-month routine due to localized deficiencies, a special inspection limited to those deficiencies, conducted by a certified team leader, as described in 23 CFR 650.313(h), can meet this requirement in lieu of a complete routine inspection. In such cases, a complete routine inspection must be conducted at the original 24-month interval. If a partial inspection is conducted, it should be recorded as a Special (In Lieu of Routine) and include the following wording in the Inspection Comment when scheduling the inspection in InspectX: "A special inspection limited to XX deficiencies was conducted in lieu of a routine." As shown in Figure 4-2 below.

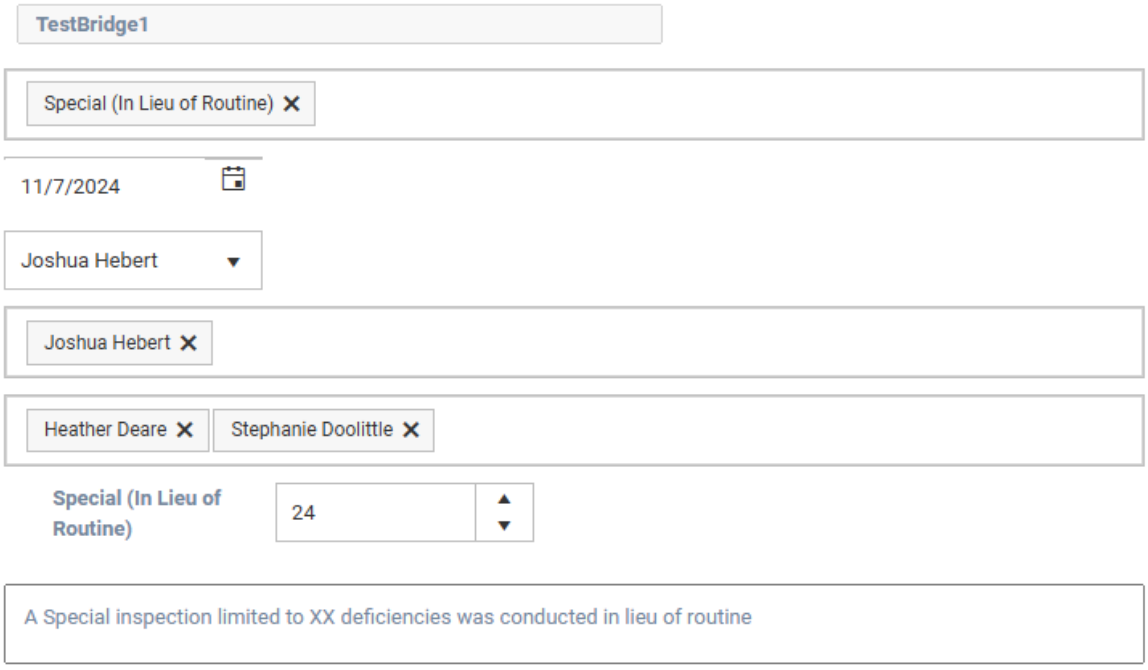


Figure 4-2: Example scheduling a partial routine inspection

4.4 NONREDUNDANT STEEL TENSION MEMBER

A Nonredundant Steel Tension Member (NSTM) is a steel member in tension (or with a tension element) whose failure could cause a portion of, or the entire bridge to collapse.

A Nonredundant Steel Tension Member (NSTM) inspection consists of a visual hands-on inspection of NSTM components and may include other nondestructive testing. It is DOTD's policy to inspect all bridges that have NSTMs in accordance with 23 CFR 650.313. The District Bridge Engineer along with a qualified NSTM Bridge Inspection Team Leader must be present during the inspection.

The NSTM inspection is to be performed concurrently with the routine inspection.

An NSTM inspection is conducted at a frequency not to exceed 24 months. Inspection results will be recorded in the inspection report using the inspection type *NSTM. If the NSTM condition rating (B.C.14) is 4 or less, 12-month routine/NSTM inspections are required.*

4.4.1 Identifying NSTM Elements

NSTM inspections must begin with advanced planning. 23 CFR 650.313(f)(1) requires all NSTMs and the inspection procedures to be listed prior to any NSTM inspection. An office review (with structural plans) should contain the following:

- Identify NSTM members (See Routine Walkthrough on website)
- Note members that may require special field attention, such as built-up tension members

- Plan means of access to the members
- Identify bridge-specific tools and equipment necessary to perform the NSTM inspection, such as nondestructive testing tools, cleaning equipment, mirrors, paint pens, etc.

4.4.2 Inspecting NSTM Elements

Field inspections will be conducted in accordance with the procedures stated in the *Bridge Inspection Techniques for Nonredundant Steel Tension Members*. Typical NSTMs include:

Steel girders and floor beams

Trusses

Steel box girders

Eyebars

Cross girders/steel pier caps

Pin and hanger assemblies

DOTD Districts will not be responsible for performing inspections involving specialized nondestructive evaluation. In-depth inspections of this nature will be managed by HQ. The District Bridge Engineer will submit a written request to HQ when such testing is necessary. The DOTD District inspectors should regularly use quick and cost-effective NDE methods such as dye penetrant in appropriate applications. Refer to Nondestructive Testing Methods (Section 4.18) for further details.

4.4.3 Documenting NSTM Inspection Notes

The NSTM inspection details will be documented in the inspection remarks, and element notes sections of the inspection report.

Required minimum documentation is as follows:

- **Inspection Remarks:** Statement required include the following:
  - Date of NSTM inspection
  - All inspectors' full names
  - Team leader must be clearly identified
  - List of all NSTM's
- **Element Notes:**
  - A statement in the element notes that identifies which member is an NSTM. Include notation that a "**hands-on inspection**" was performed.
  - The location of the NSTM member(s) on the bridge and the method of access to the member(s) to facilitate a hands-on inspection.
  - Method of NSTM inspection, such as visual/hands-on and/or nondestructive testing; state type of NDE used.
  - Findings: (If no defects are found, state "no defects were found")
    - General location of crack/defect with respect to the entire bridge and the exact location on the member
    - Dimensions and details (including modifications) of the member containing the crack/defect
    - Date and weather condition when the crack/defect was first detected, confirmed by NDE, and reexamined on subsequent inspections
    - Label the member with the date of inspection and the initials of the certified inspector using permanent marker or a paint pen (be sensitive to aesthetics of prominent areas)
    - Detailed sketch of crack/defect that shows length, width, and depth, and include photographs of crack/defect, preferably with a scale reference included
    - Noticeable conditions of crack/defect when exposed to live load such as lengthening, opening and closing, and distortions
    - General condition at the location of the crack/defect such as corrosion, dirt, debris, traffic impact, and steel type (if available)

Additional information on NSTM inspection procedures can be found in the *MBE, Section 4.8*.

4.5 INTERIM

Interim inspections are to monitor a known or suspected deficiency. When scheduling an interim inspection, the Inspection Comment must clearly document what was inspected. (Examples:. "This was a 6 month Interim Inspection to document bridge closure." Or "This was a 6 month Interim Inspection limited to XX deficiencies."

Interim inspections are Special Inspections performed at the 6-month interval between the scheduled 12-month Routine Inspection. Interim inspections are required when any of the following criteria are met:

Table 4-4: Interim inspection criteria

SNBI Item	Name	Condition
-	Full or partial closure of the bridge?	Yes
B.C.01, B.C.02, B.C.03, B.C.04, or B.C.15	Deck, Superstructure, Substructure, Culvert, or Underwater condition rating	2 or less
B.C.09, or B.C.11	Channel or Scour condition rating	2 or less
B.C.14	NSTM condition rating	3 or less
-	Critical deficiency requiring immediate load restriction or load posting?	Yes
-	Immediate repair work (including shoring) required for bridge to remain open?	Yes

Figure 4-3 shows how to offset the scheduling of 12-month Routine and 6-month Interim inspections for On-System bridges. **Only HQ should change reduced interval frequencies.**

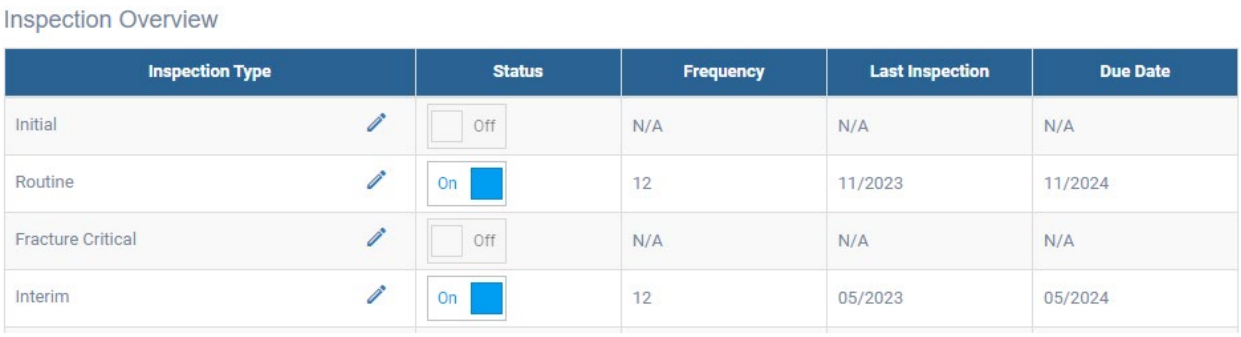


Figure 4-3: InspectX screen shot for setting up on-system interim inspection schedule

4.6 SPECIAL (NON-RECURRING)

Special (non-recurring) inspections are unique, one-time inspections conducted for a specific purpose, typically to evaluate something in detail. This type of inspection is not part of a routine inspection but is initiated on an ad-hoc basis. Reasons for special inspections include:

- Callouts for public safety concerns
- Document repairs (Section 3.1.7)
- Critical finding follow-up
- Any required service inspection

When scheduling a special (non-recurring) inspection, the Inspection Comment must clearly document what was inspected. (Example: “This Special Inspection documented the following recently completed repairs: XX.”

4.7 DAMAGE

A damage inspection is an unscheduled inspection to assess structural damage resulting from any incident, including but not limited to accident (vehicular, helicopter, fire, marine, etc.), human action, or natural disaster/environmental factor. This report type will only be used for the assessment and documentation of damage caused by an outside force. Refer also to Emergency Response Section 5.1.

Damage inspections should include:

- Cause of damage
- Extent of damage to all bridge members with detailed measurements
- Photographs and sketches
- Vertical clearance measurements, if applicable
- Streambed profile, if applicable
- Accident report, if applicable
- Assessment of possible need to close or restrict traffic

Only damage identified during this inspection type should be categorized as a "Damage" defect type. Typical types of damage include impacts from vehicles, debris, vessels, etc.

When scheduling a damage inspection, the Inspection Comment must clearly document what was inspected. (Example: "This Damage Inspection documented traffic impact damage to Girders #-# at Span #."

4.8 HIGH WATER EVENT

As flood or high flow events occur, all affected scour critical bridges should be monitored during and after the event. Inspectors should collect streambed profiles as soon as conditions allow. This inspection type may also be used on non-scour critical bridges if deemed necessary by HQ or the District Bridge Engineer. The District Bridge Engineer will determine when high flow events occur, and when this inspection is required.

High Water Event Inspection Form will be entered into the inspection software by the bridge inspectors with the current streambed profile information to provide official documentation of required monitoring during and following a high-water event. Refer to Appendix A-4 for documentation forms.

When scheduling a High Water event inspection, the Inspection Comment must clearly document what was inspected. (Examples: "This High Water Event inspection was completed in response to Hurricane XX" or "This High Water Event inspection was completed following a heavy rain event on MM/DD/YY."

All bridges that have been issued a POA in accordance with the NBIS will be closely monitored during times of flooding and high-water flow until the flow subsides.

In addition to streambed profiles (Section 3.1.10), visually observe and document the following:

- Debris accumulation
- Damage to piles
- Span alignment
- Bridge rail alignment
- Approach slab undermining
- Approach roadway wash-out or undermining
- Approach slope erosion
- Assessment of possible need to close or restrict traffic

For On-System bridges where known scour may contribute to the possible collapse of the bridge, the bridge will be closed to traffic until the situation is evaluated and stabilized. Refer to bridge closure procedures in Section 3.1.5. In cases where drift presents a potential threat to the lateral stability of the bridge, the District will remove the drift when feasible or close the bridge until the problem has been corrected.

