

## Technical Note Notification

No. 04  
May 2024

## Technical Note 04

### 1. Chapters 3, 4 and 8 of the BIGD along with Appendices O, T and U of the BIGD

**Commentary:** To capture revisions in the 2022 National Bridge Inspection Standards (NBIS), the following chapters and appendices of the BIGD are being reissued or released as part of this Technical Note.

- Chapter 3 (Bridge Inspection Personnel Qualifications and Responsibilities)
- Chapter 4 (Types, Scope, and Interval of Inspections)
- Chapter 8 (Critical Findings and Repair Recommendations)
- Appendix O (Example Critical Findings and Repair Recommendations)
- Appendix T (Timber Bridge Inspection Guidance)
- Appendix U (Extreme Event Response Plan)

Note that some outdated appendices and attachments will no longer be updated/used as listed in Section 2 and Section 4 of this Technical Note.

### 2. Updated List of Appendices

**Commentary:** Appendices with a strikethrough are no longer used.

List of Appendices	
Appendix Letter	Name of Appendix
<del>A</del>	<del>Code of Federal Regulations (CFR), 23 CFR 650, Subpart C</del>
<del>B</del>	<del>SCDOT District Map</del>
<del>C</del>	<del>Bridges with Complex Features</del>
<del>D</del>	<del>Border Bridges</del>
<del>E</del>	<del>Bridges with Underwater Inspections</del>
<del>F</del>	<del>Bridges with Nonredundant Steel Tension Members (NSTMs)</del>
<del>G</del>	<del>Scour Critical Bridges</del>
<del>H</del>	<del>AASHTO Detail Categories for Fatigue</del>
<del>I</del>	<del>South Carolina Railroad Map and List</del>
<del>J</del>	<del>Supplemental Guide for Structure Inventory &amp; Appraisal Data</del>
<del>K</del>	<del>Supplement Guide for NBI Condition Ratings</del>
<del>L</del>	<del>Supplement Guide for Element-Level Condition States</del>
<del>M</del>	<del>Coding Guide for NBI Items 06 and 07</del>
<del>N</del>	<del>Average Daily Traffic Count Formulas &amp; Example Calculations</del>
<del>O</del>	<del>Example Critical Findings and Repair Recommendations</del>
<del>P</del>	<del>Common Inspection Shorthand and Abbreviations</del>
<del>Q</del>	<del>Critical Security Bridges</del>
<del>R</del>	<del>Underwater Inspection Guidance Document</del>
<del>S</del>	<del>Memorandum Regarding Maintenance of Guardrail on H10 and H15 Bridges</del>
<del>T</del>	<del>Timber Bridge Inspection Guidance (TBIG)</del>
<del>U</del>	<del>Extreme Event Response Plan (EERP)</del>

Copies of the Bridge Inspection Guidance Document and related Technical Notes can be obtained from the SCDOT Bridge Management Office website at the [SCDOT Bridge Inspection Guidance page](#).

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**3. Updated Standard Inspection Equipment Table**

**Commentary:** Appendix T includes equipment required for in-depth timber inspections. Table 5.1.5.1 is being reissued to include all equipment required for inspections.

**Table 5.1.5.1 Standard Inspection Equipment**

General Access	Inspection	Timber Inspection
Hip Wader	Camera	Pick Hammer
Chest Wader	Hammer	Awl, Pointed and Flat Probes
Brush Hook – Sickle	Scraper	Cordless Drill and Drill Set
Extension Ladder	Flashlight/Headlamp	Resistance Microdrill
Machete	Wire Brush	Resistance Microdrill Supplies
Magnifying Glass	Binoculars	Silicone Sealant or Marine Adhesive
Compass	Inspection Mirror	Extra Batteries
	Shovel	Truck Charger/Inverter
	Screwdriver	
	Drill, Sealant, and Caulk	
	Sounding Chain	

Measuring	Note Taking	Personal Protection
6-Foot Rule Ruler	Inspection Forms	Hard Hat
Probing Rod	Extra Paper	High Visibility Vest
Level	Laptop/Tablet Computer	Safety Glasses / Goggles
100-Foot Tape	Field Binder	First Aid Kit
Thermometer	Clip Board	Safety Shoes/Boots
Length Measuring Wheel	Calculator	Work Gloves
Plumb Bob/Protractor	Writing Instruments	Ear Protection
Vertical Clearance Device	<i>Keel / Chalk</i>	Dust Mask / Respirator
Crack Gauge	<i>Sharpie / Paint Stick</i>	Two Way Radio
Calipers	<i>Spray Paint</i>	Harness/ Lanyard
D-Meter	Plans / Labeling Diagrams	Life Jackets
Sonar Depth Finder/ Fathometer		

Miscellaneous
Drinking Water
Sunblock
Insect Repellent
Knee Pads
Chargers/Inverter/Extra Batteries
Utility Belt, Tool Belt, or Utility Bag
Eye Wash Bottle
Vehicle Strobes/Cones/Warning Signs
Reference Materials
Phone Numbers

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### 4. Updated List of Attachments

**Commentary:** Attachments with a strikethrough are no longer used.

List of Attachment Files			
Attachment No.	Name of Attachment File	Version	Page Count
<b>ROUTINE INSPECTION (NO WATERWAY)</b>			
A5.20	Photograph Form Instructions	MAR2023, V1	2
	Photograph Form		1
A5.25	Bridge Inspection QC Form Instructions	MAR2023, V1	1
	Bridge Inspection QC Form (SCDOT Inspection)		1
	Bridge Inspection QC Form (Consultant Inspection)		1
<b>ROUTINE INSPECTION OF BRIDGE (OVER WATERWAY)</b>			
A5.7	Scour Stream Ground Profile Instructions	MAR2023, V1	2
	Scour Stream Ground Profile		2
<b>ROUTINE INSPECTION OF CULVERT</b>			
A5.21	Culvert Profile Sketch Sheet Instructions	MAR2023, V1	2
	Culvert Profile Sketch Sheet		1
<b>INSPECTION FOR DECK</b>			
A5.11	Deck Sketch Sheet Instructions	MAR2022, V1	1
	Deck Sketch Sheet (Panel Deck by Panel Number)		1
	Deck Sketch Sheet (Panel Deck by Panel Number, non visual)		1
	Deck Sketch Sheet (Panel Deck by Bay Number)		1
	Deck Sketch Sheet (Flat Slab)		1
<b>INSPECTION FOR SUPERSTRUCTURE</b>			
A5.26	Blank Inspection Sketch Sheet Instructions	MAR2022, V1	1
	Blank Inspection Sketch Sheet		1
A5.12	Prestressed Concrete Member Deterioration Sketch Sheet Instructions	MAR2022, V1	1
	Prestressed Concrete Member Deterioration Sketch Sheet (Cored Slab)		1
	Prestressed Concrete Member Deterioration Sketch Sheet (Beam)		1
A5.13	Reinforced Concrete Member Deterioration Sketch Sheet Instructions	MAR2022, V1	1
	Reinforced Concrete Member Deterioration Sketch Sheet (Tee Beam)		1
	Reinforced Concrete Member Deterioration Sketch Sheet (Slab)		1
A5.14	Steel Member Deterioration Sketch Sheet Instructions	MAR2022, V1	1
	Steel Member Deterioration Sketch Sheet		1
A5.15	Rigid Frame Deterioration Sketch Sheet Instructions	MAR2022, V1	1
	Rigid Frame Deterioration Sketch Sheet (Concrete)		1
	Rigid Frame Deterioration Sketch Sheet (Steel)		1
<b>INSPECTION FOR SUBSTRUCTURE (WITH PILES)</b>			
A5.18	Pile Section Sketch Sheet Instructions	APR2022, V1	1
	Pile Section Sketch Sheet (Vertical Orientation)		1
	Pile Section Sketch Sheet (Horizontal Orientation)		1

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<b>INSPECTION FOR SUBSTRUCTURE</b>			
A5.17	Bent Cap and Bearing Sketch Sheet Instructions	MAR2022, V1	1
	Bent Cap and Bearing Sketch Sheet (Single Bent Cap)		1
	Bent Cap and Bearing Sketch Sheet (Plan View (Bents/Caps))		1
	Bent Cap and Bearing Sketch Sheet (Plan View (Caps/Saddles))		1
	Bent Cap and Bearing Sketch Sheet (Eight Pile Bent Sketch)		1
	Bent Cap and Bearing Sketch Sheet (Seven Pile Bent Sketch)		1
	Bent Cap and Bearing Sketch Sheet (Six Pile Bent Sketch)		1
	Bent Cap and Bearing Sketch Sheet (Five Pile Bent Sketch)		1
	Bent Cap and Bearing Sketch Sheet (Four Pile Bent Sketch)		1
<b>OTHER ATTACHMENTS</b>			
A3.2	Exemption for BITL Status Form Instructions	MAR2022, V1	1
	Exemption for BITL Status Form		1
A3.3	Complex Inspector Summary Form (CISF) Instructions	MAY2024, V1	1
	Complex Inspector Summary Form (CISF)		1
A3.4	Multi-Disciplinary Inspector Form (MDIF) Instructions	MAY2024, V1	1
	Multi-Disciplinary Inspector Form (MDIF)		1
A5.24	Closed Bridge Re-opening Form Instructions	MAR2022, V1	1
	Closed Bridge Re-opening Form		1
<b>OTHER INSPECTION FORMS</b>			
A4.5	Scour Inspection (Post Storm Inspection) Form Instructions	MAR2022, V1	1
	Scour Inspection (Post Storm Inspection) Form		1
A5.8	Damage Inspection Form Instructions	MAR2022, V1	1
	Damage Inspection Form		2
A5.9	Steel Superstructure Damage Inspection Form Instructions	MAR2022, V1	3
	Steel Superstructure Damage Inspection Form		2
A5.10	Concrete Superstructure Damage Inspection Form Instructions	MAR2022, V1	2
	Concrete Superstructure Damage Inspection Form		2
A5.16	Nonredundant Steel Tension Member (NSTM) Inspection Form Instructions	MAR2023, V1	1
	Nonredundant Steel Tension Member (NSTM) Inspection Form		1
A5.19	Textual Data – Written Description Form Instructions	MAR2022, V1	1
	Textual Data – Written Description Form		1
A5.22	Bridge Joint Sketch Sheet Instructions	MAR2022, V1	2
	Bridge Joint Sketch Sheet		1
A5.23	AASHTO Element Table Worksheet Instructions	MAR2022, V1	1
	AASHTO Element Table Worksheet		1
A5.29	Non-BIO Non-Scheduled (NBNS) Inspection Form Instructions	MAR2023, V1	1
	Non-BIO Non-Scheduled (NBNS) Inspection Form		2
<b>INSPECTION PREPARATION AND PROCEDURES</b>			
A5.1	Bridge Data Form Instructions	MAR2024, V1	1
	Bridge Data Form (Asset ID Request)		1
	Bridge Data Form (Asset ID Retirement)		1
	Bridge Data Form for SCDOT BMO (Admin)		1
	Bridge Data Form for SCDOT Road Data Services (RDS)		1

Copies of the Bridge Inspection Guidance Document and related Technical Notes can be obtained from the SCDOT Bridge Management Office website at the [SCDOT Bridge Inspection Guidance page](#).



