Bridge Inspection Manual

Table of Contents

1.0 INTRODUCTION

The State of Hawaii Department of Transportation (HDOT) Bridge Inspection Program (BIP) was established in response to the National Bridge Inspection Standards (NBIS) published in the U.S. Code of Federal Regulations 23 CFR 650, Subpart C and National Tunnel Inspection Standards (NTIS) published in 23 CFR 650, Subpart E.

The NBIS and NTIS sets the national standard for proper safety inspection and evaluation of bridges, reportable structures and highway tunnels on all public roads and requires that each State transportation department must include an inspection organization for bridges and tunnels that is responsible for the following:

a. Statewide inspection policies and procedures, quality assurance, quality control, and preparation and maintenance of the inventory of structures, except for bridges and tunnels that are owned by Federal Agencies.

b. Structure Inspections, reports, load ratings and other requirements of these standards.

c. The functions identified above may be delegated, but such delegation does not relieve the HDOT of any of its responsibilities under Subpart C or Subpart E.

1.1 Purpose

This BIP Manual was developed to provide context of how the Inspection process relates to the Statewide Transportation Asset Management Program (TAMP), as well as provides guidelines, policy, and procedures to ensure compliance with federal regulations CFR 650 Subpart C and CFR 650 Subpart E, respectively the National Bridge Inspection Standards and the National Tunnel Inspection Standards. Unless a Local Public Agency (LPA) develops its own BIP Manual or policies that are approved by HDOT and FHWA, LPAs are to adhere to the procedures within this document.

Each State must prepare and maintain an inventory of all bridges subject to the NBIS, and tunnels subject to the National Tunnel Inspection Standards (NTIS), in accordance with CFR 650. The inventory includes the data needed for the Bridge Inspection Program and Bridge Asset Management Program (BAMP) to function and to comply with the FHWA requirements. This data includes Structure Inventory and Appraisal (SI&A) data and Element data stored in HDOT's Bridge Management database (BrM) with information submitted to FHWA annually.

This manual is not an engineering textbook or primer on the fundamentals of bridge inspection, instead the purpose of this BIP Manual is to assure that the bridge and tunnel inspections are being conducted in accordance with the requisite standards and to assure the quality of inspection data being presented for programming into the TAMP goals and life cycle preventive maintenance of the Assets.

1.2 Using BIP Manual & BrM

New BrM users need to request a UserID and Password from brm.help@ hawaii.gov to access BrM at https://brm.hawaii.gov/. Help for using BrM is available from the AASHTOware website and

can be accessed in the upper left-hand corner of any screen in BrM by clicking on the Logo.

The most current version of the Bridge Inspection Program (BIP) Manual is on the HDOT website. Suggested edits or errors should be emailed with a recommended correction to the Statewide Bridge Asset Program Manager (BAMP). Text changes to the BIP Manual will be highlighted in red text and will indicate the Revision Date (Rev Date) in red text below the Publication Date (Pub Date) at the bottom of the page.

All links in the BIP Manual are provided as a convenience to the reader, but may not be up to date.

1.3 Definitions and Terms

Definitions used within this manual can be found in CFR 650. Subpart C contains terms related to bridges and Subpart E contains terms related to tunnels. Definitions from CFR 650 that are repeated here may be paraphrased or quoted directly from CFR 650. Other terms are provided for clarity and may be specific to this BIP Manual for the State of Hawaii Department of Transportation.

Bridge is defined in CFR 650.305 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 under copings of abutments or spring lines of arches, or extreme ends of openings for multiple boxes; it may also include multiple pipes, where the clear distance between openings is less than half of the smaller contiguous opening"

When used in this manual the term "bridge" includes all reportable structures which include bridges, culverts and tunnels unless stated otherwise.

Bridge Inspection Experience is defined as active participation in bridge inspections in accordance with the NBIS, in either a field inspection, supervisory, or management role. A combination of bridge design, bridge maintenance, bridge construction and bridge inspection experience, with the predominant amount in bridge inspection, is acceptable. The National Highway Institute training may be found at the following URL: *https://www.nhi.fhwa.dot.gov/home.aspx*

BIP is the abbreviation for Bridge Inspection Program.

Bridge ID number is a unique number as defined in National Bridge Inventory (NBI) Item 008-Structure Number in the FHWA Recording and Coding Guide.

Bridge File is a file containing historic and current information about a bridge as required per CFR 650.313(d) and containing the necessary information in Chapter 2 of the (American Association of State Highway and Transportation Officials (AASHTO) Manual for Bridge Evaluation (MBE).

Bridge Preservation is defined by FHWA as Actions or Strategies that prevent, delay, or reduce deterioration of bridges or bridge elements; restore the function of existing bridges; keep bridges in good condition; and extend their useful life. Preservation actions may be preventative, or condition driven.

23 CFR 650 is used as an abbreviation for the term "Code of Federal Regulations - Title 23". The Code of Federal Regulations (CFR) is a codification of the general and permanent rules published in the Federal Register by the departments and agencies of the Federal Government. Title 23 is the section designated for Highways, while Section 650 is designated for Bridges.

Certification Date is the date personnel were qualified to perform BIP tasks.

Complex Bridge is a movable, suspension, cable stayed, and other bridges with unusual characteristics.

Critical Finding (CF) is defined in Critical Find Reporting Section of the BIP.

HDOT is the abbreviation for Hawaii Department of Transportation.

Inspections is defined in the Inspection and Report Types Section of the BIP.

Local Public Agency (**LPA)** within the state of Hawaii that own and/or are responsible for roadway bridge structures include County of Kauai, City and County of Honolulu, County of Maui, and the County of Hawaii. Other LPA that do not own and/or are responsible for transportation infrastructure include the Oahu Metropolitan Planning Organization, and the Maui Metropolitan Planning Organization.

The AASHTO Manual for Bridge Evaluation (MBE) provides guidelines for the procedures and policies for determining the physical condition, maintenance needs, and load capacity of highway bridges. It was developed to assist bridge owners by establishing inspection procedures and evaluation practices that meet the National Bridge Inspection Standards (NBIS)

National Tunnel Inventory (NTI) is the aggregation of structure inventory and appraisal data collected to fulfill the requirements of the National Tunnel Inspection Standards. Each State shall prepare and maintain an inventory of all tunnels subject to the NTIS.

National Tunnel Inspection Standards (NTIS) are the Federal regulations establishing requirements for inspection procedures, frequency of inspections, qualification of personnel, inspection reports, and preparation and maintenance of a State tunnel inventory. The NTIS apply to all structures defined as tunnels located on all public roads.

Non-Reportable Structure is a structure that is not required to be included in the annual NBI or NTI data submittal but may be included and managed in the BrM database. Examples include pedestrian bridges, privately owned structures, culverts and bridges less than 20 feet.

Owner is defined as a person or entity who has the legal or rightful title and is held responsible by the law as the owner of the property.

Portal The term "portal" means the entrance and exit of the tunnel exposed to the environment; portals may include bare rock, constructed tunnel entrance structures, or buildings.

Quality Assurance (QA) The use of sampling and other measures to assure the adequacy of quality control procedures in order to verity or measure the quality level of the entire bridge inspection and load rating program.

Quality Control (QC) Procedures that are intended to maintain the quality of a bridge inspection

and load rating at or above a specific level.

Scour is erosion of streambed or bank material due to flowing water; often considered as being localized around piers and abutments of a structure.

Scour Countermeasure: Defined here as a scour feature placed during construction of a new bridge or added to an existing bridge that is designed and constructed to mitigate scour in accordance with the current Hydraulic Engineering Circular (HEC-23) requirements. See Scour Repair.

Scour Critical Bridge is a bridge with an NBI Item No. 113 Scour Critical Bridges coding of 3, 2, 1, or 0 because of a foundation element that has been determined to be unstable for the observed or evaluated scour condition.

Scour Repair is defined here as a scour repair or feature that is not designed to meet Hydraulic Engineering Circular (HEC-23) requirements.

Shall is applied in this Manual to mean the same as must. Must is a regulatory or legal term and means that conformance is required and mandatory without exception.

Specification for the National Tunnel Inventory (SNTI) provides the recording and coding specifications for tunnel information to be entered into the NTI.

Structure is defined as a bridge, culvert or tunnel unless specified otherwise.

Statewide Transportation Asset Management Plan (TAMP) – The Statewide Transportation Asset Management Plan was prepared on June 30, 2019 as required by the FAST Act, describes the processes and formally defines HDOT's framework for asset management.

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

Under Bridge Inspection Truck (**UBIT)** A truck (aka snooper truck or reach-all) with a bucket used to access elements under a bridge deck.

1.4 Standards and Regulatory Documents

All inspections and reports for bridges and tunnels must be in accordance of the following list of applicable standards, regulations & references. The current version or edition is applicable, including subsequent revisions, interims or errata unless stated otherwise. The current version for inspection contracts is the active version on the date the contract is awarded. The list indicates the Document Order of Precedence for inspections and a basis to resolve conflicts. Please notify the Statewide BIP Manager when there is unresolved or conflicting information.

The signs for bridges and tunnels must comply with the Manual on Uniform Traffic Control Devices or MUTCD.

1.4.1 Bridge Inspections Reference Documents

1. State of Hawaii Statewide Transportation Asset Management Plan (TAMP)
2. "FHWA Recording and Coding Guide" - FHWA Recording and Coding Guide for the Structure Inventory and Appraisal of the Nation's Bridges, FHWA Report No. PD-96-001December 1995.
3. FHWA Memo, "Revision of Coding Guide, Item 113 - Scour Critical Bridges", April 2001.
4. AASHTO Manual for Bridge Evaluation (MBE); incorporated by reference in 23 CFR 650.317.
5. Bridge Inspector's Reference Manual (BIRM), FHWA NHI 12-049
6. HDOT Design Criteria for Bridges and Structures
7. HDOT Design Criteria for Highway Drainage
8. Inspection of Fracture Critical Bridge Members, FHWA Report No. IP-86-26, September 1986.
9. FHWA Technical Advisory T 5140.23, Evaluating Scour at Bridges, dated October 28, 1991.
10. HEC 18 Evaluating Scour at Bridges, FHWA-HIF-12-003, 2016.
11. HEC 20 Stream Stability at Highway Structures, FHWA-HIF-12-004, 2012.
12. HEC 23 Bridge Scour and Stream Instability Countermeasures, Volume 1 (FHWA-HNI-09-111, 2009) & Volume 2 (FHWA-HNI-09-112, 2009).
13. HEC 25 Highways in the Coastal Environment, Volume 1 (FHWA-HNI-14-006, 2014) and Volume 2 (FHWA-HNI-07-096, 2008)
14. 2D Hydraulic Modeling for Highways in the River Environment, FHWA-HIF-19-061, 2019.
15. FHWA Memorandum "Scourability of Rock Formations," dated July 19, 1991.
16. Underwater Bridge Inspection, FHWA-NHI-10-079, 2010
17. ASCE Underwater Investigations: Standard Practice Manual, 2001
18. FHWA Questions and Answers on the National Bridge Inspection Standards CFR 650 Subpart C (FHWA Q&A).

1.4.2 Tunnel Inspections Reference Documents

1. Tunnel Operations Maintenance Inspection and Evaluation (TOMIE) Manual, FHWA-HIF-15-005, July 2015.
2. National Tunnel Inspection Standards (NTIS), 23 CFR 650, Subpart E
3. Specifications for the National Tunnel Inventory (SNTI)

2.0 BRIDGE INSPECTION PROGRAM

2.1 Organization

Per 23 CFR 650.307(a), “each State transportation department must inspect or cause to be inspected, all highway bridges located on public roads that are fully or partially located within the State’s boundaries, except for bridges that are owned by Federal agencies.” HDOT’s Statewide Bridge Inspection Program (BIP) Manager administers this program as described below on the organizational chart and in Section 2.3, Roles and Responsibilities.

HDOT BIP Leaders are responsible for oversight and support of the LPA offices within the HDOT District. An LPA not in compliance could result in the suspension of Federal-Aid highways funding to HDOT until compliance is met.

The remainder of this page is intentionally left blank

2.2 Statewide Program Directory

POSITION TITLE	OFFICE LOCATION	PHONE NUMBER	EMAIL
Statewide Bridge Asset Management Program (BAMP) Manager			
Statewide Bridge Design Engineer	Bridge Design Section (HWY-DB)	692-7611	James.Fu@hawaii.gov
Statewide BrM Coordinator	Bridge Design Section (HWY-DB)	692-7613	BrM.help@hawaii.gov
Statewide Load Rating Engineer	Bridge Design Section (HWY-DB)	692-7611	James.Fu@hawaii.gov
Statewide Hydraulic Design Engineer	Hydraulic Design Section (HWY-DH)	692-7561	Kevin.Kasamoto@hawaii.gov
Statewide Maintenance Engineer	Maintenance Section (HWY-CM)	587-2183	John.Williams@hawaii.gov
Statewide BIP Manager	Maintenance Section (HWY-CM)	587-2183	John.Williams@hawaii.gov
Hawaii District BIP Leader	HWY Hawaii District Office (HWY-H)	933-6820	Harry.h.takiue@hawaii.gov
Hawaii Co BIP Leader	Hawaii County	961-8926	robert.yanabu@hawaiicounty.gov
Kauai District BIP Leader	HWY Kauai District Office (HWY-KE)	241-3018	Jeff.J.Aguinaldo@hawaii.gov
Kauai Co. BIP Leader	Kauai County	241-4882	DFujimoto@kauai.gov
Maui District BIP Leader:	HWY Maui District Office (HWY-MD)	873-3540	Annette.dh.Matsuda@hawaii.gov
Maui Co. BIP Leader	Maui County	270-7434	Ty.Takeno@co.maui.hi.us
Oahu District BIP Leader	HWY Oahu District Office (HWY-OM)	862-6700	Ryan.a.Nakata@hawaii.gov
Oahu C&CH BIP Leader	City & County of Honolulu	768-8831	skatsura@honolulu.gov

2.3 Roles and Responsibilities

2.3.1 Owner Responsibilities

Owner (as specified in NBI Item 21 – Maintenance Responsibility), is defined as the individual or agency that legally owns the asset. BIP Leads represent each HDOT/HWY District and LPA in the Bridge Inspection Program and works within the Owner Agency to accomplish the necessary program activities. For instance, the Department of Land and Natural Resources (DLNR) may own the asset and the HWY district has responsibility to inspect and maintain the asset.

Non-NBI Structures:

Owners may want to track or be aware of structures that do not meet the definitions contained in the NBIS or SNTI such as: Pedestrian bridges, privately owned bridges, or Structures < 20 feet. These structures are not included in the National Inventories but may be included in the BrM database at the Owners discretion. The Inspection Frequency is determined by the BIP Leader for these structures and should not exceed 48 months for structures more than 5 feet. Initial inspections and coding these structures should follow the same criteria

2.3.2 Statewide Bridge Asset Management Program (BAMP) Manager: (currently under development)

Role: Bridge Asset Management is a core bridge discipline that focuses on making informed and effective decisions on the operation, maintenance, preservation, replacement, and improvement on a program of bridges evaluating alternative strategies for addressing needs, and prioritizing investments, projects, and work types that satisfy the objectives of being cost effective while maintaining safety. These objectives can among other things be satisfied by implementing programs of projects that maximize overall bridge program performance where performance may include multiple factors such as condition, structural reliability, mobility, and minimizing the cost to achieve desired service life. Bridge Asset management also extends beyond identifying optimal investments, projects and work types and includes using optimal maintenance, preservation, and improvement design, material, and construction technologies that provide sustainable performance.

Bridge Asset management decision making is highly dependent on relevant and quality data and on methodologies and tools for analyzing that data across an inventory of bridges. In this regard FHWA promotes the use and understanding of data collection technologies and bridge management systems. The modeling and analyses performed by bridge management systems assists bridge owners in making informed and effective decisions that will achieve their programmatic goals and objectives and maximize returns on investment.

Responsibilities:

- Provides overall leadership, directs and provides guidance to decision makers and county bridge or highway engineers in the planning, developing, programming, and implementing of effective and efficient capital programs and maintenance actions to preserve the bridge

structures (bridges, culverts, tunnels, pedestrian bridges, and overpasses) in the State of Hawaii.

- Provides information to assist local agencies in understanding their bridge network, in preparation and implementation of a bridge preservation plan and to support applications for funding in the State of Hawaii Bridge Program. Works with the LPA BAMP Managers to determine priorities and critical infrastructure needs.

- Has regular communication with the Planning and Design Section Managers in support of the States BAMP and TAMP by providing technical assistance and guidance, and by publishing annual asset management reports, communicating infrastructure needs and implementing asset management principles.

Qualification Requirements:

- Be a professional structural engineer (SE) licensed in the State of Hawaii

- Must have a minimum of 10 years leading a program of similar scale.

2.3.3 Statewide BIP Manager:

Role: Has delegated responsibility for the statewide administration and oversight of the Bridge Inspection Program, which includes the Tunnel Inspection Program. Provides assistance with the State policy, procedures, quality assurance, and statewide guidance on bridge inspections in compliance with all Federal Regulations for bridges and tunnels. Provides support and oversight of BIP Leader duties.

Responsibilities:

- Maintains a registry of nationally certified tunnel and bridge inspectors that work in Hawaii and verify qualifications are up to date and satisfy CFR 650.309 and CFR 650.509. The registry contains Inspector ID number, contact information, copy of certification, and adverse action notes.

- Administers and conducts Quality Assurance for statewide bridge and tunnel inspection program. Refer to the Quality Assurance section of this manual.

- Determine when an inspection Team Leader's qualification must meet 23 CFR 650.509(b) under the direction of the BAMP Manager. Communicate and process the request for consideration of approval of each candidate from FHWA, as required for complex tunnels.

- Reports findings to the Bridge Asset Management Program Manager for any action required.

Qualification Requirements:

- Be a professional civil (PE) or structural engineer (SE) licensed in the State of Hawaii

- Successfully complete FHWA National Highway Institute's (NHI) comprehensive bridge

inspection training course and re-certify every 5 years or less by successfully completing FHWA NHI's bridge inspection refresher training.

- Be a nationally certified tunnel inspector and re-certify every 5 years or less; and be able to determine when a Team Leader must successfully complete FHWA NHI's tunnel inspection refresher training to maintain certification.

2.3.4 Statewide Bridge Design Engineer:

Role: Responsible for statewide bridge design by overseeing structural integrity, reviews inspection reports, reviews BrM data, conduct analyses, develops alternative strategies through a programmatic approach, develops a program of projects that supports structural damage assessments and repairs Statewide;

Responsibilities:

- Works with the Statewide BIP Manager to enforce the standards and procedures Statewide.
- Is on call for Emergencies as they arise and responds with decisions on the structural integrity of impacted assets.
- Assists the BIP Leaders with Bridge Design and Maintenance Requirements and Reviews.
- Responsible for the structure inventory data and the BrM software.
- Supervises the Statewide Load Rating Engineer.

Qualification Requirements:

- Be a professional structural engineer (SE) licensed in the State of Hawaii
- Successfully complete FHWA National Highway Institute's (NHI) comprehensive bridge inspection training course and re-certify every 5 years or less by successfully completing FHWA NHI's bridge inspection refresher training.

2.3.5 Statewide Load Rating Engineer:

Role: Responsible for statewide load rating and overweight permitting policies and procedures for the safe load carrying capacity in accordance with the AASHTO Manual for Bridge Evaluation (MBE), for all legal vehicles and State routine permit loads.

Responsibilities:

- Ensures structures are posted or restricted statewide in accordance with MBE when the maximum unrestricted legal loads or State routine permit loads exceed the Rating Factor.
- Administers and conducts statewide Load Rating Program Quality Assurance. Refer to the Load Rating Section of this Manual for detailed program requirements.

Qualification Requirements:

- Be a professional civil (PE) or structural engineer (SE) licensed in the State of Hawaii

2.3.6 Statewide Hydraulic Design Engineer:

Role: Responsible for statewide administration and oversight of the Scour Program for the State of Hawaii;

Responsibilities:

- Provides scour design policy and inspection procedures;
- Oversight of scour coding, scour repairs, and Scour Critical Plan of Actions;
- Provides technical expertise for scour evaluations and scour repairs.
- Administers and conducts statewide scour program Quality Assurance. Refer to the Scour Section of this Manual for detailed program requirements.

Qualification Requirements:

- Be a professional civil (PE) or structural engineer (SE) licensed in the State of Hawaii

2.3.7 Statewide BrM Manager:

Role: Responsible for Statewide administration, oversight and maintenance of the BrM data and system and provides software improvements to support all users.