A POA has been created for each bridge categorized as scour critical or has unknown foundations (B.AP.03 = C, D). These POA documents can be found in the Scour Analysis Report that is stored in the Bridge Inspection Software.

4.9 LOAD RATING

All bridges in the NBI are required to have a load rating, which is calculated based on the bridge's "as-inspected" condition. If any changes to the structural capacity of a primary member or connection are observed, a load rating report will be performed by the DOTD Load Rating Section. See Section 3.1.6.

4.10 POSTING CHANGE UPDATE

Posting change updates are entered into the inspection software when the load posting changes for a particular bridge, including bridge closures. These updates should generally follow a load rating and the Required Posting should match the Posted Load (only off-system Posted Load may be less than Required Posting). The Posting Change Update is the only Inspection type that requires less than 90 days for final approval. The timelines for submittal and final approval are as follows:

> For Closure due to Critical Finding - Submit Posting Change Update for Final Approval within 24 hours and Receive Final Approval within 7 days.
> For all other Posting Change Updates - Submit Posting Change Update for Final Approval within 14 days and Receive Final Approval within 30 days of Notification or Load Rating Approval.

When scheduling a Posting Change Update, the Inspection Comment must clearly document what was inspected. (Example: "This Posting Change Update was done to change the load posting from XX to XX.")

Once the bridge posting is updated in the field, a Posting Change Update is created within the inspection software and must include photos of the load posting sign or closure at both ends of the bridge. For more information regarding the allowed signage and documentation required, please see Section 3.1.8 and Section 3.1.9. This creates a historical record of all posting changes as required by the SNBI.

When completing a Posting Change update for Bridge Closure, Please see Section 2.1.3 and the Coding and Field Guide for more information.

DOTD requires all bridge load postings to be made as soon as possible but no later than 30 days after a load rating determines a need for such posting.

4.11 INVENTORY UPDATE

An Inventory Update is performed by HQ to make data corrections when there is a change or error in the bridge's inventory data. Any data can be updated using this report type with the exception of the SNBI Posting fields. The Reason for the Inventory Update must be included in the Inspection Comment box when scheduling the inspection in InspectX. (Example: This Inventory update was done to update the following items: XX (List SNBI Item #s))

4.12 DISTRICT INVENTORY UPDATE

A District Inventory Update is the same as an Inventory Update, with the only difference being that this report is completed by the District and sent to HQ for approval. Refer to Updating Bridge Data (Section 2.1) for more information. The Reason for the Inventory Update must be included in the Inspection Comment box when scheduling the inspection in InspectX. (Example: This District Inventory update was done to update the following items: XX (List SNBI Item #s))

4.13 DISTRICT QC

The District QC inspector performs Quality Control (QC) inspections to ensure the accuracy of bridge inspection reporting as outlined in Section 6. The QC inspection is an independent inspection performed separately from the Routine for the District Bridge Engineer to compare with the Routine report to find errors in reporting. These are typically conducted in the same approval cycle as the Routine so the District Bridge Engineer can review both and address discrepancies prior to approval.

4.14 HQ QA

HQ will perform Quality Assurance (QA) inspections as a random independent inspection to find errors and ensure better note taking. These inspections may also be assigned to verify the condition of typical deficiencies associated with certain bridge types or verify information needed for a load rating.

4.15 SCOUR ANALYSIS

A Scour Analysis report is typically done once to determine the scour vulnerability of the structure and complete the POA if necessary. The final Scour Analysis report will be stamped, signed, and dated by a registered professional engineer.

All bridges that have been issued a POA in accordance with the NBIS will be closely monitored during times of flooding and high-water flow until the flow subsides. See Section 4.7.

4.16 IN-DEPTH

All inspectors, dive tenders, and divers on site need to be identified in the inspection report. Individuals who participated as Team Leader during the inspection MUST be identified in the report.

An in-depth inspection is a "hands-on" inspection that may require the use of non-destructive field tests and other material tests to identify deficiencies that are not readily detectable using routine inspection procedures. This inspection type is often used to record the condition and geometric details for a load analysis or rehabilitation design of complex bridges and are conducted at 10-year intervals unless they are programmed for rehabilitation or replacement in which case the DOTD Design section will manage the NBI In-Depth Inspection. Specialized consultant contracts are sometimes utilized for in-depth inspections of major complex bridges and movable bridges. Other in-depth inspections can consist of assessments of bridge elements such as:

- Cable stays and dampeners
- Pin and hanger assemblies
- Nondestructive load testing (Section 4.18)

The scope of the In-depth inspection must be included in the Inspection Comment box when scheduling in InspectX. (Example: This In-depth Inspection completed a full routine, NSTM, Pin and Hanger assembly testing, and Paint testing inspection)

The in-depth inspection report will document the reasons, planned activities, procedures, and findings of in-depth inspections.

In-depth movable bridge inspection reports will be signed and sealed by a single registered professional engineer who served as the Team Leader. Refer to Section 5.6

4.17 UNDERWATER

All inspectors, dive tenders, and divers on site need to be identified in the inspection report. Individuals who participated as Team Leader during the inspection MUST be identified in the report.

An UWI will typically summarize the structural condition of the bridge substructure elements below the high-water line only. UWIs must be completed by NHI-certified and professionally trained commercial divers. Therefore, all underwater bridge inspection services will be conducted through consultant retainer contracts administered by the Headquarters Bridge Inspection Office. Per 23 CFR 650.313(e), new bridges requiring an underwater inspection must receive their first underwater inspection within 12 months of the bridge being open to traffic.

All underwater bridge inspections may be performed 6 to 12 months prior to the *next due* UWI, as an effort to keep the UWI frequency at 60 months without becoming delinquent.

Bridges require a UWI when structural components are submerged in over 4.0 feet of water (during seasonal low stream flows) and/or components are otherwise inaccessible by wading and probing during routine inspections. **Any bridge with continually submerged timber or steel elements that may be difficult to tactically inspect below the waterline should be added to the UWI list.** For example, a timber pile may be in 3.5 feet of water with a soft or unstable bottom, hazardous wildlife, and/or the approach bottom is unstable or over 4.0 feet deep. Bridge elements that require an UWI will be noted under "Metric 17" notes in the *Structure Notes* section of the Routine Inspection report.

The scope of the Underwater inspection must be included in the Inspection Comment box when scheduling in InspectX. (Example: This Underwater Inspection was limited to Bents XX-XX.)

New bridges or replacement bridge UWI needs are generally determined during the initial inventory. However, in the event it is determined that a bridge meets the requirements to be added to the UWI list, an Initial UWI Request Form and the most recent streambed profile are to be submitted via email to the QA Bridge Inspection Engineer. Refer to Appendix A-7 for the Initial Underwater Inspection Request Form. Example wording for the email is as follows:

> *The subject bridge requires an underwater inspection due to [reasons the topside team can't inspect the entire bridge substructure or culvert]. I have attached the Initial Request Form as well as the most recent channel bed profile for your review.*

Justification for the UWI request may include water being consistently over 4 feet deep, culvert barrels being too full for safe access, or wading/probing being insufficient, in which case, the attempt at full inspection must be documented in the element notes.

An UWI is also required for submerged culvert structures that are inaccessible during routine inspections. Underwater inspections of culverts typically consist of a "complete" inspection; however, it will not be coded as a routine inspection, but only as an UWI under SNBI Item B.IR.03. These structures will be identified in the UWI list. See the culvert section below for further UWI details. The inspector is required to take streambed measurements per Section 3.1.10 along with offset soundings at distances of 25 and 50 feet upstream and downstream of the bridge fascia.

The typical underwater inspection is every 60 months. However, a 24-month inspection is required if any of the criteria in Table 4-6 are met with the exception of closed bridges. When a bridge is closed for replacement, it will be removed from the UWI list.

Table 4-5: Criteria for reduced underwater inspection intervals

SNBI Item	Name	Condition
B.C.15	Underwater Condition Rating	3 or less
B.C.09, B.C.10	Channel Condition Rating or Channel Protection Condition Rating	3 or less
B.C.11	Scour Condition Rating	3 or less

Certain bridges may qualify for an extended underwater inspection interval of 72 months per 23 CFR 650.311(b)(1)(iii).

Table 4-6: Criteria for extending the underwater inspection interval

SNBI Item	Name	Condition
B.C.15	Underwater Condition Rating	6 or greater
B.C.09, B.C.10	Channel Condition Rating or Channel Protection Condition Rating	6 or greater
B.C.11	Scour Condition Rating	6 or greater
B.AP.03	Scour Vulnerability	A or B

Bridges and submerged culverts with an Underwater Condition Rating (B.C.15) of 4 or less will require a Level III inspection.

Consultants who perform underwater bridge inspections (for the DOTD or Local Bridge Owners) will input inspection data directly in the inspection software. The consultant will list the team members' names in the inspection report. After the inspection is complete, the underwater inspection reports are to be submitted to the DOTD within 60 days of the underwater inspection date for final review and approval.

A routine UWI will consist of a minimum intensity level of 100% Level I and 10% Level II. If the routine UWI is not conclusive then a Level II or Level III effort will be applied, only with prior approval from the Headquarters Bridge Inspection Office. Refer to the BIRM for intensity levels for Underwater Inspections.

4.17.1 Submerged Culverts

A submerged culvert is any culvert with less than 18 inches of freeboard at the time of inspection or culverts longer than 100 feet with poor air circulation. For safety, submerged culverts often require a larger dive team to treat the operation as a penetration dive. The minimum geometric dimensions of a submerged single barrel/box culvert that a diver can safely access are ones with a width and height greater than 36 inches.

When completing an NBIS inspection of a culvert, the inspector should look for damage and distortion along the culvert walls, soffit, and floor while also noting any debris or aggradation that would reduce the hydraulic capacity of the culvert. Typically, deterioration is located along the waterline. Toe walls, aprons, and retaining walls will be inspected for vertical exposure and undermining.

4.18 RAILROAD/PEDESTRIAN

HQ maintains a list of under-records for Railroad and Pedestrian bridges throughout the state. A Railroad/Pedestrian inspection is performed to collect the required under-record information. Data collected includes the following, as applicable:

- Highway Maximum Usable Vertical Clearance (B.H.12)
- Highway Minimum Vertical Clearance (B.H.13)
- Highway Minimum Horizontal Clearance, Left (B.H.14)
- Highway Minimum Horizontal Clearance, Right (B.H.15)
- Highway Maximum Usable Surface Width (B.H.16)

SNBI data will be reviewed prior to each inspection and taken into the field to verify critical measurements.

4.19 NDE INSPECTIONS

DOTD has recently added the Nondestructive Evaluation inspection type to the inspection software. There is no mandatory inspection frequency, and this inspection type will generally be performed by consultants, as specialized training is often required. When appropriate, the nondestructive field-testing results should be documented in the bridge file.

The scope of the NDE inspection must be included in the Inspection Comment box when scheduling in InspectX. (Example: This NDE Inspection completed Pin and Hanger assembly testing.)

