











South Carolina Department of Transportation

Bridge Inspection Guidance Document

2026

GUIDANCE DOCUMENT PURPOSE

The purpose of this Guidance Document is to provide guidance and direction with regards to the inspection of bridges in South Carolina. Any modifications to this Guidance Document require approval of the South Carolina Department of Transportation (SCDOT) Bridge Management Office (BMO) and Federal Highway Administration (FHWA). This Guidance Document will be reviewed and updated as needed by the Bridge Inspection Program Manager (BIPM) or designated representative. However, SCDOT reserves the right to make interim updates to the procedures to address lessons learned, evolving approaches, updates to federal, state, local laws, regulations, and policies, provided those updates are reviewed with SCDOT and FHWA oversight.

DISCLAIMER

THE BRIDGE INSPECTION GUIDANCE DOCUMENT IS PUBLISHED SOLELY TO PROVIDE INFORMATION AND GUIDANCE TO BRIDGE INSPECTORS WHEN INSPECTING BRIDGES IN THE STATE OF SOUTH CAROLINA. THIS DOCUMENT IS ISSUED TO PROMOTE, SO FAR AS POSSIBLE, UNIFORMITY OF PRACTICE AND PROCEDURE IN COMPLIANCE WITH THE NATIONAL BRIDGE INSPECTION STANDARDS. THIS DOCUMENT IS NOT PURPORTED TO BE A COMPLETE GUIDE IN ALL AREAS OF BRIDGE INSPECTION AND IS NOT A SUBSTITUTE FOR ENGINEERING JUDGMENT.

TABLE OF CONTENTS

Chapter 1 Introduction 1-1
1.1 Background 1-1
1.2 Purpose and Scope 1-1
1.3 Definitions, Abbreviations, Acronyms and References 1-1
Chapter 2 NBIS Program Requirements, Organization, and Applicability 2-1
2.1 NBIS Program Requirements and Organization 2-1
2.2 Bridge File Requirements 2-2
2.3 Structures Requiring Bridge Inspections 2-3
2.4 Structures Requiring Tunnel Inspection 2-5
Chapter 3 Bridge Inspection Personnel Qualifications and Responsibilities 3-1
3.1 General Requirements 3-1
3.2 Bridge Inspection Training Courses 3-4
Chapter 4 General Types, Scope and Interval of Inspections 4-1
4.1 Team Leader Assignments and Inspection Scheduling 4-1
4.2 Routine Inspections 4-4
4.3 Underwater (UW) Inspections 4-8
4.4 Special Inspections 4-9
4.5 Non-Redundant Steel Tension Member (NSTM) Inspections 4-10
4.6 In-Depth Inspections 4-11
4.7 Service Inspections 4-12
4.8 Complex Inspections 4-13
4.9 Initial Inspections 4-14
4.10 Maintenance Inspections 4-15
4.11 Load Ratings 4-15
4.12 Hydraulic Analysis 4-15
4.13 Damage Inspections 4-16
4.14 Data Update Inspections 4-17
4.15 Scour Monitioring Inspections 4-17
4.16 Non-Bridge Inspections 4-17
4.17 Incomplete Inspections 4-18
4.18 Out-of-Interval Policy 4-18
Chapter 5 Pre-Inspection Actions 5-1
5.1 Inspection Safety 5-1
5.2 Inspection Equipment 5-1
5.3 Planning, Preparing and Scheduling 5-3
Chapter 6 Inspection Procedures and Methods 6-1
6.1 Guidance on Field Measurement 6-1

6.2 Photographs, Videos, and Sketches 6-2
6.3 Deck Inspection Procedures and Methods 6-4
6.4 Superstructure Inspection Procedures and Methods 6-8
6.5 Bearing Inspection Procedures and Methods 6-10
6.6 Substructure Inspection Procedures and Methods 6-11
6.7 Culvert Inspection Procedures and Methods 6-13
6.8 Channel and Channel Protection Inspection Procedures 6-14
6.9 Underwater Inspections 6-15
6.10 Structure Appurtenances and Other Components Inspection Procedures and Methods 6-17
Chapter 7 Inspection Follow-Up Actions 7-1
7.1 Repair Recommendations 7-1
7.2 Critical Findings 7-2
7.3 Additional Follow-Up Actions 7-6
Chapter 8 Bridge Inspection Quality Control/Quality Assurance 8-1
8.1 Introduction 8-1
8.2 Quality Control (QC) 8-1
8.3 Quality Assurance (QA) 8-5
8.4 Participation in FHWA Audits and Reviews 8-6