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<b>INSPECTION PREPARATION AND PROCEDURES (CONTINUED)</b>			
A5.2	Request for Bridge Preparation Prior to Inspection Instructions	MAR2023, V1	1
	Request for Bridge Preparation Prior to Inspection (Word Document)		2
	Request for Bridge Preparation Prior to Inspection (PDF)		2
A5.3	Railroad Flagging Service Form Instructions	MAR2023, V1	1
	Railroad Flagging Service Form		1
A5.4	Inspection Access, Procedures and Equipment Form Instructions	MAR2023, V1	1
	Inspection Access, Procedures and Equipment Form		2
A5.28	Bridge Specific Inspection Procedure (BSIP) Template Instructions	MAR2023, V1	1
	BSIP Template Fracture Critical Member (Blank) (Word Document)		2
	BSIP Template Fracture Critical (w/ Instructions) (Word Document)		3
	BSIP Template Underwater (Blank) (Word Document)		2
	BSIP Template Underwater (w/ Instructions) (Word Document)		2
	BSIP Template Complex Components (Blank) (Word Document)		2
	BSIP Template Complex Components (w/ Instructions) (Word Document)		2
<b>BRIDGE ASSESSMENT FOLLOWING INSPECTION (NON-CRITICAL FINDINGS)</b>			
A3.1	Load Rating Request Form Instructions	MAR2023, V1	1
	Load Rating Request Form		1
A4.1	Consultant Inspection Request Form (CIRF) Instructions	MAR2022, V1	1
	Consultant Inspection Request Form (CIRF)		1
A4.2	Bridge Seour – Item 113 Re-evaluation Form Instructions	MAR2022, V1	1
	Bridge Seour – Item 113 Re-evaluation Form		1
A4.3	Inspection Out-of-Interval Form Instructions	MAR2023, V1	1
	Inspection Out-of- Interval Form		1
A4.4	NDT Request Form Instructions	MAR2022, V1	1
	NDT Request Form		1
<b>CRITICAL FINDINGS AND REPAIR RECOMMENDATIONS</b>			
A5.5	Critical Findings Form Instructions	MAR2023, V1	2
	Critical Findings Form		2
A5.6	Repair Recommendations Form Instructions	MAR2022, V3	2
	Repair Recommendations Form (PDF)		2
	Repair Recommendations Form (Spreadsheet)		N/A
A5.27	Stud up Pile Repair Planning Form Instructions	MAR2022, V1	1
	Stud up Pile Repair Planning Form		1
<b>MUNICIPALITY-COUNTY BRIDGES – CORRESPONDENCES</b>			
A2.1	Municipality-County Bridge Inspection Report Release Letter (No Repair Recommendations and No Critical Findings) Instructions	MAR2023, V1	1
	Municipality-County Bridge Inspection Report Release Letter (No Repair Recommendations and No Critical Findings) (Word Doc)		1
	Municipality-County Bridge Inspection Report Release Letter (No Repair Recommendations and No Critical Findings) (PDF)		1

Copies of the Bridge Inspection Guidance Document and related Technical Notes can be obtained from the SCDOT Bridge Management Office website at the [SCDOT Bridge Inspection Guidance page](#).

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A2.2	Municipality-County Bridge Inspection Report Release Letter (Repair Recommendations) Instructions	MAR2023, V1	1
	Municipality-County Bridge Inspection Report Release Letter (Repair Recommendations) (Word Document)		1
	Municipality-County Bridge Inspection Report Release Letter (Repair Recommendations) (PDF)		1
A2.3	Municipality-County Bridge Receiving Closed Bridge Inspection Letter Instructions	MAR2023, V1	1
	Municipality-County Bridge Receiving Closed Bridge Inspection Letter (Word Document)		1
	Municipality-County Bridge Receiving Closed Bridge Inspection Letter (Repair Recommendations) (PDF)		1
A2.4	Municipality-County Bridge Critical Finding Memorandum Instructions	MAR2023, V1	1
	Municipality-County Bridge Critical Finding Memorandum (Word Doc)		1
	Municipality-County Bridge Critical Finding Memorandum (PDF)		1
A2.5	Municipality-County Bridge Critical Finding Reminder Memorandum Instructions	MAR2023, V1	1
	Municipality-County Bridge Critical Finding Reminder Memorandum (Word Document)		1
	Municipality-County Bridge Critical Finding Reminder Memorandum (PDF)		1
A2.6	Municipality-County Bridge Critical Finding Action Taken by SCDOT Instructions	MAR2023, V1	1
	Municipality-County Bridge Critical Finding Action Taken by SCDOT (Word Document)		1
	Municipality-County Bridge Critical Finding Action Taken by SCDOT (PDF)		1
A2.7	Municipality-County Bridge Inventory List and Status Instructions	MAR2023, V1	1
	Municipality-County Bridge Inventory List and Status (Word Document)		2
	Municipality-County Bridge Inventory List and Status (PDF)		2
A2.8	Municipality-County Bridge Removed from Inventory Letter Instructions	MAR2023, V1	1
	Municipality-County Bridge Removed from Inventory Letter (Word Doc)		1
	Municipality-County Bridge Removed from Inventory Letter (PDF)		1
<b>QUALITY</b>			
A9.1	Inspection Team Qualification Tracking Log Instructions	MAR2023, V1	4
	Inspection Team Qualification Tracking Log (Spreadsheet)		N/A
A9.2	Field Review Quality Form Instructions	MAR2023, V1	1
	Field Review Quality Form		2
A9.3	Independent Inspection Check Form Instructions	MAR2023, V1	1
	Independent Inspection Check Form (SCDOT)		5
	Independent Inspection Check Form (Consultant)		5
A9.4	District Quality Meeting Form Instructions	MAR2022, V1	1
	District Quality Meeting Form		1
A9.5	Quality Control Tracking Spreadsheet Instructions	MAR2023, V1	4
	Quality Control Tracking Spreadsheet (Spreadsheet)		N/A
A9.6	Quality Assurance Tracking Spreadsheet Instructions	MAR2023, V1	4

Copies of the Bridge Inspection Guidance Document and related Technical Notes can be obtained from the SCDOT Bridge Management Office website at the [SCDOT Bridge Inspection Guidance page](#).

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	Quality Assurance Tracking Spreadsheet (Spreadsheet)		N/A
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<b>QUALITY (CONTINUED)</b>			
A9.7	Bridge Inspection QA Form Instructions		3
	Bridge Inspection QA Form (SCDOT Inspection)	MAR2023, V1	1
	Bridge Inspection QA Form (Consultant Inspection) (Spreadsheet)		N/A
A9.8	Consultant QC Plan Review Checklist Instructions	MAR2024, V1	1
	Consultant QC Plan Review Checklist		1
A9.9	Inspector Quality Summary Form Instructions	MAY2023, V1	1
	Inspector Quality Summary Form		1

Please direct any questions concerning the above to the Bridge Inspection Program Manager or other representatives at the Bridge Management Office.

Approved: **Chris R. Lacy** Digitally signed by Chris R. Lacy  
Date: 2024.05.30 21:56:16 -04'00' 5/30/24  
 Director of Bridge Management Date

- BIGD Technical Note 01, June 14, 2022
- BIGD Technical Note 02, October 28, 2022
- BIGD Technical Note 03, March 27, 2023

## CHAPTER 3: BRIDGE INSPECTION PERSONNEL QUALIFICATIONS AND RESPONSIBILITIES

Bridge inspectors are the first line of defense in maintaining the state's investment in bridge infrastructure, and therefore protecting and preserving billions of dollars of capital investment. The information they provide through inspections and the detailed records they keep help to ensure the safety of the traveling public and the longevity of the states' bridges. This information also provides data for the NBIS and state programs to determine funding allocation. This chapter summarizes bridge inspection personnel qualifications and responsibilities.

### 3.1 GENERAL REQUIREMENTS

Bridge inspection personnel qualifications and responsibilities are codified into federal law by *23 CFR 650 Subpart C*, otherwise known as the National Bridge Inspection Standards (NBIS). Within the NBIS, minimum requirements and qualifications are specified for Bridge Inspection Program Managers (BIPMs) and Bridge Inspection Team Leaders (BITLs), including mandatory training. Approved training courses are provided by the National Highway Institute (NHI).

The purpose of the NBIS is to provide regulation setting standards for the proper safety inspection and evaluation of all highway bridges in accordance with *23 U.S.C. 151*. The NBIS apply to all structures defined as highway bridges located on all public roads; see Section 1.6.1 for the definition of a bridge.

Inspection personnel must meet the definitions and requirements from the NBIS outlined below.

Per Section 9.2.2.4, the Quality Control Reviewer (QCR) who performs the review of an inspection shall meet the same qualification requirements as a BITL for both SCDOT-performed inspections and consultant-performed inspections. For consultants, the prime consultant or subconsultant shall have a minimum of one qualified BITL to perform the types of inspections they have been assigned and have a minimum of one qualified BITL to perform reviews of inspection for a total of two minimum BITLs on staff.

All inspectors shall make sure their qualifications and certifications are up to date prior to starting work and shall keep up with related documentation requirements.

#### 3.1.1 Bridge Inspection Program Manager (BIPM) – § 650.309(a)

The BIPM shall be the individual in charge of the unit which has been assigned or delegated the duties and responsibilities for bridge inspection, reporting, or inventory. The BIPM provides overall leadership and is available to BITLs to provide guidance.

A BIPM must possess, at a minimum, the following qualifications:

1. Be a registered professional engineer or have ten years bridge inspection experience.
2. Successfully completed a FHWA-approved comprehensive bridge inspection training course as described in the NBIS and score 70 percent or greater on an end-of-course assessment.
3. Successfully completed a cumulative total of 18 hours of FHWA-approved refresher bridge inspection training course over each 60-month period.

At least annually, the BMO shall identify the staff member who is serving as the BIPM for SCDOT.

#### 3.1.2 Bridge Inspection Team Leader (BITL) – § 650.309(b)

The BITL shall be present on-site throughout the duration of the bridge inspection and shall oversee the work of inspectors. A BITL must possess, at a minimum, all four (4) of the Qualifications listed in Table 3.1.2. For the education and experience required as part of Qualification #4, the BITL must satisfy at least one of the four (4) SCDOT-recognized Certification Options listed.

**Table 3.1.2 Qualification and Certification Requirements for the BITL**

Qualification and Certification Requirements		
Qualification #1	Successfully completed a FHWA-approved comprehensive bridge inspection training course as described in the NBIS and score 70 percent or greater on an end-of-course assessment.	
Qualification #2	Successfully completed a cumulative total of 18 hours of a FHWA-approved bridge inspection refresher training course over each 60 month period.	
Qualification #3	Maintained documentation supporting the satisfaction of this section.	
Qualification #4 <i>(The BITL must satisfy at least one of the four (4) SCDOT-recognized Certification Options listed.)</i>	Certification Option I	Be a registered professional engineer
		Six (6) months of bridge inspection experience per BIGD 3.1.2.1
	Certification Option II	Successfully passed the National Council of Examiners for Engineering and Surveying (NCEES) Fundamentals of Engineering examination
		Have a bachelor’s degree in engineering from a college or university accredited by or determined as substantially equivalent by the Engineering Accreditation Committee of the Accreditation Board for Engineering and Technology (EAC/ABET)
		Two (2) years of bridge inspection experience per BIGD 3.1.2.1
	Certification Option III	Have an associate’s degree in engineering or engineering technology from a college or university accredited by or determined as substantially equivalent by the EAC/ABET;
		Four (4) years of bridge inspection experience per BIGD 3.1.2.1.
	Certification Option IV	Five (5) years of bridge inspection experience per BIGD 3.1.2.1.

**3.1.2.1 Minimum Bridge Inspection Experience Level**

Per FHWA, the predominant amount of required experience for a BITL (more than 50 percent) should come from bridge inspection experience. Other experience in bridge design, bridge maintenance, or bridge construction may be used to provide the additional required experience. If at least 50 percent of experience comes from bridge inspection experience, additional approval is not needed from the BIPM.

When an individual's bridge inspection experience is less than 50 percent, the BIPM may (in accordance with the evaluation of experience criteria below) review and approve an appropriately varied combination of bridge inspection and other experience associated with bridge design, bridge construction, and bridge maintenance to satisfy the 50 percent threshold. Since it is necessary to become familiar with inspection, safety, and data collection practices and procedures, bridge inspection experience shall be part of the experience required.

The remaining experience would preferably be obtained through other bridge design, bridge load rating, bridge maintenance, and bridge construction activities. The BIPM may (in accordance with the evaluation of experience criteria below) approve for experience in other activities that enable an individual to develop skills directly applicable to the leadership of a bridge inspection team.

When the BIPM evaluates an individual’s actual experience for compliance with the experience requirements for a BITL, the BIPM should consider the following minimum criteria:

1. The relevance of the individual’s actual experience (i.e., has the other experience enabled the individual to develop the skills needed to properly lead a bridge inspection).
2. Exposure to the problems or deficiencies common in the types of bridges being inspected by the individual.
3. Complexity of the structures being inspected in comparison to the knowledge and skills the individual gained through their prior experience.
4. The individual’s understanding of the specific data collection needs and requirements.
5. Demonstrated ability, through some type of a formal certification program, to lead bridge inspections.