Following are examples of NDE inspection types by material:

4.19.1 Timber

Nondestructive evaluation methods for timber include:

- Probing with an awl, pick, or knife
- Sounding with a hammer
- Resistograph drilling

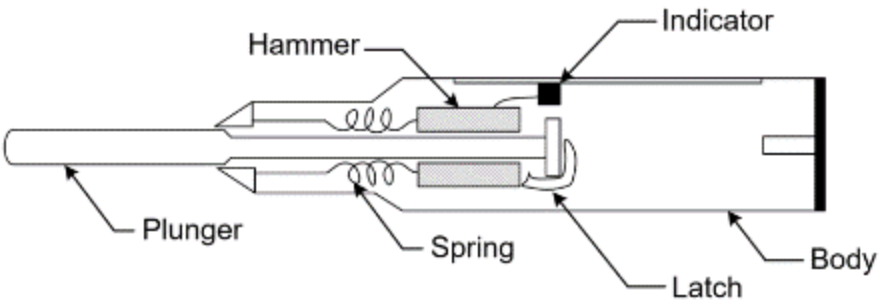
- Mechanical sonic pulse-velocity methods
- Moisture content meter

- Field ohmmeter
- Spectral analysis
- Increment borer

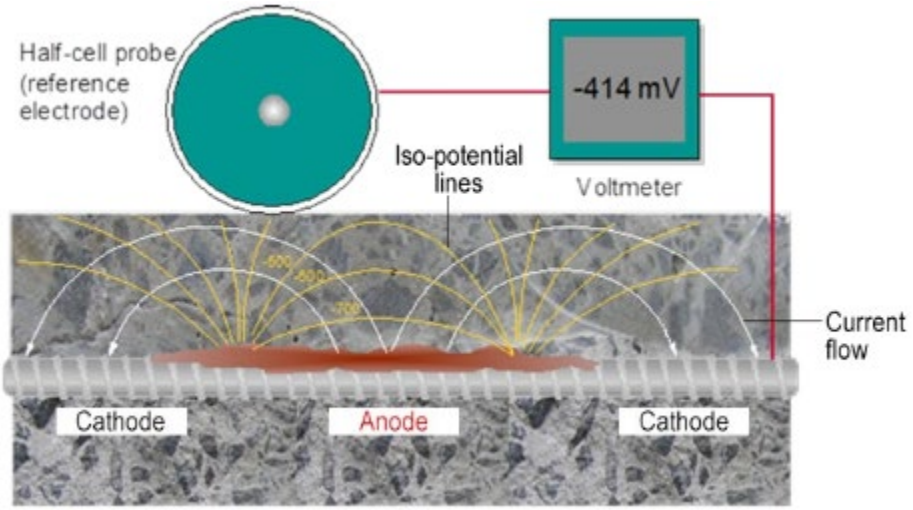
4.19.2 Concrete

Nondestructive evaluation methods for concrete include:

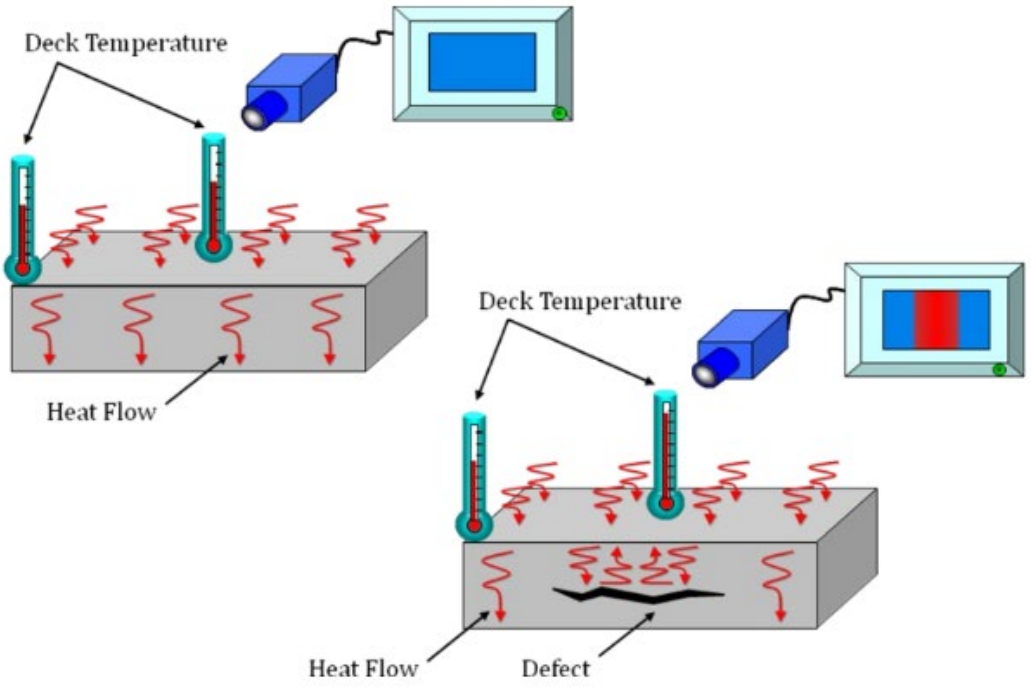
- Chain drags and hammers
- Schmidt Hammer and Windsor Probe for relative compressive strength



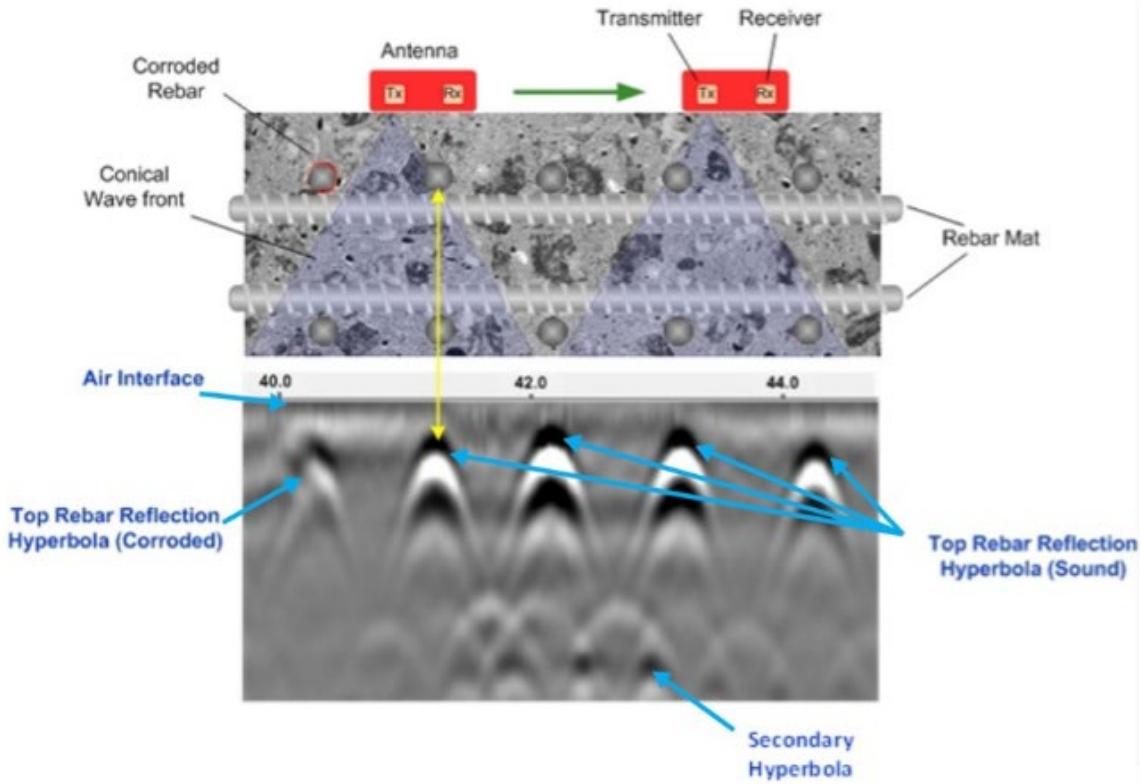
- Cover meters or pachometers or rebar locators
- Copper half-cell to measure corrosion potential



- Infrared thermography



- Ground-penetrating radar

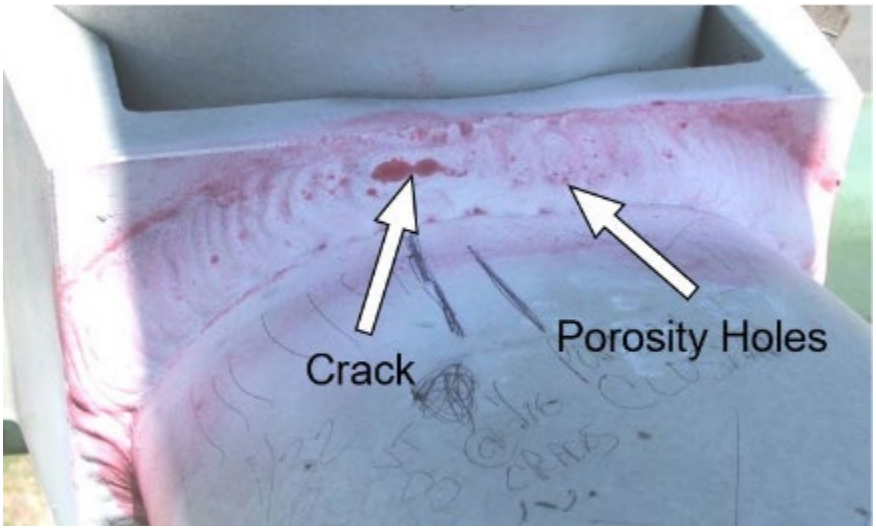


- Mechanical sonic pulse-velocity methods
- Piezoelectric transducer

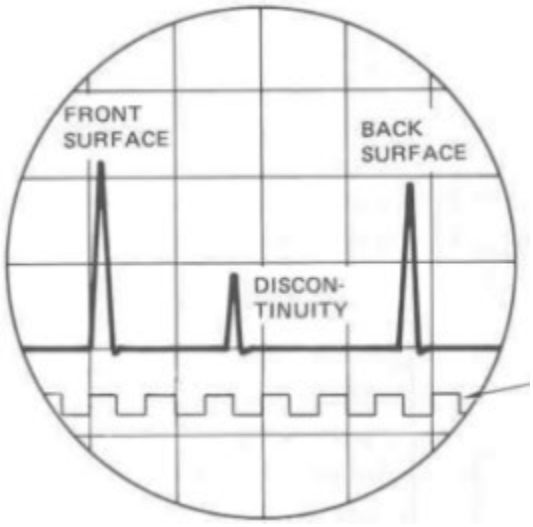
4.19.3 Steel

Nondestructive evaluation methods for steel include:

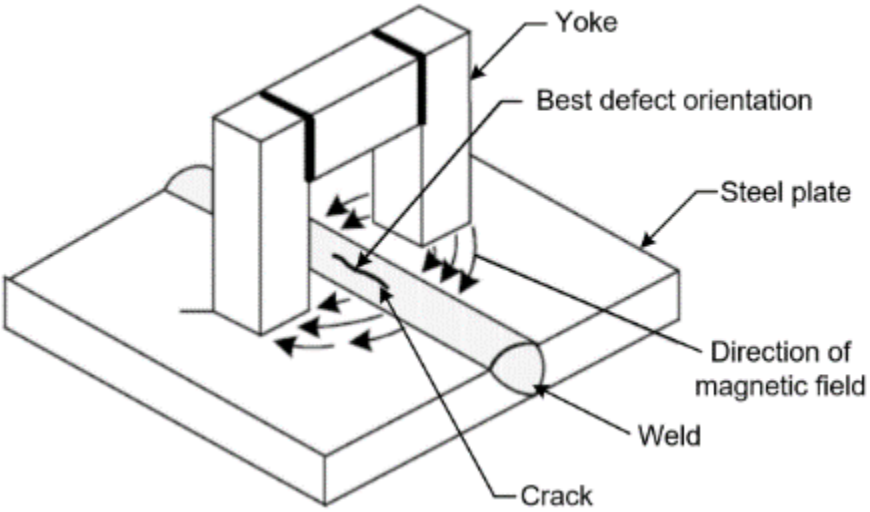
- Dye penetrant



- Ultrasonic testing

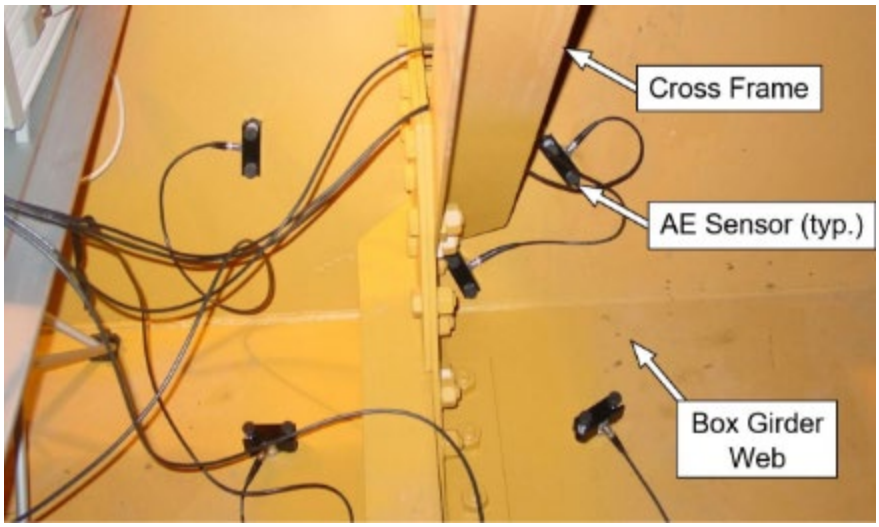


- Magnetic particle



- Eddy current

- Acoustic emissions testing



- Corrosion sensors
- Smart coatings
- Radiography testing
- Electrochemical fatigue sensor
- Laser vibrometer

Refer also to the *BIRM, Chapter 6*, and the *MBE, Chapter 5*, for further guidance.