List of Tables

Table 1 – Abbreviations and Acronyms 1-3
Table 2 – Qualification and Certification Requirements for the BITL 3-2
Table 3 – Inspection Types, BSIP Requirement, Qualifications and Intervals 4-3
Table 4 – Routine Inspections - BSIP Requirement, Qualifications and Intervals 4-4
Table 5 – Reduced Interval Routine Inspection Criteria 4-4
Table 6 – Extended Interval Routine Inspection Criteria 4-5
Table 7 – Allowable Span Material Type for Extended Intervals (SNBI Item B.SP.04) 4-6
Table 8 – Allowable Span Type for Extended Intervals (SNBI Item B.SP.06) 4-6
Table 9 – UW Inspections - BSIP Requirement, Qualifications and Intervals 4-8
Table 10 – Reduced Interval Underwater Inspection Criteria 4-9
Table 11 – Extended Interval Underwater Inspection Criteria 4-9
Table 12 – Special Inspections - BSIP Requirement, Qualifications and Intervals 4-9
Table 13 – NSTM Inspections - BSIP Requirement, Qualifications and Intervals 4-10
Table 14 – In-Depth Inspections - BSIP Requirement, Qualifications and Intervals 4-11
Table 15 – Interval for In-Depth Inspections on Pins 4-12
Table 16 – Service Inspections - BSIP Requirement, Qualifications and Intervals 4-12
Table 17 – Condition Ratings Verified During Service Inspections 4-13
Table 18 – Complex Inspections - BSIP Requirement, Qualifications and Intervals 4-13
Table 19 – Initial Inspections - BSIP Requirement, Qualifications and Intervals 4-14
Table 20 – Maintenance Inspections - BSIP Requirement, Qualifications and Intervals 4-15
Table 21 – Load Ratings - BSIP Requirement, Qualifications and Intervals 4-15
Table 22 – Hydraulic Analysis - BSIP Requirement, Qualifications and Intervals 4-15
Table 23 – Damage Inspections - BSIP Requirement, Qualifications and Intervals 4-16
Table 24 – Data Update Inspections - BSIP Requirement, Qualifications and Intervals 4-17
Table 25 – Scour Monitoring Inspections - BSIP Requirement, Qualifications and Intervals 4-17
Table 26 – Acceptable Tolerance for Bridge Inspections 4-18
Table 27 – Standard Inspection Equipment 5-2
Table 28 – Standard Underwater Inspection Equipment 5-3
Table 29 - Measurements & Locations for Profile (Structure to Channel Bottom) (Underwater Inspection Only) 6-17
Table 30 - Time Frame for Repair Recommendations 7-1
Table 31 - Structural Non-Deck Elements (CS4 Quantity Requires Load Rating Request) 7-8
Table 32 - Types of Specialty Testing 7-10

List of Figures

Figure 1 – Bridge Lengths (Single Span) 1-1
Figure 2 – Culvert Identification and Flowchart..... 1-2
Figure 3 – "Skinny Leg" Channel Section..... 4-7
Figure 4 – "Wide Leg" Channel Section 4-7
Figure 5 – Split Reinforced Concrete Cap Founded on Timber Piles..... 4-8
Figure 6 – Edge Lines Between Precast Panels 6-7
Figure 7 - Field use of a resistance drill and the field marking of a timber pile that has been drilled and sealed. .. 6-12

APPENDICIES AND REFERENCES

Appendices to this document and applicable references are maintained by the BMO and available on the Bridge Management Office website.

CHAPTER 1 INTRODUCTION

1.1 BACKGROUND

The National Bridge Inspection Standards (NBIS) are published in the Code of Federal Regulations (CFR), *23 CFR 650, Subpart C*. The NBIS sets the national standard for the proper safety inspection and evaluation of bridges and applies to all structures defined as part of the National Bridge Inventory (NBI). The Federal Highway Administration (FHWA) requirements were utilized as a guide to assist with the development of this document.

The South Carolina Department of Transportation (SCDOT) created the bridge management program in the 1970's which began to formalize the inspection of the state's bridges. This program continues to evolve as conditions, needs, and new technologies become available. Safety is the primary goal; however, in addition to safety, the data collected is critical to managing the state's bridge infrastructure and asset management. SCDOT is responsible for maintaining the inventory of all federally defined bridges within South Carolina.

1.2 PURPOSE AND SCOPE

The purpose of the Bridge Inspection Guidance Document (BIGD) is to organize, document, and combine SCDOT policies and procedures for bridge inspection practices and post-inspection recommendations. This document is intended to promote uniformity and document best practices for inspection of South Carolina's bridges.