Responsibilities:

- Provides NBIS and Element coding support Statewide.
- Responsible for posting Bridge Inspection Reports and documents in the BrM Bridge File that are provided by the BIP Leaders.
- Responsible for Element changes in the BIP Manual and Element coding support for Inspectors. Responsible for processing changes to SI&A data.
- Submits NBI and NTI data submittals to FHWA in March of each year.

Qualification Requirements:

- Has 2 or more years of experience working with BrM or equivalent experience with similar databases.

2.3.8 BIP Leader (BIP Lead):

Role: Each HDOT/HWY District and each LPA must have one person within their office serve as

BIP Leader responsible for their respective bridge inspection program. Each HDOT/HWY District Office and LPA *should* have a second person in their office serve as alternate BIP Leader when the BIP Leader is unavailable. This ensures inspections, reporting, and BIP Lead duties function at times for emergencies and compliance.

Responsibilities: BIP Leader responsibilities are described in the BIP Leader Section of this manual. Responsibilities include, but are not limited to:

- Inspection Report QC and maintenance of the Bridge File documents
- Responsible for Storm Reporting and Post Event Inspection of Scour Critical bridges.
- Initiate unscheduled Inspections for Damage and completed construction prior to opening to traffic.
- Notify the Statewide BAMP Manager if funding threatens to effectively execute the Program mandates

Other Duties include:

- Organizing, scheduling, and ensuring compliance with programmatic responsibilities.
- Verify and maintain a Certification Records (digital or paper) as required by NBIS: BIP Leaders must maintain a record of their certification, Team Leads, and Inspectors. When new inspection contracts are awarded, BIP Leaders are responsible for verifying all inspectors are qualified for the duration of the contract. New certifications or re-certifications must be requested and forwarded to the Statewide BIP Manager to update the Statewide database.
- Responsible for retaining their own personal certification records and notifying the Statewide BIP Manager 1 year in advance of re-certification training to assist the BIP Manager of continued compliance.
- Ensures inspections can be completed safely, timely and efficiently.

Qualification Requirements:

1. Be a professional civil or structural engineer licensed in the State of Hawaii; and
2. Successfully complete FHWA National Highway Institute's (NHI) comprehensive bridge inspection training course and re-certify every 5 years or less by successfully completing FHWA NHI's bridge inspection refresher training.
3. If the BIP Leaders District has tunnel(s) the BIP Leader must also successfully complete FHWA National Highway Institute's (NHI) comprehensive tunnel inspection training course and re-certify every 5 years or less by successfully completing FHWA NHI's tunnel inspection refresher training.

The following positions can be filled by either the owner's employee or by a contracted consultant. All of the positions described prior, while can be contracted to a consultant, requires that the owner still

maintains the responsibilities and authority associated with the position as described.

2.3.9 Team Lead Inspector (Team Leader or Team Lead):

Role: The On-site individual in charge of an inspection team responsible for planning, preparing, performing and reporting on the inspections.

Plans, inspects, prepares reports, and timely submits documentation to a BIP Leader for Bridge and/or Tunnel Inspections. Inspections must be in accordance with the Standards, Regulations & References listed in the Standards and Regulatory Document Section of this Manual.

Responsibilities:

- A qualified Team Leader must be present at all times during inspection and for all Inspections Types.
- Team Leaders must immediately notify the BIP Lead of significant or critical findings which might impact public safety or the integrity of the structure.
- Certification of inspection teams should be emailed to BIP Lead prior to their conducting bridge/tunnel inspections.
- The team leader must understand and take responsibility of the planning and execution of the inspection team and product as described in the Inspection Section of this Manual.

Qualification Requirements:

There are five ways to qualify as a Team Lead to inspect bridges & culverts as stated in CFR 650.309 (b). If licensed as a Professional Engineer, the engineer must be licensed as a PE in the State of Hawaii.

1. Have the following minimum qualifications;
   a. Be a registered professional engineer, or have ten years bridge inspection experience; and
   b. Successfully complete a Federal Highway Administration (FHWA) approved comprehensive bridge inspection training course.
2. Have five years bridge inspection experience and have successfully completed an FHWA approved comprehensive bridge inspection training course;
3. Be certified as a Level III or IV Bridge Safety Inspector under the National Society of Professional Engineer's program for National Certification in Engineering Technologies (NICET) and have successfully completed an FHWA approved comprehensive bridge inspection training course; or
4. Have all of the following:

a. A bachelor's degree in engineering from a college or university accredited by or determined as substantially equivalent by the Accreditation Board for Engineering and Technology;

b. Successfully passed the National Council of Examiners for Engineering and Surveying Fundamentals of Engineering examination;

c. Two years of bridge inspection experience; and

d. Successfully completed an FHWA approved comprehensive inspection training course, or

5. Have all of the following:

a. An associate degree in engineering or engineering technology from a college or university accredited by or determined as substantially equivalent by the Accreditation Board for Engineering and Technology;

b. Four years of bridge inspection experience; and

c. Successfully completed an FHWA approved comprehensive bridge inspection training course.

Team Lead for Tunnel Inspections: *The above Section 2.3.9 Requirements apply as well as the following:*

There are four ways to qualify as a Team Lead for tunnel inspections as stated in CFR 650.509 (b). If licensed as a Professional Engineer, the engineer must be licensed as a PE in the State of Hawaii.

1. Meet at least one of the following qualifications:

a. Be a registered professional engineer and have six months of tunnel or bridge inspection experience.

b. Have 5 years of tunnel or bridge inspection experience,

c. Have all of the following:

i. A bachelor's degree in engineering or engineering technology from a college or university accredited or determined as substantially equivalent by the Accreditation Board for Engineering and Technology.

ii. Successfully passed the National Council of Examiners for Engineering and Surveying Fundamentals of Engineering Examination.

iii. Two (2) years of tunnel or bridge experience.

d. Have all of the following:

i. An associate's degree in engineering or engineering technology from a college or university accredited or determined as substantially equivalent by the Accreditation Board for Engineering and Technology.

ii. Four years of tunnel or bridge inspection experience. or

2. Be a Nationally certified tunnel inspector. or

3. Provide documentation supporting the satisfaction of paragraphs 1 and 2 above to the BIP Leader. or

4. Be a registered Professional Engineer and have six (6) months of tunnel or bridge inspection experience if the BIP Leader determines through the approved process that the tunnel being inspected in complex or has distinctive features or functions that warrant this level of qualification.

2.3.10 Underwater Inspection Diver (UW Diver):

Role: An Underwater Inspection Diver is responsible for evaluating and assessing scour, material conditions, structures or construction underwater and fulfills the responsibilities of an Inspector for Underwater Inspections.

Responsibilities: see the UW Inspection Requirements Section

Qualification Requirements:

1. Successfully complete FHWA NHI's comprehensive bridge inspection training course or UW Diver Bridge Inspection course and maintain such certification by successfully completing FHWA NHI's bridge inspection refresher training course or UW diver bridge inspection course every 5 years or less.
2. Underwater inspectors must be qualified as divers in accordance with OSHA 29 CFR Part 1910, Subpart T–Commercial Diving Operations, as well as other state regulations related to commercial diving safety. An UW Diver should also have commercial diving training and bridge inspection experience which demonstrates his/her competence.

2.3.11 Specialty Contractors

Specialty contractors are beneficial when the regular inspection staff lacks the specialized skills and experience necessary to inspect sophisticated equipment of complex systems such as power distribution systems, fire protection and detection systems, security systems, and SCADA systems. In these circumstances, specialty contractors must be used when inspecting complex units that pose elevated risks to safety such as boiler units, electrical systems, or energized equipment like transformers. This minimizes health and safety risks to the inspection crew and prevents damage to very expensive equipment.

Electrical and Electronic Inspectors - To inspect elements with advanced electronic circuitry, the staff furnished by the specialty contracts should have the following education, training and experience:

- Certified by an organization meeting the requirements of the International Electrical Testing Association (NETA); or

- All of the following qualifications:
  - Be nationally recognized as an electrical testing laboratory.
  - Be regularly engaged in the testing of electrical systems and equipment for the past 5 years.
  - Have at least one professional engineer on staff that is licensed in the State of Hawaii.
  - Have in house or lease sufficient calibrated equipment to do the testing required.

3.0 BRIDGE and TUNNEL INVENTORY and CODING

Per 23 CFR 650.315 and 650.515, each State must prepare and maintain an inventory of all bridges subject to the NBIS and NTIS. The inventory consists of the data needed for the Bridge Asset Management Program (BAMP) to function and to comply with the FHWA requirements. This data includes Structure Inventory and Appraisal (SI&A) data and Bridge Element data which is stored in HDOT's Bridge Management database (BrM). HDOT/HWY's BAMP is administered by the Statewide BIP Manager and the Statewide Bridge Engineer. The Statewide BrM Coordinator manages the BrM asset management software and submits the data annually to FHWA.

3.1 Bridge & Tunnel Number & Format

The Bridge Number- NBI Item 8 and Tunnel Number - SNTI Item I.1, must be unique in the State Inventory and should not be re-used. Re-using a number provides inconsistent FHWA historical data. Bridge and tunnel numbers are a 15-digit format that allows Alpha and Numeric characters.

Structures owned or maintained by HDOT uses the following format. For LPAs, the first three digits must be the HDOT District. The other 12 characters should follow a consistent naming convention desired by the LPA.

123 **4568** 9 10 **11 12 13.14 15**

District – The first three digits (1 thru 3) indicate the HDOT District/County, NBI Item 3 or SNTI Item I.4 where the structure is located in Hawaii, as follows:

001 = Hawaii, 003 = Oahu, 007 = Kauai, 009 = Maui

Route – The next five digits (4 thru 8) indicate the Inventory Route - NBI Item 5 or SNTI Item I.7.

Functional Class – The next two digits (9 & 10) indicate Functional Classification – NBI Item 26.

Mile Post – The last five digits (11 thru 15) indicate the milepost in miles as xxx.xx – NBI Item 11 or SNTI I.12.

Per the Specification for the National Tunnel Inventory (SNTI), Section 2.2 (Item I.1), the Tunnels have Tunnel Numbers like the below example:

NTI Tunnel Number	NTI Tunnel Name
003000H30200544	Harano Tunnel (Inbound)
003000H30200545	Harano Tunnel (Outbound)

3.1.1 Rehabilitation, Strengthening, or Widening Existing Structures

Construction projects that rehab, strengthen, or widen the existing structure are not considered new structures and must not change the bridge or tunnel number.

Structure Replacement projects that remove an existing structure and build a new one must have

a new Bridge Number and a new Bridge File because the existing data and history no longer apply.

Temporary structures used during construction will not have a new Bridge Number assigned.

3.2 Bridge and Tunnel Names

The Bridge Name does not have an NBI specified format. Hawaii does not have any specific naming criteria and the format is to be determined by the BIP Leader with the approval of the Statewide BIP Manager. Generally, unless named by the State Legislature, the stream crossing, the route the structure is on, or a local reference is used.

There are no national policies established for assigning unique tunnel names. Therefore, as with the Bridge's, the BIP Leader with the approval of the Statewide BIP Manager shall establish a name.

3.3 Inspection Frequency

To be compliant with FHWA requirements, Routine (RTN), Fracture Critical (FC), Underwater (UW), and Tunnel (TUN) bridge inspections are to be completed within the month of the Inspection Due Date. RTN, FC, and TUN (NTI Item D.3) inspection frequencies are not to exceed (NTE) **24 months**. For example, the last inspection was on September 15, 2018 and the next routine inspection must be completed by September 30, 2020 within the same month.

The UW frequency NBI Item 92B (Critical Feature Inspection) shall not exceed **48 months**; and should be the same month as the RTN inspection.

Regularly scheduled UW and FC Inspections should be conducted concurrently or within the same month, with the RTN Inspections. The State of Hawaii combines the UW and FC inspections to simplify reporting and contracting. Inspection frequency greater than 24 months (or greater than 48 months for UW inspections) must be approved by the Statewide BAMP Manager.

See Inspection Schedule for coding Inspection Date and Frequency of unscheduled inspections.

3.3.1 Reducing Inspection Intervals

Inspection intervals should be reduced when it is deemed necessary or as a precautionary measure to protect the traveling public or monitor field conditions. Reductions are recommended to be increments of 12, 6, 3, or 1-month inspections unless more frequent or odd numbered are justified. Reducing the inspection interval is at the discretion of the inspector's professional judgement and is recommended to the District/LPA BIP Leader for approval. The Statewide BIP Manager should be notified for situational awareness and tracking.

If a reduced inspection interval is desired, then a Monitor Report type, Inspection Date, and Frequency should be coded as an "Other Special" in BrM, see Inspection Frequency. Monitoring a specific structural item for an extended period can overlap or extend beyond and miss the regularly scheduled inspections. Therefore, Team Leads must not change the Inspection Date or Inspection Frequency for the RTN, FC, UW, and TUN inspections unless the BIP lead receives approval from

the Statewide BAMP Manager.

3.3.2 Late Inspections

All late Inspections should return to the previous or original schedule for the next inspection, unless the schedule change is permanent and approved by FHWA in writing. Any late inspection is considered non-compliant in the annual Bridge or Tunnel Metrics and late or rescheduled inspections approved by FHWA are considered compliant.

For Late Inspections: The Team Lead must email the District/LPA BIP Leader and the Statewide BIP Manager stating the reason why a TUN, RTN, FC, or UW inspection was not inspected within the month due. When these inspections are late, it is imperative that the District/LPA BIP Leader inform the Statewide BIP Manager the Plan of Corrective Action (PCA) to complete the inspection.

For Rescheduled Inspections: Prior to the regularly scheduled inspection date, the Team Leader must justify in an email to the District/LPA BIP Leader and the Statewide BIP Manager why a TUN, RTN, FC, or UW inspection needs to be re-scheduled. If Inspections are being done by a hired consultant, the District/LPA BIP Leader must send the justification email to the Statewide BIP Manager. Rescheduling inspections must have prior written FHWA approval before the regularly scheduled inspection date. Justification for late inspections may include: Severe weather, Inspector safety, Inspection quality, or Statewide schedule adjustment approved by the FHWA Bridge Safety Engineer.

3.4 Latitude & Longitude

Bridge NBI Item 16 (Latitude) & 17 (Longitude) and Tunnel Item I.13 (Latitude) & I.14 (Longitude) are the latitude and longitude for the structures, respectively. GPS readings for all structures should be recorded at the same location, which is the right most lane, at the right edge of pavement solid line, looking towards increasing Milepost at the abutment joint or the portal.

The record should be coded in degrees, minutes and seconds to the nearest hundredth of a second (with an assumed decimal point). The values recorded should be consistent with the Linear Referencing System (LRS) data that uses the North American Datum 1983 (NAD83).

Per SNTI, The Tunnel Portal's Latitude and Longitude shall be recorded in decimal degrees at the same location as the LRS Mile Point (SNTI Item 1.12). When the Mile Point is blank, record the latitude and longitude at the tunnel portal on the edge of the right traveled way in the direction of the route mileage.

3.5 NBI Item 113 – Scour Critical Bridge Coding (Scour Coding)

Scour Coding uses a single-digit code as indicated in NBI Item 113 to identify the current status of the bridge regarding its vulnerability to scour. Scour analyses shall be performed by a hydraulic, geotechnical or structure engineer. Details on conducting a scour analysis are included in the FHWA Technical Advisory T5140.23 titled, "Evaluating Scour at Bridges"."

The Scour Evaluation Report (SER) provides the engineering justification for the NBI Item 113 code and must not be changed without the approval of the Statewide Hydraulics Engineer. If a

scour inspection finds the field condition is beyond the limits described in the SER, the SER must be updated to justify the new scour code. The Team Lead should immediately contact the Statewide Hydraulic Engineer for approval to change the SER and notify the District/LPA BIP Leader.

The Statewide Hydraulic Engineer concurs with the code recommended by the Team Leader and concurred by the District /LPA BIP Leader. If NBI Item 60 Substructure is less than or equal to 4, due to scour or Item 62 Culverts is less than or equal to 5 due to scour, the Team Leader should contact the District/LPA BIP Leader who should contact the Statewide Hydraulic Design Engineer for bridges under the jurisdiction of HDOT. For bridges under the jurisdiction of a Local Public Agency (LPA), the Team Leader should make a recommendation to the LPA BIP Leader. The LPA BIP Leader should contact the Statewide Hydraulic Engineer for concurrence.

The Team Leader is responsible for 1) Updating a SER and POA, 2) Changing the NBI Item 113 code, 3) Submitting the updated scour documents (docx & PDF) with the other Inspection Report files.

Coding Countermeasures

Scour Countermeasures designed and installed in accordance with HEC-23 qualifies a bridge to have an item 113 rating of 8. Therefore, **new structures** designed with countermeasures will be coded as “8”. **Existing structures** retrofitted with a designed countermeasure are coded as “7” to track the performance at these structures. The designer must provide inspection guidelines in a Plan of Action (POAC) which should include:

1. A description of the scour vulnerability including scour history, discussion on why countermeasures were installed and what design standard was used.
2. Plan sheets and visual benchmarks such as the limits of riprap, so inspectors can verify the countermeasure performance and if it is still functioning properly.

HDOT defines Scour Repairs as repairs that are not designed and installed in accordance with HEC-23. Therefore, Inspector Repair recommendations and other existing repairs to the waterway or substructure are considered Scour Repairs unless documented as HEC-23 compliant. Accordingly, Scour Repairs should be inspected carefully for performance and condition and must not raise the NBI Item 113 scour code.

3.6 NBI & NTI Data Submittal to FHWA

The deadline for the Statewide BIP Manager to submit the annual NBI and NTI data to FHWA Hawaii Representative is March 15th annually. The process to submit inspection and element data is as follows:

1. HDOT/HWY generates the submittal data files and completes a NBI Submittal File Check and NTI Submittal File Check which analyzes for inconsistencies and errors.
2. District/LPA BIP Leaders will be required to correct all Fatal Errors and address general (Non-Fatal) errors. Fatal errors prevent acceptance of the entire submittal where it is HDOT policy to address all Non-Fatal errors. Most of the data associated with Non-

Fatal errors is required for the Bridge Management System to function, with exceptions such as Half-Bridges.

3. The Data and Element Check spreadsheets are emailed by the Statewide BIP Manager, or delegated assistant, to the FHWA Hawaii Division for review of the exceptions.

4. FHWA Hawaii Division will respond to the Statewide BIP Manager within 48 hours with data corrections or approval.

5. The Statewide BIP Manager, or delegated assistant, submits the data to the FHWA UPACS website.

4.0 INSPECTION REPORTS

This Section describes the Team Leader report requirements to inspect all structures in the State of Hawaii. The Team Leader prepares and signs off on the Inspection Report and the required data entered in BrM. All required information prepared is then submitted to FHWA by March 15th each year by the Statewide BIP Manager, or delegated assistant. Reports are public legal documents and the contents should be factual, clear and concise to avoid ambiguity in meaning.

4.1 Report Contents and Format

The following basic format and order sequence of information applies to all HDOT Inspection Report Types. A complete Inspection Report consists of several 8 1/2" x 11" pages consolidated in one PDF for the Bridge File. Pages may be one or two sided. The order of information presented in a report is as follows. The use of Company Logo on the report cover, header, footer, Plan Sheets is acceptable.

4.1.1 Report Cover Sheet

The Report Cover Sheet should be one page with the following information from top to bottom:

1. Title: Report Type
2. Subtitle: Bridge Name and Bridge Number
3. Report Date: Date the structure was inspected.
4. Color Elevation photo (if cannot be obtained, then a bridge approach).
5. Prepared For: Owner Name (Centered)
6. Prepared By:
   a. Left side: Team Lead name, Certification Date and company if consultant
   b. Right side: Signed Engineering Stamp if Team Lead is licensed Structural Engineer in the State of Hawaii.

4.1.2 Vicinity Map

The Vicinity Map should be a one-page map of the island showing the vicinity around the bridge and an exploded view of the exact location of the structure on the route. The island map should show the State routes and Local routes in or near the structure.

4.1.3 Table of Contents (TOC)

TOC page numbering should be able to identify if pages are missing in the Report. Sections should identify the concepts presented here.

4.1.4 Inspection Summary

This can be used for any justifications, instructions, or summary statements deemed appropriate by the Team Lead for topics such as: load rating, actions taken, FC, or underwater inspections.

Plans, sketches, and test results should be included on separate pages following this section.

Damage, Monitoring, or other non-scheduled inspection report should summarize the inspection and results here. All details of the inspection observations, findings, repairs, and structural evaluation must be labeled and dated in BrM Element notes but may be referenced in this section. The Element Notes are assumed to be Routine Inspection notes unless labeled and dated otherwise. The label format for non-Routine Inspection notes is RPT MM/YY. For example: DAM 01/20, MON 03/20, or UW 04/20.

The following items are recommended for the inspection summary, but not required.