Figure 4-4: UT on steel pile

5 Specialized Inspection Procedures

5.1 EMERGENCY RESPONSE

During or immediately after a major event (hurricane, flood, fire, etc.), a bridge may need to be inspected to ensure the bridge is still safe to remain open. Inspectors will be required to perform High Water Event (hurricane or flood), Damage (fire or bridge impact), or Special (Non-Recurring) (service inspection to document damage) inspections as part of a larger emergency response effort. These inspections should be performed as soon as it is safe to inspect the bridge, and ideally within a 72-hour window following any major event. If damage is found during these inspections, HQ must be notified, and Bridge Design may be required to perform a DDIR (Detailed Damage Inspection Report) for repairs to receive Federal Emergency Funding. If the damage constitutes a Critical Finding, Critical Finding procedures must be followed. (refer to Section 3.1.5)

5.2 TIMBER BRIDGES

When DOTD District Bridge Inspectors inspect a bridge containing timber spans, each timber span will be evaluated to determine:

- The consistency of the calculated load ratings (inventory, operating, and posting vehicle) with the currently observed condition of the structure,
- The presence of an up-to-date Timber Inspection Spreadsheet on file for that structure.
- HQ performs all timber load ratings for On-System bridges.

During each inspection, the DOTD inspector will ensure that the timber defects are documented properly with the location, type of defect, and appropriate dimension. When required, the load rating engineer will update the load rating based on inspection notes and sketches. DOTD and local bridge owners are responsible for reviewing these ratings and ensuring the bridges are properly weight-restricted, if necessary. DOTD or local bridge owners are also responsible for installing required weight limit signs by the minimum timeframe (refer to Section 3.1.9 and the LADOTD Off-System Bridge Inspection Manual for more information).

5.2.1 Timber Inspection Spreadsheet

For all timber bridges or bridges with timber spans, the district bridge inspectors must complete a Timber Inspection spreadsheet and submit it with the initial inspection report in InspectX.

As part of the field bridge inspection process for timber bridges, a copy of the Timber Inspection spreadsheet will be completed during the initial inspection or the next routine inspection if the structure has been modified. The inspector must fill out the spreadsheet with all span and bent information. The

information in the spreadsheet, along with detailed information on the size and severity of defects, will then be used by the load rating engineer to accurately rate the bridge.

Upon completion of the inspection, the Timber Inspection spreadsheet will be attached to and become part of the regular bridge inspection report for that bridge and submitted to the Headquarters Bridge Inspection Office through normal channels. It is the responsibility of the preliminary approver to make sure this spreadsheet is completed during the inspection.

5.3 RAILROADS

For bridges over a railroad with a vertical clearance of 25 feet or less, Inspectors will determine the minimum vertical clearance from the top of each rail to the underside of the lowest member of the superstructure. Each minimum vertical clearance documented will have an approximate location in relation to the bridge. Inspectors will produce a simple sketch showing a plan view of the bridge to locate all railroad tracks in relation to the bridge.

Notify the District Bridge Engineer at least ten (10) business days before work where any person or equipment will be within 25 feet horizontally or vertically of the railroad track. A railroad flagger may be necessary if the inspector needs to be within 25 feet of a railroad track. The railroad companies may provide the flaggers. The railroad companies may require inspectors entering a railroad right-of-way to complete Roadway Worker Protection Training. The District Bridge Engineer or Bridge Inspection Supervisor will coordinate with the appropriate Railroad Representative to determine the need for a flagman and any special protective safety measures.

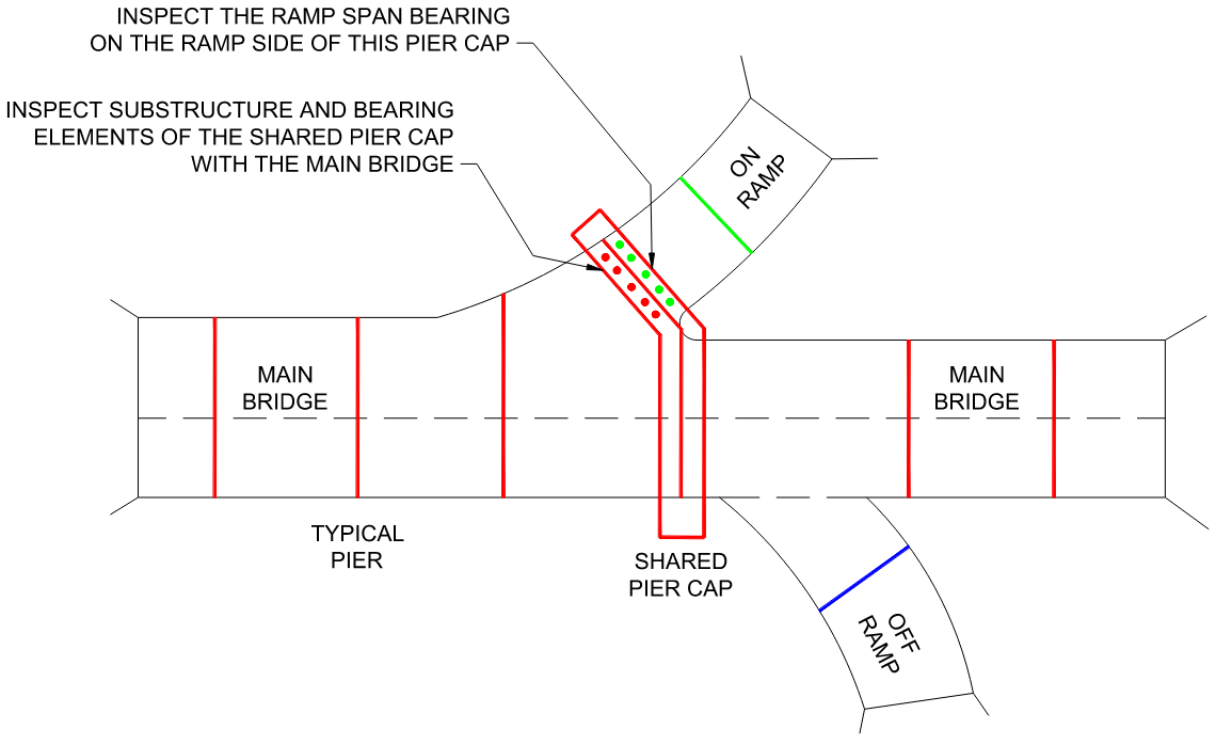
5.4 RAMP BRIDGES

A ramp bridge is a structure typically used to connect a mainline bridge with another road or structure. Ramp bridges are supported at one end by a mainline bridge and on the other end by an abutment. Refer to the Figure 5-1 sketch and example below that shows an example of “direction of inventories” for ramp bridges.

When the beginning or end of a ramp bridge is supported on a pier that also supports a part of a mainline bridge, the substructure elements at that location will be inspected and assessed with the mainline bridge. This is to include pedestals, cap beams, columns, footings, piles, etc. Deck joints at these locations are also to be assessed with the mainline structure. The only substructure elements to be assessed with the ramp structure at these locations are the bearings supporting the ramp.

If mainline substructure deficiencies adversely affect a ramp bridge, cross-referenced remarks on the mainline and ramp inspection reports are necessary.

Figure 5-1: Ramp bridges



5.5 BORDER BRIDGES

For all bridges that cross a border between Louisiana, Federal agency, or Tribal government jurisdiction, all entities must determine through a joint written agreement the responsibilities of each entity for that bridge under this subpart, including the designated lead State for reporting NBI data. An example of the Vicksburg bridge is shown below.

End Latitude	32.31124
End Longitude	-90.90096
B.L.11 Bridge Location	.1 MI EAST OF US 80
B.L.12 Metropolitan Planning Organization	N
B.L.07 Border Bridge Number	110002007500010
B.L.08 Border Bridge State or Country Code	MISSISSIPPI
B.L.09 Border Bridge Inspection Responsibility	Shared responsibility with bordering State or country
B.L.10 Border Bridge Designated Lead State	LOUISIANA

Figure 5-2: InspectX data for the Vicksburg Bridge between Louisiana and Mississippi

5.6 COMPLEX BRIDGES

Complex bridges currently include movable and cable-stayed bridges. Often, they require specialized inspection training for Team Leaders and individualized routine inspection procedures.

Consultant-led In-Depth Inspections of movable bridges must be performed in accordance with the AASHTO Movable Bridge Inspection, Evaluation, and Maintenance Manual. Movable bridges require the inspection of all electrical and mechanical components, in addition to the elements required by a regular routine inspection. Electrical and mechanical engineers should assist in movable bridge inspections; their names will be included in the inspection notes. Agency-defined elements have been assigned for movable bridge inspections and can be found in the DOTD Movable Bridge Manual.

Routine inspections for complex bridges in accordance with 23 CFR 650.313 (f) and Metric 19 that contain details or components requiring specialized equipment or evaluation techniques should annotate the required inspection process in the structure notes field in the inspection software. Each complex bridge must have the following minimum items noted within the “Structure Notes”:

- Identification of complex features or features with unusual characteristics
- Inspection methods, specialized inspection procedures, and frequencies
- Additional qualifications/experience required of inspection personnel and qualification/experience for specialized personnel assisting in the inspection
- Other procedure items that would assist an inspection team to ensure a successful inspection

In-depth inspections of complex bridges will be performed by consultant contract for major truss, cable-stayed, and movable bridges to supplement (not replace) the information in the routine inspection.

5.6.1 Movable Bridges

A movable bridge is defined as a bridge where a span can be moved by in-place mechanical or other means to allow for the passage of maritime traffic (boats or barges) per the proceedings of the *American Society of Civil Engineers (ASCE), Volume 33, Part 1, Page 154.* Louisiana has four types of movable

bridges in service across the state: bascule, vertical lift (table), swing, and pontoon. A bridge with a removable span that can be removed to allow access or passage and can be reset is not considered a movable bridge.

Movable structure inspections may involve an electrical and mechanical inspector or technical assistance. Generally, the inspection of mechanical and electrical components of movable bridges is beyond the scope of general bridge inspections, but structural components of movable spans must be inspected with the same intensity and frequency required for conventional bridges. Movable bridge electrical and mechanical components will be documented in the element rating data in the inspection software during routine inspections and consultant-led in-depth inspections.

Refer to the DOTD Movable Bridge Manual for more information on the DOTD's procedures for inspecting movable bridges.

5.6.2 Cable-Stayed Bridges

There are two cable-stayed bridges in Louisiana, the John James Audubon Bridge and Luling Hale Boggs Memorial Bridge. These cable-supported bridges require special inspection procedures (refer to Section 4.15) which should be routinely revised in accordance with recent inspection operations.

Cable-stayed bridges are sensitive to dynamic forces due to their flexibility and high stress levels in main load-carrying members. Dampening systems are used in the cables which should be inspected for deterioration and adequacy. Local and global vibrations of the cables induced by wind or other means should be observed and documented.

Cable-stayed bridges receiving a consultant-led in-depth inspection will require special attention to components such as cable stays, dampeners, anchorages, towers, and inspection travelers. Cable-stayed bridge components will be inspected in accordance with the Designer's Maintenance and Inspection Manual for that structure. Nondestructive testing will be performed as required on the cable stays to verify their condition.

5.7 POST-TENSIONED TENDON ELEMENTS

In post-tensioned members, the transfer of tendon tensile stress is accomplished by mechanical end anchorages and locking devices. Steel, stainless steel, and carbon fiber reinforced polymer rods or strands are common material that may be found in the field.

Figure 5-3: Post-tension ducts during construction

5.7.1 Segmental Box Girders

When inspecting segmental box girder bridges, the inspector needs to pay special attention to the following areas:

- **Tendon anchor blocks**
  Anchor blocks are where the tendons terminate. At these points, there are very large concentrated forces that have a tendency to crack the concrete if it is not adequately reinforced or if voids are present.