There are several goals of South Carolina's NBIS program:

- Assure the safety of the traveling public on bridges,
- Achieve and maintain compliance with the NBIS,
- Identify deficiencies to initiate maintenance and support identification of project needs, and
- Provide accurate and reliable data to support sound asset management of the bridge inventory.

1.3 DEFINITIONS, ABBREVIATIONS, ACRONYMS AND REFERENCES

1.3.1 Definitions

The following terms in this document are used as defined below. Some definitions are included for emphasis and should not be interpreted as redefining or modifying existing definitions found in applicable publications.

- *Appurtenances* – These are items which are not technically part of the bridge but are generally associated, inspected, and maintained with the bridge. Examples include approach guardrail, fender systems, traffic control devices, bridge mounted signs, and approach slabs.
- *Asset ID* – A unique bridge number assigned to a single bridge per the NBIS.
- *Bridge* – A structure, including supports, erected over a depression or an obstruction such as water, a highway, or a railway; having a track or passageway for carrying traffic or other moving loads; and having an opening measured along the centerline of the roadway of more than 20 feet between under copings of abutments or spring lines of arches or extreme ends of openings for multiple boxes. See Figure 1. Bridges generally run from abutment to abutment, but some ramp bridges have only one abutment. Bridges can diverge into a single bridge or from a bridge out to multiple structures at complex system interchanges. Parallel bridges with separate superstructures, even with a shared substructure, shall be considered separate bridges even with a small gap between them. A rigid frame, including a cut-and-cover structure, shall be considered a bridge, regardless of what the structure is named in the plan set, so long as the structure is not hydraulically designed to carry solely water; see *Culvert*. Such a structure shall also be evaluated to ensure that it does not meet requirements to be considered a tunnel; see *Tunnel*. It may also contain multiple pipes, where the clear distance between openings is less than half of the smaller contiguous opening.

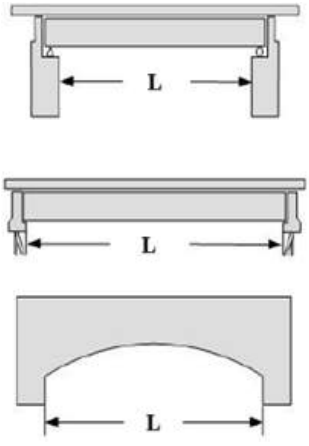
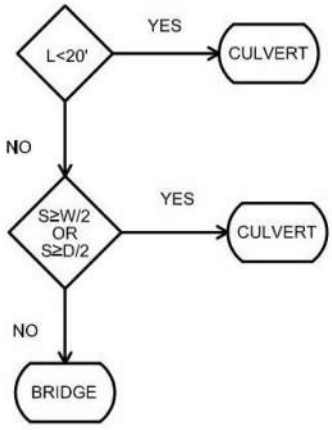


Figure 1 – Bridge Lengths (Single Span)

- *Bridge File* – A digital record containing inspection and inventory data for a public bridge, submitted to the FHWA for inclusion in the NBI. These files are maintained according to the SNBI and are used to ensure bridge safety, track national bridge conditions, and manage funding. The data includes details like load ratings, flood history, and inspection reports.
- *Critical Finding* – A structural or safety related deficiency that requires immediate action to ensure public safety.
- *Culvert* – A type of structure which is designed hydraulically to take advantage of submergence to increase water carrying capacity. Culverts are usually covered with embankment and are composed of structural material around their entire perimeter. Culverts shall only carry water. A culvert is considered a bridge and needs to be inspected and load rated per the NBIS if any of the following conditions are met. Whether a culvert has a floor or not does not matter when determining if a culvert is considered a bridge or not. See Figure 2. Concrete culvert-like structures, where the deck or top slab supports live load traffic over an obstruction other than water, shall be considered a rigid frame and not a culvert.
  - The culvert has a hydraulic opening greater than 20 feet as measured along the center of the roadway.
  - A grouping of culverts with a total length greater than 20 feet as measured along the roadway centerline, and where the clear distance between openings is less than half the smaller contiguous opening.