1. State the orientation convention used for of the structure. Default orientations are:
    a. Looking in the direction of the route stationing where Pier 1 is at the minimum station; and superstructure elements are alpha labeled from left to right. For example: Abut 1 or Pier 1 is the first pier and Girder A is on the left.
    b. Orientation as shown in the Plans.
    c. Overcrossings of a main route: When looking up station of the main route, Abut 1 or Pier 1 is on the left side.
    d. Indicate cardinal direction of the route or increasing station. Mauka or Makai is acceptable.
2. Parking or access to the bridge.
3. Safety issues or instructions for the next inspection such as: Directions, Inspection Hazards, Access limits, Required equipment, Terrain, Presence of Homeless, or Traffic Safety.

4.1.5 Load Rating Summary (LRS)

A LRS must be included in the Report if the structure was re-load rated as part of the inspection. Load Rating calculations with a Load Rating Summary are submitted as a separate PDF and submitted to the Bridge File for reference in future inspections.

4.1.6 BrM Element and SI&A Reports

The final report must have the SI&A Report and the BrM Element Report with Team Lead and BIP Lead signatures printed from BrM.

4.1.7 Report Photos

All photos must be colored photos and clearly show details. Supplemental photo markups are welcome such as Arrows, Text, etc. All photos must be numbered for reference in the Report. The Report should not include photos that do not show a defect or fail to add value.

1. Four (4) photos per page is preferred with a description in a Photo Title.
2. First 4 photos should show two (2) bridge deck approach and two (2) elevations from upstream and downstream to get the reader oriented.

3. Photo Description:
    a. Photo Number, Direction, Location on structure, Date, Defect description
    b. Include direction of observation such as “Looking Upstream”, “Up Station”, “NW corner”, etc.
    c. Defect Description that includes Condition Element Rating (CS#) and Quantity of defect found, including a short description that indicates what the reader should look for in the photo.
4. Date stamp (MM/DD/YY) on photo preferred to a date in Photo Description for assurances that photos collected at time of inspection.
5. Posting Signs require a photo to be taken of the sign, as well as provide enough detail in the description to identify where the sign is located.

4.1.8 Plan Sheets

Drawings as necessary to include minimum of a Plan View, Elevation, & Cross Section. If Plans do not exist, use field dimensions to provide drawings and note this on the Drawings. AutoCAD generated drawings are recommended but not required. At a minimum, the following information should be included:

2. Plan View: Show NBI (SNTI) all dimensions coded on SI&A such as: Structure length, Roadway (curb-to-curb), Curb or Sidewalk, Deck width (out-out) or Culvert approach width, Skew angle, Median width, Traffic barrier height.
    a. Locate and label deck patches and spalling on the Plan View for ease of reader and follow on inspector to check for changes.
3. Elevation View: Vertical Clearance to roadway under/over structure and measurement location.
4. Scour extent at piers must be shown (sketched) and dimensioned (HxWxL) in Plan and Elevation to support notes. Separate drawings may be used to show this.
5. All defect quantities in CS3 and CS4 should be labeled and located on Plan Sheet Drawings to support the element notes. Defects may be shown by hand if not practical to show defects with drafting software.
6. Stationing for long structures: The locations of many devices on the Interstate H-3 corridor, such as electronic traffic signs and surveillance cameras, are often described by their stationing. Stationing is a method used to describe location along a linear alignment, such as the interstate H-3 corridor or the Tunnel. For example, the station “435+20 refers to a point 43,520 feet away from the predefined location. As another example, the station 301_65 is 165 feet away from station 300+00.
    a. Tunnels require stationing.
    b. Utilize clock format
    c. Grid lines with major tick marks labeled for scaling and finding defects

4.2 BrM Data and Coding

This Section describes the inspection data inputs for BrM. Clarifications or questions should be directed to the Statewide Program Manager.

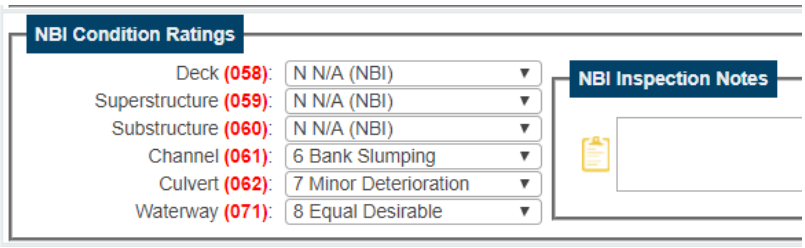
4.2.1 Traffic Safety Features Notes

The Traffic Safety Features notes should justify coding of “0” - not acceptable and “N” – not required or direct the reader to the appropriate Rail Element(s).

4.2.2 NBI Condition Ratings Notes

The NBI Inspection Notes should direct the report reader to the Elements that justify or support the NBI coding of the Deck, Superstructure, Substructure, or Culvert. If the NBI Items are in Good condition, this can be left blank.

Channels and Waterways that do not have Elements and comments to support coding should be included here.



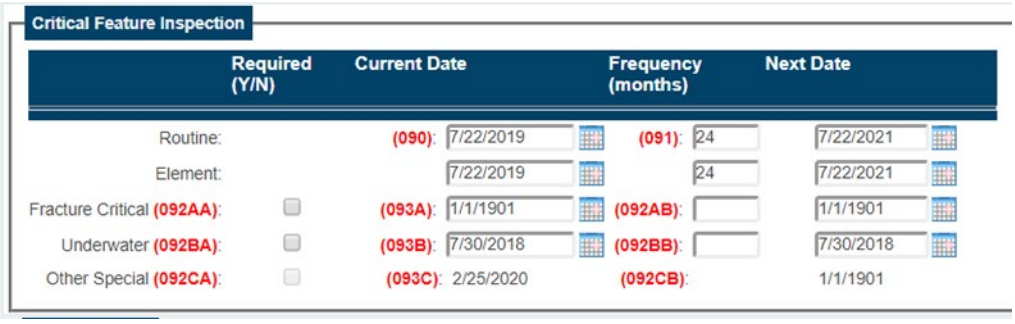
4.2.3 Coding Report Type, Date, & Frequency

All Reports must complete the *Inspection* > *Schedule* > *Summary* & *Schedule* menus to record the Inspection Type, Inspection Date, Frequency, and the Next Date the Inspection is due.

The Inspection Date or Current Date is the date the structure was inspected. If the inspection is completed over several days, the first day of inspection is the Current Date.

The Inspection Frequency and Inspection Date for the following Report types are defined in the FHWA Coding Guide and must be coded in the *Inspection* > *Schedule* > *Summary* & *Schedule* or the Inspection > *HDOT Inspection* > *Critical Feature* menu pictured below.

- RTN Ins. Date = Item 90 Freq = Item 91
- FC Ins. Date = Item 93A Freq = Item 92A
- UW Ins. Date = Item 93B Freq = Item 92B



Critical Feature Inspection

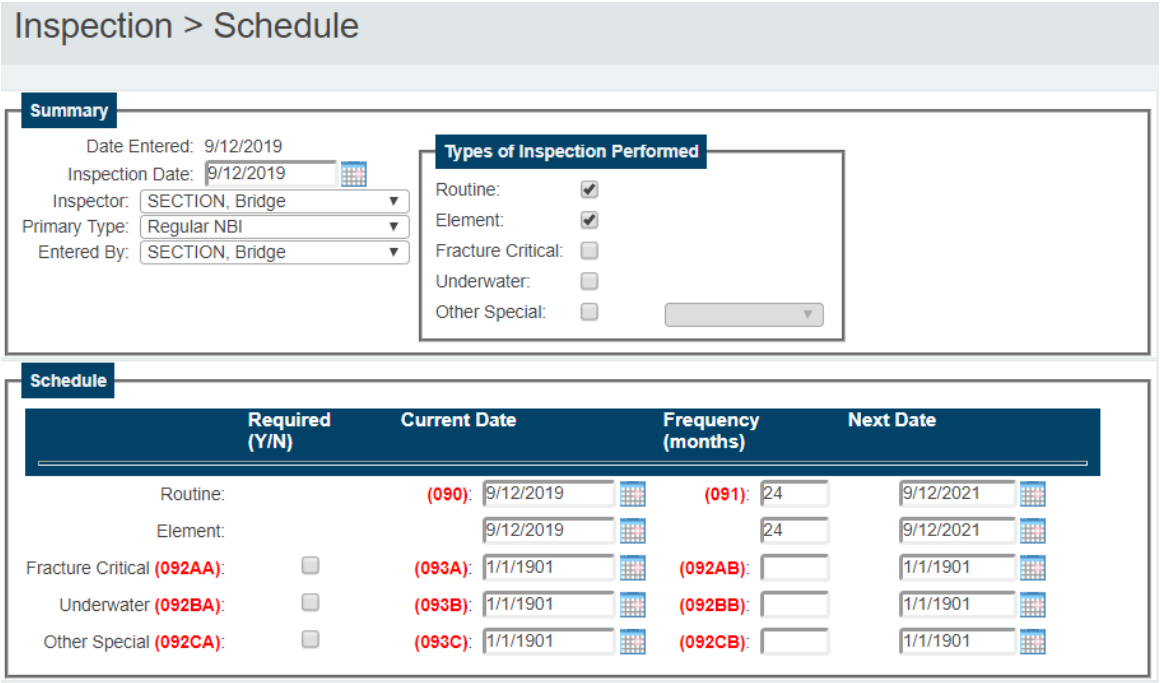
	Required (Y/N)	Current Date		Frequency (months)		Next Date	
Routine:		(090):	7/22/2019	(091):	24	7/22/2021	
Element:			7/22/2019		24	7/22/2021	
Fracture Critical (092AA):	☐	(093A):	1/1/1901	(092AB):		1/1/1901	
Underwater (092BA):	☐	(093B):	7/30/2018	(092BB):		7/30/2018	
Other Special (092CA):	☐	(093C):	2/25/2020	(092CB):		1/1/1901	

4.2.3.1 Inspection Schedule

The *Inspection* > *Schedule* > *Summary* & *Schedule* menus are completed for all Reports and indicate the Report Type of: RTN, FC, UW, or “Other Special” Report in the Check Box. The Element Report type can be ignored.

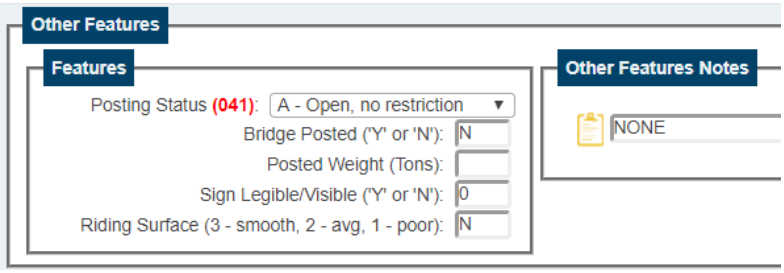
Checking “Other Special” inspection must indicate the Report Type: DAM, MON, POSTE, IN-DEPTH in the Pull-Down menu. These are unscheduled inspections that do not have an assigned frequency and must be provided by the Team Lead. If the structure does not need another inspection, then the Next Date should be blank. The Next Inspection Date or Next Date is defined as the number of Inspection Frequency months added to the last Inspection Date. Code “Other Special” Report in BrM as follows:

- Check 092CA to indicate an unscheduled report.
- Current Date 093C is the Inspection Date.
- Frequency 092CB is the number of months the next inspection is due. Decimal month acceptable for weeks.
- Next Date is the number of Inspection Frequency months added to the last Inspection Date.



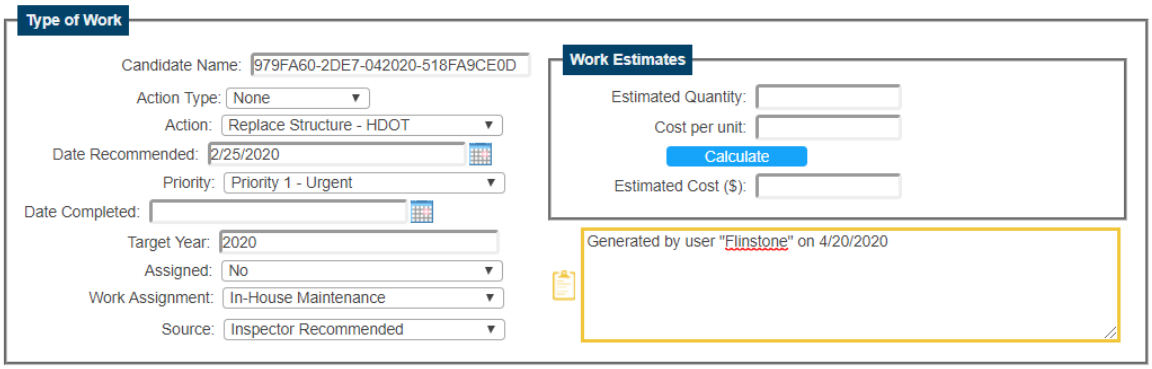
4.2.4 Other Features Notes

The "Other Features Notes" should describe weight restriction signs present at both ends of the structure, and the Report should include photos of each. The description should include the Posted weight (Tons) and where they are located. Team Lead is responsible for ensuring compliance with MUTCD which includes advanced warnings signs. Repairs should be recommended when signs are missing, dirty, or not compliant with MUTCD in Proposed Work.



4.2.5 Proposed and/or Recommended Work

All repair recommendations must describe the repair in Inspection > Work > Work Candidates. Repairs should include critical repairs as well as routine.



The remainder of this page is intentionally left blank

5.0 INSPECTION and REPORT TYPES

This Section describes the inspections and report types defined by HDOT to document different types of inspection and facilitate contract work.

5.1 General Inspection Criteria

All Inspections must follow the inspection procedures, coding, defect descriptions, and documentation in accordance with MBE, BIRM, and FHWA Coding Guide for bridges and the TOMIE and SNTI for tunnels. Inspections are to follow the national elements as stated in the manuals, unless stated otherwise in this BIP Manual.

Reporting of structure conditions should focus on Element Condition State 3 and Element Condition State 4 where defects and conditions are quantified, located, and dimensioned for others to effectively detect a change in the condition. Element Condition State 4 quantities must be documented to the extent necessary for a load rating engineer to revise the Load Rating calculations.

The Team Leader is responsible for the following general items prior to all inspections.

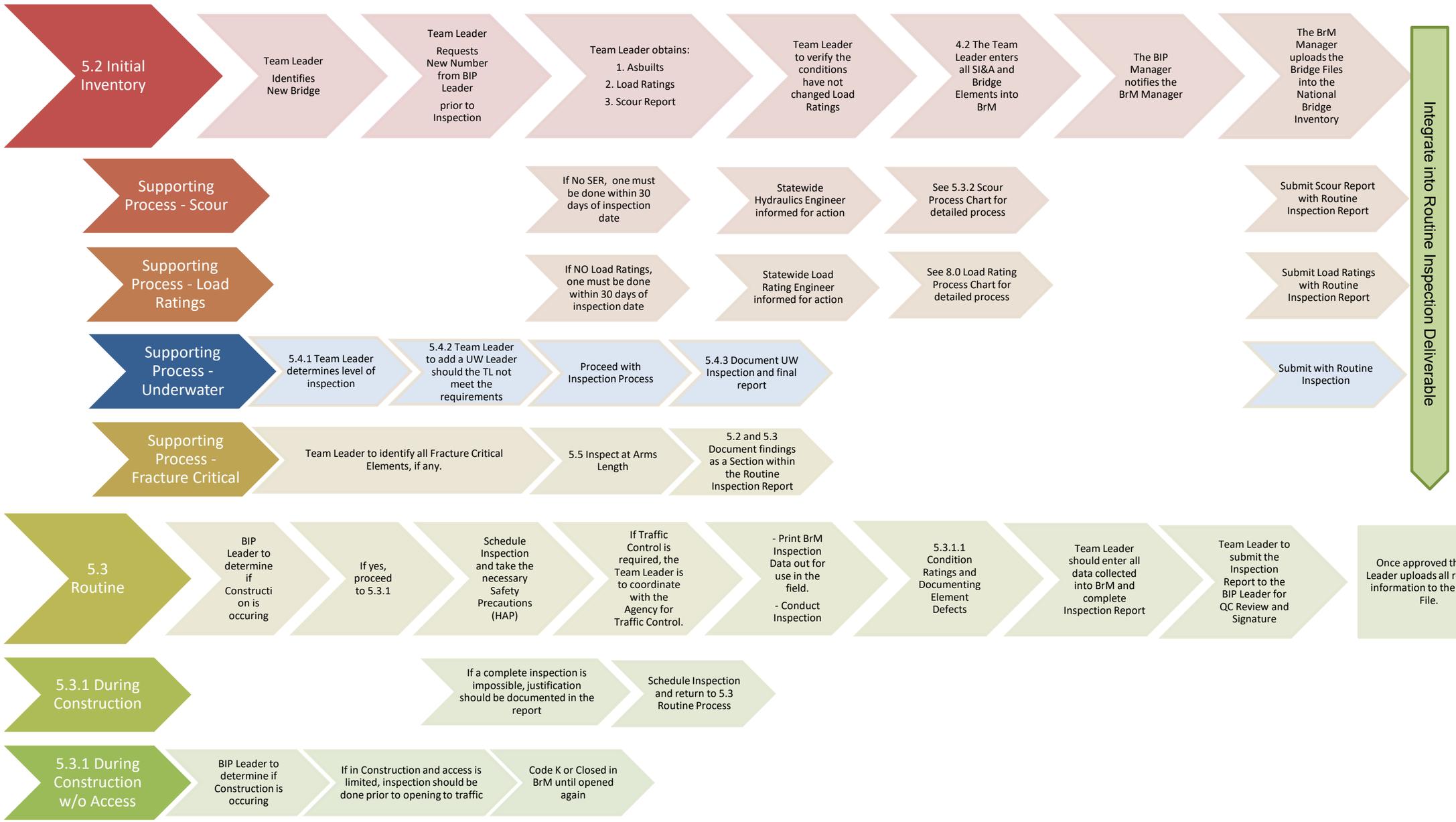
1. Personnel, qualifications, equipment, traffic control, permissions, or permits.
2. Previous inspection reports, Plan or Design information, and Scour POAs.
3. Review recommended Owner Actions in previous reports. Contact the Statewide BIP Manger if a lack of Owner Action threatens the safety of the structure or traveling public.
4. Signing the Report.

5.1.1 Inspection Methods and Drones

When more than one method is used to inspect a structure, the Report must state the limits of what was inspected by each method. For example, if an Under-Bridge Inspection Truck (UBIT), ropes, and ground inspection is used to inspect a large truss, then which portions were inspected by what method should be documented. Drone cameras are an acceptable bridge inspection method and considered equivalent to a hand-held camera. Drones do not replace the need for other close-up inspection procedures or requirements such as: crack inspections, sounding concrete or bolts, measurement of marks, installing crack monitoring.

5.1.2 Inspection Process Diagram

The diagram on the following page outlines the process for Inspections and details decision points and by whom.


5.2 Initial Inventory
Team Leader Identifies New Bridge
Team Leader Requests New Number from BIP Leader prior to Inspection
Team Leader obtains: 1. Asbuilts 2. Load Ratings 3. Scour Report
Team Leader to verify the conditions have not changed Load Ratings
4.2 The Team Leader enters all SI&A and Bridge Elements into BrM
The BIP Manager notifies the BrM Manager
The BrM Manager uploads the Bridge Files into the National Bridge Inventory
Supporting Process - Scour
If No SER, one must be done within 30 days of inspection date
Statewide Hydraulics Engineer informed for action
See 5.3.2 Scour Process Chart for detailed process
Submit Scour Report with Routine Inspection Report
Supporting Process - Load Ratings
If NO Load Ratings, one must be done within 30 days of inspection date
Statewide Load Rating Engineer informed for action
See 8.0 Load Rating Process Chart for detailed process
Submit Load Ratings with Routine Inspection Report
Supporting Process - Underwater
5.4.1 Team Leader determines level of inspection
5.4.2 Team Leader to add a UW Leader should the TL not meet the requirements
Proceed with Inspection Process
5.4.3 Document UW Inspection and final report
Submit with Routine Inspection
Supporting Process - Fracture Critical
Team Leader to identify all Fracture Critical Elements, if any.
5.5 Inspect at Arms Length
5.2 and 5.3 Document findings as a Section within the Routine Inspection Report
Integrate into Routine Inspection Deliverable
5.3 Routine
BIP Leader to determine if Constructi on is occuring
If yes, proceed to 5.3.1
Schedule Inspection and take the necessary Safety Precautions (HAP)
If Traffic Control is required, the Team Leader is to coordinate with the Agency for Traffic Control.
- Print BrM Inspection Data out for use in the field.
- Conduct Inspection
5.3.1.1 Condition Ratings and Documenting Element Defects
Team Leader should enter all data collected into BrM and complete Inspection Report
Team Leader to submit the Inspection Report to the BIP Leader for QC Review and Signature
Once approved the BIP Leader uploads all required information to the Bridge File.
5.3.1 During Construction
If a complete inspection is impossible, justification should be documented in the report
Schedule Inspection and return to 5.3 Routine Process
5.3.1 During Construction w/o Access
BIP Leader to determine if Construction is occuring
If in Construction and access is limited, inspection should be done prior to opening to traffic
Code K or Closed in BrM until opened again

5.2 Initial Inventory

An initial inspection, also referred to as an inventory inspection, is the first inspection of a new bridge or an existing bridge after a construction alters structure elements such as a deck replacement, superstructure replacement, widening. This is a Routine Inspection with additional effort to establish new Structural Inventory and Appraisal (SI&A) data and reporting. Depending on the structural design, additional types of inspections, such as Fractural Critical Inspection and Underwater Inspection, may be required and must be performed at the same time.