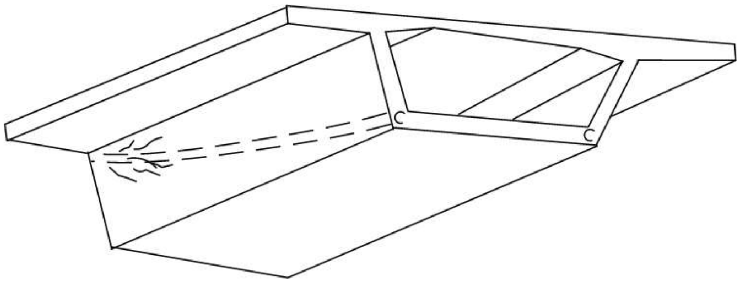


Figure 5-4: Web splitting at anchorage

- **Tendon deviation blocks**
  Deviation blocks allow the tendons to change direction or angle within the box girder. As with anchor blocks, deviation blocks have very high concentrated forces that can cause cracking if not properly reinforced or if voids are present.

Figure 5-5: Tendon deviation block

- **Internal diaphragms**
  Internal diaphragms are located at piers and abutments. The diaphragms stiffen the box section and distribute large bearing forces. These sections need to be examined closely for cracks and spalls. Cracks may be caused by improper reinforcement, internal voids, or differential settlement.

Figure 5-6: Internal diaphragm with tendon anchors

- **Joints**
  The joints of a segmental box girder need to be inspected for signs of cracking or movement of the shear keys or signs of water leakage.

5.7.2 Transverse Tie-Rods

Precast concrete slab units may be post-tensioned together with tie rods to enable them to act monolithically. Cracked grout or rust staining may indicate a failure of the post-tensioning rod or loss of monolithic action. DOTD records all transverse tie-rods as Agency Defined Elements in the inspection software. Each tie-rod defect will be recorded with a defect unit of sqft (1 FT wide per tie rod x bridge out to out width) applied to the concrete slab element.

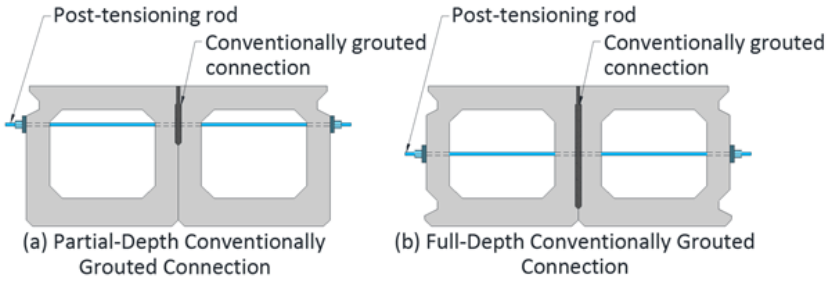


Figure 5-7: Transverse post-tensioned tie-rods

5.7.3 External Post-Tension Repairs

Figure 5-8: External post-tensioned concrete bridge

5.8 GUSSET PLATES

The FHWA released a technical advisory on January 29, 2010, noting the importance of proper gusset plate inspections following the collapse of the I-35W bridge over the Mississippi River. Ultrasonic testing will be performed by trained technicians when significant corrosion is evident. The training level will be appropriate to the complexity level of the connection.

Typical areas of deterioration include pockets that hold debris and moisture. Debris should be removed to facilitate inspection. Pack rust can also occur between plates of built-up members and cause large internal forces. If buckling or cracking is evident, properly document the defect with narrative, sketches, and photographs. These types of defects are to be considered Critical Findings and the District Bridge Engineer must be contacted immediately. Refer to Section 3.1.4 for communicating critical findings.

5.9 ACCESS AND TECHNOLOGY

The size and configuration of a bridge can present difficulties when accessing each component to perform a complete inspection. In such cases, inspectors should record appropriate access guidance in the inspection comments. These notes may include special procedures, personnel coordination, safety concerns, and optimum periods of the year to inspect the bridge. Within the inspection software, the Inspection Equipment field (B.IE.12) should be filled out with the equipment required to complete the inspection.

All field personnel must be properly trained and able to work at heights, on ladders, and on aerial lifts. Inspectors shall follow the DOTD's Loss Prevention Safety Manual referenced in Section 3.

All underwater bridge inspections are contracted out to consultants who are ADCI-certified commercial divers. Consultants should prepare JSAs and operate under OSHA standards for all activities. Divers must be capable of working within tolerable limits of underwater hazards.

Culverts that are long, submerged, or present unusual problems in obtaining barrel measurements may need to be evaluated differently. Culverts can be considered confined spaces if they are over 100 feet long with limited ventilation, several bends, or intersecting laterals large enough for occupancy. Refer to Section 4.16 for further inspection protocol of culverts.

5.9.1 Drones

Unmanned aerial vehicles (UAV), commonly referred to as drones, provide an excellent access option in certain situations. While drones can enhance bridge inspections, they cannot replace the inspector. The Headquarters Bridge Inspection Office or the District Bridge Engineer must approve drone use on a bridge inspection. All DOTD pilots must adhere to the DOTD UAV and Bridge Maintenance UAS SOP manuals.

Some common uses for drones include the following:

- Inspecting components that would otherwise require special access.
- Collecting inventory photos from better vantage points.

- Inspecting decks and joints on roads with high traffic volume while reducing the risk to inspectors.
- Creating high resolution orthomosaic images of bridge features like the deck or superstructure to provide a better overall assessment of the bridge. This can also aid in providing more accurate quantity take-offs.

Only FAA-certified pilots on the DOTD's Aircraft Fleet Command Pilot's list are authorized to fly drones. Before their first flight, pilots must sign the DOTD's document acknowledging they have read and will adhere to the SOPs.

All aircraft must be certified and registered by the FAA for commercial use. The visual observer must always maintain a visual line of sight with the aircraft during the flight. Drones cannot be operated within 5 miles of an airport without prior authorization. Exemptions from standard rules can take several months to receive FAA approval.

DOTD is currently testing drone capabilities on selected bridge sites to identify the advantages and disadvantages of drones in bridge inspection. The overall value of using drones differs at each bridge site. It is generally determined by the structural configuration, type of inspection, traffic flow priorities, safety considerations, environmental conditions, structural capacity, and cost comparisons of alternative methods.

All DOTD employees who are FAA-certified UAS pilots must have a signed document on file acknowledging that they have read and will adhere to the DOTD's drone SOPs and be placed on the Aircraft Fleet Command Pilot's list.

5.9.2 Rope Access

Rope access is an acceptable way to access elements on a bridge, particularly for NSTM and in-depth inspection types requiring a "hands-on" inspection. Bridge inspectors must have specialized training prior to utilizing rope access techniques on bridge inspection. The Society of Professional Rope Access Technicians (SPRAT) has developed standards that will be observed during operations.

Advantages of using rope access techniques include:

- Safe mobility of the inspector for best positioning at any location on a bridge,
- No (or minimal) impact on the traveling public,
- Alternative to using under-bridge inspection vehicles for bridges with weight limit restrictions.

Figure 5-9: Bridge inspection with rope access

5.9.3 Underwater Acoustic Imaging

Many of Louisiana's bridges are over large waterways, several with high flow velocities, over 50 ft deep, zero visibility, and significant timber debris buildup. High-resolution underwater acoustic imaging (UAI) has proven to be a viable method to augment these underwater inspections with commercial divers. UAI services will be contracted to consultants through the HQ on an as-needed basis with FHWA approval.

UAI technology should be considered when overcoming the following conditions:

- Extreme depths
- Significant flow velocities
- Limited visibility
- Potential debris buildup
- High volumes of vessel traffic
- Scour, undermining, and other channel stability concerns
- To verify as-built drawings, monitor construction activities, or document post-construction repairs
- Expedited damage assessments such as vessel impacts or flood events
- Security threat assessments

Limitations of UAI technology should also be considered:

- The technology and the methodology can limit the size range of detectable deficiencies.
- When attempting to detect the depth of a void or depth of undermining, it is often difficult or inaccurate.
- Operator proficiency and experience are vital for data interpretation and the overall work quality.
- Observation of deficiencies will be limited to a Level I inspection only.

- Soil compensation data and penetration depths around the foundation will be missing without divers.
- Refilled scour holes cannot be detected with sonar technology. Geophysical sub-bottom profiles will be needed to determine variations in channel bed densities.

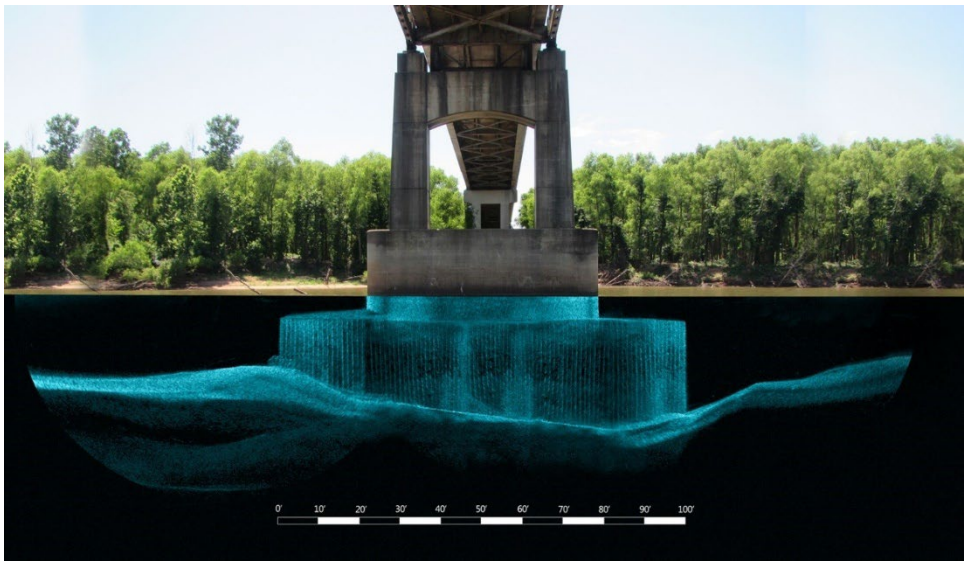


Figure 5-10: Example of 2D underwater acoustic imaging

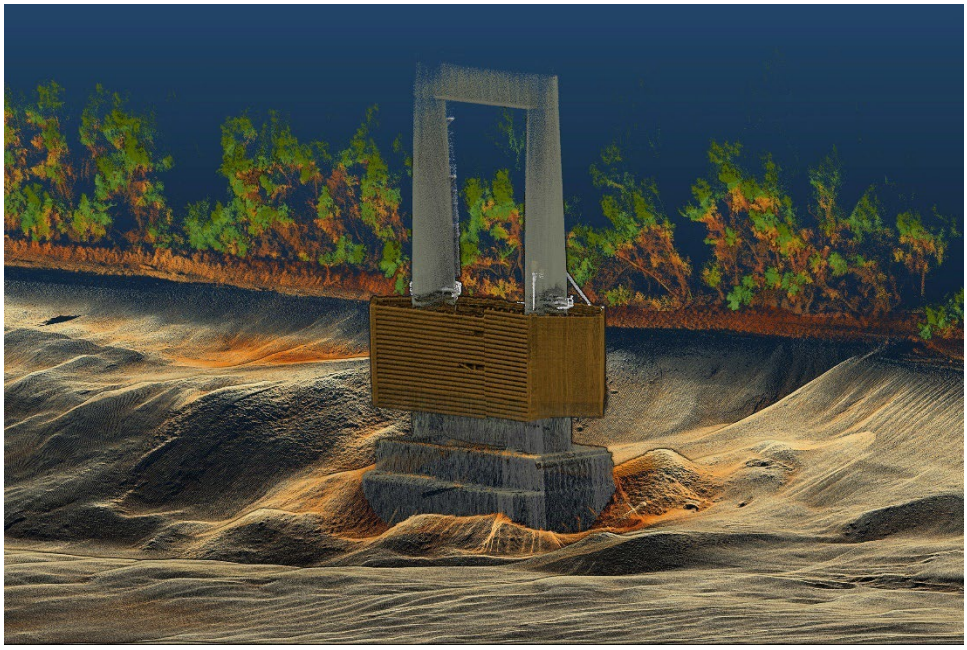


Figure 5-11: Example of 3D underwater acoustic imaging

6 Quality Control / Quality Assurance

Figure 6-1: "Field" review of bridge inspection

6.1 PROGRAM OVERVIEW

Systematic quality control (QC) and quality assurance (QA) procedures are used to maintain a high degree of accuracy and consistency in the inspection program.