6. The level of oversight and supervision of the individual.

### **3.1.3 BITLs on Non-Redundant Steel Tension Member (NSTM) Inspections – § 650.309(c)**

BITLs who perform NSTM inspections shall meet the requirements of Section 3.1.2 and be qualified as a BITL. BITLs who perform NSTM inspections shall also complete the NHI Course 130078 “*Bridge Inspection Techniques for Nonredundant Steel Tension Members*” and score 70 percent or greater on an end-of-course assessment.

For consultant inspectors, the NHI Course 130078, NHI Course 130078A “*Bridge Inspection Techniques for Nonredundant Steel Tension Members Refresher*”, or another SCDOT-approved refresher course shall be taken by the BITL on a NSTM inspection at intervals no greater than ten years apart.

Some bridges may have specific requirements for the BITL on NSTM inspections; these requirements are listed in the Bridge Specific Inspection Procedure (BSIP).

### **3.1.4 Individuals Performing Bridge Load Ratings – § 650.309(d)**

Load ratings must be performed by, or under the direct supervision of, a registered professional engineer licensed in the state of South Carolina.

### **3.1.5 BITLs on Underwater (UW) Inspections and Inspection Divers – § 650.309(e)**

Some UW inspections may have specific or additional requirements for members of the dive team; these requirements are listed in the BSIP.

#### **3.1.5.1 BITLs on Underwater Inspections and Underwater Bridge Inspection Divers (UBIDs)**

BITLs who perform UW inspections as an UBID shall meet the requirements of Section 3.1.2 and be qualified as a BITL. BITLs who perform UW inspections shall also complete the FHWA-approved underwater bridge inspection training and score 70 percent or greater on an end-of-course assessment. Note that successful completion of the FHWA-approved comprehensive bridge inspection training by a BITL who served as an underwater bridge inspector before June 6, 2022 satisfies the intent of the requirement. After January 1, 2028, all BITLs who perform UW inspections shall have completed a FHWA-approved underwater bridge inspection training course. The BITL’s ADCI certification requirement is included in Section 3.1.5.2.

The UW BITL shall personally inspect at least 25% of substructure units (SSUs) on initial UW inspections and on UW inspections where the UW inspection interval is less than 60 months due to bridge condition (see Section 4.6.1). In addition, an UW BITL should personally inspect, at a minimum, 25% of substructure units (SSUs) on the bridges during the UW inspections that they lead.

#### **3.1.5.2 Underwater Bridge Inspection Divers (UBIDs) who are Non-BITLs and Dive Team Requirements**

UBIDs who perform underwater inspections shall also complete the FHWA-approved underwater bridge inspection training and score 70 percent or greater on an end-of-course assessment, unless they qualify under the BITL exemption in Section 3.1.5.1. Divers must be commercially certified divers having formal diver training meeting the minimum requirements of the Occupational Safety and Health Administration (OSHA) Commercial Diving Operations standard (OSHA 29 CFR Part 1910, Subpart T).

In addition, at least three inspection team divers, including the BITL, shall be certified through the Association of Diving Contractors International (ADCI) or equivalent agency, such as federal or military commercial-diver training, as approved by the BMO. The dive team shall include one dive supervisor who shall possess the proper ADCI Dive Supervisor certification.

#### **3.1.5.3 Dive Plan Certification Requirements**

Certifications, including professional registrations and appropriate certificates for all team members (including the BITL for the UW inspection), shall be provided and updated prior to any field work and included in the dive plan (see Section 5.2.1.7).

### **3.1.6 BITLs on Complex Routine Inspections**

BITLs who perform inspections on non-movable bridges with complex components shall meet the requirements of Section 3.1.2 and be qualified as a BITL. In addition, BITLs who perform inspections on non-movable bridges with



complex components shall have either:

- A minimum of five years bridge inspection experience as a BITL or
- Bridge experience on a minimum of five similar type bridges with complex components as deemed acceptable to the BIPM.

Bridges with complex components may have specific requirements for the BITL; these requirements are listed in the BSIP. SCDOT may require additional inspector training and experience to inspect bridges with complex components.

### **3.1.7 BITLs on Complex Moveable Inspections**

BITLs who perform inspections on movable bridges meet the requirements of Section 3.1.2 and be qualified as a BITL. BITLs who perform mechanical and electrical inspections on movable bridges shall have at least five years of experience performing mechanical and electrical bridge inspections. In addition, the BITL for mechanical and electrical inspections on bridges shall be experienced with applicable codes and understand the relationships between all portions of the structure. The inspection team working under the BITL shall include structural, electrical and mechanical inspectors, as applicable to each bridge inspection. A single individual may serve as an inspector in more than one of the areas if they have the necessary experience.

## **3.2 BRIDGE INSPECTION TRAINING COURSES**

Most bridge inspection training courses are developed by the FHWA and are offered by the NHI. Training courses are approved by FHWA and SCDOT to meet the training requirements outlined in *23 CFR 650 Subpart C*. More information, including information on course changes or new course offerings can be found at the NHI website.

## CHAPTER 4: TYPES, SCOPE, AND INTERVAL OF INSPECTIONS

Various types of inspections are performed by SCDOT inspectors and consultants on the bridges and structures in the state. This chapter describes the general types of inspections and the scope of these inspections. Table 4.0 lists the types of inspection and the related intervals. Specific requirements for bridge inspection and reporting procedures, for culvert inspection and reporting procedures, and for evaluation procedures are described in Chapters 5, 6, and 7, respectively.

The inspection intervals included in Chapter 4 are based on either required policy or suggested guidance. The BITL is responsible for confirming all inspection intervals for the subject bridge and shall use their discretion to determine inspection intervals. If the BITL changes the interval of an inspection, this change and a reason for the change shall be noted in the inspection report.

**Table 4.0 Inspection Types and Intervals**

	Inspection Type	BSIP	Interval	Section
<b>Scheduled Inspections</b>	Routine	As Needed	24 Months <sup>1</sup>	4.2
	Service	Not Required	24 Months	4.3
	Special	Mandatory	Interval required but varies	4.4
	In-Depth	Mandatory	Interval required but varies	4.5
	Underwater (UW)	Mandatory	60 Months <sup>1</sup>	4.6
	Non-Redundant Steel Tension Member (NSTM)	Mandatory	24 Months <sup>1</sup>	4.7
	Complex Routine	Mandatory	24 Months <sup>1</sup>	4.8
	Complex Movable	Mandatory	24 Months <sup>1</sup>	4.8
<b>Unscheduled Inspections</b>	Initial	Not Required	Within 3 months of bridge opening to traffic	4.1
	Unscheduled	Not Required	As needed	4.9.1
	Damage	Not Required	As soon as possible after the occurrence	4.9.2
	Scour	As Needed	As soon as possible after a triggering event, as dictated by the Plan of Action (POA), or as needed or as requested	4.9.3
	Safety	Not Required	As needed	4.9.4
<b>Non-Field Inspection Events</b>	Data Update	Not Required	N/A	4.10
	Load Rating	Not Required	N/A	4.10
	Hydraulic Analysis	Not Required	N/A	4.10
	Inspection Procedure	Not Required	N/A	4.10

<sup>1</sup> = Inspection intervals included in Table 4.0 are typical intervals. Intervals may vary if an abbreviated interval is required or suggested or if an extended interval is suggested.

### 4.1 INITIAL INSPECTIONS

**Table 4.1 Initial Inspections - Qualifications and BSIP Requirement**

Qualification	BSIP
BITL <sup>1</sup>	Not Required

<sup>1</sup> = The BITL performing the initial inspection on a bridge shall be qualified for that bridge type. See qualification requirements in Section 3.1.3, Section 3.1.5, Section 3.1.6 or Section 3.1.7.

An initial inspection is the first inspection of a bridge and is the first entry of the bridge inventory for that structure.



However, an initial inspection shall be required when there has been a change in the configuration of the bridge due to widening, lengthening, rehabilitation, the shifting of traffic during phased construction or partial-width construction, the addition of supplemental bents/piers, or the changing of bridge clearances.

Initial inspections shall be performed in accordance with Section 4.2 of the *AASHTO MBE* as soon as practical, but within 3 months of the bridge or a portion of the bridge opening to traffic.

This inspection is the initial data collection and baseline assessment of the condition of the bridge and provides a basis for future inspections. Initial inspections provide inventory data along with bridge element information. Initial inspections usually begin in the office with the review of construction plans and route information, then proceed to the field for verification of the as-built conditions.

#### **4.1.1 Coordination for Initial Inspections**

Coordination between the DBIS, the DBE, the RCE, and/or Contractor is critical in keeping the state's bridges safe and limiting delays impacting the traveling public. The DBIS shall coordinate and communicate with the RCE, DBE, or their designee regarding any relevant projects. If the DBIS is unsure of who they should coordinate with, the DBIS shall contact the BMO as soon as practicable.

The contractor shall notify the RCE four weeks prior to opening any new, widened, stage constructed, rehabilitated, or temporary bridge to traffic to allow for an initial bridge condition evaluation, an inventory inspection, and an inventory underwater inspection (if needed). Every effort should be made to complete the inspection(s) prior to opening the bridge to traffic. The RCE will then contact the DBIS.

For construction of a Non-SCDOT owned bridge, the owner's representative is responsible for notification to the DBIS four weeks prior to opening any new, widened, stage constructed, rehabilitated, or temporary bridge to traffic to allow for an initial bridge condition evaluation.

#### **4.1.2 Coordination for Initial Underwater Inspections**

If an initial underwater inspection is needed for a bridge that is receiving an initial inspection, the BITL shall request the initial underwater inspection as soon as possible. The initial underwater inspection shall be performed within 3 months of the initial inspection.

#### **4.1.3 Preparation for Initial Inspections**

For new bridges with original construction or as-built plans, much of the required inventory record information can be obtained from plans which can be requested from the RCE, staff from Preconstruction, agency designee, or bridge owner. During this office exercise, bridge information, elements, and components may be identified and quantified. During the inspection, the inspector must verify the office coded information.

#### **4.1.4 Immediate Initial Inspection Findings**

##### **4.1.4.1 Immediate Initial Inspection Findings (Contractor Construction)**

Within two business days of the completion of the inspection, the DBIS shall provide the RCE and the DBE with repair recommendations and/or preliminary results. If a consultant performs an initial inspection, the consultant PM shall provide the DBIS with repair recommendations and/or preliminary results as soon as possible after the inspection is completed.

##### **4.1.4.2 Immediate Initial Inspection Findings (Self-Performed Construction)**

For bridge construction self-performed by SCDOT, counties, municipalities, or other agencies, repair recommendations and/or preliminary results shall be sent from the DBIS to the agency designee following the initial inspection.

#### **4.1.5 Load Ratings for Initial Inspections**

If load rating is needed for a bridge that is receiving an initial inspection, the BITL shall request the load rating as soon as possible. The load rating shall be completed within 3 months of the initial inspection.

## 4.2 ROUTINE INSPECTIONS

**Table 4.2 Routine Inspections - Qualifications and BSIP Requirement**

Qualification	BSIP
BITL	Possible

A routine inspection is a regularly scheduled inspection consisting of observations and/or measurements needed to determine the physical and functional condition of a bridge, and to identify any changes from the initial inspection or previously recorded conditions. Routine inspections will also determine if further analysis or investigation of the structure’s adequacy or condition is needed. Further analysis or investigation may include hydraulic analysis, load ratings, underwater, special, or in-depth inspections and testing.

The BITL shall determine the schedule and interval for routine inspections for a specific bridge. The routine inspection intervals on most bridges will be 24 months; see Section 4.2.1 for reduced inspection intervals (more frequent inspections) and see Section 4.2.2 for extended inspection intervals (less frequent inspections). Permitted routine inspection intervals are less than 12 months, 12 months, 24 months or 48 months.

If there is minimum freeboard under a bridge or the water level in a culvert is very high, the BITL should first consider performing the inspection during a different time of the year. If a seasonal adjustment will not allow the safe inspection of the bridge, the routine inspection may need to be performed by an underwater inspection team. For these structures, the routine and underwater inspections shall both have intervals equal to or less than 24 months.