In addition to a Routine Inspection, new structures and existing structures with contracted work or structures new to the BrM database have the following initial inspection requirements.

1) For new structures and discovered structures not in the BrM database, the Team Lead must request a Bridge Number from the BIP Lead before data can be entered in BrM. If a Bridge Number has not been provided, Team Leads should request a new Bridge Number prior to inspection.
2) Within one week of identifying that the bridge/tunnel requires a bridge number the following steps should be taken simultaneously:
   a) The Team Leader is to obtain the original As-Built Plans from the BIP Lead. These are required to determine the proper Elements, SI&A coding, and used to design repairs. Submit an As-Built Plans PDF with the Initial Inspection report.
   b) The Team Leader is to obtain Load Rating calculations and Load Rating Summary from the Statewide Bridge Design Engineer. The Team Leader is responsible for verifying the field conditions have not changed in the Load Rating calculations.
      (i) HDOT and/or the County should have Load Ratings available as part of the Design Contract. In accordance with CFR 650.313(c), if Load Ratings are not available for new or existing structures, a Load Rating and Summary must be completed within 30 days of the Inspection Date; and submitted with the Routine Inspection Report.
   c) The Team Leader is to obtain the Scour Evaluation Report (SER) for bridges over a waterway from the Statewide Hydraulics Engineer. Inspector must review the SER for completeness, As-Built changes, or change in conditions; and complete an initial Channel Cross Section. If a SER is not available, then SER must be completed within 30 days of the Inspection Date; and submitted with the Routine Inspection Report.
      (i) HDOT and/or the County should have SER available as part of the Design Contract. In accordance with CFR 650.313(e)(3), if the SER is not available for new or existing structures, a SER and POS for scour (if necessary) must be completed within 30 days of the Inspection Date; and submitted with the Routine Inspection Report.
3) Upon receipt of each of the above, proceed to the following steps:
   a) Initially code the bridge using Plan data. Conduct Routine Inspection. Verify Element and SI&A coding match to constructed components and conditions in the field.
   b) All SI&A Items and Bridge Elements must be coded carefully this first time to avoid errors in the FHWA data submittal and future inspection re-coding. Coding questions may be directed to the BIP Lead or Statewide BIP Manager.
   c) HDOT and/or the County should have Load Ratings available as part of the Design Contract. In

accordance with CFR 650.313(c), if Load Ratings are not available for new or existing structures, a Load Rating and Summary must be completed within 30 days of the Inspection Date; and submitted with the Routine Inspection Report.

d) HDOT and/or the County should have SER available as part of the Design Contract. In accordance with CFR 650.313(e)(3), if the SER is not available for new or existing structures, a SER and POS for scour (if necessary) must be completed within 30 days of the Inspection Date; and submitted with the Routine Inspection Report.

4) More specific inspections such as Underwater and Fracture Critical Inspections must be completed with the Initial Inventory Inspection.

5) Obtain documents proving ownership (NBI Item 22) if the new structure is a result of a change in ownership; and include the document as a separate PDF submittal for the BrM Bridge File. Include all pertinent agreements that also indicate if maintenance (NBI Item 21) is the responsibility of another agency.

5.3 Routine Inspection

Structural Inspections document the field condition and findings in one of the HDOT Inspection Report types. CFR 650.305 defines a Routine Inspection as a "Regularly scheduled inspection consisting of observations and/or measurements needed to determine the physical and functional condition of the bridge or tunnel, to identify and document changes from initial or previously recorded conditions, and to ensure that the structure continues to satisfy present service requirements."

The inspection data is used to determine the Load Rating of a structure, which is used for posting weight limits and truck permits. Reports are also a legal record, which may form an important element in some future litigation. Reports should include the source(s) of all information contained in the report, including the names/date of other inspections, as well as any other source of data.

Routine inspections are conducted from the deck, ground, or water level, permanent walkways and may require a UBIT or ropes to access elements. Photos should be provided for all described defects in the Report. Routine inspection activities include:

- Concrete element sounding to determine the limits of delamination/deterioration
- Timber sounding and probing/drilling to determine the limits of internal deterioration, rot, and decay
- Connection inspections (bolts, rivets, welds) to identify failing welds/rivets and loose/failing bolts
- Measurement of remaining steel or rebar section
- Inspection of bearings, paints, or finishes and other miscellaneous structural elements.

5.3.1 Routine Inspection During Construction

If a scheduled inspection occurs during construction, the inspection of the structure or the temporary structure, must still be performed as scheduled where all accessible elements are inspected. If necessary, Team Leads should contact the BIP Lead for access to the construction

site. Inspection must follow any site-specific safety protocols. If construction operations prevent a complete inspection, then the Report must provide a detailed description what prevented the inspection and the limits of what elements were not inspected.

If a structure is closed to traffic without a temporary structure, then NBI Item 70 Bridge Posting is coded K or Closed; and the structure should be re-inspected before it is open to traffic. See Coding Section in the Recording and Coding Guide for the Structure Inventory and Appraisal of the Nation's Bridges (FHWA Report No. FHWA-PD-96001).

5.3.2 Condition Ratings

In order to promote uniformity between the Statewide Bridge Inspectors the guideline in the referenced Coding Section of the Recoding and Coding Guide for the Structural Inventory and Appraisal of the Nation's Bridges (FHWA Report No. PD-96001) will be used.

Condition ratings are used to describe the existing, in-place bridge as compared to the as-built condition. Evaluation is for the materials related, physically condition of the deck, superstructure, and substructure components of a bridge. The condition evaluation of channels and channel protection and culverts is also included. Condition ratings are properly used when they provide an overall characterization of the general condition of the entire component being rated. Conversely, they are improperly used if they attempt to describe localized or nominally occurring instances of deterioration or disrepair. Correct assignment of a condition rating must, therefore, consider both the severity of the deterioration or disrepair and the extent to which it is widespread throughout the component being rated. The following are the condition ratings to be used:

CONDITION RATINGS:

	Code	Description
	N	Not Applicable
GOOD	9	Excellent Condition
	8	Very Good Condition – no problems noted.
	7	Good Condition – some minor problems.
FAIR	6	Satisfactory Condition – structural elements show some minor deterioration.
	5	Fair Condition – all primary structural elements are sound but may have minor section loss, cracking, spalling or scour.
P O	4	Poor Condition – advanced section loss, deterioration, spalling or scour.

	3	Serious Condition – loss of section, deterioration, spalling or scour have seriously affected primary structural components. Local failures are possible. Fatigue cracks in steel or shear cracks in concrete may be present.
	2	Critical Condition – advanced deterioration of primary structural elements. Fatigue cracks in steel or shear cracks in concrete may be present or scour may have removed substructure support. Unless closely monitored it may be necessary to close the bridge until corrective action is taken.
	1	"Imminent" Failure Condition – major deterioration or section loss present in critical structural components or obvious vertical or horizontal movement affecting structure stability. Bridge is closed to traffic, but corrective action may put back in light service.
	0	Failed Condition – out of service – beyond corrective action.

5.3.2.1 Documenting Element Defects

Notable Bridge Deficiencies are defects leading to NBI component ratings of 5 or less and require a description in an element with the quantity in CS3 and/or CS4. Photos should be provided for all notable structural defects but are not required for CS2 defects.

Defect descriptions in the element notes must be clear and detailed to ensure that text and sketches can be fully interpreted by others. Inspection Reports must accurately document the dimensions, quantity, and location of all distress and deterioration in a fashion meaningful to a Load Rating Engineer. Report all signs of distress, failure, or defects with sufficient precision so that future inspections can readily make a comparison of conditions.

Defect Descriptions in the Elements should state: 1) Location using cardinal directions: N, NE, E, SE, S, SW, W, NW. 2) Shape, Dimensions, and Quantity where square or rectangular shape is assumed. For example:

1. Concrete Girder**:** Span 2, Girder A 5-7 ft from North End, 1' x 2' wide spall 2" deep in bottom flange. No loss of reinforcing steel or prestressed strands.

2. Steel Girder: Span 3, Girder F, Mid-span, 3' long dent in South side of bottom flange

3. Concrete Column: Span 4, Column 6" diameter spall.

Photo No. 18 – Spall measuring approximately 9" long x 4" wide x 1/2" deep occurring along deck near midspan

Document Element Quantities

The total quantity of the defect in the element must be described in the notes as a sum of the individual defects using the element units. For example, a Deck Element with 15 SF:

1. Span 3, RT wheel line, 10' from pier 3: 2 patches 2'x 3' = 12 SF
2. Span 4, LT shoulder, 30' from pier 4: 3 spalls 1'x1'= 3 SF

Documenting NBI Deck, Super, Substructure, Culvert and other Items

Element notes should clearly justify NBI ratings of Fair (5,6) or Poor (4 or less) based on the field conditions or defects described. Team Leads should use following examples or similar statements, to clarify NBI Ratings for the reader. If more than one element contributes to an NBI Rating, please cross-reference the justification so the reader does not miss it.

1. In a deck element, "The NBI Deck rating is based on the XX SF of patching described below."
2. In a superstructure element, "The NBI Superstructure rating is based on the XX LF of damage in the truss described below."
3. In a substructure element, "The NBI Substructure rating is based on the XX SF of undermining scour at Pier 3 as described in the Scour Element - 6000".

5.3.3 Routine Inspection for Scour

Scour is the movement of channel bed material by the action of the moving water, and it has been the leading cause of bridge failures. Scour can raise or lower the stream, erode the stream banks, and create holes around or under the substructure and pose an unseen threat to safety. Scour is generally most severe during periods of high flow. When flows recede to normal levels, the presence of scour is often hidden by silt or debris, making detection of compromised foundations difficult.

Routine Inspections of a structure over a waterway must include an inspection for scour, collect Channel Cross Sections, and incorporate the results of a required UW inspection. The scour condition is required to code NBI Items: 60 Substructure, 61 Channel, 62 Culvert, and 113 Scour. Therefore, the full height or face of any substructure in the water must be inspected for scour, and substructures that have the potential of being in the water.

5.3.4 Scour Inspection

Scour inspections must document a change in condition of the: Stream Channel, Stream Banks, Material supporting substructures, Countermeasures, and Scour Repairs. Inspectors must look for changes in the field conditions as compared to previous reports, channel cross sections, and the Scour Evaluation Report (SER). HEC 18 "Evaluating Scour at Bridges" as well as the BIRM and MBE discuss inspection procedures for bridges over water. The field inspection includes the specific location and extent of any deterioration, damage, or undermining in:

1. The stream channel and stream banks.
2. The substructure elements. (i.e., footings and seals).
3. Channel protection devices (i.e., dams and levees).
4. Scour countermeasures (i.e., riprap or shielding).

5.3.4.1 Scour Conditions in Element Defect 6000

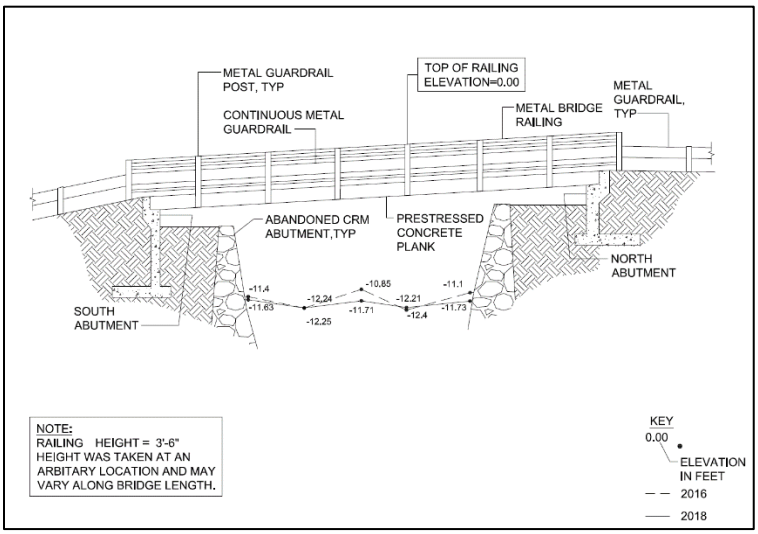
Scour reporting must describe the scour and location in the substructure Elements using the Scour Condition Defect 6000. The Team Lead must recommend a scour repair when the scour threatens the structure, see *Process for Programming of Scour Repair Projects*. When inspecting scour conditions, the inspector must document the following: In addition, include the narrative above under the substructure element 6000 Scour Defect notes (See Process for Programming Repairs subsection for details).

1) Locate and dimension exposed foundations/piles, undermined footings, and scour holes within 50 feet upstream and downstream.
2) Follow any special inspection requirements documented in a Scour or Countermeasure POA. Existing Countermeasure repairs should be coded as NBI Scour Item 113 = "7" and inspected for deterioration and effectiveness.
3) Complete cross section profile in accordance with *Channel Cross Section Profiles* and compare current cross section profiles with: 1) The initial and previous channel profile, 2) Soundings documented under Element Condition 6000 Scour Defect, and 3) Foundation and/or pile tip elevations to determine if the bridge has experienced scour activity or infill of scour holes. If there is unexpected or undocumented scour or lateral movement of the streambed, notify the Statewide Scour Engineer for possible changes to the NBI Item 113 Scour Code.

4) Channel and channel protection devices should be inspected for signs of flooding or excessive water velocity which may affect undermining, erosion of banks, and realignment of the stream. If stream behavior is different from the assessment described in the Scour Evaluation Report, see Changing NBI Item 113 Scour Code.
5) Measure and record the extent of foundation exposure and undermining.
6) Recommend any repairs, replacement, or maintenance required.
7) Perform soundings on bridges as identified by the Scour Engineer using the Scour Defect 6000.

5.3.4.2 Scour Sketches and Photos

Scour Sketches, and photos if scour is visible, must be included in the inspection report for Critical Findings, Condition State 3, and Condition State 4 defects. A Plan and Elevation drawing for each scour defect must provide adequate dimensions for the next Inspector to determine a change in scour volume. If previous drawings exist in the Bridge File, the current scour voids may be plotted over previous drawings for ease of comparison with the information labeled by date. Sketches must show the following minimum bridge information in addition to the scour defect:

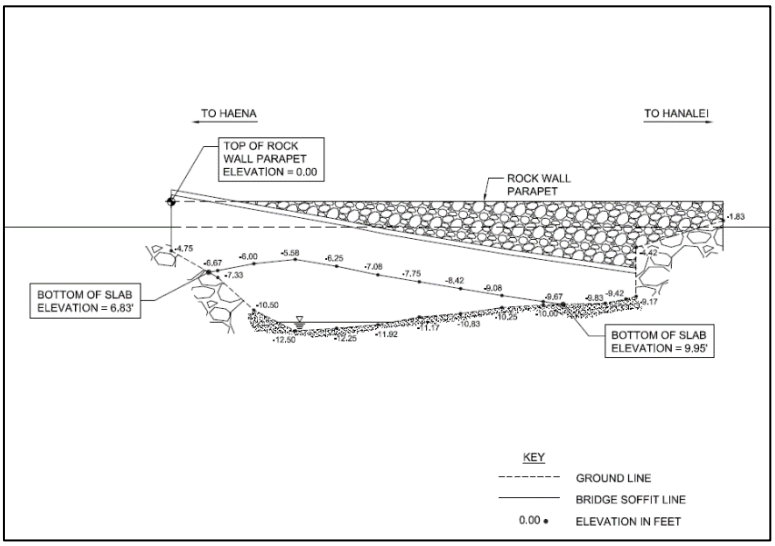


1. Bridge Name, Bridge Number, and Waterway Name (Feature Intersected)
2. Orientation direction, Direction of flow, and Substructure labels.
3. Substructure footing/pile cap top and bottom Elevations with dimensions.
4. Scour depth dimensions provided in the Scour Evaluation Report (not shown)
5. Label cross-section reference points within the sketched area.

5.3.4.3 Channel Cross Section Profiles in BrM

Profiles will be collected during each scour inspection and Post Event inspections for scour. New structures may use the as-built plan information for the initial cross section and the next inspection must collect field measurements.

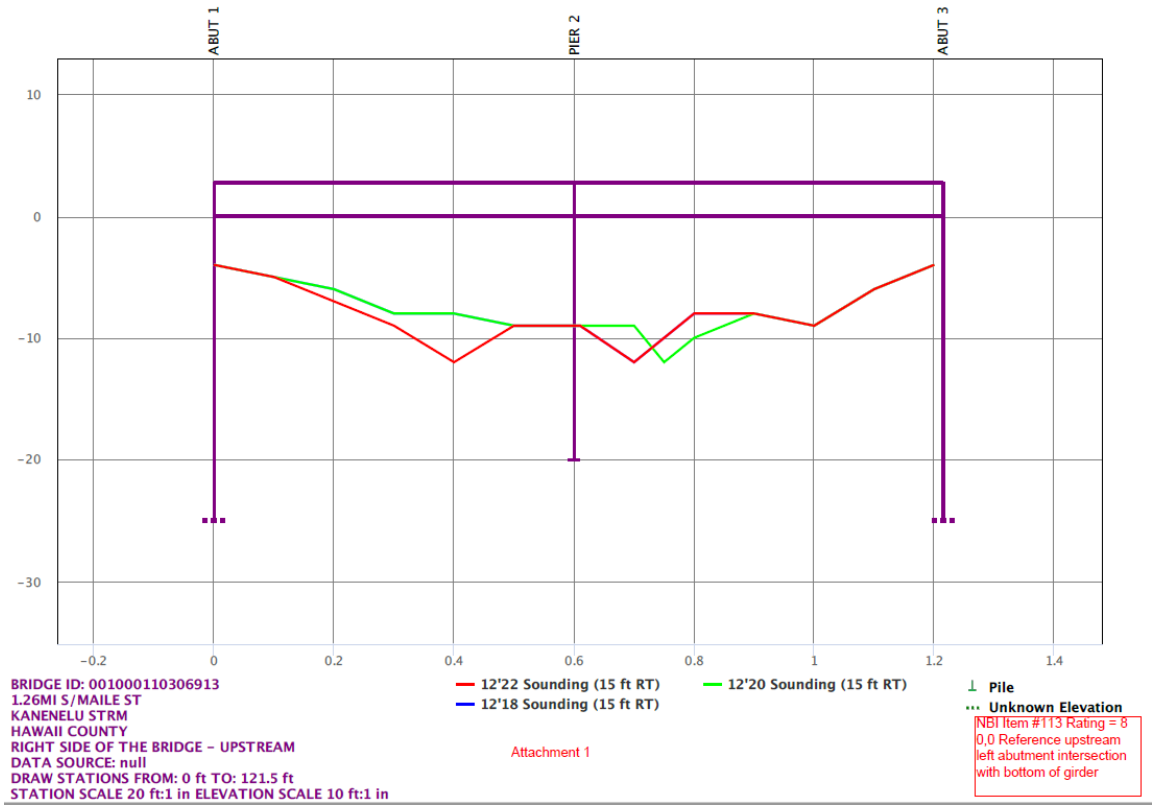
Scour Inspections must collect Profiles for all bridges and floorless bridge-length culverts with the NBI Item 113 Scour **not coded "9" or "N"**. If an initial Profile is not in BrM, then an initial profile must be provided by the Scour Inspection. Structures with **NBI Item 113 Scour coded 8** are historically stable channels and embankments such as a concrete lined channel. Some of the structures coded 8 do not require a Channel Cross Section with each scour inspection as follows:



1. If scour is observed at any time, a Channel Cross Section Profile is required, and the Statewide Hydraulics must be informed, see Changing NBI Item 113 – Scour Code.

2. Profiles are required when scour is observed for non-NBI structures such as: Pipes, Box culverts, and Floorless culverts. Profile collection for non-NBI structures may be discontinued at the discretion of the Owner.