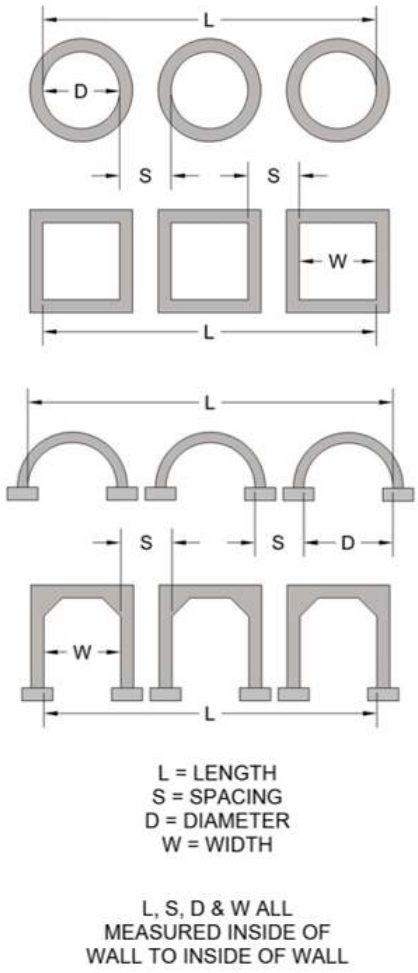


Figure 2 – Culvert Identification and Flowchart

- *Element* – A standardized, specific component of a bridge that are inspected and rated for condition (Good, Fair, Poor, Severe) to create consistent data for the NBI, helping prioritize maintenance and ensuring safety. Elements can be defined by FHWA (NBE or BME) or by SCDOT (ADE).
- *Fatigue* – Fatigue is the initiation and/or propagation of cracks due to a repeated variation of normal stress with a tensile component.
- *Fatigue-Prone Detail (FPD)* – A steel bridge detail which falls into fatigue Categories E and E' per the AASHTO fatigue specifications classifications based on their susceptibility to load-induced fatigue. Damage due to fatigue can be categorized by either load-induced or displacement-induced stresses.
- *Load Rating* – The analysis to determine the safe vehicular live load carrying capacity of a bridge using bridge plans and supplemented by measurements and other information gathered from an inspection.
- *Nonredundant Steel Tension Member (NSTM)* – 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.

- *Phased Construction* – The process of building a bridge's cross section in stages and opening portions to traffic as such until the final cross section is completed. This extends to existing structures that are being rehabilitated or replaced, requiring an inspection to be performed for any intermediate phase during which a partially-demolished bridge will be open to traffic. This also includes instances of an existing bridge which will be partially demolished and a portion of the replacement structure built with both bridges open to live traffic.
- *Quality Assurance* – The use of sampling and other measures to assure the adequacy of QC procedures in order to verify or measure the quality level of the entire bridge inspection and load rating program.
- *Quality Control* – Procedures that are intended to maintain the quality of a bridge inspection and load rating at or above a specified level.
- *Rigid Frame* – A structural system where the superstructure (e.g., the bridge deck and girders) and the substructure (e.g., legs or columns) are firmly connected to act as a single, integral unit.
- *Scour Critical Bridge* – A bridge with a foundation member that is unstable, or may become unstable, as determined by a hydraulic analysis.
- *Scour Plan of Action (POA)* – A written procedure developed by the bridge owner or the bridge owner's designee outlining the foundation scour monitoring plan to be followed for a specific bridge during flood events. Procedures for bridge inspectors and engineers in managing each bridge determined to be scour critical or that has unknown foundations.
- *Temporary Bridge* – A bridge which is constructed to carry highway traffic until the permanent facility is built, repaired, rehabilitated or replaced.
- *Tunnel* – An enclosed roadway with vehicle access that is restricted to portals regardless of type of structure or method of construction. Tunnels do not include highway bridges, railroad bridges or other bridges over a roadway. Tunnels are structures that require special design considerations that may include lighting, ventilation, fire protection systems, and emergency egress capacity. A tunnel does not include bridges or culverts inspected under the NBIS.
- *Undersized Bridge (SCDOT owned)* – A structure, including supports, erected over an obstruction such as water; having a passageway for carrying traffic or other moving loads; exhibiting characteristics of a bridge, such as a foundation and/or piles but shorter than the minimum NBI length (20 feet), excluding pipes and culverts, and that should be included in the state database.

1.3.2 Abbreviations and Acronyms

The abbreviations and acronyms used in this guidance document are defined in Table 1. Other abbreviations used by inspectors are included in Appendix A.