### 4.2.1 Reduced Interval Routine Inspections

If any of the following criteria are met, the routine inspection interval shall be equal to or less than 12 months. The BITL can schedule an inspection interval less than 12 months, if desired.

**Table 4.2.1 Reduced Interval Routine Inspection Criteria**

Criteria	NBI/SBI Item	SNBI Item	Notes
Deck Condition Rating $\leq$ 4	058	B.C.01	For bridges only
Superstructure Condition Rating $\leq$ 4	059	B.C.02	For bridges only
Substructure Condition Rating $\leq$ 4	060	B.C.03	For bridges only
Culvert Condition Rating $\leq$ 4	062	B.C.04	For culverts only
Scour Condition Rating $\leq$ 4	631	B.C.11	Only for bridges over water
Bridge is a Channel Beam Bridge with Skinny Legs	571	N/A	See Section 4.2.1.1

A routine inspection with a 12-month interval shall be applied to bridges as stated in Table 4.2.1 except for the following conditions:

- If the Condition Rating is linked to an isolated defect that is still controlling the Condition Rating, a special inspection with a 12-month interval between the routine inspection with a 24-month interval is acceptable as long as the special inspection has a BSIP. The BITL shall coordinate the development of a BSIP for the special inspection prior to the start of the special inspection. Note that widespread defects that effect over 50% of a component and are causing the Condition Rating for the component to be a “4” should have a routine inspection with a 12-month interval.
- If the Condition Rating is linked to an isolated defect that is observed during an underwater inspection, the routine inspection can remain at a 24-month interval and the inspection interval of the underwater inspection can be reduced in accordance with Section 4.6. A special inspection with a 12-month (or less) interval shall still be scheduled between the routine inspection with a 24-month interval and the special inspection shall have a BSIP. The BITL shall coordinate the development of a BSIP for the special inspection prior to the start of the special inspection.
- If the Condition Rating is linked to an isolated defect that is observed during an NSTM inspection, the routine inspection can remain at a 24-month interval and the inspection interval of the NSTM inspection

can be reduced in accordance with Section 4.7. A special inspection with a 12-month interval shall still be scheduled between the routine inspection with a 24-month interval and the special inspection shall have a BSIP. The BITL shall coordinate the development of a BSIP for the special inspection prior to the start of the special inspection.

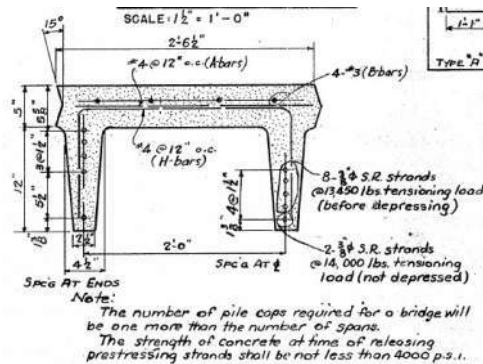
**4.2.1.1 Channel Beam Bridge with Skinny Legs**

Channel beam bridges with “skinny leg” channels should have a routine inspection every 12 months.

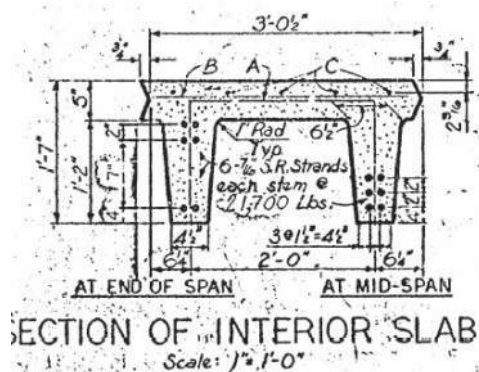
The design load (NBI 031 or SNBI B.LR.01) for the “skinny leg” channels shall be coded as H-10 regardless of the load included on the design plans.

Inspectors are to understand the difference between “skinny leg” channels and “wide leg” channels; “wide leg” channels most likely have design load of H-15. The “skinny leg” channels only have a single vertical row of prestressing strands in the channel legs, whereas the “wide leg” channels have double rows. Figures 4.2.1.1 and 4.2.1.2 include cross sketches showing “skinny leg” channels and “wide leg” channels.

If inspectors discover a channel beam bridge with “skinny leg” channels and the bridge inventory does not indicate that the bridge is a channel beam bridge with “skinny leg” channels, the BITL shall contact the BMO as soon as possible.



**Figure 4.2.1.1 “Skinny Leg” Channel Section**



**Figure 4.2.1.2 “Wide Leg” Channel Section**

**4.2.2 Extended Interval Routine Inspections**

If, and only if, all applicable criteria on Table 4.2.2.1 are met, the routine inspection interval may be set to 48 months. If the interval for the routine inspection is 48 months and the bridge crosses a roadway, a railroad, and/or a navigable waterway, a service inspection shall be scheduled to occur 24 months after the last routine inspection; see Section 4.3.

**Table 4.2.2.1 Extended Interval Routine Inspection Criteria**

Criteria	NBI/SBI Item	SBI Item	Notes
Deck Condition Rating $\geq 6$	058	B.C.01	For bridges only
Superstructure Condition Rating $\geq 6$	059	B.C.02	For bridges only
Substructure Condition Rating $\geq 6$	060	B.C.03	For bridges only
Culvert Condition Rating $\geq 6$	062	B.C.04	For culverts only
Bridge Rating Transitions Condition Rating $\geq 6$	602	B.C.05	
Bridge Rating Transitions Condition Rating $\geq 6$	603	B.C.06	
Bridge Bearings Condition Rating $\geq 6$	604	B.C.07	For bridges only
Bridge Joints Condition Rating $\geq 6$	605	B.C.08	For bridges only
Channel Condition Rating $\geq 6$	061	B.C.09	Only for bridges over water
Channel Protection Condition Rating $\geq 6$	602	B.C.10	Only for bridges over water
Scour Condition Rating $\geq 6$	631	B.C.11	Only for bridges over water
Scour Vulnerability = "A" or "B"	632	B.AP.03	Only for bridges over water
Inventory Rating Factor $\geq 1.0$	066	B.LR.05	
Operating Rating Factor $\geq 1.0$	064	B.LR.06	Only for bridges over water
Routine Permit Loads = "A" or "N"	851	B.LR.08	
Minimum Roadway Vertical Clearance $\geq 17'-0"$	54B	B.H.13	Only for bridges over roadway
Main/Approach Span Material Type = (See Tables) <sup>1</sup>	43A,44A	B.SP.04	
Main/Approach Span Design Type = (See Tables) <sup>1</sup>	43B/44B	B.SP.06	
Steel Fatigue Details = No Category E or F <sup>1</sup>	630	B.IR.02	Only for steel bridges

<sup>1</sup> = Main and Approach Structure Span Material and Design Type vary between the Recording and Coding Guide and the Specifications for the National Bridge Inventory (SMBI). The group box to the right includes the only material types and the only design types where a routine inspection interval can be extended. Only the material types and design types included shall be permitted to have an extended routine inspection interval. For example, if NBI 42A/NBI 42B (Material) is timber (NBI Code 07), the routine inspection cannot be extended. Another example would be that if NBI 43A/NBI 43B (Design Type) is a through truss (NBI Code 10), the routine inspection cannot be extended.

**Permitted Material Types and Design Types for Extended Routine Inspections**

**Recording and Coding Guide**

**Table 4.2.2.2 Allowable Main/Approach Structure Span Material Type (NBI Item 43A/NBI 44A)**

NBI Code	Description
01	Concrete
02	Concrete Continuous
03	Steel
04	Steel Continuous
05	Prestressed Concrete
06	Prestressed Concrete Continuous

**Table 4.2.2.3 Allowable Main/Approach Structure Span Design Type (NBI Item 43B/NBI 44B)**

NBI Code	Description
01	Slab
02	Stringer/Multi-beam or Girder
04	Tee Beam
05	Box Beam or Girders (Multiple)
06	Box Beam or Girders (Single/Spread) <sup>1</sup>
07	Frame (non-culvert)
11	Arch – Deck
19	Culvert
22	Channel Beam

<sup>1</sup> = Spread Box Beams Only

**Specification for the National Bridge Inventory (SMBI)**

**Table 4.2.2.4 Allowable Main/Approach Structure Span Material Type (SMBI Item B.SP.04)**

NBI Code	Description
C01	Reinforced Concrete – Cast-In-Place (CIP)
C02	Reinforced Concrete – Precast
C03	Prestressed Concrete – Pre-Tensioned
C04	Prestressed Concrete – CIP Post-Tensioned
C05	Prestressed Concrete – Precast Post-Tensioned
S01	Steel – Rolled Shapes
S02	Steel – Welded Shapes
S03	Steel – Bolted Shapes
S04	Steel – Riveted Shapes
S05	Steel – Bolted and Rivet Shapes

**Table 4.2.2.5 Allowable Main/Approach Structure Span Type (SMBI Item B.SP.06)**

NBI Code	Description
A01	Arch – Under Fill without Spandrel
B02	Box Girder/Beam – Multiple Adjacent
B03	Box Girder/Beam – Multiple Spread
F01	Frame – Three-Sided
F02	Frame – Four-Sided
G01	Girder/Beam – I-Shaped Adjacent
G02	Girder/Beam – I- Shaped Spread
G03	Girder/Beam – Tee-Beam
G04	Girder/Beam – Inverted Tee-Beam
G05	Girder/Beam – Double-Tee Adjacent
G06	Girder/Beam – Double-Tee Spread
G07	Girder/Beam – Channel Adjacent
G08	Girder/Beam – Channel Spread
S01	Slab – Solid
S02	Slab – Voided
P01	Pipe – Rigid
P02	Pipe – Flexible

### 4.2.3 Routine Inspections of Non-NBI Bridges

While the inspection of non-NBI bridges is not mandated by the FHWA, they should be inspected in accordance with Section 4.2, 4.2.1 or 4.2.2. Scheduling priority within districts will always be for NBI bridges. Non-NBI bridges should be scheduled for inspection as staffing levels and workloads permit. Scheduling prioritization should consider average daily traffic (ADT), age, and condition of the structure.

## 4.3 SERVICE INSPECTIONS

**Table 4.3 Service Inspections - Qualifications and BSIP Requirement**

Qualification	BSIP
BITL	Not Required

A service inspection must be performed during the month midway between routine inspections when a routine inspection interval is 48 months and when the bridge is either:

- Over a roadway (when NBI 42B is “1”, “4”, “6”, or “8”)
- Over a railroad (when NBI 42B is “5” or “4”)
- Over a navigable waterway (when NBI 38 is “1”)

The intent of a service inspection is to identify major deficiencies and safety issues. The inspections are meant to be performed from the ground and are not intended to be as rigorous as routine inspections. Traffic control and equipment rentals should not be required to perform a service inspection.

If the BITL discovers a defect or change at the bridge during a service inspection that changes the bridge’s eligibility to have a routine inspection with a 48-month interval, the BITL shall, if possible, change the inspection scope from a service inspection to a routine inspection and perform the routine inspection in accordance with the BIGD. If this is not possible, the BITL shall complete the service inspection but schedule the routine inspection to be completed within one month of the date of the service inspection. Specific examples of a discovery that would change the bridge’s eligibility to have a routine inspection with a 48-month interval would be change in a Condition Rating or finding an element with a different quantity in CS4 than previously known.