FHWA defines QC/QA procedures to include periodic field review of inspection teams, periodic refresher training requirements, and independent review of inspection reports and computations.

DOTD's QC/QA program consists of the following:

- Review and approval of all inspection reports by 2 levels of engineers, minimum
- Independent Field reviews of select bridges by certified Team Leaders who are technical experts in quality control
- Field Reviews of Inspection teams by HQ-QA including joint inspections
- Independent office reviews
- An action plan if deficiencies are identified in the review process.
- Verification of team leader training and Refresher training requirements

The DOTD's policy requires all consultants to submit their own QC/QA plans to HQ for review.

6.1.1 Quality Control

The QC program is used to maintain a high degree of accuracy and consistency within the Bridge Inspection Program. It is also used to evaluate and communicate directly with staff about any assessment made of their work. The District Bridge Engineer, District Inspection Engineer, and QC inspector perform the quality control at the district level. The District Bridge Engineer and District Inspection Engineer review every bridge inspection report for accuracy and compliance in the InspectX workflow feature. The QC report review checks for:

- Consistency with the SNBI ratings
- Consistency with Bridge Inspection policies
- Sufficient documentation and photographs

Peer Rotation for Quality Control

The rotation of NBIS-qualified inspection Team Leaders is a statewide DOTD policy for all On-System and Off-System bridges that are in the National Bridge Inventory. Every full routine inspection should have a different Team Leader than the previous routine inspection.

The District Bridge Engineer ensures proper hands-on training for all inspectors by rotating bridge inspections properly, resulting in a blend of On- and Off-System bridges.

QC Review Procedures

QC reviewer's (Preliminary and Final Review) functions for each bridge inspection are delegated to the Districts who conducted the inspection, and typically include:

- Correlation and accuracy between SNBI condition ratings, element quantities, and condition states
- Completeness and accuracy of inventory photographs, defect photos, defect notes, etc. (Refer to Appendix A-6 for examples of proper notes)
- Qualifications of personnel
- Consistency with Bridge Inspection policies

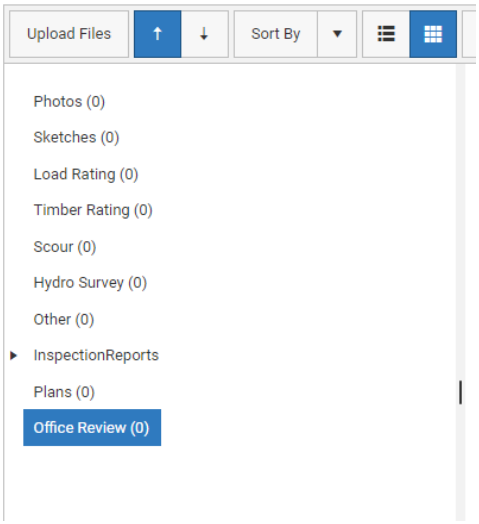
The QC Inspector in each district is responsible for:

- 10 independent field reviews each month (with exception of the UBIT months) and
- 20 office reviews each month.

The field reviews are to be selected from routine inspections due within the 90-day approval window. At least 50% of the field inspection reviews are to be conducted as independent, full routine inspections, including quantities, assigned to the QC inspector by the District Bridge Engineer. The remaining 50% can be independent special inspections but must verify at least 1 structural element (condition, quantity, accuracy of notes, and CS quantities with overall condition).

The purpose of the office review is to ensure that the quality of the process is maintained by confirming that there is a relationship between the field documentation and the condition ratings in the report. The reviewer is to ensure completeness and adherence to State and FHWA requirements regarding procedures, guidelines, and training. The office reviews (attach new form to appendix) should focus on proper documentation (photos, notes, CS levels, consistency of CS % to overall condition rating) of fair/poor condition structures. A minimum of 75% shall have a deck, superstructure, or substructure condition state between 2-5.

All QC office reviews will be uploaded into the InspectX Office Review folder (as shown in the screenshot below) and saved in the Inspection Documents network drive.



Resolution of errors for QC

To maintain the validity and integrity of the bridge inspection report, all changes that occur after the original inspection is complete will be thoroughly documented in the QC Office Review Report and the record maintained. All changes will be made by either the Team Leader or by the Quality Control Inspector.

6.1.2 Quality Assurance

The Headquarters Bridge Inspection Office performs and manages the quality assurance program.

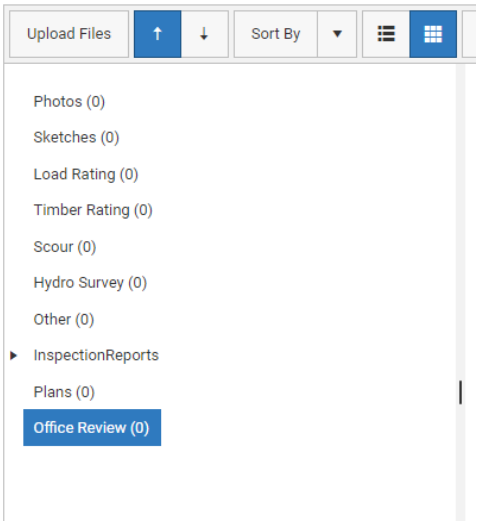
The QA reviews consist of:

- Office review of inspection reports
- Verification of current qualifications and training of inspection personnel
- Field review of selected bridges
- Check for implementation of corrective measures and follow-up procedures

Office Review of Inspection Reports

Similar to QC, the QA Inspectors also perform a minimum of 20 office reviews each month. The purpose of the office review is to ensure that the quality of the process is maintained by confirming that there is a relationship between the field documentation and the condition ratings in the report. The office reviews (DOTD internal Bridge Maintenance website) should focus on proper documentation (photos, notes, CS levels, consistency of CS % to overall condition rating) of fair/poor condition structures.

All QA office reviews will be uploaded into the InspectX Office Review folder (as shown in the screenshot below) and saved in the Inspection Documents network drive.



All NSTM inspection reports performed by all Districts in a calendar year will undergo an office review by an NBIS qualified Team Leader from Headquarters Bridge Inspection Office.

An NBIS-qualified team leader from HQ Bridge Inspection Office will review all SNBI data submitted by each district through the District Inventory Update inspection type.

Verification of current qualifications and training of inspection personnel

Verifying inspector qualifications is a key element to maintaining compliance with the NBIS. The Headquarters Bridge Inspection Office maintains a list of certifications for all inspection personnel.

Field Review of Selected Bridges

The QA Engineer will determine the number of independent field reviews to be conducted within any given year. These reports are to be randomly selected from approved reports that have gone through the quality control process. These field reviews are used to evaluate the quality and consistency of the data produced from the inspections.

In addition to the independent field review, the QA Engineer will determine the number of joint field inspections to be conducted within a given year. These inspections are to be conducted with district personnel to train district inspectors on proper documentation and SNBI data collection.

Review of Bridge Files

A centralized reporting system called InspectX is used to maintain all bridge files and inspectors' records. Inventory and routine error reports are run monthly to flag conflicts in the database. The HQ-QA staff performs the error checks and sends to each District as needed. The error checks consist of running filters in the InspectX Inspection tab comparing Inspection Date to Inspection Status. If the status is not "Approved" and the Inspection Date is over 75 days old, an e-mail is sent to the approvers/district inspection engineers.

Monthly Error checks consist of:

- Routine and Interim frequency,
- overdue reports,
- overdue approvals, and
- load postings.

Other Frequency Error checks are as follows:

- Federal data review is run quarterly to check for errors in the NBI data.
- Off-System inventory data is checked bi-annually. (See Off-System manual for more information)
- Inspectors' qualifications are verified annually for all bridge inspectors in accordance with NBIS standards.

7 References

7.1 PRIMARY STANDARDS, MANUALS, AND TECHNICAL ADVISORIES

- FHWA, *National Bridge Inspection Standard*, CFR 23 - Highways Part 650 Subpart C
- AASHTO, *Manual for Bridge Evaluation*
- AASHTO, *Manual for Bridge Element Inspection*
- AASHTO, *LRFD Bridge Design Specification*
- AASHTO, *Movable Bridge Inspection, Evaluation & Maintenance Manual*
- DOTD, *Movable Bridge Manual*
- DOTD, EDSM No. III.2.5.6, *Movable Bridges – Design, Construction and Maintenance Training Requirements*, March 26, 1978
- DOTD, *SNBI Coding and Field Guide*
- DOTD, *Loss Prevention Safety Manual*
- DOTD, Temporary Traffic Control
- DOTD, Use of Weight Limit Signs
- DOTD, UAV SOP
- DOTD, Bridge Maintenance UAS SOP
- FHWA, *Bridge Inspector's Reference Manual* (BIRM) (2022 NBIS) - FHWA-NHI-23-024
- FHWA, *Inspection of Nonredundant Steel Tension Members*, May 2022
- FHWA, *NBIS Oversight Program: Metrics for the Oversight of the National Bridge Inspection Program*
- FHWA, *Specifications for the National Bridge Inventory*, March 2022 and all updates
- FHWA, *Underwater Bridge Inspection*, Publication No. FHWA-NHI-10-027, and all updates:
- FHWA, *Evaluating Scour at Bridges 5th Edition Hydraulic Engineering Circular 18*, FHWA-HIF-12-003, April 2012
- FHWA, *Inspection of Gusset Plates Using Non-Destructive Evaluation Technologies Technical Advisory*, January 29, 2010
- FHWA, *Manual of Uniform Traffic Control Devices for Streets and Highways (*23 CFR 655)

7.2 PERIPHERAL STANDARDS, MANUALS, AND TECHNICAL ADVISORIES

- AASHTO, Policy on Geometric Design of Highways and Streets, 7th Edition
- FHWA, *Culvert Inspection Manual*, Report No. FHWA-IP-86-2, 1986
- FHWA, *The Bridge Inspector's Manual for Movable Bridges*, 1977
- FHWA, *Bridge Load Ratings for the National Bridge Inventory*, October 30, 2006
- FHWA, *Development of Phased-Array Ultrasonic Testing Acceptability Criteria (Phase I)*, October 2014
- FHWA, *Development of Phased-Array Ultrasonic Testing Acceptability Criteria (Phase II)*, October 2014
- NCHRP, *Guideline for Implementing Quality Control and Quality Assurance for Bridge Inspection*, June 2009
- DOTD, *Test Procedures Manual*
- DOTD, *Location and Survey Manual*, April 1, 1987
- DOTD, *Roadway Design Procedures and Details Manual*, March 2009
- DOTD, *2011 Hydraulics Manual*
- DOTD, *Standard Specifications for Roads and Bridges Manual*, 2016 Edition
- DOTD, *Traffic Signal Design Manual*, Version 2.0
- DOTD, *Mud Sill Use Guidance Memorandum*, October 24, 2013
- DOTD, *Materials Sampling Manual*, 2016
- DOTD, *Bridge Design and Evaluation Manual* (BDEM)
- DOTD, *BDTM's*
- NCHRP, *Synthesis 375: Bridge Inspection Practices*
- 29 CFR 1910 Occupational Safety and Health Standards
- 29 CFR 1926 Safety and Health Regulations for Construction
- *Nondestructive Testing and Evaluation of Steel Bridges, James Bader, 2008*
- USDA, Forest Service, *Timber Bridges; Design, Construction, Inspection and Maintenance*, 1990

8 Appendix

A-1: Add and Delete Bridges Worksheet

A-2: Bridge Type Codes

A-3: Phase 1 Scour Assessment Form

A-4: Scour Highwater Inspection

A-5: Mud Sill Use Guidance

A-6: Examples of Good/Bad Element Notes

A-7: Flowchart for Critical Finding and Bridge Closure Procedures

A-8: Parts of a Bridge

A-1: Add and Delete Bridges Worksheet

ADD/DELETE

DIST. _____

OFF PARISH _____

ON/OFF _____

ROUTE _____

FEATURE CROSSED _____

NEW LATITUDE _____

NEW LONGITUDE _____

PROJECT # _____

NO

ADD _____ YES/NO

NEW RECALL # _____

BRIDGE TYPE _____

LENGTH _____

NO

DELETE _____ YES/NO

YES

EXISTING RECALL # _____

STRUCTURE # _____

BRIDGE TYPE _____

LENGTH _____

UNDERWATER NEEDED _____

HYDROGRAPHIC NEEDED _____

PROJECT NAME _____

REMARKS :