Each scour inspection must collect a minimum of two channel cross section profiles in the *BrM Inspection* > *Cross Sections* tab. The frame of reference for the channel cross sections are always ***looking downstream***, 1) One section is measured from the upstream top of rail, or Left View and 2) One section is measured from the downstream top of rail, or Right View. Additional cross-sections may be needed to capture stream movement or scour holes further away from the bridge. These additional sections need to be well documented and repeatable by another Team Lead. Inspectors may contact the Statewide Hydraulic Design Engineer for assistance or for questions about whether additional cross sections should be taken. See the following figure for an example:



5.3.4.3.1 Channel Cross-Section Reference Points

Reports must document an X coordinate reference point of 0 at the left bridge abutment looking downstream, at the top of the rail such as a: Rail contraction joint, Expansion joint, or some other readily identifiable and repeatable location at the abutment. Reports must document the same for a Y coordinate reference elevation of 0 at the top of the rail at the right bridge abutment looking downstream. Some structures such as trusses or culverts, may have to reference a different horizonal element for X and Y. The same X and Y reference points must be used in all future cross-section's profiles.

The following guidelines provide the minimum data points for consistency in the cross-section data. It is at the Team Lead's discretion to adjust or add more points to locate scour holes or for breaks in the ground line especially in the streambed.

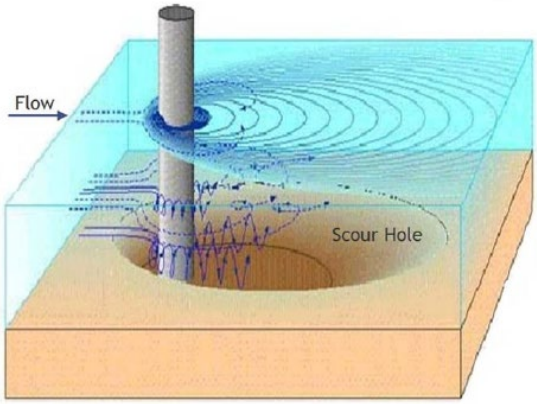
1. For bridge spans 50 feet or less, take measurements at all piers/abutments, span ¼ points, and lowest point of the channel.
2. For Bridge spans greater than 50 feet, take measurements at maximum 1/10 span up to a maximum of 20 feet on center.
3. Long bridges with a small, clearly defined channel only need to record Profiles near the channel and not the entire length of the bridge. In these cases, X and Y should start at a bridge

Pier and end at a bridge Pier that includes the stream channel Q_{100} Elevations. An initial cross section inspection for these structures must verify and document the Contract Plan Profile elevations reasonably represent the elevations in the field.

5.3.4.4 Scour Critical Findings

Scour Critical Finding must follow the Critical Finding Reporting policy and are generally defined as newly discovered conditions of:

1. **Spread footing** undermining that reduces design capacity below legal or posted limits,
2. **Deep Foundations**: Wooden piles newly exposed for any length, with brackish or tidal saltwater. Any pile newly exposed more than 3 feet, more than 1/3 of the front row, more than 10% of the pile height, or more than 10 feet of piles with unknown length.



Courtesy of FHWA

5.3.5 Re-Load Rating during Inspection

Whenever a bridge's load carrying capacity changes or is affected in any way, a new load rating must be completed as part of the Inspection. Team Leaders are responsible for submitting the updated rating calculations with a Load Rating Summary and NBI coding. Re-rating may or may not require posting. The following minimums are provided as to when HDOT recommends a load rating should be reviewed or a new load rating is required.

1. Change in field conditions.
   a. If **NBI drops to < 5** for Items 58 Deck, 59 Superstructure, 60 Substructure or 62 Culvert AND the Load Rating **Factor < 1.5**.
   b. A **rehabilitation** is complete and load rating has not been updated.
   c. Adequacy or condition of repairs or temporary shoring are questionable, see NBI Item 103.
2. Increases in Dead Load on a Bridge:
   a. If the asphalt thickness is more than 2" of load rated depth.
   b. If the asphalt thickness is 6" or more, verify the existing depth and the load rated depth.
   c. If the asphalt has a variable thickness more 3".

If an updated rating requires a structure to be posted, Team Lead must notify the BIP Lead and update NBI Item 41 Structure Open, Posted, or Closed to Traffic and NBI Item 70 - Bridge Posting.

5.3.6 Posting & Pictures

It is the Team Leader's responsibility to verify the posted signs comply with MUTCD requirements,

including cases where the MUTCD requires additional advanced warning signs. All Posted structures must have a picture of each sign in the Bridge File PDF named POST, see Document ID. Routine Inspections must submit a new POST.PDF if the Bridge File does not have one.

5.3.7 Repair Recommendations

Team Leads should keep in mind that repairs are managed, and funding is allocated based on the quality and accuracy of the element information and the repair description. Write repairs in a manner to be easily understood by all stakeholders with clear instructions others can follow.

The following are required information that the Team Leader should provide to the LPA/District BIP Leader when reporting recommendations:

1. Inspection Report
2. Plan of Action Required as described in Work Candidates in BrM Section:
    a. Scope of work
    b. Work Candidate Priority
    c. Temporary closure or action while recommended remedy is underway.
    d. Estimated Cost

The LPA/District BIP Leader will analyze and discuss the recommended actions with the LPA/District BIP Manager for programming into future budgets and/or emergency repair programs. This process requires the involvement of the BAMP Manager for reviews and approvals as well as the Statewide BAMP Manager for Statewide Funding implications and forecasting need.

5.3.7.1 Work Candidates in BrM

Repairs are documented as Work Candidate in the *Inspection* > *Work* > *Work Candidates* tab in BrM for structural defects in Element Condition State 4 or other repairs recommended by the Team Lead. The repair should be described in the Work Candidate with a scope, *Priority*, and a cost. The Element with the defect should have a reference to the repair in the notes.

Repair Scope for contract repairs should briefly describe the work required. Maintenance repairs should provide repair instructions and include: Product recommendation or Material description, Quantities, Methods, etc.

Work Candidate Priority may be assigned as follows:

Priority 1 (Urgent) – Critical Findings are documented in the BrM database as Priority 1 repairs. These repairs required an immediate action to stabilize the bridge or protect the public such as a Posted weight restriction.

Priority 2 (High) – Contract Repair is needed within a 3 years where deteriorating Element

conditions could threaten the safety or load capacity of the structure. The Load Rating has been revised and reduced the load capacity and structure may or may not require posting. Team Leads should consider a reduced frequency for these structures.

Scour defects**:** For spread footing or unknown foundations the bottom edge of the footings is exposed for less than 1/3 of the horizontal length of the footing. For deep foundations or spread footings on rock: 1) Any piling exposed above or below water more than 3 feet high. 2) More than 1/3 of the front row of piling exposed less than 10% of pile height. 4) Assume 10-foot-deep pile if pile lengths are unknown. These bridges should be monitored every 2 months as the project is being programmed.

Priority 3 (Medium) – Repairs should be completed within 6 years.

Scour defects: For spread footing or unknown foundations, scour has fully exposed the footing less than 1/3 the horizontal length of the footing. For deep foundations or spread footings on rock, one or two pilings are visible less than 10% of the piling height (Assume 10-foot-deep pile if foundation plans do not exist). These bridges should be monitored every 6 months as the project is being programmed.

Contract Repair Cost

Repairs that are assumed to be completed by contract must provide a contract scope work and an estimated cost by the Team Leader. The scope for scour defects should provide HEC-23 Countermeasure design; or justify why not with an alternate scour repair.

The estimated cost to complete the work should be based on HDOT contract costs or other sources such as “RS Means Heavy Construction Cost”. The cost should include two costs: 1) Design cost and 2) Repair construction cost. The repair construction estimate should not include other contract costs such as overhead, traffic control, mobilization, etc.

Maintenance Repair Cost

Repairs assumed to be completed by the Owners maintenance forces need a detailed scope of work or instructions, and an estimated maintenance cost. The Team Leader should verify the scope acceptable and cost is reasonable with the BIP Lead for planning. If the scope or cost is not acceptable to the Owner, then the repair should be documented as contract repair.

5.3.7.2 Completed Repairs

Inspections must verify repairs are completed properly and move the repaired quantity to Condition State 1. If the repair is not quality or is deteriorating, then the quantity should be coded appropriately.

Scour repairs do not change the Scour coding of NBI Item #113. Designed scour countermeasures repairs should be coded a 7. The Design should have prepared a POA for Scour Countermeasures (POAC). The Team Lead must obtain a copy of the POAC for inspection and submit the PDF with the Report.

5.4 Underwater (UW) Inspections

Underwater inspections (UW) are to be performed under CFR 650.313(e)(2) and are defined in Section 650.305 as the "Inspection of the underwater portion of a bridge substructure and the surrounding channel, which cannot be inspected visually at low water by wading or probing, generally requiring diving or other appropriate techniques." Per CFR 650.313(e)(2), the underwater inspections must "Identify the location of underwater elements and include a description of the underwater portion of the elements, the inspection frequency and procedures in the inspection records… Inspect those elements requiring underwater inspections according to these procedures."

5.4.1 UW Level of Effort

UW Level of Effort should be stated in the Inspection Summary of the UW Report. Due to limited underwater visibility, the inherent access restrictions of the underwater environment, and the presence of marine growth, the required underwater inspection precision depends on the level of effort. The Team Lead is responsible for deciding which of the three underwater diving inspection levels are appropriate as described here and in the BIRM Section 13.3.2.

Level I: A visual and tactile inspection of **100 percent of all underwater elements** to provide a general overview of the substructure condition and verify the as-built drawings. If undermining is detected, the scour volume must be documented to the extent necessary to detect changes in the next inspection.

Level II: Inspection requires portions of the structure be cleaned of marine or aquatic growth to allow an inspection of at least 10% of all underwater elements. In some cases, cleaning is time consuming, particularly in saltwater and the Team Lead should consider a risk-based sampling of critical areas if the marine or aquatic growth is difficult to remove. This level of inspection is intended to detect and identify high stress, damaged and deteriorated areas that may be hidden by surface growth.

Level III: A highly detailed inspection of critical structures or structural elements. Or a member where extensive repair or possible replacement is contemplated. The purpose of this type of inspection is to quantify hidden or interior damage and section loss prior to an element repair or replacement. This level of inspection includes extensive cleaning, detailed measurements, and selected nondestructive and other testing techniques such as ultrasonic, sample coring or boring, physical material sampling, and in-situ hardness testing. The use of testing techniques is generally limited to key structural areas; areas that are suspect; or areas that may be representative of the entire bridge element in question.

5.4.2 UW Requirements:

Underwater Inspection is required in Hawaii when normal water depths are more than three and a half feet a submerged element; and a safe inspection of submerged elements requires a diver. The Team Lead may request an UW Inspection be delayed due to temporarily high water by emailing the Statewide BIP Manager for approval and notify the BIP Leader.

A qualified Team Leader must ensure elements are inspected and reported properly. A Team Lead must be present during the entire dive inspection. A separate inspection Team Lead is not required if the underwater bridge inspection diver meets the qualifications of an inspection Team Leader, in accordance with MBE 4.2.5.7. If a UW Team Leader is not conducting the associated Routine Inspection, then a separate UW Report is required to document the UW inspection.

UW findings can't raise but can lower NBI Item codes in the UW or Routine Inspection. If the Team Leader determines the Scour code should be changed or updated, the Team Lead should directly contact the Statewide Hydraulic Design Engineer for a coding consensus and notify the BIP Lead. This applies to State and LPA bridges.

5.4.3 UW Reporting

Routine Inspections must either conduct an UW Inspection or verify the previous UW was timely and incorporate the results.

Stand-a-lone UW Reports should contain the following items in the given order for consistency as per CFR 650.313.

1. **Cover Page, Vicinity Map, TOC** is the same as for a Routine Inspection, see Routine Contents and Format.
2. **Inspection Summary** should include: Level of Effort performed; Justification for code changes to NBI Item 60 Substructure, 61 Channel and Channel Protection, 62 Culverts and 113 Scour Critical Bridges; Previous and new inspection report findings; Recommended Actions.
3. **Inspection Notes:** Procedures employed, ingress and egress locations, equipment used, problems encountered, and additional information helpful to future dives.
    a. Inspection frequency for each element
    b. Inspection procedures **to be followed** for each element
    c. Inspection procedures that were followed during current inspection.
4. **Existing channel conditions** must be described and include the approximate surface water velocity at the deepest point in the channel and the approximate visible distance (ft) into the water. Channel materials adjacent to all foundations must be described, above and below the waterline.
5. **Scour Defects** including dimensioned location, section loss dimensions, sketches, and pictures if conditions permit. A record of investigation at foundations that includes soil sampling and probing to determine backfilling of scour holes.
6. **Scour Findings** must have a brief description and labeled as "**UW Note DD/MM/YY:**" in the substructure element Defect 6000 for scour with a quantity and location.

7. **Designed** Scour Countermeasures, not built with the original construction, must report the existing conditions and summarize performance of the countermeasures.
8. **BrM Elements and SI&A Reports**.
9. **Photographs** taken looking upstream, downstream, debris at piers, scour repairs, scour countermeasures. If site conditions permit a photo of typical soil materials above and below the waterline, channel conditions (stability), substructure above and below waterline.
10. **Plan Sheets:** Use a Plan and Elevations to identify the UW elements inspected and show: High Waterline and date, Normal Highwater Line, Waterline elevation on each element, Stream shoreline, Direction of Flow, North arrow.
    a. **Sketch of bottom elevations of scour critical members** including locations and volume of backfilled scour holes. Include a line that indicates the calculated level of scour determined by the Scour Evaluation Report.
    b. Location of underwater elements
11. **Evaluation** of the stream and underwater substructure elements to complete the Routine Inspection Report.
12. **Scour Repairs** constructed that are not designed and do not meet HEC23 requirements. Report the existing conditions or performance of the repair.
13. **Scour Repair recommendations** with a scope, schedule and direct cost for the work.
14. **Review of SI&A data** pertaining to underwater elements against the current condition.
15. **Report Critical Finding** if applicable, in accordance with the CF procedures.

5.5 Fracture Critical (FC) Inspection

A fracture critical member (FCM) is a steel tension member that is not load path redundant. Failure of an FCM has the potential to cause the bridge or a portion of the bridge to collapse. CFR 650.305 defines an FC Inspection as “A hands-on and conducted at arms-length inspection of a fracture critical member or member components that may include visual and other nondestructive evaluations.” A Fracture Critical Inspection is a Routine Inspection that includes the additional inspection requirements stated in the Fracture Critical Procedures. See Inspection Frequency if bridge conditions require a reduced inspection interval.

The identification of FCMs are typically in the Design/As-built Plans. Per Section 6.6.2 of the AASHTO LRFD Bridge Design Specifications states, “The Engineer shall have the responsibility for determining which, if any, component is an FCM. Unless a rigorous analysis with assumed hypothetical cracked components confirms the strength and stability of the hypothetically damaged structure, the location of all FCMs shall be clearly delineated on the contract plans.

Identification of FCMs for Inservice inspection protocol includes the analysis of demonstrating that a structure has adequate strength and stability sufficient to avoid partial or total collapse and carry traffic in the presence of a totally fractured member (by structural redundancy), the member does not need to be considered fracture critical for in-service inspection protocol. If determined as such, the assumptions and analyses conducted shall become part of the permanent inspection records

in the BrM. Older structures fabricated before 1978 are not eligible for relief from fracture critical in-service inspection. The inspector must verify and document that the materials and fabrication specifications of any existing bridge being assessed for structural redundancy would meet the FCP.

5.5.1 FC Member Procedures (FCP)

The fracture critical procedures identify and locate the fracture critical limits within a member and the inspection method. Steel structures must have a Plan set indicating the required limits and methods where other structures with FCMs. The engineer developing this plan may use a Word.docx to document the plan. The FCP must be in the BrM Bridge File for reference by inspectors.

5.5.2 FC Reporting

FC Reports are to be included with the Routine Inspection Report as a separate summary section of findings and recommendations. The FC Inspection **findings** should be documented in the Element notes and labeled as "**FC Note DD/MM/YY:**" where FC labels distinguish FC findings from the RTN element comments.

Due to scheduling, access, equipment, etc. the FC inspection may not be completed at the same time as the Routine Inspection. In these cases, the 90-day deadline to complete the Routine Report with the FC Inspection still applies.

5.6 Damage Inspection (DAM)

A Damage Inspection is an unscheduled inspection to investigate, evaluate and document the structural damage resulting from environmental factors or human actions such as a superstructure traffic impact or high load hit. A Damage Report documents the findings, prior to a repair, for reference by future inspections and a Load Rating. The damage must document in detail for a structural engineer to design a repair.

Team Leads should provide a complete Damage Inspection Report with a recommendation to the BIP Lead within 3 days of notification. A load rating must be revised if the structural damage will not be repaired within 6 months, or the repair does not restore the original design capacity.

Damage discovered during a Routine or scheduled inspection should be documented in the scheduled inspection and should not complete a Damage Report.

5.6.1 Damage Inspection Procedures

All normal expectations of a Routine Inspection Report apply to a Damage Inspection Report, except only the damaged elements are inspected. The following guidelines describe the addition issues to be addressed in a Damage Inspection.

5.6.2 Damage Inspection

The first step in a Damage Inspection, the Team Lead must verify the site and structure is safe to inspect. Any safety issues must be resolved by the BIP Leader before the inspection can proceed.

5.6.3 Damage Report

A Damage Report will follow the template for a Routine Inspection Report with the following exceptions:

1. A Damage Report in BrM is considered a Special Inspection for frequency and signature. Inspectors must not change the Routine Inspection frequency for the structure.

2. All Damage Element Notes should be appended to the existing BrM Element notes and labeled as "**DAM Note DD/MM/YY:**" where DAM labels distinguish inspection findings from the RTN element comments. The DAM comments should remain in the Element notes until the damage has been repaired.

   - To properly describe the deficiency(ies), as mentioned below, provide a narrative and also provide sketches, photographs, marked up drawings, etc. It is important to provide a numbering scheme in the narrative and in the sketches, photographs, marked up drawings, etc. so that the narrative description of a deficiency readily matches up with the sketches, photographs, marked up drawings, etc.

   - For a structural engineer (contracted or DOT/LPA) to make a competent structural assessment of the critical damage, it is important to accurately describe the deficiency(ies).

   - Provide a narrative describing the deficiency(ies)

     - Provide sketches, photographs, etc. that corresponds to the narrative describe above. As mentioned above, provide a numbering scheme so that the narrative matches up easily with the sketch, photograph, marked up drawing, etc,

     - For a girder bridge, if there are deficiencies in a girder, provide a sketch or drawing showing that portion of the deficient girder within the entire deck area.

     - For a concrete deck, if there are critical spalls in the deck, provide a sketch or drawing showing the spalled areas within the entire deck area.

3. Immediate Action/s – describe action/s needed to immediately safeguard the public until recommended corrective measures can be made. The Team Leader is, in coordination with the BIP Leader is responsible for the following:

   For example:

   - Should the bridge be closed?

   - Should one lane be closed?

   - Should shoring be provided?

   - Should portable concrete barriers be placed?

- Should a snooper truck or scaffolding be needed to more accurately measure section loss?

4. Recommended corrective measures - Plan – describe actions, beyond the immediate action/s taken, being planned or taken. The Team Leader is, in coordination with the BIP Leader is responsible for the following:

   - Identify the what is needed to resolve the critical finding. This would most likely involve repairs but could also involve rehabilitation or replacement of the bridge.
   - Provide an estimate and timeline for the items needed to resolve the critical finding.

5.7 Monitor Inspection (MON)

A Monitor Inspection observes a specific known or suspected deficiency, such as cracks, settlement, or scour at an increased inspection interval less than 24 months. The Team Lead must assess the risk to the public and determines the inspection frequency and notify the Statewide BIP Manager. Monitor inspections are scheduled at the discretion of the BIP Leader.

Monitor Inspections are scheduled when a structural item needs a follow up after a RTN, FC, UW, DAM, or POSTE inspection. The originating Inspection Report must be specific as to 1) What is the monitored threat with the Element quantity and location stated. 2) What the monitor inspection must document or measure. 3) What is threshold(s) for Owner Action(s).

5.7.1 Monitor Report

A Monitor Report will follow the template for a Routine Inspection Report with the following exceptions:

1. A Monitor Report in BrM is considered a type of Special Inspection for frequency and signature. Inspectors must not change the Routine Inspection frequency for the structure.
2. All Monitor Element Notes should be appended to the existing BrM Element notes and labeled as "**MON Note DD/MM/YY:**" where MON labels distinguish MON findings from the RTN element comments. The monitoring history and measurements should be retained in the Elements until the structural issue has been repaired or addressed to the satisfaction of the BIP Lead.