The inspection scope for a service inspection is as follows:

- An element-level inspection is not required.
- The inspectors shall verify all Condition Rating fields (see Table 4.3.1).
- The inspectors shall document the condition of the bridge by taking the photographs that are required by a routine inspection; see Section 5.4.4.2.
- The inspectors shall verify that there are no impacts to the previously performed load rating. Factors that may impact the previously load rating are included in Section 5.5.
- For bridges over a roadway or over a railroad, the inspectors shall verify the accuracy of the previously recorded vertical clearance by confirming factors impacting the previously recorded vertical clearance have not changed. Factors that may impact the previously recorded vertical clearance include the placement of pavement or overlays, signs installed on the bridge over the roadway, changes in the superstructure above the roadway, etc. If any factors potentially changing vertical clearance are observed, field measurement shall be taken and the updated vertical clearance shall be recorded. Actual field measurements are not required for vertical clearance verification if factors are not present that would change the vertical clearance from the measurements previously recorded.
- The inspectors shall verify that any vertical clearance signs are in place (if required).
- For bridges over a navigable waterway, the inspectors shall verify that the following data fields are coded correctly:
  - Navigable Vertical Clearance (NBI 039)



- Navigable Horizontal Clearance (NBI 040)
- Navigable Pier Protection (NBI 111)
- Minimum Navigable Vertical Clearance (NBI 116)
- Navigable Channel Minimum Horizontal Clearance (SBI 631)

**Table 4.3.1 Condition Ratings Verified During Service Inspections**

Criteria	NBI/SBI Item	SNBI Item
Deck Condition Rating	058	B.C.01
Superstructure Condition Rating	059	B.C.02
Substructure Condition Rating	060	B.C.03
Culvert Condition Rating	062	B.C.04
Bridge Railing Condition Rating	602	B.C.05
Bridge Railing Transitions Condition Rating	603	B.C.06
Bridge Bearings Condition Rating	604	B.C.07
Bridge Joints Condition Rating	605	B.C.08
Channel Condition Rating	061	B.C.09

#### 4.4 SPECIAL INSPECTIONS

**Table 4.4 Special Inspections - Qualifications and BSIP Requirement**

Qualification	BSIP
BITL	Mandatory

A special inspection is an inspection scheduled at the discretion of the BITL. It is used to monitor a particular known member condition or suspected deficiency and it must be performed by a qualified BITL. If the overall deterioration of the whole structure is accelerating, the routine inspection interval may be shortened by the BITL. However, if just a single component warrants inspection prior to the next routine inspection, a special inspection should be scheduled; see Section 4.2.1.

Special inspections shall be performed at intervals of 12 months or less. If monitoring of a specific member condition or suspected deficiency needs to be performed at an interval greater than 12 months, an in-depth inspection shall be scheduled; see Section 4.5. Special inspections require a scheduled interval and should not be used for one-time inspections.

During special inspections, the entire bridge does not require inspection. Only the specific components which are the subject of the special inspection shall be inspected. Only inspection and document requirements associated with the subject components are applicable.

During a scheduled inspection, a BITL may recommend special inspections before the next scheduled inspection. A special inspection should be considered when:

1. Deterioration of a member is progressing at a rate which warrants inspection more frequently than 24 months.
2. Channel degradation or channel movement is progressing at a rate which warrants inspection more frequently than 24 months or 60 months for underwater inspections. A BITL may recommend more frequent channel surveys which are performed as special inspections; see Section 5.3.4.1.
3. Temporary supports are in place.
4. Fatigue cracks have been found in a redundant steel structure.
5. Fatigue cracks have been found in an NSTM.

A special inspection may be performed as needed at the discretion of the BITL. A special inspection can be requested by the BPM, the DBE, the DME, or a BITL or his or her designees.

Special inspections require a BSIP. The BSIP shall include guidelines and procedures on what to observe or measure, and a timely process to interpret the field results.

## 4.5 IN-DEPTH INSPECTIONS

**Table 4.5 In-Depth Inspections - Qualifications and BSIP Requirement**

Qualification	BSIP
BITL / See BSIP	Mandatory

An in-depth inspection is a close-up, detailed inspection of one or more bridge members using visual or nondestructive evaluation techniques as required to identify any deficiencies not readily detectable using routine inspection procedures. Hands-on inspection may be necessary at some locations. In-depth inspections may occur at intervals as outlined in the BSIP. The members requiring an in-depth inspection and their locations shall be identified in the BSIP.

Specific types of in-depth inspections include intermediate fatigue inspections if there are fatigue concerns, pin inspections and in-depth inspections on bridges with complex components.

### 4.5.1 Intermediate Fatigue Inspections

The purpose of scheduling an intermediate fatigue inspection is to monitor fatigue-prone details (FPDs). AASHTO fatigue specifications classify commonly used steel bridge details into fatigue Categories A, B, B', C, C', D, E, and E' based on their fatigue characteristics. Details which fall into Categories D, E, and E' shall be considered FPDs.

Another reason for this type of inspection would be to observe and monitor fatigue crack retrofits to determine if they have successfully arrested potential propagation of fatigue cracks. Fatigue categories can be found in Appendix H.

Good practice for intermediate fatigue inspections includes marking and dating locations where fatigue cracks are present. To accurately determine the ends of fatigue cracks, NDT methods may need to be incorporated to supplement visual investigation. These NDT methods typically include dye penetrant or magnetic particle testing methods.

The inspection report should note the locations and photographs of the fatigue details as required by Section 5.3.2.15 and Section 5.4.4.2. The BSIP should include locations to inspect. Plans showing the locations of fatigue details may be uploaded to the Bridge File.

Interval for intermediate fatigue inspections range from 6 months to 24 months depending on the detail. Fatigue details are inspected at intervals no greater than 24 months for NSTM. The BITL can recommend an increased inspection interval for fatigue details for non-NSTMs.

### 4.5.2 Pin or Pin and Hanger Inspections

Pin inspections are one type of inspection which could be required for steel bridges with pinned elements. This might include steel truss bridges pinned at their joints, or steel arch bridges pinned at their supports or at their crown. This type of inspection requires specialized equipment and often special access methods to allow for testing of the pin members by NDT methods (i.e. ultrasonic).

Some pin connections are considered NSTMs and require a hands-on, visual inspection of all elements of the connection. This is part of the regularly scheduled NSTM inspection; see Section 4.7. However, because the ultrasonic pin testing usually requires specialized access, such as a mobile elevated work platform (MEWP), to place personnel and the test equipment close to the pin, it also allows for ready access to perform supplementary hands-on inspection of the assembly.

Pin connections not considered NSTMs shall be inspected with ultrasonic testing methods at no greater than a 60-month interval.

If a pin and hanger structure is discovered, the BITL shall contact the BMO.

### 4.5.3 In-Depth Inspections on Bridges with Complex Components

Bridges with complex components require routine inspections according to their BSIPs. However, some bridges may require in-depth inspections to compliment or enhance the routine inspections according to their BSIPs. Examples of in-depth inspections on bridges with complex components include cable inspections, post-tensioning tendon inspections, inspections with a survey or detailed monitoring, etc.

## 4.6 UNDERWATER (UW) INSPECTIONS

**Table 4.6 UW Inspections - Qualifications and BSIP Requirement**

Qualification	BSIP
UW BITL and Dive Team	Mandatory

An underwater inspection is used to inspect structural members which cannot be inspected visually or by wading during the initial or routine inspection. If members of a bridge cannot be visually evaluated during periods of low flow or examined by feel for condition, integrity, and safe load capacity due to excessive water depth or turbidity, then an UW inspection is required. Normally, when the depth of water is four feet or more, an underwater inspection would be required unless the inspector can properly examine substructure or channel components. These inspections are performed by a certified commercial diver and they often require inspection by tactile probing methods.

UW inspections shall be performed at intervals no greater than 60 months unless BITLs recommend shorter durations for UW inspections or unless the bridge meets the requirements outlined in Section 4.6.3 “Reduced Interval Underwater Inspection”.

Due to their nature, UW inspections require more extensive planning and preparation while following the BSIP for the UW inspection for the bridge. See Chapter 5.

Underwater inspections may be required for scour critical bridges as part of their POAs. Applicable POAs for scour critical bridges should be included in the Bridge File.

See Section 4.2 regarding the need for UW inspections on bridges with minimal freeboard or culverts filled with water.

### 4.6.1 Determining the Need for an UW Inspection

See Section 4.1.2 for the requirement for performing initial underwater inspections. An initial underwater inspection shall be scheduled to determine if scheduled underwater inspections are needed. If it is determined that regular underwater inspections are not needed after the one-time inspection, a procedure for the bridge may be included in the BSIP to ensure that the bridge is inspected properly during future inspections. For example, it may be added to the BSIP that inspectors should use a boat to check scour at a particular pile instead of requiring an UW inspection. After an initial UW inspection has been performed and underwater inspections are determined to be necessary, an underwater inspection shall be scheduled.

### 4.6.2 Removing Scheduled UW Inspections

If three consecutive inspections (with at least four years between the first and last inspections) perform channel surveys that indicate the water depth is less than four feet at the bents, the underwater inspection can be removed.

### 4.6.3 Reduced Interval Underwater Inspection

In addition to the requirements listed below, occurrences which could result in a decision by the BITL to perform underwater inspections at intervals less than 60 months are known instances of structural damage; scour and erosion due to water movement; streambed load; ice loading; navigation traffic collision; deleterious effects of water movement; and effects of drift or elements in the water.

If any of the following criteria are met, the underwater inspection interval shall be equal to or less than 24 months.



**Table 4.6.3 Reduced Interval Underwater Inspection Criteria**

Criteria	NBI/SBI Item	SNBI Item
Underwater Inspection Condition Rating $\leq 4$	600	B.C.15
Channel Condition Rating $\leq 4$	061	B.C.09
Channel Protection Condition Rating $\leq 4$	602	B.C.10
Scour Condition Rating $\leq 4$	631	B.C.11

**4.6.4 Extended Interval Underwater Inspection**

If any of the following criteria are met, the underwater inspection interval may be extended to 72 months at the discretion of the BITL.

**Table 4.6.4 Extended Interval Underwater Inspection Criteria**

Criteria	NBI/SBI Item	SNBI Item
Underwater Inspection Condition Rating $\geq 6$	600	B.C.15
Channel Condition Rating $\geq 6$	061	B.C.09
Channel Protection Condition Rating $\geq 6$	602	B.C.10
Scour Vulnerability = A or B (coded by HDSO)	632	B.AP.03
Scour Condition Rating $\geq 6$	631	B.C.11

**4.7 NON-REDUNDANT STEEL TENSION MEMBER (NSTM) INSPECTIONS**

**Table 4.7 NSTM Inspections - Qualifications and BSIP Requirement**

Qualification	BSIP
NSTM BITL	Mandatory

A NSTM inspection is required on any steel member that is non-redundant. A NSTM inspection consists of a hands-on inspection of NSTMs or NSTM components including visual and other NDT.

A NSTM is defined as a primary steel member fully or partially in tension, and without load path redundancy, system redundancy, or internal redundancy, whose failure may cause a portion of or the entire bridge to collapse. For this member to be considered a NSTM, there must be no redundancy in the member or the bridge. There must be no other structural elements able to carry the load of the member if the given member fails.

There are three types of redundancy: internal, load path, and system. Load path redundancy must be evaluated to determine whether a member is a NSTM. Load path redundancy refers to the number of supporting elements such as girders or trusses. For a bridge to be non-redundant, it must have two or fewer load paths. If a bridge does not have load path redundancy, the bridge owner must demonstrate to FHWA (by nationally recognized methods) that the bridge has internal redundancy or system redundancy in order to not require a NSTM inspection.

Requirements for a NSTM BSIP are included in Section 5.3.2.14.

A degree of caution must be exercised during the inspection; this is largely due to the manner in which NSTM defects manifest themselves. By the time a hairline fracture is visible on the surface of a steel member, over 95 percent of the life of the member has expired. This hairline fracture can spread and widen within a short time until the member fractures and there is a sudden and catastrophic collapse.

SCDOT requires all bridges with NSTMs to have a hands-on NSTM inspection performed at intervals no greater than 24 months. If the NSTM Condition Rating (SBI Item 633/SNBI Item B.C.14) is four (4) or less, the NSTM inspection shall be performed at intervals no greater than 12 months.

The NSTM inspection of a bridge may take place in conjunction with other inspections being performed on the bridge such as a routine inspection.

#### 4.8 ROUTINE INSPECTIONS OF BRIDGES WITH COMPLEX COMPONENTS (INCLUDING MOVABLE BRIDGES)

**Table 4.8 Routine Inspections on Bridges with Complex Components - Qualifications and BSIP Requirement**

Qualification	BSIP
BITL / See BSIP <sup>1</sup>	Mandatory

<sup>1</sup> = The BITL performing the routine inspection on a bridge with complex components shall meet the qualification requirements of Section 3.1.6 or Section 3.1.7. The BSIP will provide additional qualification requirements for the BITL.