Table 1 – Abbreviations and Acronyms

Abbreviation	Term
AASHTO	American Association of State Highway and Transportation Officials
ABI	Associate Bridge Inspector (no Team Leader status)
ADCI	Association of Diving Contractors International
ADE	Agency Defined Element
ADT	Average Daily Traffic
ADTT	Average Daily Truck Traffic
AISC	American Institute of Steel Construction
ASR	Allowable Stress Rating
ASSE	American Society of Safety Engineers
ASTM	American Society for Testing and Materials
BFP	SCDOT Bridge File Policy

Table 1 – Abbreviations and Acronyms

Abbreviation	Term
BIGD	SCDOT Bridge Inspection Guidance Document
BIPM	Bridge Inspection Program Manager
BIRM	Bridge Inspector's Reference Manual
BITL	Bridge Inspection Team Leader
BME	Bridge Management Element
BMO	Bridge Management Office
BMQE	Bridge Management Quality Engineer
BMS	SCDOT Bridge Management System
BSIP	Bridge-Specific Inspection Procedure
CCR	Component Condition Rating
CFR	Code of Federal Regulations
CS	Condition State
CSB	Critical Security Bridge
DBE	District Bridge Engineer
DBIS	District Bridge Inspection Supervisor
EAC/ABET	Engineering Accreditation Committee of the Accreditation Board for Engineering and Technology
ED	SCDOT Engineering Directive
EOR	Engineer of Record
EPA	Environmental Protection Agency
EV	Emergency Vehicle
FHWA	Federal Highway Administration inside the U.S. Department of Transportation
FOIA	Freedom of Information Act
FPD	Fatigue-Prone Details
HEC-18	Hydraulic Engineering Circular No. 18
HL-93	Highway Loading (Developed in 1993)
LFD	Load Factor Design
LFR	Load Factor Rating
LRFD	Load and Resistance Factor Design
LRFR	Load and Resistance Factor Rating
LRGD	SCDOT Load Rating Guidance Document
MASH	AASHTO Manual for Assessing Safety Hardware
MBE	AASHTO Manual for Bridge Evaluation
MBEI	Manual for Bridge Element Inspection
MSA	Multi-Span Approach Bridges
MSM	Multi-Span Main Bridges
MUTCD	Manual on Uniform Traffic Control Devices
NBE	National Bridge Element
NBI	National Bridge Inventory
NBIS	National Bridge Inspection Standards
NCEES	National Council of Examiners for Engineering and Surveying
NCHRP	National Cooperative Highway Research Program
NDT	Non-Destructive Testing

Table 1 – Abbreviations and Acronyms

Abbreviation	Term
NHI	National Highway Institute
NHS	National Highway System
NICET	National Institute for Certification in Engineering Technologies
NSTM	Nonredundant Steel Tension Member
NTIS	National Tunnel Inspection Standards
OSOW	Oversize Overweight
POA	Plan of Action
PPE	Personal Protective Equipment
QA	Quality Assurance
QAR	Quality Assurance Reviewer
QC	Quality Control
QCR	Quality Control Reviewer
RDS	SCDOT Road Data Services
RME	Resident Maintenance Engineer
ROE	Right of Entry
ROW	Right of Way
RR	Railroad
SBI	State Bridge Inventory
SCDOT	South Carolina Department of Transportation
SCUBA	Self-Contained Underwater Breathing Apparatus
SNBI	Specifications for the National Bridge Inventory
SPRAT	Society of Professional Rope Access Technicians
SSU	Substructure Unit
TPM	Tunnel Program Manager
UBIU	Under Bridge Inspection Unit
USCG	United States Coast Guard
USGS	United States Geological Survey

1.3.3 References

References for this document are included in Appendix B. Select documents in Appendix B are incorporated by reference to the BIGD.

CHAPTER 2 NBIS PROGRAM REQUIREMENTS, ORGANIZATION, AND APPLICABILITY

2.1 NBIS PROGRAM REQUIREMENTS AND ORGANIZATION

2.1.1 NBIS Program Objectives

The primary objective of the NBIS program is to protect the safety and welfare of the motoring public and safeguard the public's investment while complying with the NBIS. The program identifies deficiencies which are critical to public safety as well as non-critical deficiencies which need to be corrected to extend the structure's service life and reduce total maintenance costs. An inspection will:

1) Provide for immediate action to limit the use of or close any structure which is reveled by inspection to endanger public safety;
2) Establish a chronological record of periodic inspections, listing structure components, component condition at the time of each inspection, thus allowing detection of progressive changes;
3) Determine the extent of any deficiency resulting from deterioration or any other cause;
4) Enable maintenance, repair, and rehabilitation to be programmed more effectively through early detection of structure deficiencies;
5) To collect, record, and store bridge inventory and inspection data, and;
6) Comply with FHWA National Bridge Inspection Standards.