_____ Date

_____ Completed By

Rev. 11/12/2024

A-2: Bridge Type Codes

Rev. 8/27/2024

LADOTD Bridge Types

	NAME	DESCRIPTION
Timber Spans	TTTRES	Treated Timber Trestles
	TTTCOF	Treated Timber Trestles (w/ Concrete Deck)
	TTTLAM	Treated Timber Trestles (w/ Laminated Deck and/or Stringers)
Timber & Steel Spans	CIBTTF	Timber Trestle w/ I-Beam Stringers (w/ Timber Deck)
	CIBTCF	Timber Trestle w/ I-Beam Stringers (w/ Concrete Deck)
Concrete Girder/Slab Spans	COSLAB	Concrete Slab
	LWSLAB	Lightweight Concrete Slab
	CNTSLB	Concrete Slab - Continuous
	COPCSS	Concrete Precast Slab Units
	LWPCSS	Lightweight Concrete Precast Slab Units
	COCHAN	Concrete Channel Units
	COVSLB	Concrete Voided Slab
	CODEKG	Concrete Deck Girder
	CNTCDG	Concrete Deck Girder - Continuous
	COPSGR	Concrete Prestressed Girders
	CCPSGR	Concrete Prestressed Girders - Continuous
	COBXGR	Concrete Box Girder
	CBXSEG	Concrete Box Girder - Segmental
Movable Spans	TRSWNG	Truss Swing Span
	PGSWNG	Steel Plate Girder Swing Span
	TRBASC	Steel Truss Bascule Span
	PGBASC	Steel Plate Girder Bascule Span
	STVERT	Steel Tower Vertical Lift Span
	COVERT	Concrete Tower Vertical Lift Span
	PONTON	Pontoon Bridge
Culverts	BOXCLV	Box Culvert(s)
(Over 20ft total opening)	FRACLV	Frame Culvert(s)
	ARCCLV	Arch Culvert(s)
	PIPCLV	Pipe Culvert(s)
Steel Girder Spans	STSIBM	Steel I-Beam (Simple Span)
	STCIBM	Steel I-Beam - Continuous
	STPLGR	Steel Girder (w/ Floor Beams or Pin & Hanger)
	STCUGR	Steel Curved Girder
	STBXGR	Steel Box Girder
	STCUBX	Steel Curved Box Girder
	STCAGR	Cable Stayed
Truss Spans	STHITR	Steel Simple Through Truss
	STCANT	Steel Cantilevered Through Truss
	STPONY	Steel Pony Truss
	STDKTR	Steel Deck Truss
Miscellaneous Structures	FERRYT	Ferry - Toll
	RRFLCR	Railroad Flat Car
	PEDXNG	Pedestrian Walkway
	BAILEY	Bailey, ACRO, or other "Portable Army Type" Bridging

A-3: Phase 1 Scour Assessment Form

S.P. No: FAP. No: Date:	**PHASE 1** **SCOUR ASSESSMENT OF BRIDGES OVER WATERWAYS**	DISTRICT: PARISH: RECALL. No.:

Stream Name: **Route:**

SNBI Item B.AP.03 Worksheet

☐ Unknown Foundation, Code (D) Pile Length

☐ Bridge Not Over Water (N) Min, pile penetration %

☐ Scour Stable (A) ☐ Bridge Designed for Scour: See plans, Project #

- ☐ Min. pile penetration of 50%, 20-ft minimum (drainage area < 10-sq mi)
- ☐ Min. pile penetration of 50%, 25-ft minimum (10-sq mi < drainage area < 25-sq mi)
- ☐ Min. pile penetration of 50%, 30-ft min; (25-sq mi < drainage area < 100-sq mi)
- ☐ Engineering Judgment* (See Notes/Report)
  *Not valid for new bridges
  - ☐ Drainage area <= 2-sq mi
  - ☐ No history of scour (from available records)
  - ☐ Bridge service life >= 20-yrs
  - ☐ Not on Interstate/NHS Route
  - ☐ No significant signs of lateral/vertical instability

☐ Scour Susceptible (D), Bridge is or may become Scour Critical

- ☐ Pile penetration less than 50%
- ☐ Pile penetration less than 20-ft (drainage area < 10-sq mi)
- ☐ Pile penetration less than 25-ft (drainage area > 10-sq mi)
- ☐ Pile penetration less than 30-ft (25-sq mi < drainage area < 100-sq mi)
- ☐ Drainage area greater than 100-sq mi

☐ Scour Critical with Temporary (not designed) Countermeasures (C)

Phase I SNBI Item B.AP.03 Rating

Notes:

A-4: Scour Highwater Inspection

STATE OF LOUISIANA
DEPARTMENT OF TRANSPORTATION AND DEVELOPMENT
SCOUR/HIGH WATER INSPECTION REPORT

Rev. 08/2024

Recall# ______________ **District:** ______________

Parish: ______________________________

Circle **On / Off**

Side of structure LEFT OR RIGHT

Reference Point ______________

Correction (Ft) ______________

Water Level (Ft) ______________

Bent No.	Distance from beginning of structure	Current Streambed Measurement Upstream

Active Scour : YES or NO
(Including Abutments & Approach Rdwy) (If yes, explain in notes)

Debris : YES or NO
(If yes, explain in notes)

Damage: YES or NO
If yes, Fill out Survey123

Hydrographc Survey Required : YES or NO

Overtopping : YES or NO

Concrete Lined: YES or NO

Notes: ______________________________

Photos Taken : YES or NO ______________

Further Review Needed : YES or NO ______________

Inspected By : ______________
(Full Name) ______________

Date : ______________

A-5: Mud Sill Use Guidance

DOTD
LOUISIANA DEPARTMENT OF TRANSPORTATION & DEVELOPMENT

DEPARTMENT OF TRANSPORTATION AND DEVELOPMENT

INTRADEPARTMENTAL CORRESPONDENCE

REFERRED TO

_____
_____
_____

_____ REFERRED FOR ACTION
_____ ANSWER FOR MY SIGNATURE
_____ FOR FILE
_____ FOR YOUR INFORMATION
_____ FOR SIGNATURE
_____ RETURN TO ME
_____ PLEASE SEE ME
_____ PLEASE TELEPHONE ME
_____ FOR APPROVAL
_____ PLEASE ADVISE ME
_____ _____

BY _____ DATE _____
BY _____ DATE _____
BY _____ DATE _____

MEMORANDUM

TO: DISTRICT BRIDGE INSPECTION OFFICES

FROM: DAVID MILLER, P.E. David H. Miller

DATE: OCTORBER 24, 2013

SUBJECT: MUD SILLS

As bridges come up for their routine inspection or bridge rating, the use of existing mud sills should be evaluated for consistency with the guidance from this memorandum.

Because of the uncertainty in calculating the capacity of mud sills, their use will be phased out over time and should only be used as a last resort on temporary repairs not to exceed 12 months. There are many repair methods that function better and can be backed up with engineering data to support the repair methodology.

Criteria for use of mud sill are listed below:

- Heights of 5 feet or less
- If inundated do not use
- Should not be used on scour susceptible waterways
- Full bearing between the cap and the ground
- Mud sill usage should be limited to abutments. They should also be limited to portions of the abutment and not the entire abutment.

If there are extenuating circumstances that arise that are not covered in the memorandum, please contact the Section 51 office for further guidance.

cc: Vince Latino

_____ _____
RECOMMENDED FOR APPROVAL DATE

_____ _____
RECOMMENDED FOR APPROVAL DATE

_____ _____
RECOMMENDED FOR APPROVAL DATE

_____ _____
APPROVED DATE

A-6: Examples of Good/Bad Element Notes

Bad Description	Good Description
Bottom of deck has cracks, delaminations, and spalls with exposed corroding rebar along panel joints and throughout deck area. QA Comments: Add Dimensions of spalls and corrosion Defect, Condition state, and quantity to the end of comment	Bottom of deck in Span 1 has cracks and delaminations up to 12” diameter along a spall approximately 3’ L x 6” W x 2” D with exposed rebar having approximately 10% section loss (1090, CS3, 1.5 SF).

Bad Description	Good Description
Panel 6, left side is spalled. (77" x 13" x 4") with 120" of # 8 rebar with 1/8" section loss. QA Comments: Great! Very Descriptive, just add location, Defect, Condition State, and quantity to the end of comment.	Span 3, Panel 6, left side has a spall at midspan, 77" L x 13" W x 4" D with 120" of #8 rebar with 1/8" section loss (1090, CS4, 7 SF).

Bad Description	Good Description
Both spans are longitudinally cracked with efflorescence. QA Comments: Add crack width measurement, approximate spacing (or number), and Defect, Condition State, and quantity to end of comment.	Both spans have 3 full-length, longitudinal cracks less than 0.012” with light efflorescence (1120, CS2, 40 SF).

Bad Description	Good Description
The piles are in fair condition with protective paint system failure in the bottom 10" to 12", with up to 1/16" section loss present. QA Comments: Great job, just add Defect, Condition State, and quantity!	The piles are in fair condition with protective paint system failure in the bottom 10" to 12", with up to 1/16" section loss present (1000, CS3, 20 LF).

Bad Description	Good Description
Helper piles and caps have corrosion. QA Comments: Needs improvement. Add dimensions of corrosion, pile number and location. Add Defect, Condition State, and quantity to the end of the comment.	Helper Piles 1 - 4 at Bent 2 have flaking corrosion with up to 3/16” section loss on the flanges and webs extending 12” down from the cap (1000, CS3, 4 LF). Bent 2 Cap beam has corrosion with up to 3/16” section loss on the flanges and 1/8” section loss on the web, extending 24” at all 4 pile to cap connections (1000, CS3, 8 LF).

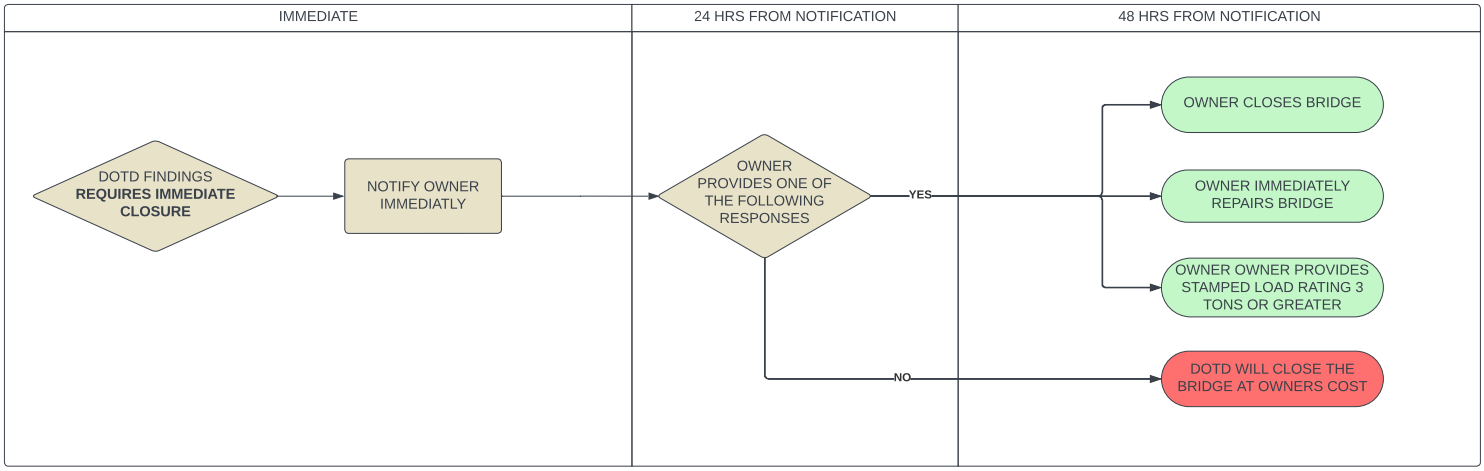
Bad Description	Good Description
Girders 5 and 6, which are the center girders, have heavy corrosion with section loss to the webs and bottom flanges. This is caused by the joints being unsealed at the median. The open joints are allowing debris to accumulate on the caps and around the bearings and girders. QA Comments: Add more dimensions. Add Defect, Condition State, and quantity. Get away from paragraphs, use bulleted list instead	Span 1, Girders 5 and 6 - Heavy corrosion with 100% section loss at the bottom of the web 12” L x 3” H located at Abutment 1 (1000, CS3, 1 LF). - Corrosion appears to be accelerated by open joints at Abutment 1 and Pier 2 above the girders allowing debris and water to accumulate.