NBIS defines complex features as bridge component(s) or member(s) with advanced or unique structural members or operational characteristics, construction methods, and/or requiring specific inspection procedures. This includes mechanical and electrical elements of moveable spans and cable-related members of suspension and cable-stayed superstructures. The *AASHTO MBE*, Section 4.3.6 “Complex Bridge Inspections”, provides guidance on bridge inspection requirements for bridges with complex features such as movable bridges, suspension bridges, and cable-stayed bridges. Bridges with complex features are structure types with unusual characteristics. SCDOT has identified the following structures and inspection types as complex.

- Suspension
- Stayed Girder
- Movable – Lift
- Movable – Bascule
- Movable – Swing
- Segmental Box
- Long Span Steel (LSS) Bridges (steel bridges with at least one span greater than 200 feet)
- Long Span Concrete (LSC) Bridges (concrete girder bridges with at least one span greater than 150 feet)
- Multi-Span Main (MSM) Bridges (bridges with at least 25 main spans of any length or type)
- Multi-Span Approach (MSA) Bridges (bridges with at least 25 approach spans of any length or type)

Bridges with complex components are subject to BISP. Additional inspector training and experience may be required to inspect bridges with complex components. Inspections on bridges with complex features require BSIPs and bridges with complex components are inspected according to those procedures. Under the NBIS, SCDOT is required to identify bridges with complex components and develop the inspection procedures and may develop additional training and experience requirements for these structures. If no BSIP is present, the BMO shall be notified, and a qualified engineer will need to develop them prior to the inspection taking place.

#### 4.9 INSPECTIONS WITHOUT INTERVALS

**Table 4.9 Inspections without Intervals - Qualifications and BSIP Requirement**

Inspection	Qualification	BSIP
Unscheduled	BITL	Not Required
Damage	BITL <sup>1</sup>	Not Required
Scour	BITL	Possible
Safety	BITL	Not Required

<sup>1</sup> = Damage inspections shall be performed by a BITL who is qualified for the bridge or bridge components affected/inspected.

While most inspections occur on established, federally required intervals, some inspections are unscheduled or only happen occasionally during a bridge’s life. The unscheduled inspections in this section do not necessarily require the collection of NBI data; however, some form of reporting is required.

### 4.9.1 Unscheduled Inspections

Unscheduled inspections may occur when bridge information needs to be updated and an inspection is not scheduled. An example of an unscheduled inspection would be following the completion of specific work on Critical Findings or repair recommendations by bridge maintenance; a BITL performs an unscheduled inspection to confirm the work was completed (see Chapter 8). Unscheduled inspections can also be used to update bridge data. If updates to bridge data are needed because of bridge damage, a damage inspection shall be performed. If updates to bridge data are needed as a result of a scour event or per the bridge's POA, a scour inspection shall be performed.

### 4.9.2 Damage Inspections

A damage inspection is an unscheduled inspection used to assess damage resulting from environmental factors or human actions and must be performed by a BITL qualified for that bridge and/or inspection type. A damage inspection shall only occur if there is damage to a structural element of a bridge. Such inspections may be warranted due to events such as an unexpected overload of the bridge; a vehicle-bridge collision (such as a bridge being struck by an over-height vehicle); a bridge being struck by a boat or vessel; a reported deficiency by the public or maintenance personnel; or flood-induced damage from floating flood debris, bridge buoyancy conditions, wash-out of a bridge approach, or scour damage/bridge settlement.

A damage inspection may be required at any time during a bridge's service life. Unusual occurrences, such as hurricanes, floods, earthquakes, fires, explosions, and accidents have the potential to adversely affect the condition of bridges and other structures. In the case of multiple structures affected by the event, the BIPM or designee shall prioritize the structures for inspection based on engineering judgment considering susceptibility to damage and traffic levels. Inspections shall be made of these structures as soon as possible after the occurrence.

A thorough examination of the damaged portions of the bridge shall be made, along with an assessment of any residual damage to other bridge components. The amount of time and effort required to make this assessment will depend upon the extent and severity of the damage.

If damage has occurred, the inspector may need to:

- Identify any damaged members.
- Determine any loss of foundation or substructure support.
- Compute the amount of any diminished section remaining.
- Measure the amount any member is out-of-alignment.
- Request a load rating.
- Request a hydraulic analysis.

### 4.9.3 Scour Inspections

A scour inspection is an inspection used to update the bridge's waterway condition and/or assess an existing bridge's vulnerability to scour and stream instability. In addition, a scour inspection allows for documentation of scour changes since the previous inspection.

A scour inspection shall be performed as determined to be needed at the discretion of the DBIS, BITL, or BMO or per the bridge's POA. Scour inspections may also occur during hurricanes or other storms; see Section 4.13.

A channel survey is likely to be taken during the scour inspection; see Section 5.3.4.1. The visual inspection shall document the existing condition of the bridge, including, but not limited to:

- Pier and abutment type
- Foundation depth (based on existing plans or physical probing in the field)
- Substructure location and alignment relative to the stream
- Scour depth at abutments and piers
- Bridge skew

- Effectiveness, condition, or absence of scour countermeasures
- Stream aggradation or degradation
- Upstream and downstream channel stability
- Potential or presence of debris
- Lateral movement of stream
- Bed and bank soil material

#### 4.9.4 Safety Inspection

A safety inspection is performed on bridges under construction. These bridges may require inspection for the safety of the traveling public prior to substantial construction completion. An example of a safety inspection would be the inspection of a new overpass bridge over live traffic.

These inspections are requested at the discretion of the BIPM, DME, District Construction Engineering (DCE), RCE, or DBIS. These inspections must also be closely coordinated with construction personnel and district personnel.

If the bridge is open to traffic, safety inspections shall not be performed. Safety inspections are not considered initial inspections (see Section 4.1).

#### 4.10 NON-FIELD INSPECTION EVENTS

The inspection events listed in this section typically require no field work. The inspection events typically are used by inspectors or load rating engineers to update bridge data. The use of each of these inspection types is included in Table 4.10.

**Table 4.10 Non-Field Inspection Event - Qualifications and BSIP Requirement**

Inspection	Qualification	BSIP	Notes
Data Update	BMO	Not Required	Used by the BMO only to update bridge inventory information
Load Rating	South Carolina PE	Not Required	As required by the LRGD
Hydraulic Analysis	HDSO	Not Required	After request or notification
Inspection Procedure	South Carolina PE	Not Required	Used to update inspections procedures as needed

#### 4.11 NON-BRIDGE INSPECTIONS

Inspection of the following elements are not performed by SCDOT bridge inspectors or its consultants:

- High-Mast Light Poles
- Overhead Span Type Sign Supports
- Cantilever Signs
- Retaining Walls (not supporting bridge live or dead load)

The inspection of these elements is not covered by this document. If, during the course of bridge inspections, deficiencies are discovered on these elements, the applicable DME or RME shall be contacted by the bridge inspectors. Some retaining walls supporting bridge live or dead load will be included in the bridge inspection. Limits of retaining walls included in bridge inspection are stated in Section 5.3.5.2.

#### 4.12 INSPECTION INTERVAL

SCDOT policy is to inspect all bridges within their established interval. The responsibility for performing inspections within their established intervals has been delegated to the appropriate DBIS or consultant Project Manager (PM). Table 4.0 at the beginning of this chapter summarizes the inspections and the related inspection

intervals. The BMQE or their designee monitors the conformance of inspection dates with the required inspection intervals. The BMQE or their designee manages monthly assignments for district and consultant inspection forces.

If a bridge inspection is completed out-of-interval, the procedure in Section 4.12.2 shall be followed.

The DBIS or consultant PM is allowed to move bridges within an established interval for several reasons. For example: water flow conditions, access restrictions, special requests, etc.

If during a non-interval inspection (i.e. damage) the condition of a bridge changes to warrant a BITL to recommend a reduction in inspection interval, the BITL shall update the inspection interval in the inspection report and add a note for the reason so that inspections will occur within allowable tolerance. The BITL shall, if possible, change the inspection scope from a service inspection to a routine inspection and perform the routine inspection in accordance with the BIGD. If this is not possible, the BITL shall complete the service inspection but schedule the routine inspection to be completed within one month of the date of the service inspection.

### **4.12.1 Bridge Inspection Scheduling**

The DBIS or consultant PM should attempt to evenly distribute the bridges to the available BITLs while attempting to schedule a BITL who has not inspected the bridge in its previous inspection. Rotating BITLs improves overall quality of the program.

#### **4.12.1.1 Reassignment of Inspections**

The DBIS is required to evaluate the upcoming workload from month to month in their district and request consultant services to help, when needed, to meet the required intervals. When scheduling inspections, the DBIS must consider the type of inspections required.

If the number and/or complexity of the bridges to be inspected exceed the capabilities of the district's inspection staff, then the DBIS shall request consultant assistance by requesting an inspection reassignment. The reassignment request should be sent to the BMO for review. The reassignment request should be submitted to the BMO no later than the 15<sup>th</sup> of the month for inspections due in the following month. For example, for bridges requiring inspection by September 30, the reassignment request should be submitted by August 15.

Consultant inspection requests on bridges over active railroads, inspections which require specialized inspection equipment, inspections which require significant traffic control, or inspections which have some other unique requirements should be requested at least nine months prior to their due date. This will allow for the time needed to properly prepare and plan for inspection. Bridges with complex components and any associated approach bridges are generally assigned to consultants on a regular schedule by the BMO.

The BMO and the DBIS shall coordinate on bridges which should be assigned to consultants. The DBIS can coordinate a reassignment request with the Consultant PM and the BMO if an inspection assigned to a consultant needs to be performed by the district.

If a consultant is requesting another type of inspection, the inspection shall be requested by the BITL for review by the BMO. An example would be if a consultant recommends an underwater inspection for a bridge not currently receiving an underwater inspection.

Consultant PMs are also required to review their own workload and communicate any concerns with the BIPM.

#### **4.12.1.2 Incomplete Inspections**

If a bridge or portion thereof cannot be accessed to complete an inspection during the month it is due, the BITL shall conduct as much of the inspection as possible and complete an inspection report depicting the areas and elements inspected. For areas and components not accessible, a visual inspection from as close as possible shall be done to ensure there are no obvious safety issues. The report shall also clearly indicate areas of the bridge which were not inspected and provide the reason.

The BITL shall then return to the bridge to complete the inspection when access is granted and/or possible. The BITL shall establish a schedule which shall be targeted for the inspection to be completed. The BITL shall inform the DBIS responsible for the bridge when they plan to complete the incomplete inspection. After the inspection is fully completed, the BITL shall determine the interval for the next inspection based on when the first inspection was attempted to keep the bridge on schedule. Depending on when the inspection was completed, an unscheduled inspection is likely required to be performed; see Section 4.9.1. The inspection must be completed within the



acceptable tolerances for the inspection, see Table 4.12.2. If the inspection cannot be completed within this tolerance than the inspection can be considered out-of-interval and the procedures included in Section 4.12.2.2 are applicable.

### 4.12.2 Out-of-Interval Policy

SCDOT expects bridge inspections to be completed either before or during the month in which the inspection is due. SCDOT is evaluated annually by FHWA and interval compliance is a critical metric. The due month is determined by the date of the previous inspection and the interval for the inspection type.

#### 4.12.2.1 Acceptable Tolerance for Out-of-Interval Inspections

SCDOT permits an acceptable tolerance for inspections to be performed beyond the due month as outlined in Table 4.12.2.

**Table 4.12.2 Acceptable Tolerance for Bridge Inspections**

Inspection Intervals	Acceptable Tolerance Beyond Due Month
24 Months or More	Two (2) Months
Less than 24 Months	One (1) Month

If an inspection needs to be performed with the one-month or two-month tolerances, the DBIS or Consultant PM shall request the inspection be reassigned to a later inspection assignment by the BMO. The DBIS or Consultant PM shall coordinate and receive concurrence from the BIPM and the BMQE. The DBIS or Consultant PM shall note that the inspection is being performed in a later month within the acceptable interval tolerance in the reassignment request. The reassignment request should be made during the month the inspection is due.

When the inspection is completed, the BITL shall note in the inspection report that the inspection was completed within the acceptable interval tolerance. The next inspection should be scheduled based on the new inspection date.

#### 4.12.2.2 Out-of-Interval Inspections Beyond Acceptable Tolerance

Exceptions to the inspection interval tolerance due to rare and unusual circumstances must be approved by FHWA. The DBIS or Consultant PM shall notify BIPM in advance of the inspection due date. The inspection due date is considered the current due date for the inspection within the assignment if has been reassigned per Section 4.12.2.1.