5.8 Post Event Inspection (POSTE)

A Post Event Inspection investigates the structural conditions after any event such as: Scour POA triggers, Earthquake, Lava, and as a follow up to structural damage. In addition, HDOT requires a Post Event inspection after all Critical Finding repairs are completed.

The Team Lead must determine the scope of the inspection based on the situation in the field, and then inspect the appropriate elements. If inspecting a completed repair that was a Critical Finding,

investigation of construction records or staff should confirm construction followed all the design requirements.

A Post Event Inspection for a scour event should document the following items:

1. Storm event peak water surface elevation. This should be determined from debris lines, description from personnel, rain gage station, etc.
2. Changes in stream bed elevations
3. Dimensions of scour hole or undermining at foundations
4. Debris at waterway openings
5. Structure movement or settlement
6. Other post-event inspection requirements listed in the POA.

5.8.1 Post Event Report

A Post Event Report will follow the template for a Routine Inspection Report with the following exceptions:

1. A Post Event Report in BrM is considered a Special Inspection for frequency and signature. Inspectors must not change the Routine Inspection frequency for the structure.
2. All Post Event Element Notes should be appended to the existing BrM Element notes and labeled as "**POSTE Note DD/MM/YY:**" where POSTE labels distinguish POSTE findings from the RTN element comments. The following Routine Inspections may include some, all, or delete the comments.

5.9 In-Depth Inspection (DEPTH)

An In-Depth inspection is generally defined in CFR 650.305 as "a close-up inspection to identify any deficiencies not readily detectable while conducting routine inspection procedures and conducted at arms-length." An In-Depth inspection may be required routinely by an inspection procedure or specified by the Team Lead.

In-Depth inspections are a specialized structural inspection usually completed as contract work. Generally, these are non-visual or non-destructive inspection such as: Investigation of unknown foundations, Ultrasonic Testing, Ground Penetrating Radar (GPR), Concrete strength testing, Deck Chain Drag Testing, etc.

Measuring and quantifying large and small areas of exposed corrosion, deterioration or member thickness is considered Routine Inspection work required for load rating analysis and not considered an In-Depth Inspection.

5.9.1 In-Depth Report

An In-Depth Report will follow the template for a Routine Inspection Report with the following exceptions:

1. An In-Depth Report in BrM is considered a Special Inspection for frequency and signature. Inspectors must not change the Routine Inspection frequency for the structure.

2. All In-Depth Element Notes should be appended to the existing BrM Element notes and labeled as "**DEPTH Note DD/MM/YY:**" where DEPTH labels distinguish DEPTH findings from the RTN element comments. The following Routine Inspections may include some, all, or delete the comments.

5.10 Tunnel Inspection (TUN)

Tunnel Inspections always require the Team Lead to be present during each initial, routine, and special inspection, which may not occur at the same time. Tunnel inspections document the findings in a Tunnel Inspection Report. The tunnel report contents, format, documenting practice, and submittal requirements are same as the requirements for a Routine Inspection with the additional requirements described in this Section.

Tunnel inspections are documented in the Tunnel Inventory and Tunnel Inspection tabs in BrM, and do not use the Bridge tabs.

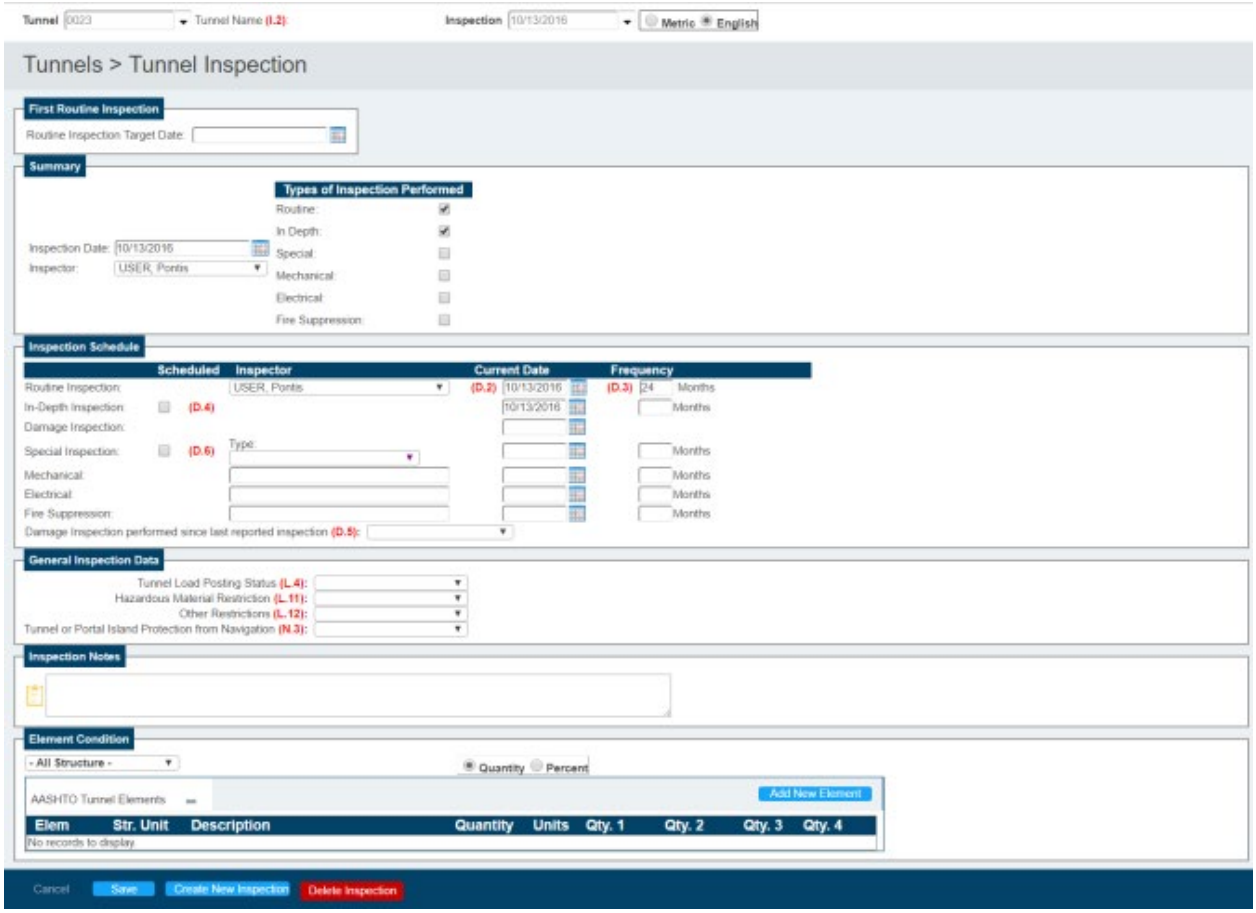
Tunnel inspection must be conducted in a safe manner. Rescue in tunnel facilities can be complicated because tunnels have limited access points and areas of confined space. Some of the dangers in tunnels include energized equipment, highway traffic, service and emergency vehicles, power supply, rigid objects, sharp edges, working from heights, flying debris, and hazardous materials.

The activities of the inspection team should be closely coordinated with the personnel at the tunnel facility. The traveling public should also be protected from any hazards of the inspection work. A written health and safety plan shall be submitted to the TIP Leader prior to inspection. That plan should focus on preventing injury, death, and equipment damage to ensure the overall success of the inspection program. The goal should be to complete the inspection with zero accidents.

Refer to the TOMIE manual Section 4.7 for details on inspection health and safety plans and procedures, including personal protective equipment (PPE), public safety measures, incident reporting, confined space entry, working from heights, lock out/tag out (LOTO), hazardous materials (asbestos, lead), etc.

5.10.1 NTI Data and Coding

Follow the detailed instructions for data organization and coding in the SNTI.

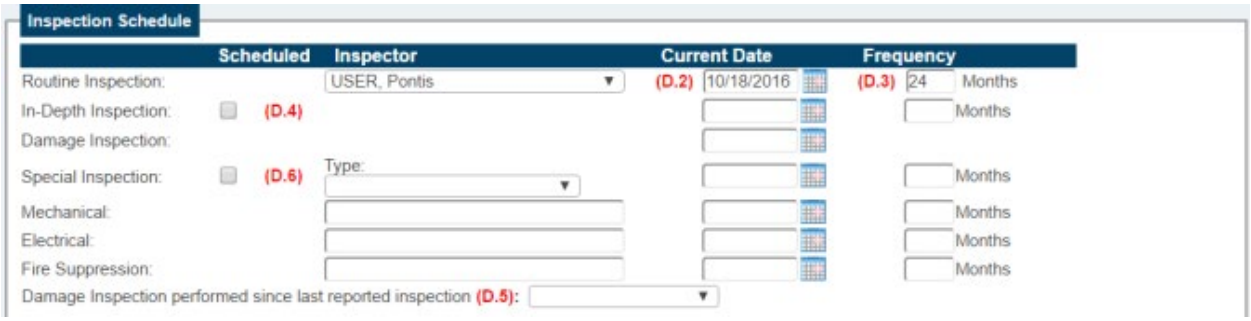


5.10.2 Coding Report Type, Date, & Frequency

All Reports must complete the *Tunnels* > *Tunnel Inspection* menus to record the Inspection Type, Inspection Date, Frequency, and the Next Date the Inspection is due.

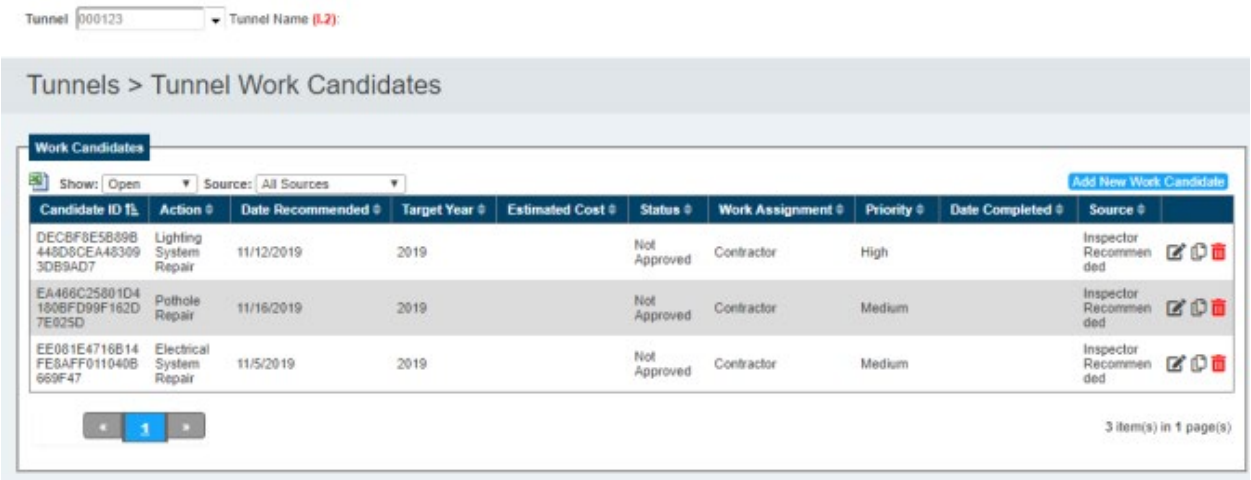
The Inspection Date or Current Date is the date the structure was inspected. If the inspection is completed over several days, the first day of inspection is the Current Date.

The Inspection Frequency and Inspection Date for the following Report types are defined in the FHWA Coding Guide and must be coded in the Tunnels > *Tunnel Inspection* menu pictured below.



5.10.3 Proposed and/or Recommended Work (TBD)

All repair recommendations must describe the repair in Tunnels > Tunnel Work Candidates.



5.10.4 General Inspection Criteria and Preparation

Refer to the TOMIE Manual for additional details on tunnel inspections and the HDOT Special Procedures for complex tunnel inspections such as the Interstate Route H-3 Tunnel and Wilson Tunnels.

Prior to any inspection the Team Leader must have the following in order to identify problem areas, formulate appropriate inspection procedures, check assumptions, verify schedules and develop inspection documents:

1. Prior Inspection Reports (Routine, Monitor, Damage, etc.)
2. Available Sketches
3. Crash data
4. A pre-inspection visit that prepares the team for the inspection. The team should understand the tunnel configuration, current site conditions, methods of access, and traffic condition.
5. Prepare As-built sketches, diagrams and schematics, if not already available, of the structural,

electrical, mechanical, hydraulic systems for use during the inspection.

6. Confirmed communication procedures with tunnel personnel including having contact information for onsite scheduling for equipment use and power down processes.

5.10.5 General Tunnel Inspection Practices

The tunnel inspection organization should develop a set of best practices to help maintain the quality of the tunnel inspection program. Some common types of general inspection practices include cleaning, field measurements, and establishing survey control. Refer to TOMIE manual for additional information.

Cleaning – Debris, efflorescence, rust, or other foreign substances should be removed to better observe the condition of the defect. The appropriate tools and equipment should be used to remove corrosion and limit damage to any applied finishes. In many cases, wire brushes may be appropriate to remove corrosion; while in other cases, foreign substances can be removed using water, solvent, compressed air, or another cleaning fluid in conjunction with a soft bristled brush.

Field Measurements – After visually inspecting all exposed surfaces, the defects and deficiencies should be properly measured and recorded. The location of the defect is important for subsequent monitoring and repair work. For example: Spalls in the concrete are characterized by their length, width, and depth. Length and width are noted for cracks. Corrosion of steel members is measured along the length and width. The depth of corrosion is measured. Similar measurements can be made on wood members to document any deterioration. Accurate measurements ensure quality results.

Survey Control – It is important to be able to locate a defect once it has been documented. A survey control system helps to locate defects during follow-up inspections, monitoring or repairs.

Most highway tunnels have a baseline or stationing system already established. Using this information, the tunnel inspectors can accurately record the location of the defects and deficiencies. To take this one step further, some tunnel facilities use wall panels that have defined widths that can be used as part of the survey control system. By establishing a grid incorporating the panels, defects can be measured from the panel joints and their location converted to the stationing system.

In addition to locating a defect by panel number and station in the longitudinal direction of the tunnel, the position of the defect within the tunnel cross-section (perpendicular to the tunnel axis) should be recorded. The direction to face must be established. For example, a defect in a circular tunnel located at 4 o'clock facing in the direction of traffic would be at 8 o'clock when facing against the direction of traffic. The areas of horseshoe, rectangular, and other shaped tunnels can be divided into convenient sections that uniquely define the location such as the top, left, right, or bottom. For example, a defect in a rectangular tunnel at Station 10+55.33 may be written as "located 3.5 feet up from the bottom right wall when facing up-station" or abbreviated as "3.5BRW/US@10+55.33".

5.10.6 Tunnel Special Procedures (TSPs)

Hawaii has four complex tunnels that require Tunnel Special Procedures (TSPs) for inspection which are:

Wilson Tunnels (IB 003000630400575 & OB 003000630400576)

Harano Tunnels (IB 003000H30200544 & OB 003000H30200545)

The tunnel special inspection procedures describe the requirements to inspect specialized systems in the complex tunnels such as fire protection, lighting and ventilation. These systems must be kept in good working order to minimize the risk of death and injury during an emergency such as a vehicle collision, fire, flood, earthquake, or criminal act.

TSPs are in the Bridge File and the Tunnel Inspection must document the special procedures were followed in the Tunnel Inspection reporting.

5.11 Critical Finding (CF)

A Critical Finding is defined as a structural or safety related deficiency that requires immediate follow-up inspection or action, as described in CFR 650.313(h). When Team Leaders discover a structural or safety related deficiency that threatens public safety, they must act immediately to protect the public and contact the BIP Leader. If necessary, call 911. In these situations, the BIP and Team Lead must be proactive and timely to protect the public. Immediate actions associated with a Critical Finding include, but not are limited to:

1. Reducing the speed limit, Diverting the traffic, or Lane closure
2. Shoring of unstable elements
3. Emergency weight restriction
4. Coding NBI Item to “3” for Deck (58), Superstructure (59), Substructure (60), Culvert (62)
5. Bridge rail failure or field condition that threatens public safety
6. Bridge Closure should follow Agency Emergency Closure protocols.

It is the Owner’s responsibility to implement immediate actions and complete the temporary or permanent corrective measures timely. Until corrective measures have restored structural integrity or safety, a Critical Finding status remains “Open”. The Statewide BAMP Manager will determine when the deficiency is no longer a threat to the public and “Close” the Critical Finding. All Critical Findings and the monthly progress are reported to FHWA until the Critical Finding is Closed.

5.11.1 Critical Finding Notification

The BIP Lead must email a Critical Finding Notification to the Statewide Bridge Design Engineer and the Statewide BIP Manager immediately or by the close of business (COB) that day. The report or email should be uploaded to the BrM Bridge File the same day. The Bridge Design Engineer should forward the Critical Finding Report to FHWA by the COB the following day and cc the Statewide BIP Manager. The Critical Finding Report email or PDF should report the following information.

1. **Subject:** Critical Finding: Date/Time discovered, Bridge Name, Bridge Number, Owner
2. **Immediate action/s taken** to safeguard the public.

3. **Description of damage** or conditions of elements and probable cause of Critical Finding.
    a. If known, source of discovery.
    b. Description of damage or typical conditions.
    c. Include at least one photo of the damage or typical conditions.
    d. Estimated scope, schedule, and cost to repair Critical Find.
    e. Team Lead, Inspection Report Date, or when it is expected to be complete.
    f. Load Rating Engineer and Load Rating Date, or when it is expected to be complete.
4. **Plan of Action**: Brief statement of current planned actions for the Short Term (days), or Long Term (months) with Monitor Inspection frequency.

This is a highlighted summary of the situation and field conditions for the Statewide BIP Manger. The inspection assessment and detailed information is documented in the appropriate HDOT Inspection Report type. The Inspection Report (with updated Element, NBI, and SI&A data) should be uploaded to the Bridge File as soon as possible for the Statewide BIP Manager.

5.11.2 Critical Find Repairs

All Critical Finding repairs must be designed by a Licensed Structural Engineer. If the repair cannot restore the design capacity of the structure, the Load Rating must be revised and submitted to the Bridge File to reflect the current conditions.

5.11.3 Critical Finding Monthly Status Report

The BIP Lead must follow up each CF and send a Critical Finding Monthly Status Report (CFMSR) by the 15th of every month to the Statewide Bridge Design Engineer and Statewide BAMP Manager until the Critical Finding status is Closed. The CFMSR can be an email or spreadsheet stating:

1. Prior month's activity such as: Inspection Results, Design update, or percent Completed Construction.
2. Schedule of next Activities or Actions.
3. Expected Completion date of safety measures.
4. File format: YYYY Month CFMSR BridgeName such as: 2017 Sept CFMSR BridgeName

The remainder of this page is intentionally left blank

6.0 BRIDGE FILE & REPORT DEADLINES

This Section describes the Bridge Inspection Program Bridge File and the Tunnel File required documentation, the maintenance process, and reports deadlines for the State of Hawaii.

The Bridge File (Bridge Metric 15) and Tunnel File (Tunnel Metric 11) must be maintained to document the structure's history and relevant information, including non-inspection activities such as: Preservation, Repairs, Rehabilitation, and Improvements, ref CFR 650.313(d) and CFR 650.513(h). The BIP Leader is responsible for maintaining an up-to-date Bridge File or Tunnel File for each structure.

The official **Bridge and Tunnel File** for Previous Inspection Reports is the *BrM Inspection Multimedia* tab. The official Bridge File for all other information such as Load Rating, Scour reports, As-built data, and all other files as defined in section 6.2. are located within the HDOT Bridge Servers where all electronic documents are stored and secure. An Inspection Report is not considered complete until the document is stored in BrM and available as a public document within 90 days, ref CFR 650.315 and HDOT policy.

All original signed bridge documents submitted to BrM, paper or digital, must remain in BIP Lead Bridge File until the files are verified to be in the BrM Multimedia folder. If all historical and relevant information is scanned and posted in the BrM Multimedia folder, the BIP Lead may dispose of the paper and delete the digital BIP Files.

All current and previous inspection report types with SI&A sheets must in the Bridge File.

For access to information not stored on the BrM Inspection Multimedia tab, please contact BrM.Help@hawaii.gov and request the information required. Please provide specific information such as Bridge ID, Island, type of document/information and any other specifics that may help assist in the team providing the appropriate information to you.