2.1.2 NBIS Program Requirements

SCDOT is responsible for inspecting all highway bridges located on public roads fully or partially within the state's boundaries, with the exception of bridges owned by Federal agencies. Federal agencies must inspect all highway bridges within the respective responsibility or jurisdiction. A further requirement is for SCDOT to have a Bridge Inspection Program Manager, who meets specific required qualifications, to oversee the program. To execute the duties set forth above, the NBIS program is responsible for the following:

- Developing and implementing written statewide bridge inspection policies and procedures.
- Maintaining a registry of nationally certified bridge inspectors who are performing the duties of a team leader.
- Documenting the roles and responsibilities of personnel involved in the NBIS program.
- Managing a bridge file that contains inspection reports, procedures and related files.
- Developing QA/QC procedures and performing quality control and quality assurance activities.
- Preparing, maintaining, and reporting bridge inventory data.
- Creating and updating load ratings based on current condition of bridge and when required, implementing load posting or other restrictions.
- Managing corrective actions and documenting actions taken in response to a Critical Finding in defined timelines.
- Managing scour appraisals and creating, updating, and maintaining scour plans of action.

2.1.3 NBIS Program Organization

The Bridge Management Office (BMO) staff at SCDOT Headquarters in Columbia administers the NBIS program, which includes setting policy, performing various field reviews, and completing quality assurance activities. SCDOT bridge inspection personnel are located in the various districts and work under the supervision of the BMO. SCDOT inspectors or contracted consultants perform inspections of all NBIS bridges in South Carolina.

The BMO is responsible for collecting, maintaining, and reporting bridge inspection data and for ensuring the NBIS program complies with the requirements of the FHWA. The program provides data which SCDOT uses when determining preservation, rehabilitation, and replacement options for each bridge.

2.1.3.1 SCDOT Headquarters Organization for Bridge Inspection

2.1.3.1.1 Assistant Director of Bridge Management (NBIS Compliance) – Bridge Inspection Program Manager (BIPM)

The BIPM has responsibility for and manages the statewide bridge inspection and load rating programs. They also monitor compliance with the NBIS, serve as a contract manager overseeing consultant inspection and load rating contracts, monitor consultants' progress, check invoices and associated documents, evaluate deliverables, monitor the consultant's compliance with the terms of the contract, and evaluate consultant performance.

2.1.3.1.2 Bridge Load Rating Engineer (LRE)

The LRE has responsibility for preparing and analyzing summaries of bridge inspection computer data. They also coordinate between bridge inspectors and load rating engineers.

2.1.3.1.3 Bridge Management Quality Engineer (BMQE)

The BMQE has responsibility for the quality of bridge inspection operations. They perform quality assurance reviews of inspection reports, coordinate with the district staff on Critical Findings, closures, and posting recommendations, oversee the Quality Assurance (QA) initiative, verify consultants have written Quality Control (QC) Plans, coordinate QC/QA with consultants for inspections, and perform review of consultants' QC records (if needed). The BMQE also tracks frequent errors and corrections for inspection data.

2.1.3.1.4 State Bridge Inspection Supervisor (SBIS)

The SBIS is the supervisor of the District Bridge Inspection Supervisors (DBIS) and has responsibility for oversight of each supervisor in each of the districts. They also track inspection workload in each of the districts.

2.1.3.2 District Organization for Bridge Inspection

2.1.3.2.1 District Bridge Engineer (DBE)

The DBE has responsibility for bridge related maintenance issues on SCDOT owned bridges in their district. They coordinate with the DBIS on Critical Findings as needed.

2.1.3.2.2 District Bridge Inspection Supervisor (DBIS)

The DBIS oversees and supervises the Bridge Inspection Team Leaders (BITLs) in each district and is also responsible for confirming maintenance requests that are submitted to the DBE from inspection findings. They schedule, assign, and oversee bridge inspection activities. They perform QC reviews of inspection reports from their assigned district or other districts. The DBIS coordinates with the DBE on Critical Findings but is ultimately responsible for Critical Finding tracking on the bridges in their district.

2.1.3.3 Organization for Bridge Inspection Team

2.1.3.3.1 Bridge Inspection Team Leader (BITL)

The BITL coordinates, plans, prepares for, and performs the day-to-day field inspections as the individual in charge. They oversee data entry and report preparation for bridge inspection findings for submittal for review. The BITL holds responsibility for signing of inspection report and is responsible for the information contained within.

2.1.3.3.2 Associate Bridge Inspector (ABI)

Assists the BITL during the day-to-day field inspections, data entry, and report preparations.

2.1.4 Bridge Inventory Requirements

SCDOT must prepare and maintain an inventory of all bridges subject to the NBIS within its jurisdiction.

Certain NBI data must be collected and submitted to FHWA. The data must be reported yearly using FHWA-established procedures as outlined in the NBIS.