The DBIS or Consultant PM shall complete Attachment 4.3, the Out-of-Interval Form. The BIPM (or designee) will then notify FHWA of the out-of-interval occurrence. At a minimum, FHWA must acknowledge receipt of the notice on Attachment 4.3. FHWA may not approve the out-of-interval occurrence. In some instances, FHWA may approve an out-of-interval occurrence. This approval may be granted depending on circumstances, but advanced notice is required, and sufficient reasoning is needed. An example of a reason for an out-of-interval occurrence which gets approval from FHWA would be if the bridge is not accessible due to an unforeseen weather event.

Following FHWA notification and response and following the inspection, documentation shall be combined into the completed inspection report and the documentation shall be placed as a stand-alone document in the Bridge File. The DBIS or Consultant PM shall confirm that the combined document includes the reason for bridge falling out-of-interval including estimated date(s) for completing overdue inspection(s).

Attachment 4.3 is not required for inspections performed within the acceptable one-month or two-month tolerances included in Section 4.12.2.1.

#### 4.12.2.3 Out-of-Interval Checks

Out-of-interval checks shall be performed to monitor compliance with the NBIS. The BMQE or designee shall monitor all inspection interval compliance. At the beginning of each month, the BMQE or designee shall run an out-of-interval checks. The out-of-interval check shall determine all bridge inspections due in the second most recent month which were not performed. For example, on March 1, any inspections overdue which should have been completed in January will be reviewed.

For any bridge which is discovered being out-of-interval during the check, the BMQE shall inform the DBIS or consultant PM of the non-compliance. Once the status of the inspections has been determined, then required actions related to any exceptions to the inspection interval tolerance can be initiated per Section 4.12.2.1 or Section 4.12.2.2, if not already started.

### **4.12.3 Consideration of Time of Year for Inspection Effectiveness**

After performing an inspection and determining an inspection at a different time of year would be more effective, the BITL may update the next inspection date to change the time of year the bridge would be inspected next. If the BITL changes the time of year the bridge would be inspected next, this change and a reason for the change shall be noted in the inspection report. Acceptable reasons for this change can include water level, traffic patterns, seasonal impacts, etc. Inspection intervals should remain unchanged and intervals shall not exceed the allowable intervals listed in Table 4.0.

## **CHAPTER 8: CRITICAL FINDINGS AND REPAIR RECOMMENDATIONS**

The purpose of this chapter is to provide consistent procedures for reporting bridge repair needs and following up on previous bridge repairs. FHWA has general reporting requirements related to critical findings (discussed below), but otherwise leaves the tracking of repair and maintenance to SCDOT.

Recommendations for repairs arising from bridge inspections range from preventive maintenance (to preserve the life of the structure), routine maintenance (to correct minor problems), and critical repairs (to immediately restore service or safeguard the public). SCDOT relies on accurate and timely information provided by concise reports and thorough procedures to identify and track bridge repair needs. The following sections outline both the reports to use and procedures to follow for various types of repair and maintenance needs.

This chapter is specifically written for inspections on both state and locally owned structures. For inspection work on locally owned structures, it is important for the non-state owner to be aware of the procedures that will be used by the inspectors. Counties and municipalities are encouraged to also follow these guidelines but can tailor internal procedures to their specific organizational need.

### **8.1 CLASSIFICATION OF CRITICAL FINDINGS**

The NBIS (23 CFR 650.313(q)) defines a Critical Finding as “a structural or safety related deficiency that requires immediate action to ensure public safety.” Critical Findings are a special category of repair need requiring immediate attention of the bridge owner with timely notification to FHWA and subsequent tracking of repair status. Bringing the issue to the bridge owner’s attention immediately ensure both:

1. Timely action is taken to ensure the safety of the traveling public and
2. Damage or deterioration can be repaired in a proper and timely manner.

SCDOT further defines a Critical Finding as a deficiency of a bridge component, visually or by rating evaluation, of such severity that might critically threaten public safety, compromise structural stability, or create irreparable damage so that the bridge lifespan is shortened. Critical Findings are classified by priority, based on levels of severity and the potential immediate action, as described below, and summarized in Table 8.1. The classification process for a Critical Finding is included in Figure 8.1 below. The initial classification of a Critical Finding shall be completed by the BITL who discovered the Critical Finding.

**Table 8.1 Summary of Critical Finding Priority Classification**

Priority	Potential Immediate Action(s)
Closure	Bridge Closure
Restrictive	Bridge Restriction (i.e. load posting or lane closure)
Serious	Immediate Safety Action

#### **8.1.1 Closure Priority Critical Findings**

Closure Priority Critical Findings are structural deficiencies of primary structural bridge element which threaten the integrity of the structure as a whole or creates irreparable damage so that the bridge lifespan is shortened. Closure Priority Critical Findings likely require the bridge to be closed and immediate action is required. For Closure Priority Critical Findings, the person discovering the finding may use their inspection vehicle to close the bridge and they need to immediately contact district personnel. Bridge closing procedure is included in Section 8.4. Appendix O contains specific items that would require a closure.

#### **8.1.2 Restrictive Priority Critical Findings**

Restrictive Priority Critical Findings are structural deficiencies that may affect load restrictions and/or establish



restrictions. Restrictive Priority Critical Findings likely require a lane and/or shoulder closure, a load restriction, and/or the immediate request that a load rating be performed. Potential lane closures include lanes on or under a bridge.

### 8.1.3 Serious Priority Critical Findings

Serious Priority Critical Findings are deficiencies that do not have an effect on the traffic pattern on the bridge because of structural deficiencies. These deficiencies are typically safety items that are still critical in nature and must be addressed as soon as possible by maintenance.

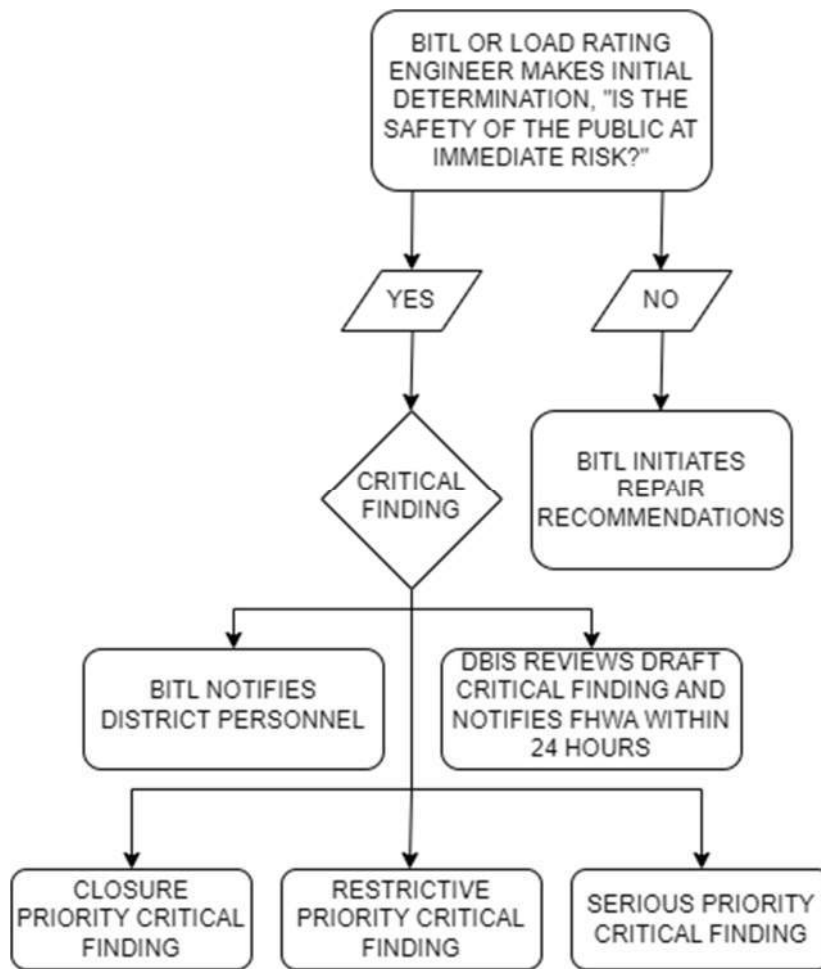


Figure 8.1 Critical Findings Classification Flow Chart

## 8.2 NOTIFICATION OF CRITICAL FINDINGS

### 8.2.1 Discovery of Critical Findings

As described below, at any time during the observation of the field conditions, during the completion of a load rating and/or during the completion of a scour assessment someone may discover the need to notify the bridge owner of a Critical Finding. See Section 8.2.2 regarding the notification requirements.

The lists below are not all-inclusive. Special consideration shall be made if the bridge involved carries or is over an Interstate or route on the NHS, has an ADT greater than 10,000, or has recommendations for immediate work needed to prevent a substantial load reduction for the safety of the traveling public.

Whenever there is an imminent threat to public safety that demands an immediate response, the deficiency is considered a Critical Finding regardless of whether it was resolved immediately upon discovery or not. These

deficiencies are to be reported as required in the NBIS.

### 8.2.1.1 Field Observation

Field observation can be initiated from a variety of sources varying from inspectors, maintenance crews, or the general public. A condition of the bridge may be field discovered which prompts a Critical Finding. Critical Findings can be the result of many factors. Examples include scour, fire, structural deterioration, vehicular impact, or extreme events such as floods and earthquakes. A relatively frequent cause is vehicular impact. Short-term closure or restriction of a structure to clean up debris and perform inspections does not qualify as a Critical Finding incident by itself. Judgment must be used in determining whether to categorize a finding as critical. Detailed examples of what may be discovered in the field and what may warrant a Critical Finding are included in Appendix O. If a field condition changes one of the NBI ratings listed below, a Critical Finding shall be documented.

- Bridges which are given a structural condition evaluation rating code of 3 or less; this includes:
  - NBI Item 58 [SNBI Item B.C.01] (Deck Condition Rating)
  - NBI Item 59 [SNBI Item B.C.02] (Superstructure Condition Rating)
  - NBI Item 60 [SNBI Item B.C.03] (Substructure Condition Rating)
  - NBI Item 62 [SNBI Item B.C.04] (Culvert Condition Rating)
  - SBI Item 633 [SNBI Item B.C.14] (NSTM Inspection Condition Rating)
- Bridges which are given any waterway rating of 3 or less; this includes:
  - NBI Item 61 [SNBI Item B.C.09] (Channel Condition Rating)
  - SBI Item 601 [SNBI Item B.C.10] (Channel Protection Condition Rating)
  - SBI Item 631 [SNBI Item B.C.10] (Scour Condition Rating)

### 8.2.1.2 Completion of a Load Rating

If a load rating engineer completes the load rating and the resulting inventory or LFR (H-20 truck) load rating is 6 tons or less (Rating Factor of 0.3 or less), a Critical Finding shall be documented. Existing posting signs which may be displaying restrictions 6 tons or less shall not be used as a reason for submitting a notification. FHWA has set 3 tons as the absolute minimum gross live load capacity for a bridge and a bridge closure is required for load ratings that result in that capacity.

## 8.2 Documenting Critical Findings

### 8.2.2.1 Immediate Notification

Depending on the severity of the deficiency discovered, the BITL shall not wait to document the deficiency and shall immediately take action to protect the public as described in this chapter. If a deficiency is found that requires instant action, the BITL shall immediately notify district personnel including the DBE, RBE, or DBIS.

SCDOT has created an emergency contact list for each district. The contact list by district includes contacts who can coordinate and address immediate safety concerns, if needed. The contact list includes at least three contacts per district.

### 8.2.2.2 FHWA Notification of Critical Findings

Following immediate notification of the deficiency, the DBIS or their designee will review and confirm that the deficiency is a Critical Finding. Following DBIS confirmation, FHWA shall be notified. Per the NBIS, FHWA shall be notified of a Critical Finding within 24 hours of the discovery of the defect by the BITL or load rating engineer.