6.1 Bridge File Document Name Format

A Bridge File for each structure should include but not be limited to the items listed in this Section. Documents must be a PDF electronic format, unless specified otherwise, and use the filename format as follows:

Bridge Number (space) **DocID** (space) Bridge Name (space) **Inspection Date** (MMDDYY)**.PDF**

Bridge File Document Name Examples:

003000610300568 **TUN** Pali Tunnel No. 1A (Outbound) 010915
009003400900927 **RTN** Kahakuloa 093015
007000500001419 **FC** Kaumakani Pedestrian Overpass 012501
009000320400050 **LRS** Waiale Road Overpass 011108
001000190308146 **SER** Nanue 060513
007401111440001 **PLAN** Puuopae 090816

6.2 Document IDs

Document ID is an abbreviation for the type of inspection report or document and defined as follows. If there is more than one report in the PDF, combine the Report ID's using the format: (space)**Doc ID**(space)**Doc ID**(space) as needed.

Inspection & Report Type	Doc ID	Format Comment
• Routine	RTN	Routine Inspection Report & relevant docs
• Underwater	UW	If UW not included in a Routine Inspection
• Fracture Critical	FC	If FC not included in a Routine Inspection
• Monitor	MON	
• Damage	DAM	
• Post Event	POSTE	
• In-Depth	DEPTH	
• Tunnel	TUN	
• Critical Finding Report	CFRpt	Critical Finding summary of RTN or DAM inspection

Bridge File Documents	Doc ID	Format Comment
• Bridge Plans	PLAN	Use Plan Date or structure Year Built
• FHWA Critical Finding Notification	CFNote	Use Date of critical finding
• Cover Page	COVER	Use Date completed or revised .docx (**NOT PDF**)
• Report Drawings/Sketches	DRAW	Software file format: .DGN, .DWG, etc. (**NOT .PDF**)
• Fracture Critical Procedure	FCP	Use Date PDF completed or revised
• Load Rating Summary	LRS	Use Load Rating Date instead of Inspection Date
• Load Rating Calcs	LRC	Use Load Rating Date instead of Inspection Date
• Maintenance Repairs	MAIN	Use Date work was completed
• Ownership/transmittal Docs	OWN	Use Date transmittal was effective
• POA for Scour	POAS	Use Date PDF completed or revised
• POA for Countermeasure	POAC	Use Date PDF completed or revised
• Posting Notification	POST	Use Date posted
• Posting Picture	PostP	Use Date Picture Taken
• Scour Calculations	SCalc	Use Date PDF completed or revised
• Scour Evaluation Report	SER	Use Date PDF completed or revised
• Scour Plan sheet	SPLAN	Use Date PDF completed or revised
• Tunnel Special Procedures	TSP	Use Date PDF completed or revised
• Vicinity Map	VIC	Use Date PDF completed or revised
• Other	OTHER	

6.2.1 Document ID Descriptions (Alphabetical)

CFR	The Critical Finding Report and subsequent actions taken unless included is other Reports.
DRAW	Digital drawing file of structure Plan, Elevation, Section, or Details and Sketches used in a Report. The file extension is the file format of the software, not a .PDF file format. If more descriptors are needed to identify more than one file, then add no more than 5 characters to the end of the Bridge Name: Bridge Name(space)DESCR.
LRC	Documents that provide the basis for the reported rating value; calculations with software input/output or engineering justification for assigned ratings.
PLAN	Bridge Plans and Special Provisions for all contract work and structure types. Original Contract, widening, rehab, and repair plans will be distinguished by the Contract Date. The Contract Date (MMDDYY) should be the date indicated on the first sheet.
POST	Notification of need to Post (email); and email stating when posted & weight (picture with date).
OTHER	Documents relevant information such as: Special reports, Studies, News articles, Rehab planning. General correspondence regarding: Planned projects, High water events, or matters relevant to inspection.
RTN	This ID is used for Routine and Initial Inspections
SP	Scour Plan sheet that shows the Scour data: Hydraulic data, Footing Elev./Dimensions, & Scour depths. This should be on the Cover sheet of the Bridge Plans.
SIA UW FC	Use these if the SI&A sheet, Underwater, or Fracture Critical Report is submitted separately and not included in a Routine Inspection Report.

6.3 Finalizing Reports & Bridge File Submittal

Submitting Inspection Reports is a two-step process if there are changes to SI&A data that does not normally change.

6.3.1 Final Report Timeline & Deadlines

A signed Report is considered complete when the Report is stored in the BrM Bridge File for all scheduled and unscheduled inspections performed. The submittal process for all Reports has several steps with deadlines for a report to be complete within 90 days. The procedure applies Statewide and is the same for the HDOT and LPAs. The deadlines for the steps to be completed are based on the number of days from inspection date as follows.

Before signature, all Initial and Routine Inspection data must checked on the FHWA website for

errors. A TNI data file or, NBI data file and Element data file must generated by BrM and checked on the website and be error free. All Fatal and Non-Fatal error codes must be corrected, or justified in the report, before the Report is submitted or considered complete. This fundamental data check prevents a long list errors during the HDOT annual submittal process. The check is not comprehensive or assure quality. Coding questions may be directed to the BIP Lead or Statewide BIP Manager.

1. **Day 0:** **Team Lead** conducts field inspection within the calendar month the inspection is due.

2. **Day 30:** **Team Lead** completes a report with signature and submits applicable inspection files with Bridge File PDF names to the BIP Lead within 30 days of Inspection. The submittal should include all documents for review by the BIP Lead, including LRS, Drawings, Photos, etc. as required.

3. **Day 60:** **BIP Lead** reviews Report and returns for re-submittal, or signs as QC in BrM and notifies Team Lead. C&C Honolulu LPA provides additional QC signatures at this step.

   Team Lead provides final Report PDFs with BIP QC signature.

   BIP Lead uploads the Report file(s) to their assigned HDOT FTP site within 60 days of Inspection, and notifies brm.help@hawaii.gov.

   Other Bridge File documents not directed related to an Inspection Reporting can be uploaded to the HDOT FPT site at any time and notify brm.help@hawaii.gov

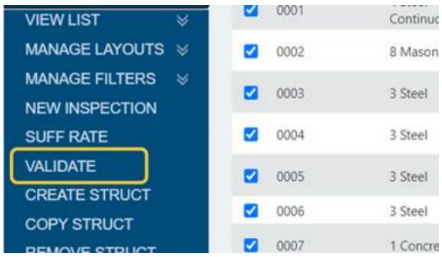
4. **Day 90:** **BrM Help** links the files in BrM Multimedia Folder within 90 days of Inspection and notifies the BIP Lead.

6.3.2 Annual BrM Data Submittal to FHWA

HDOT is required per Federal guidelines to submit a complete NBI data file with no fatal data errors annually in March. The BrM Coordination team runs a validation check in January and corrects any errors that may arise. The process defined in section 6.3.1 is in place to minimize the errors found at this time. The BrM Coordinator will make the final submission of both NBI and NTI data no later than March 15 annually. See also Section 3.6 for more general information on the submission requirements.

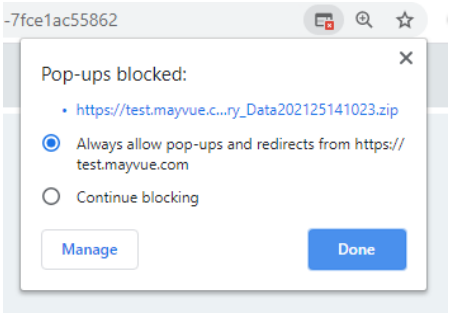
The step by step process for data checking is as follows:

1) Select your NBI bridges in BrM and click the Validate button. BrM has the NBI checks built in. The results of this validation will give you a good idea of what data needs to be cleaned up before your tape is ready.

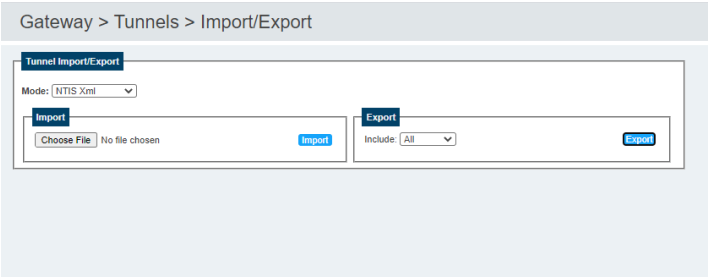


2) Generate an NBI and NBE file of your bridge data using the Gateway > Export Page in BrM.

Note: If the file does not export, check if pop-ups are blocked and allow pop-ups from your BrM site. Then click the 'Export' button again.

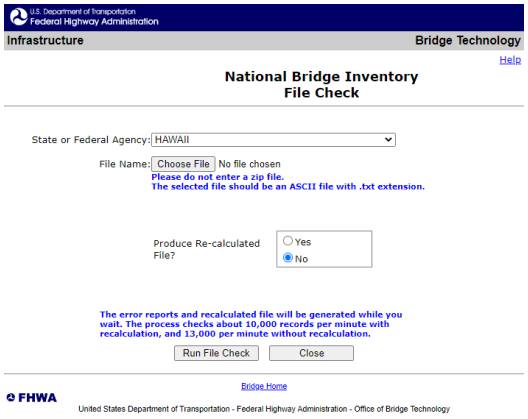


3) For Tunnel data, the NTI file can be exported using the Gateway > Tunnels > Import/Export page.

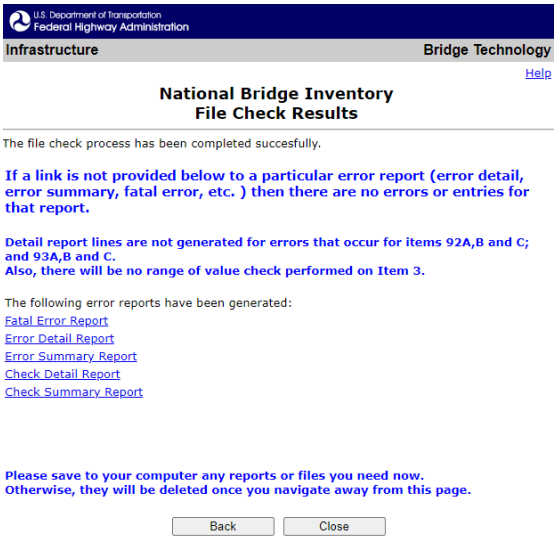


4) Upload the NBI File exported from BrM to the FHWA NBI file checking site: https://fhwaapps.fhwa.dot.gov/bridgeCheckerp/(S(fdah2dhu42chok53q5euteq3))/NBIFileCheck.aspx

   a. *Note: You will have to change the .nbi file extension to a .txt to run the file check.*

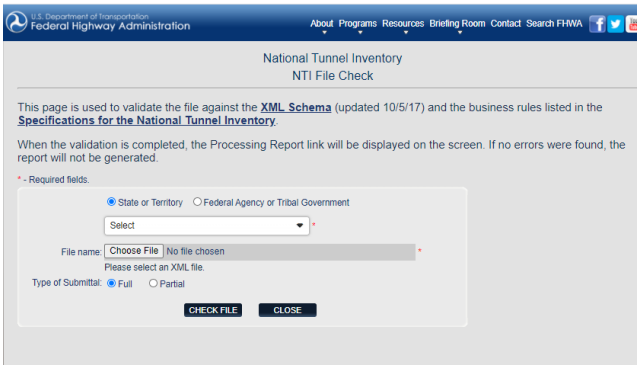


b. *Note: Address any errors found. If your error results won't download when you first click on the hyperlinks, you may also have to allow pop-ups from the site to download them.*



5) Now upload the NBE File to the FHWA NBE file checking site: https://fhwaapps.fhwa.dot.gov/elementCheckerp/(S(3eaeyup4ba5umaeku4nd5kma))/CheckBridgeElements.aspx and address any errors.

6) Upload the NTI file to the FHWA NTI File Check site: https://fhwaapps.fhwa.dot.gov/FullNTICheckerp/



7) You can repeat this process as often as necessary.

7.0 BIP LEADER DUTIES & REPORT QC

This Section of the Manual contains the QC requirements of a BIP Leader and clarifies other responsibilities. While sections may duplicate data from other sections, this section's purpose is to ensure the understanding of the BIP Leader's role and responsibilities.

7.1 Inspector Qualifications Monitoring

Upon award of consultant inspection contracts, the BIP Lead must request the contractor submit the proof of qualifications for all inspectors. After verifying the course dates and experience, PDFs of the proof need to be forwarded to the Statewide BIP Manager in order to update the Statewide Inspector Registry.

BIP Leads must keep a copy of their own inspection certifications available for audit with annual Bridge or Tunnel Metric 3.

The remainder of this page is intentionally left blank

7.2 QC Review Checklist for Reports

The BIP Leader is responsible to conduct a QC Review and sign all bridge inspection reports. The intent of the QC process is to ensure: Compliance with FHWA and BIP policies, meet Owner requirements, ensure significant findings are appropriately documented, and take necessary actions. The following is a QC Review Checklist of Inspection items.

☐ **Bridge is inspected prior to the Due Date,** see Final Report Timeline & Deadlines.

- Late Inspections are considered Non-Compliant by FHWA and the Statewide BIP Manage must be notified.
- Rescheduling Inspections to be inspected after the month due must notify the Statewide BIP Manager to obtain written FHWA approval prior to inspection.

☐ **Scour Items to look for**

- Channel cross sections are required for all bridges over a waterway.
- NBI Item #113 Scour Critical Bridges Code.
  - If inspector recommends changing Item 113, ensure the State Hydraulics Engineer has concurrence.
  - If Item 113 = 3 or 7, inspection must follow Scour Plan of Action (POA) inspection requirements.
  - Scour is described in the Element defect number 6000 (Scour).
  - Sketches quantify & locate scour in enough detail to detect changes in future inspections.

☐ **Load Rating and Posting:** If a change in load restriction is required, the new signs must be posted within 30 days of notification, which is within 60 days of the date of inspection. BIP Leads should check to see if the structure needs a new Load Rating, see Re-Load Rating during Inspection

☐ **Review Element** condition and quantities

- Load path Elements with quantities in Condition State 4 indicate an NBI Superstructure or Substructure = 4.

☐ **Critical Finding**

- If the Bridge Inspection Report documents a Critical Finding, return the Report to the Inspector until a detailed/measurable/actionable Report and process has been completed.
- Existing Critical Finding Notification is posted in BrM. If not, upload to HDOT FTP site and notify brm.help@hawaii.gov

☐ If **Super, Sub, or Culvert changes** from 5 to 4 or less, inspection should have submitted a new Load Rating

☐ **Repairs** are reasonable and coded as new Work Candidates. Design improvements such as Bridge Rail upgrade should not be coded as a Work Candidate unless the rail is not safe structurally.

- Existing Work Candidates such as structural repair work, cleaning, maintenance, etc. are updated or documented as complete.
- Notify appropriate personnel for Repair Programming.
  - Traffic of needed sign repairs
  - Maintenance of needed guardrail repairs
  - Utility Company of utility decencies
- New Work Candidates must include preliminary design, cost estimate, and when the repair should be completed to mitigate risk.

- ☐ **Bridge Inspection Report (BIR) is signed** by a qualified Team Leader and BIP Lead
- ☐ **BIR** is uploaded to FTP website BrM within 60 Days of Inspection, see **Bridge Inspection & Report deadlines.**

7.3 Unscheduled Inspections

BIP Leaders are responsible for initiating and timely completion unscheduled inspections such as traffic impacts, fire, flood, or completed construction within your jurisdiction that require inspection.

7.3.1 Structures Discovered to Exist

Existing structures new to BrM must be inspected within 90 days from the day of discovery by the Agency and complete an Initial Inventory Inspection Report with 180 days of the discovery. The BIP Leader must request a new Bridge Number from HDOT Bridge Design Office or brm.help@hawaii.gov before the Team Lead can input data into BrM for new structures and structures not in BrM.

7.3.2 Completed Construction and Temporary Structures

An Initial Inventory Inspection must be completed for all structures within 90 days from the date a **partial**, **temporary,** or **permanent** structure is open to the traveling public in accordance with FHWA Questions and Answers on the National Bridge Inspection Standards 23 CFR 650 Subpart C, Q303-7, 2004 and CFR 650.315. Inspection after substantial completion but prior to traffic is required for tunnels and recommended for all structures.

The Report must be completed and in BrM within 90 days of the Inspection Date.

- Newly constructed portions of an existing bridge must be inspected within 90 days of being open to public traffic. An Initial Inventory Inspection applies to the new construction portion, and Routine Inspection criteria applies to the existing structure.
- Long-term projects where whole or partially constructed structures are opened to traffic must be inspected with 90 days.
- **Temporary structures** with traffic during construction while the permanent structure is closed must have a Routine Inspection. The Report should provide any structural findings in an Inspection Summary and code only SI&A Items 10, 41, 47, 53, 54, 55, 56, 70, and 103 as recommended by FHWA Questions and Answers on the National Bridge Inspection Standards 23 CFR 650 Subpart C, A303-7.4. The other SI&A Items and previous element data should remain unchanged.
- Completed Bridge rehabilitation and widenings must code **Item 106** - Year Reconstructed with the year the contract work was permanently open to traffic. See the FHWA Coding Guide for types of eligible work not considered as reconstruction such as: Painting, Rail upgrade, Repairs, Retrofit without improvement.

Routine Inspections should continue for bridges that are permanently removed from service yet

remain in place above pedestrians and/or traffic or have the potential of endangering the public. When they are removed from service, the Assistant Statewide BIP Manger should be notified. NBI Item 70 Bridge Posting is coded K for “Closed” and may have up to a 72-month Inspection Frequency assigned.

7.3.2.1 Design Documents Required for New Structures

The BIP Lead must obtain 3 required documents from the designer for a Team Lead to inspect a new structure. These files should be available in the Bridge File 30 days prior to the Initial Inspection and retained until verified in the Bridge File. New structures require:

1. **Contract Plans** with special provisions – As-built plans preferred.
2. If the structure is over a waterway:
   a. **SER** with scour calculations (SCalc) & POAS.
   b. Plan Sheet with **hydraulic data.**
3. **LRS** and Load Rating calculations.

The first sheet of the Bridge Plans should show the hydraulic data which includes, 1) Calculated General & Local scour depths, 2) Scour Elevations relative to the foundations, and 3) Design high water levels. This information may be shown one or more sheets.

7.3.3 Initiating Damage Inspection by BIP Lead

The source of discovery may be from the news, the public, maintenance staff, etc. BIP Leaders need to be proactive to ensure the Owner staff and maintenance informs them when a structure is damaged.

The BIP Lead is responsible for initiating an unscheduled Damage Inspection and should receive a complete Damage Inspection Report within 3 days of notification. Damage Inspections are at the discretion of the BIP Lead’s professional judgement. If a Team Leader is not available to the BIP Lead, then contact the Statewide BIP manager. Damage inspections by a Team Leader are recommended when:

1. Damage to elements in a primary load path.
2. Damage is considered a Condition State 3 or 4 defect.
3. Damage would change NBI Items 58 Deck, 59 Superstructure, 60 Substructure, or 62 Culverts rating.

Concrete spalling that removed concrete cover and does not damage rebar would not require a Damage Inspection. If the damage meets the definition of a Critical Finding, then the damage must be reported to the Statewide BIP Manager immediately in accordance with Critical Find and Reporting.

Prior to inspection, the BIP Lead should ensure safety measures are in place to protect the staff and public. The BIP Lead should follow the Agency protocol for the situation such as: Traffic closure, Calling 911, Debris removal, or Public relations. BIP should notify their Chain of Command and notify the Statewide BIP Manager the same day. The HDOT Statewide BIP Manager will notify FHWA Hawaii Division.

7.4 Inspections Past Due

It is the Team Leaders responsibility to ensure the structures are inspected in a timely manner or to request the inspection be rescheduled. The BIP Lead must verify the structure was inspected timely for compliance and notify the Statewide BIP Manager if the field inspection was late.

7.5 Plan of Action for Scour (POAS & POAC)

The Owner must develop and maintain a Plan of Action (POAS) for scour critical structures per the requirements of CFR 650.313(e)(3) and follow Bridge Inspection Reference Documents for scour. It is the BIP Leaders responsibility to complete the activities specified in a Plan Of Action for Scour (POAS) for each structure, see Monitoring Bridges for Flood Events.

All new and modified POAs for scour (POAS) must be approved by the Statewide Hydraulic Engineer for consistency within the State of Hawaii and should be placed in the Bridge File within 30 days of completion.

Scour Countermeasure constructed on existing structures must have the NBI Item 113 Scour Critical Bridges coded “7” with a Plan of Action for the Countermeasure (POAC). This is for the Inspectors to monitor the performance of the scour countermeasure.

7.5.1 Monitoring Bridges for Flood Events

The Statewide Scour Monitoring process described in this Section applies to all structures with a POA for Scour Critical Bridge that requires monitoring during a flood event in accordance with 23CFR650.313(e).