2.2 BRIDGE FILE REQUIREMENTS

The BMO is responsible for the upkeep of bridge records. The bridge file should be kept and maintained electronically in accordance with the Bridge File Policy (BFP). The BMO is responsible for the complete bridge records, which will be electronic, for the life of the structure. The BMO maintains records for SCDOT owned

structures taken out of service for as long as deemed necessary.

The BMO may keep electronic records for non-qualifying bridges (such as SCDOT owned pedestrian bridges or non-NBIS bridges).

The BFP contains the requirements for retention of electronic copies of bridge inspection records. The BFP should be referenced for specific document type and folder location requirements pertaining to design, construction, load rating, and maintenance records.

The files which relate to bridge inspection and shall be included in the bridge file are:

- Inspection Reports
- Critical Findings and Actions Taken
- Bridge Specific Inspection Procedures and reference to any general procedures, if used
- Initial Photographs, updated every 10 years
- Applicable Quality Documentation, including:
    - District Quality Meeting Forms
    - Annual Quality Assurance Reports
    - Annual Quality Assurance Meeting Presentations
- Scour Documentation (Appraisal, Assessment, and Plan of Action, when required)
- Waterway Information (cross sections, soundings, stream profiles, etc.)
- Load Rating and Posting Documentation
- Border bridge agreement with Georgia or North Carolina, if applicable

2.3 STRUCTURES REQUIRING BRIDGE INSPECTIONS

The bridge inspectors shall perform the inspection for each bridge according to:

- This document and according to all applicable laws, procedures and guidelines,
- Standards produced by FHWA, AASHTO, OSHA, EPA, SCDOT or SCDHEC, and
- Any bridge-specific inspection procedures (BSIP).

Bridge subjectivity to inspections can be determined by bridge status, load posting status, or other bridge data which may or may not change over a bridge's lifespan.

2.3.1 Bridges Subject to NBIS Program Requirements

SCDOT is directly responsible for the inspection of all NBIS bridges. Border bridges on highways connecting South Carolina with neighboring states shall be inspected according to agreements between the North Carolina Department of Transportation or the Georgia Department of Transportation.

2.3.1.1 SCDOT Owned Bridges

SCDOT or consultants under contract with SCDOT will perform inspections of bridges owned by SCDOT.

2.3.1.2 Municipality/County Owned Bridges

SCDOT or consultants under contract with SCDOT may perform inspections of bridges owned by municipalities or counties. At completion of inspection, the DBE will provide the local agency with a copy of the report, including Critical Findings, if any are found. Local agencies are responsible for maintaining, repairing, rehabilitating, and replacing bridges that they own. It is the responsibility of the bridge owner to notify SCDOT of any changes which may warrant bridge inspections and/or bridge load ratings.

2.3.1.3 Bridges with Phased Construction

For bridges constructed with phased or partial-width construction, an initial inspection must be performed for each

of the phased conditions for all portions of the bridge that open to traffic. This extends to existing structures that are being rehabilitated or replaced, requiring an initial inspection to be performed for any intermediate phase during which a partially demolished bridge that opens to traffic. The term "phased construction" means building a bridge's cross section in phases and opening traffic, sometimes partially, until the final cross section is completed. Phased construction projects over bridges are common on projects with shifting traffic patterns.

For bridges involved in several phases, an initial inspection shall be performed for each new phase of construction which involves changes in traffic patterns or traffic shifts or structural configuration. For example, if an existing bridge is partially demolished and a portion of the replacement structure built with both bridges open to live traffic, then an initial inspection of each bridge with its unique travel way and barrier configuration shall be performed for each respective Asset ID.

If substructure units (SSUs) are being built in the water that meet the criteria for an underwater inspection, an underwater inspection shall be performed within 3 months of the initial inspection. Based on the phased construction schedule, several underwater inspections may be needed as the SSUs are being built.

2.3.1.4 Temporary Bridges

Temporary bridges are considered identical to non-temporary bridges and subject to the same requirements inspection and reporting requirements. In addition, the inspection findings for temporary bridges which are not owned by SCDOT but are inspected by SCDOT or consultants will be provided to the bridge owner by the DBIS.

2.3.1.5 Closed Bridges

Closed bridges that have been retired and removed from the inventory do not require an inspection.

Closed bridges that remain part of the inventory still require inspections. If any of the following requirements are met, the bridge shall not be retired:

- The bridge crosses over an SCDOT route regardless of bridge closure,
- The bridge is owned by SCDOT and is accessible by non-vehicular traffic (pedestrians, bicyclists, etc.),
- The bridge may be reopened in the future, or
- The bridge should not be removed from the inventory for another reason as determined by the DBIS or BITL.