## 8.3 CRITICAL FINDING PROCEDURES

The procedures outlined in this section shall be followed for Critical Findings once notification is made to FHWA. SCDOT is required to periodically notify the FHWA of the actions taken to address or resolve Critical Findings. All actions taken on a Critical Finding should be documented by the party performing the action. The responsible party for the Critical Finding shall confirm that actions performed are being documented appropriately. Any action plan for the Critical Finding (any immediate, short-term, or long-term strategies) should also be documented. Updates

for addressed Critical Findings should occur every 30 days.

### **8.3.1 Responsible Party for Documenting the Life Cycle of Critical Findings**

For all Critical Findings on SCDOT owned bridges, the DBIS responsible for the district where the bridge is located is identified as the responsible party documenting all aspects of the Critical Finding once FHWA has been notified. The DBIS shall ensure that the requirements of this section are followed for all Critical Findings. The BMO, DBE, or RBE may be involved as needed to assist the DBIS for maintenance or repair needs, but the DBIS is ultimately responsible for maintaining documentation for the life cycle of a Critical Finding from initiation to closeout.

### **8.3.2 Actions on Critical Findings**

Some actions needed to address Critical Findings may require time before they are completed. In this case, district maintenance personnel are required to take any needed actions to protect the public as warranted, such as installing Critical Finding Posting signs, implementing lane closures, or closing the bridge.

If the results from a load rating, inspection, or repair warrant a change in Critical Finding classification, the DBIS shall update the priority and status of Critical Finding. Records of changing the status of Critical Findings shall be documented along with the reason for the change.

#### **8.3.2.1 Load Ratings**

A load rating may be required to determine capacity of the bridge or a defective member following the notification of the Critical Finding. If one is required, the BITL shall document that a load rating has been assigned to a consultant related to the Critical Finding. The consultant shall perform the load rating related to a Critical Finding as soon as practical.

#### **8.3.2.2 Additional Inspections or Monitoring**

Additional inspections or monitoring may be needed following the discovery of a Critical Finding. Additional inspections or monitoring may include an underwater inspection for scour or waterway concerns, testing, including NDT or load testing, or a special inspection to monitor at a set interval. Inspection types and their scopes are included in Chapter 4. If a follow-up inspection is required, the BITL shall request an inspection assigned per Chapter 4. The scheduling of follow-up inspections alone is not considered an action that can close a Critical Finding.

#### **8.3.2.3 Maintenance**

Maintenance work may be required because of the Critical Finding and the DBIS shall input the work request within 1 day of notification of the Critical Finding to FHWA. The status of the work request along with maintenance actions including planning, mobilization, execution, and completion of the work shall be documented by the DBIS, DBE, RBE, or BMO.

### **8.3.3 Timeline for Addressing and Resolving Critical Findings**

Following the notification of a Critical Finding, the status on a Critical Finding can be updated to addressed or resolved according to the guidance below.

It is expected that Critical Findings be resolved as soon as possible, and Critical Findings shall be addressed within 30 days from the discovery date.

Critical Finding notifications are sent to the BMO and district personnel for evaluation. During this time, an interval shorter than 30 days can be established and documented to address the Critical Finding based on bridge specific conditions and safety needs.

Per Section 8.3.2, requesting a load rating, additional inspections, or increased inspection interval alone shall not address or resolve a Critical Finding if the safety issue is not rectified.

#### **8.3.3.1 Addressed Critical Findings**

Addressed Critical Findings are those where the bridge owner has taken action to address public safety, such as temporary closure, lane or load restriction, or shoring.

### 8.3.3.2 Critical Finding Posting

Per the LRGD, a bridge may be given a significantly low posting (termed a Critical Finding Posting). This posting is considered an acceptable method to address a Critical Finding as long as the posting would resolve the safety concern with the structure, but Critical Finding Postings cannot resolve a Critical Finding. If a bridge has a Critical Finding Posting, a load rating shall be requested by the BITL and the load rating shall be completed within three months to provide accurate posting values. An approved weight restriction that results in a 3-ton posting based on a calculated load rating is not considered a Critical Finding Posting. The use of a Critical Finding posting is a result of an engineering evaluation of the Critical Finding and is completed by a load rating engineer. See the LRGD for additional guidance.

If a bridge has a Critical Finding Posting, the BITL may request a special inspection be scheduled on the bridge with a 1-month interval until the repairs are made or the Critical Finding status has changed. This special inspection could be used to determine if the condition is rapidly deteriorating or if the bridge is being crossed illegally.

### 8.3.4 Resolved Critical Findings

Resolved Critical Findings are permanent solutions which are implemented to completely mitigate the deficiencies and protect public safety. These could involve permanent repair, long term closure, permanent restrictions/barriers, or replacement. If a bridge is closed due to a Critical Finding, the bridge must be closed indefinitely to resolve the Critical Finding. Short term closures (generally less than 3 months) shall not resolve the Critical Finding.

Results from a subsequent inspection or a load rating may be sufficient to resolve Critical Findings as long as the safety issue is deemed to be not present by the inspection BITL and confirmed by the DBIS.

### 8.3.5 Review of Critical Findings on Non-SCDOT Owned Bridges

Some non-SCDOT owned bridges are inspected by SCDOT forces. These inspections may produce a Critical Finding and subsequently the release of a Critical Finding Memorandum (Attachment 2.4). All attempts should be made to contact the bridge owner to match the required FHWA Critical Finding notification. In these cases, the owner has 30 calendar days or less to address Critical Findings on their structures. An interval shorter than 30 days can be established, if needed.

Following the release of the Critical Findings Memorandum, the DBIS or their designee shall follow-up at the midpoint of the follow-up period (15 days for a 30 calendar day period) with the non-state owner to confirm whether the Critical Finding has been addressed (see Attachment 2.5). Sending correspondence to the bridge owner is not sufficient to address a Critical Finding, action must be taken. Similarly, the DBIS may routinely check for any unaddressed Critical Findings on non-SCDOT owned bridges and shall document any updates, including correspondence with the owner (see Attachment 2.6). The Critical Findings reminder and the notification of the failure to act shall be prepared and sent to the bridge owner by the DBE.

Owners of non-SCDOT owned bridges with Critical Findings should notify the DBE when action has been taken on a Critical Finding. The DBE will review unresolved Critical Findings and use their understanding and knowledge to provide an update or have the DBIS update the status as needed.

### 8.3.6 Follow-up Inspection

The DBE and DBIS shall coordinate with each other, regularly monitor, and provide status updates on all Critical Findings in his/her district.

When the repairs are completed, a follow-up unscheduled inspection shall be performed to verify the work has been completed.

### 8.3.7 Critical Findings Submittal

Every month, SCDOT will provide FHWA with a status report on all unresolved Critical Findings. All Critical Findings must remain on this report until resolved. Once resolved, the Critical Finding should be reported in the following month's report to show that it is closed. Subsequent reports can remove the resolved Critical Finding.

## 8.4 BRIDGE CLOSING PROCEDURE

If the structure is in imminent danger of collapse, the inspector shall close the bridge to traffic; examples of what may require a bridge closure are included in this chapter and in Appendix O. The following is a review of the

procedures expected of the BITL/DBIS when a bridge closing is recommended by the BITL or by the BMO.

If the bridge closing procedure is not followed, the BIPM shall be contacted. If the closure is considered the action to address a Critical Finding, the bridge shall be closed within 30 days from the discovery date.

1. The BITL's first action will be to contact the county office and close the bridge until a proper determination can be made. If this is done, the BITL could contact local or state law enforcement to implement this temporary closure. The bridge may be closed by using inspection vehicle(s) to block the roadway, traffic devices, or other means necessary to protect the traveling public until proper bridge closure signs may be installed by maintenance.
2. The BITL's second action will be to notify the DBIS.
3. The DBIS or BITL will then contact the BMO to inform them of the recommended closure.
4. The DBIS has the ultimate responsibility to determine the appropriate course of action when a bridge closure is contemplated. The DBIS shall determine if the bridge shall remain closed, open with restrictions, or open without restrictions.
5. The BITL shall update the bridge traffic status (NBI Item 41); see Section 7.3.6.
6. The BITL shall complete the draft Critical Finding documentation and submit to the DBIS.
7. The DBIS shall approve of the draft Critical Finding and FHWA is notified of the Critical Finding.
8. Actions taken, as stated in 8a and 8b below. Some Critical Findings may require both actions.
  - 8a. If needed for maintenance related Critical Findings, the BITL or DBIS shall then contact the DBE to inform the DBE of the Critical Finding and to see if repairs can be made by in-house forces. The DBE is responsible for repairs.
  - 8b. If needed, the BITL and DBIS should request the load rating and confirm it has been assigned. The consultant shall initiate the load rating related to a Critical Finding as soon as practical.

#### **8.4.1 Required Action for a Closed Bridge to Reopen to Traffic**

A BITL should not update bridge traffic status (NBI Item 41) and district maintenance should not remove bridge closure signs until the Closed Bridge Reopening Form is completed. This form is included as Attachment 5.24. The form requires, at a minimum, a BITL to perform an unscheduled inspection on the bridge. In addition to the unscheduled inspection, a load rating shall be considered and, if deemed needed, requested by the BITL and performed. A load rating shall be performed prior to reopening the bridge if the load rating on file does not match the current condition of the bridge.

### **8.5 STRUCTURE LOAD RATING PROCEDURES**

Section 5.5 details procedures for how a bridge inspection can lead to a bridge load rating. The LRGD includes guidance on the process following a decision to post a bridge.

### **8.6 REPAIR RECOMMENDATION IDENTIFICATION**

BITL shall assign a priority flag to any observed defects that require corrective action to maintain the bridge for years to come. Priority flag categorization is made based on the time frame in which the bridge owner should complete the recommended repair.

The DBE are responsible for monitoring the timely completion of the work once the repair recommendation is logged. Table 8.6 below notes required time frame for work to be completed depending on the type of repair.

Inspectors are required to review previous repair recommendations prior to a bridge inspection. If a BITL has previously recommended a repair, another recommendation is not needed unless the flag type has escalated into a higher priority. If the flag type has escalated, the lower priority flag shall be closed and a new, higher priority flag shall be used.



**Table 8.6 Time Frame for Repair Recommendations**

Flag Type	Timeline for Work Completion
Priority A	30 Calendar Days (1 Month)
Priority B	90 Calendar Days (3 Months)
Priority C	365 Calendar Days (12 Months)

### 8.6.1 Priority A Flags

There is some overlap with Critical Findings and Priority A Flags. A Critical Finding may be a Priority A Flag, however, not all Priority A Flags are Critical Findings. Maintenance is expected to address Priority A Flag deficiency within 30 calendar days of being reported by district bridge inspectors or consultants.

Examples of Priority A Flags are included in Appendix O.

### 8.6.2 Priority B Flags

Maintenance is expected to address Priority B Flag deficiencies within 90 calendar days of being reported by district bridge inspectors or consultants.

Examples of Priority B Flags are included in Appendix O.

### 8.6.3 Priority C Flags

Maintenance is expected to address Priority C Flag deficiencies within 12 months of being reported by district bridge inspectors or consultants.

BITLs shall use industry knowledge of bridge maintenance operations when documenting repair recommendations and only list deficiencies which are needed on the bridge in the next 12 months.

Examples of a Priority C Flags are included in Appendix O.

## 8.7 REPAIR RECOMMENDATION NOTIFICATION (STATE OWNED BRIDGES)

Appendix O includes SCDOT's process for repair recommendation notification and tracking.

Prior to the BITL completing the inspection report, the BITL shall confirm that the repair recommendations are uploaded to the Bridge File. Repair recommendations shall include the suggested priority flag categorization in accordance with Section 8.6.

## 8.8 REPAIR RECOMMENDATION NOTIFICATION (NON-SCDOT OWNED BRIDGES)

The responsibility for issuing repair recommendations following inspections to non-SCDOT owned bridges is assigned to the DBE. Repair recommendations shall be included in the inspection report. Unlike SCDOT owned inspections, the release of the inspection report shall be accompanied by correspondence to assist with the distribution. The process outlined in Appendix O shall be used for non-SCDOT owned bridges.

Attachment 2.2 is available for use to release a bridge inspection report and repair recommendations to municipalities or counties.

The status of repair recommendations will be checked during the following inspection unless another inspection is requested. Owners of non-SCDOT owned bridges may notify the DBE that repairs have been completed. A follow-up inspection may be performed if conditions are warranted.