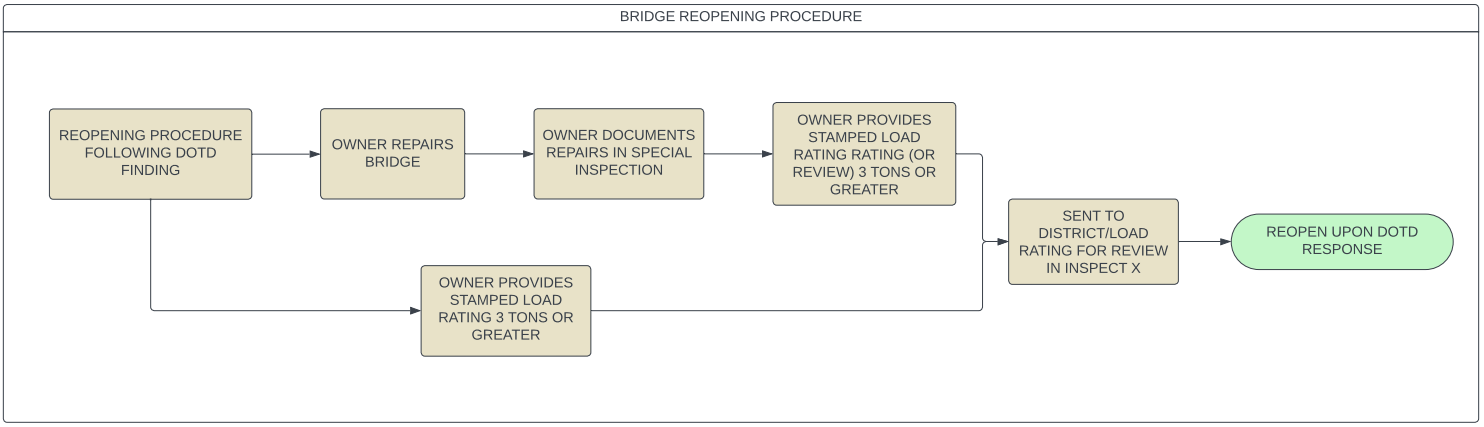
Bad Description	Good Description
Pile 1 (CS 3) - has 4'' outer shell decay (41'' circ.). This needs to be repaired. QA Comments: Nice Comment! Add Dimension of decay area, Defect, and quantity.	Pile 1 at Bent 3 - Decay 8” H x 6” W X 4” D (1140, CS3, 1 EA). - The original circumference of the pile is 41”.

Bad description	Good Description
Span #8 - Timber girder #6 broken mid-span 5' in length. QA comments: Add Defect, Condition State, and quantity	Span 8 - Timber Girder 6 has a 5’ L fracture at mid-span (1160, CS4, 25 LF). - This condition has been referred to Load Ratings for review.

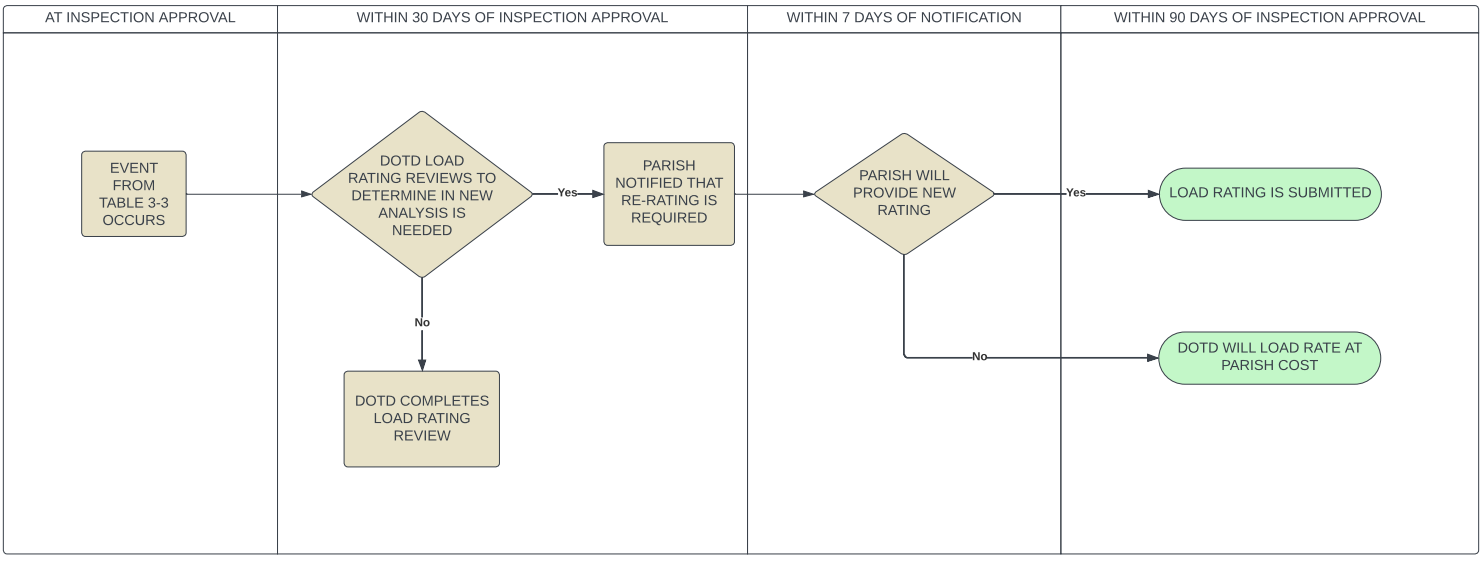
Bad Description	Good Description
Girder 9, Span 1, has a 4'L x 3"W x 3"D loss of section on bottom, also a 3'L x 3"W x 2"D loss of section on bottom. QA Comments: Add locations, Defect, Condition State, and quantity.	Girder 9, Span 1: - 4'L x 3"W x 3"D loss of section on bottom, near bearing w/ cap at Abutment 1 (1140, CS4, 4 LF) - 3'L x 3"W x 2"D loss of section on bottom near midspan (CS3). (1140, CS4, 3 LF) - These conditions have been referred to Load Ratings for review.

A-7: Flowchart for critical finding and bridge closure procedures

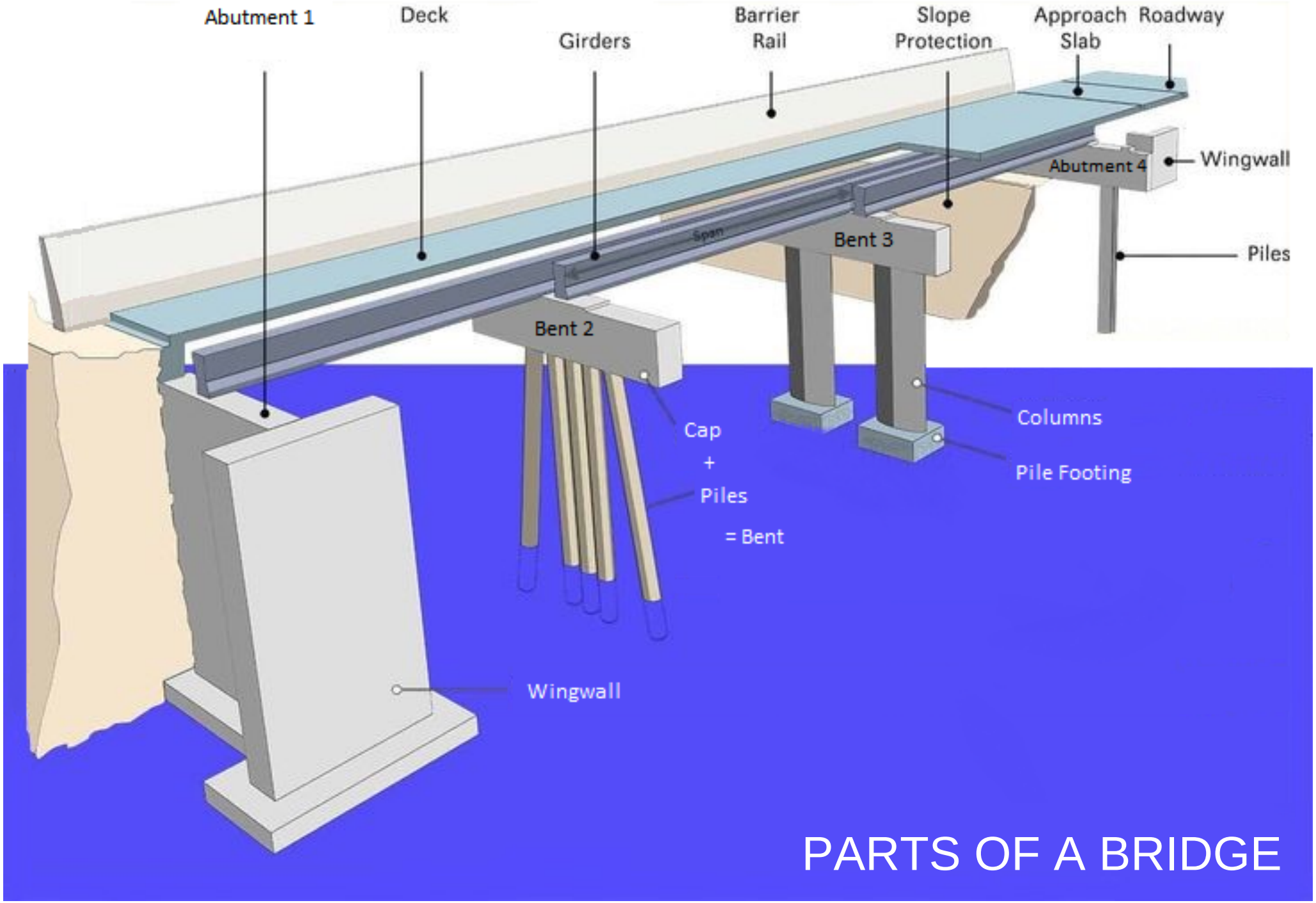

IMMEDIATE
24 HRS FROM NOTIFICATION
48 HRS FROM NOTIFICATION
DOTD FINDINGS **REQUIRES IMMEDIATE CLOSURE**
NOTIFY OWNER IMMEDIATLY
OWNER PROVIDES ONE OF THE FOLLOWING RESPONSES
YES
NO
OWNER CLOSES BRIDGE
OWNER IMMEDIATELY REPAIRS BRIDGE
OWNER OWNER PROVIDES STAMPED LOAD RATING 3 TONS OR GREATER
DOTD WILL CLOSE THE BRIDGE AT OWNERS COST


BRIDGE REOPENING PROCEDURE
REOPENING PROCEDURE FOLLOWING DOTD FINDING
OWNER REPAIRS BRIDGE
OWNER DOCUMENTS REPAIRS IN SPECIAL INSPECTION
OWNER PROVIDES STAMPED LOAD RATING RATING (OR REVIEW) 3 TONS OR GREATER
OWNER PROVIDES STAMPED LOAD RATING 3 TONS OR GREATER
SENT TO DISTRICT/LOAD RATING FOR REVIEW IN INSPECT X
REOPEN UPON DOTD RESPONSE

Load Rating


AT INSPECTION APPROVAL
WITHIN 30 DAYS OF INSPECTION APPROVAL
WITHIN 7 DAYS OF NOTIFICATION
WITHIN 90 DAYS OF INSPECTION APPROVAL
EVENT FROM TABLE 3-3 OCCURS
DOTD LOAD RATING REVIEWS TO DETERMINE IN NEW ANALYSIS IS NEEDED
Yes
No
PARISH NOTIFIED THAT RE-RATING IS REQUIRED
DOTD COMPLETES LOAD RATING REVIEW
PARISH WILL PROVIDE NEW RATING
Yes
No
LOAD RATING IS SUBMITTED
DOTD WILL LOAD RATE AT PARISH COST

A-8: Parts of a Bridge


Abutment 1
Deck
Girders
Barrier Rail
Slope Protection
Approach Slab
Roadway
Abutment 4
Wingwall
Piles
Span
Bent 3
Bent 2
Cap
+
Piles
= Bent
Columns
Pile Footing
Wingwall
PARTS OF A BRIDGE