7.5.1.1 Monitoring the Weather

The BIP Lead is responsible for **monitoring the weather** for flood warnings or appropriate triggers described in the POA. If the storm meets the trigger criteria, the BIP Lead or appropriate staff must immediately protect the traveling public and begin monitoring the structure, as described in the POA. Monitoring must continue until the storm passes or the peak water level is well established. Each Agency is responsible for staffing resources to provide adequate monitoring of each structure affected by a storm event.

If weather conditions at the site are not safe to monitor the structure, the Agency should close the structure and follow the Bridge Closure Plan in the POA and follow the Agency closure protocols.

7.5.1.2 Links to Weather Alerts

Suggested links for District/LPA BIP Leaders to obtain weather related alerts and real-time stream flow conditions are stated below. The following links enable users to opt in to emergency alerts on a cellular phone or e-mail for weather related triggers as required in the Scour POAs such as a "Flash Flood Warning".

1. OAHU-CCH - Department of Emergency Management

   Mass Notification: "HNL.Info" at https://hnl.info/

2. MAUI COUNTY - Maui Emergency Management Agency

   Mass Notification: "Everbridge" (Maka'ala):

   https://member.everbridge.net/index/892807736722768#/login

3. KAUAI COUNTY - Kauai Emergency Management Agency

   Mass Notification: "Blackboard" at https://countyofkauai.bbcportal.com/

4. HAWAII COUNTY - Hawaii County Civil Defense Agency

   Mass Notification: "Everbridge"

   https://member.everbridge.net/index/371914103062563#/signup

Additional resources that are available for government use:

1. iNWS (NOAA) at https://inws.ncep.noaa.gov/
2. Pacific Disaster Center at https://www.pdc.org/

7.5.2 Monitoring the Structures

The BIP Leader or qualified staff, must monitor the scour critical structures during a storm event and downstream of areas with heavy rainfall or known flooding in accordance with CFR 650.313(e). If the monitoring protocol is not specified in the POA, structures should be checked every hour until the flood and scour danger passes. Prolonged storms may have more than one peak rainfall and downstream locations with a delayed peak flood level. The monitoring procedure is as follows:

1. Identify limits of the storm and bridges monitor for each event. BIP Lead should, as a minimum, receive automated text Warnings from the County Emergency Services. See the following paragraph.

   If a gaging station is appropriate for the bridge site, the stream peak flow may be checked remotely with USGS gaging stations. Charts of the current water level (FT), peak, and flow (CFS) may be available for to document the event. The following USGS link allows users to subscribe to alerts based on custom real-time stream flow parameters. This webpage is useful for monitoring alerts over selected or nearby streams with real-time information. https://maps.waterdata.usgs.gov/mapper/wateralert/

2. If the water level exceeds the water mark specified in a Scour POA, the BIP Lead must initiate a Post Event Inspection for scour to be completed within 3 days; or within 7 days of a large storm event, whichever is sooner to minimize the public risk.

3. If water levels exceed the threshold for immediate action, follow the procedures in the scour POA which may restrict or close the bridge immediately to protect the public.

7.5.3 Storm Reporting

As part of the Statewide **Plan of Corrective Action (PCA) for Scour**, BIP Leads must report the high-water level to the Statewide Hydraulics Engineer and the Statewide BIP Manager. BIP Lead must maintain a Monitoring history and document each storm event for each Scour Critical structure monitored. The Monitoring history contains: Bridge ID, Bridge Name, Warning Time/Date, Monitor Period, Measured water levels and time, Peak height.

The updated Monitoring spreadsheet or a separate email must be sent to the Statewide Hydraulics Engineer and the Statewide BIP Manager within 24 hours after each storm event.

7.6 Programming BIP Repairs

HDOT BIP Leads must review the Inspector Recommendations for scope, priority, and cost (in the *Inspection* > *Work* > *Work Candidates* tab in BrM.

The BIP Lead is responsible for completing the repairs with the Owners *Assigned* in BrM as *In-House Maintenance*, where the HDOT District Engineers and County are considered the Owners.

Review of the Inspector recommended repairs should consider:

1) Extent and type of damage/deterioration
2) Possible planned rehabilitation or replacement
3) Estimated rate of damage/deterioration

The BIP Lead must include the date the repair is completed in the BrM *Date Completed* field under the appropriate work candidate.

See the TAMP Process in Section 11.

The remainder of this page is intentionally left blank

8.0 LOAD RATING & POSTING

8.1 Load Ratings

CFR 650.313(c) requires each bridge to be rated for its "safe load-carrying capacity in accordance with the AASHTO Manual for Bridge Evaluation (MBE), … and Post or restrict the bridge in accordance with the MBE or in accordance with State law, when the maximum unrestricted legal loads or State routine permit loads exceed that allowed under the operating rating or equivalent rating factor."

The NBIS requires that a load-carrying capacity be determined for all NBI bridges, culverts, and tunnels with suspended roadways. All load ratings and posting requirements shall be in accordance with the Manual for Bridge Evaluation and as modified in the HDOT Design Criteria for Bridges and Structures.

When load ratings are not completed as part of a structural inspection, the following BrM tasks must be completed by the Owner within 90 days of the load rating date.

1. Update NBI Item 41 Structure Open, Posted, or Closed to Traffic and if the bridge is posted update NBI Item 70 – Bridge Posting.
2. The State Load Rating Engineer or LPA BIP Lead will upload the Load Rating Summary and the Load Rating Calculations to the Bridge File.

8.2 LRFR Load Rating Factor Less than 1.0

When the initial load rating factor is less than 1.0, the structure must be posted. If a Load Rating is < 1.0, the Load Rating Engineer or Team Leader must inform the BIP Leader and the Statewide Load Rating Engineer of the Load Rating Summary results by the end of that day. This allows the Owner the maximum time to respond to the low rating.

The Load Rating Engineer should minimize the hardship related to emergency vehicles and economic hauling without jeopardizing the safety of the public. The Owner Agency has 30 days to complete the following steps and post. If these steps cannot be completed within 30 days, the structure must be temporarily posted and revise or remove the sign pending the finalized load rating in accordance with FHWA.

1. Review field conditions for consistency with the load rating assumed values where actual field conditions may indicate a higher load rating.
2. Review conservative load rating factors and assumptions for a justified increase in the load rating.
3. Use finite element analysis to improve the load path model.
4. Conduct material strength tests to determine if higher material strengths exist.
5. Load test the bridge with a verified truck and axle weight to a determine the load rating.

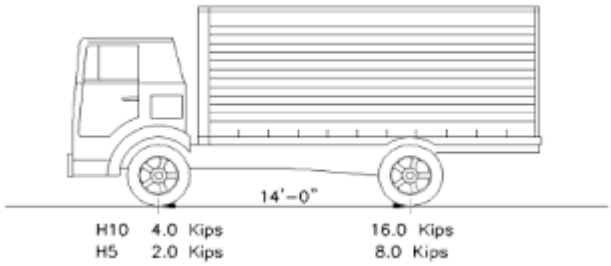
For asset management purposes, the load rating for all posted bridges must include a

recommendation for at least one rehab and cost to strengthen a structure that would obtain a legal load rating > 1.0.

8.2.1 Load Ratings Less than 0.5

If the governing load rating for legal loads is less than 0.5, then the load rating should include a Load Rating Factor for an H10 truck.

When the Load Rating Factor for the H10 truck is less than 0.3, which is less than 3 Tons, the structure must be closed immediately to the traveling public and code the NBI Item 41 a "K" within 90 days.



8.2.2 After the Structure is Posted

After the bridge is posted by the Owner, the BIP Leader must email the State Load Rating Engineer, the Statewide BIP Manager, and update the Bridge File when the structure is posted with pictures. The pictures document all signs for future inspections such as, two pictures for bridges with two-way traffic, one picture for bridges with one-way traffic, or more if necessary. The Load Rating Engineer, District Permit Engineer and State BIP Manager should be notified within 5 working days after the structure is posted. The Bridge File must be updated within 90 days of receipt of the weight restriction recommendation.

8.3 Concrete Bridges with Unknown Plans:

In accordance with MBE 6.1.4, a concrete bridge without plans or known reinforcement does not need load rating calculations if the following conditions are met:

1. The original design Live Load is verified with historical evidence.
2. The bridge shows **no significant level of distress**.
3. The bridge has been carrying normal traffic for an appreciable length of time

In these cases, the Statewide Load Rating Engineer will document the justification of the safe load carrying capacity, and maximum permit axle weights and spacing, in a memo to the Bridge File for State and Local Agency bridges.

8.3.1 Load Rating Bridges with unknown Plans.

A Load Rating based on a field investigation is required if a concrete bridge is in Fair condition, Poor condition, or showing signs of distress such as structural cracking, corrosion, spalling, etc. The field investigation must document all information necessary for a load rating such as: Concrete strength, Concrete cover, Concrete dimensions, Existing rebar size and spacing. A minimum effort for a rebar investigation should use a pacometer and visually verify the size of each load bearing bar size in tension. Structures in Poor Condition must test at least one core sample to determine the concrete strength.

For large or more complex concrete structures, an alternate method would be to reverse engineer the safe load capacity based on measured deflections of several trucks with known axle weights.

The remainder of this page is intentionally left blank

9.0 SCOUR EVALUATION REPORTS & POAS

9.1 Scour Evaluation

Each bridge over potential flowing water shall be evaluated for scour by a professional civil engineering team of hydraulic, geotechnical, and structural engineers licensed in the State of Hawaii per the requirements of 23 CFR 650.117. Design of new bridges and substructure rehabilitations within the design storm waterway must prepare a Scour Evaluation Report (SER).

9.1.1 HEC-18 Analysis

All bridges over water require a HEC-18 analysis unless the Hydraulics, Geotechnical, and location of foundation can all safely justify the bridge is stable for scour. All bridges require a SER that documents the engineering assumptions and justifies the NBI 113 code for the bridge. Circumstances that may not require a HEC-18 analysis are as follows where the circumstances are documented in the SER.

1) Bridges with a Concrete Lined Channel where the design flood elevation is less than the top of the channel.
2) Bridges with foundations near calm waterbodies such as a wetlands or lakes (reservoirs) where underwater currents do not threaten a foundation.
3) Bridges with foundations protected by structural countermeasures (e.g. riprap or hydraulic countermeasures, etc.) meeting the requirements of HEC-23 and the supporting documents are in the bridge file.
4) Culverts or bridges with an integrated concrete bottom, no stream migration or scour history; or on documented non-erodible rock.
5) Bridges with spread footings or open bottom culverts on documented non-erodible rock with no scour history.
6) Bridges with the foundations (including piles) on dry land safely above design flood water elevations.

9.2 Requirements of a Plan of Action for Scour:

Include the following sections. Alternate formats may be acceptable upon concurrence from the Statewide Hydraulic Engineer. Include the following POA sections:

1. Scour Vulnerability
   a. Scour Evaluation Summary – Include current NBI Item 113 Scour Critical Bridges rating and evidence of observed scour or calculated scour analysis, debris on piers and abutments, and countermeasures present and damaged.
   b. Scour History – Include history from inspection reports
   c. Foundation Type
   d. Foundation Material

   e. Persons writing the POA
2. NBIS Coding Information
3. Recommended Actions – Include summary of recommended actions and whether they are implemented or not
4. Hydraulic/Structural Countermeasures (If applicable)
   a. Existing Countermeasures – Describe countermeasures installed; include date (month and year) installed.
   b. Proposed Countermeasures – Include proposed countermeasures.
5. Inspection Frequency
   a. Include Recommended Inspection Intervals and items to watch.
6. Monitoring Devices (If applicable) – Include recommendations for use and type of flood monitoring devices. (Ask HWY-C What the process is for changing the frequency of inspection?)
7. Flood Monitoring Plan– Describe the flood monitoring plan including
   a. Initiation of Flood Monitoring including predetermined level marked on the bridge if applicable.
   b. Post-flood Monitoring Requirements
8. Bridge Closure Plan
   a. Include information on when to alert personnel of possible/immediate bridge closure
   b. Criteria for reopening bridge
   c. Closure Plan Summary
   d. Personnel Responsible for Closure
   e. Contact Personnel
   f. Personnel Responsible for Reopening after Inspection
9. Detour Route – Include Detour route if any.
10. Bridge Scour Schematic – Include a schematic of the bridge with water surface elevations and critical scour levels if calculated.

9.3 Scour Evaluation Report Criteria

The Scour Evaluation Report (SER) must describe the assumptions used to evaluate the risk of scour and not limited to the list below. The latest copy of Design Criteria for Highway Drainage has additional requirements to complete a SER.

1. Site Conditions – Describe the existing foundation type and elevations, stream geology, channel hydraulics, and relevant information regarding whether a HEC-18 analysis is not required per the criteria above.
2. Hydrology and Hydraulics – Include the design storm(s) analyzed and water surface elevation(s) and velocities.

3. Scour Depth Calculations and Results – Provide calculated scour depths in tabular format and in elevation view at the upstream face of the bridge (If applicable).
4. Structural Review/Foundation Stability Analysis (If applicable).
5. Conclusions/Recommendations – Include the recommended NBIS Item 113 Scour Critical Bridges rating.

The remainder of this page is intentionally left blank

10.0 STATEWIDE BRIDGE INSPECTION QUALITY ASSURANCE:

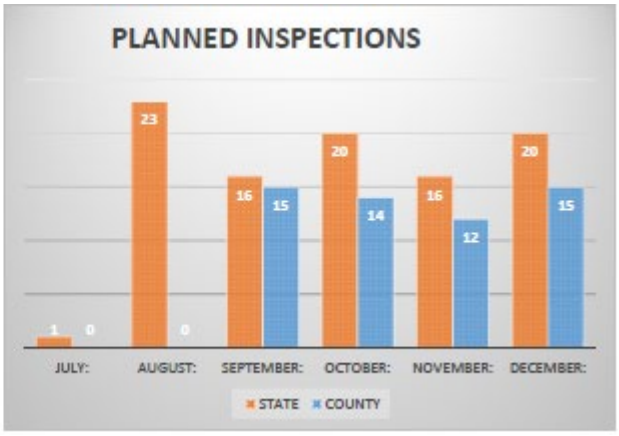
The Statewide Quality Assurance is the responsibility of the Statewide BIP Manager. In this role, the individual is responsible of making sure each of the functions of the Bridge and Tunnel Inspection Program are met and if not are taking appropriate action to remedy the non-compliance.

In this section, the critical compliance functions are outlined as follows:

10.1 Procedures

To be considered compliant, the District/LPA will need to function as stated in the BIP Manual. The Statewide BIP Manager through annual training sessions with LPA/District BIP Leaders will assure that each leader understands his/her role and the extent of their duties.

The Statewide BIP Manager will have regular look ahead forecasts of the bridge and tunnels that are coming up for scheduled inspection in the next 6 months and be provided with a report confirming that the last months inspections were completed and entered the system. Should there be non-compliance, the Statewide BIP Manager will counsel the LPA/District BIP Leaders to retrain them on the procedures and provide assistance in providing the necessary justification of late inspection and reporting to FHWA. Example of a County and District Report prepared by the Statewide BIP Manager is as follows:



The following are terms that are used:

Overdue means the inspection was due prior to the NBI submission date, but a new inspection date was not submitted. This typically occurs either when an inspection was done but not recorded in the inventory data before submission, or that the inspection has not yet been done. An overdue inspection, until resolved, is considered a high-risk safety issue per FHWA.

A ***delinquent*** inspection differs from an overdue inspection in that the inspection was competed but exceeded the required interval.

Bridges adhering to FHWA approved extended frequency criteria are assumed to be lower risk.

10.2 Roles and Responsibilities

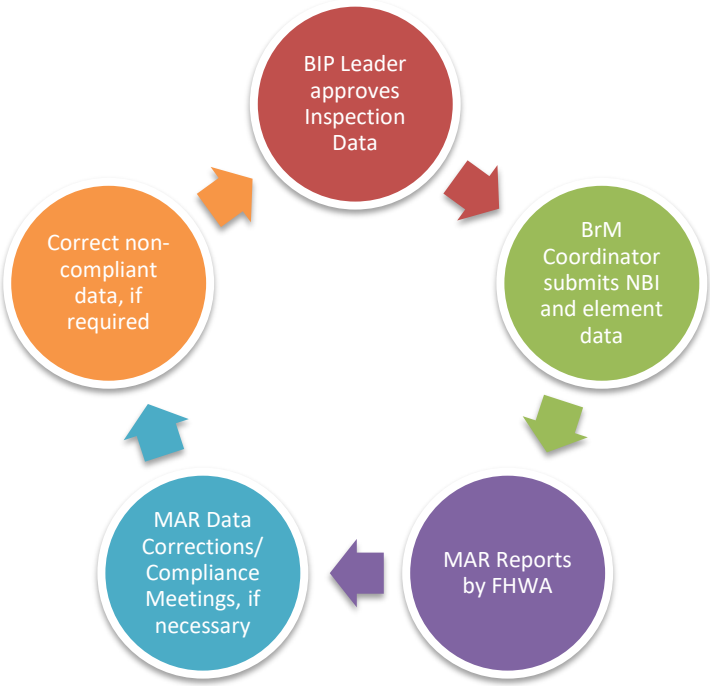
The Statewide BIP Manager will check for compliance of the required qualifications of each of the Statewide roles as well as the LPA/District BIP Leaders.

The LPA/District BIP Leaders are responsible for assuring compliance of the qualifications and deliverables (Reporting and BrM entry) of the Inspection team.

Should there be an individual that is currently in non-compliance and has not completed their refresher training but is scheduled to do so, the BIP Leaders are required to inform the Statewide BIP Manager of when the individual will be in compliance through a Plan of Correction Action (PCA) write up as soon as they are made aware.

10.3 Metric Assessment Report (MAR)

It is imperative that the BIP Leaders and their respective Team Leaders/Inspection teams understand the content of the BrM and the Reporting requirements to minimize the MAR reports and subsequent MAR review meetings that need to take place.



The MAR is generated by FHWA using the NBIP MARGentool that is downloaded from the NBIP Sharepoint site. The MAR is typically based on the most recent and previous April NBI Submissions that are provided by the Statewide BrM Coordinator. The MAR non-compliance results is an indicator of overall non-compliance of the Statewide Bridge and Tunnel Inspection Program; therefore, the monthly goal is to strive for consistent compliance for all inspections and reporting being executed throughout the State.

FHWA will conduct MAR reviews to discuss non-compliance issues with the Statewide BIP Manager, the Statewide Bridge Design Engineer and the Statewide Hydraulics Design Engineer. If necessary, a Plan of Action (POA) is for each Bridge entry issue would be generated.

Following this MAR Review, the Statewide BIP Manager will meet with each BIP Leader to go over all MAR Reports and require POA's for each MAR Report. Typically, issues that are considered safety issues by FHWA must be addressed within 30-days, which includes bridge weight restrictions and overdue inspections.

11.0 BRIDGE INSPECTIONS AND ITS ROLE IN THE TAMP

The TAMP is using the BrM information combined with technical processes that will objectively guide investment decisions to operate, maintain, and improve transportation assets, and will justify the HDOT's funding needs. The data collection and technical evaluation will be conducted in an ongoing and iterative process of activities using the TAMP Framework. Refer to the TAMP Plan for details. Transportation Asset Management Plan

The TAMP is a 10-year Mid-Range Plan that assists in determining funding needs for the 4-year planning done in the STIP. The inspection process and resulting information is crucial in providing the necessary data needed to program in informed decision making by the Administration for Bridge Maintenance.

Through the Condition Ratings and Work Candidate entries the Statewide BAMP Manager will evaluate the performance of the Statewide System and forecast funding needs to maintain the TAMP's goals as follows:

Asset	Performance Measure	Current Condition 2017	2-Year Target 2019	4-Year Target 2021	Performance Goal (Desired Condition) 10-year Goal
Bridges	Percentage of NHS bridges classified in good condition	23%	20%	20%	20%
	Percentage of NHS bridges classified in poor condition	2%	2%	2%	2%

1 Reference Page 33 of TAMP

The Statewide BAMP Manager is required to establish 2- and 4-year targets that serve as interim indicators of changes in condition levels. The targets can help the State determine how well they are progressing towards its long-term state of good repair goals.

Per the TAMP, through Life Cycle Strategic Programming the estimated gap of asset performance can be minimized or eliminated if the projected allocation of funds is realized as follows:

NHS BRIDGES	Annual Funding	Good	Fair	Poor
Current Performance (2017)	$30-40 million	23%	75%	2%
2-year Target (2019)		20%		2%
2-year Projection	$30 million	20%		2%
4-year Target (2021)		20%		2%
4-year Projection	$30 million	22.5%		1.9%
10-Year Desired State of Repair (2027)		20%		2%
10-Year Projection	$30 million	18.5%		1.8%
10-Year Projected Gap		1.5%		No gap

2 Reference Page 36 of TAMP