While the SCDOT district or other bridge owners are encouraged to contact the DBIS when a bridge is closed, inspectors may discover a closed bridge when they arrive for a field inspection. In this case, the scheduled inspection shall still take place.

If the bridge is closed and awaiting repairs or complete replacement, the bridge shall remain in the inventory with the load posting status updated as the bridge is closed to all motor vehicle traffic. The bridge owner shall contact SCDOT if the bridge is reopened.

2.3.1.5.1 Coordination with Non-SCDOT Bridge Owners for Closed Bridges

If a bridge owner informs SCDOT that a bridge is closed to traffic, the DBIS or designee will update the load posting status for the bridge. The correspondence, if available, shall also be saved in the Bridge File.

If a closed bridge that is not owned by SCDOT is discovered in the field, the DBIS shall attempt to contact the bridge owner and inquire about its status.

2.3.1.5.2 Removal of Non-SCDOT Bridges from Inventory

If the bridge owner communicates to SCDOT that the bridge is closed with no plans to reopen, it may be removed from the inventory so long as the bridge owner agrees to inform SCDOT if the bridge ever opens again in the future.

If the bridge owner is not communicating with SCDOT and the bridge has had a load posting status of closed for at least five years, the bridge may be removed from the inventory. If SCDOT retires an Asset ID and removes a bridge from the inventory without any correspondence from the bridge owner, the district shall notify the bridge owner that the bridge has been removed from the inventory.

2.3.1.6 Private Bridges

The NBIS only applies to private bridges where a public road directly carries the traveling public to the bridge, the public road continues on the other side, and the bridge is open to public travel. These private bridges are subject to the NBIS because of the seamless nature of transportation infrastructure and the public expects a uniform level of safety on bridges open to public travel. Under this definition, there are no private bridges in South Carolina that require inspection by SCDOT. If one is discovered, contact the BIPM.

2.3.2 Federal Government Bridges

The federal government owns and maintains bridges in South Carolina. The appropriate federal agency is responsible for inspecting and maintaining the bridge and providing bridge data to FHWA.

2.3.3 Non-NBIS Bridges

2.3.3.1 Undersized Bridges

There are SCDOT owned structures across South Carolina which are not included in the NBI but are included in the state bridge database. These bridges are classified differently since they are shorter than the minimum NBI length (20 feet) or have other features that may disqualify them from being submitted to FHWA such as not carrying a highway but exhibit characteristics of a bridge such as a foundation and/or piles and are not pipes or culverts.

SCDOT does not inspect undersized bridges owned by any entity other than SCDOT. For bridges owned by SCDOT shorter than the minimum NBI length, the inspection procedure and reporting process shall follow other requirements of the NBIS as defined in the BIGD with the exception of the load rating requirements. The undersized bridges shall be load rated at the direction of the Director of Bridge Management.

2.3.3.2 SCDOT Owned Non-Qualifying Bridges

Culverts and pipes which are not considered bridges are the responsibility of the RME and shall be inspected as part of the roadway work in accordance with ED 8.

2.3.3.3 Pedestrian and Bikeway Bridges

SCDOT builds and maintains pedestrian and bikeway bridges across the state. These SCDOT owned bridges shall be assigned Asset ID Numbers and the inspection procedure and reporting process for these structures shall follow other requirements of the NBIS as defined in the BIGD with the exception of the load rating requirements

SCDOT does not inspect or collect data on pedestrian and bikeway bridges, which are not owned by SCDOT, other than collecting clearances for SCDOT owned highways.

2.3.3.4 Railroad or Transit Bridges

SCDOT does not inspect or collect data on railroad or transit bridges other than collecting clearances for SCDOT owned highways.

2.4 STRUCTURES REQUIRING TUNNEL INSPECTION

Tunnels, as defined in Section 1.3.1, are inspected according to the National Tunnel Inspection Standards (NTIS). The NTIS require tunnel owners to establish a program for the inspection of highway tunnels, to maintain a tunnel inventory, to report the inspection findings to FHWA, and to correct any Critical Findings found during these inspections.

SCDOT's inventory currently contains no tunnels; however, in the event that a tunnel is newly constructed, re-classified or discovered, the inspector shall notify BIPM within three days of the discovery. SCDOT is responsible for determining if the structure is a tunnel and establishing appropriate procedures and requirements for subsequent inspection in accordance with the NTIS.

CHAPTER 3 BRIDGE INSPECTION PERSONNEL QUALIFICATIONS AND RESPONSIBILITIES

The information and detailed records provided by bridge inspectors 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 the 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).

Inspection personnel must meet the definitions and requirements from the NBIS outlined below. 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. SCDOT maintains a list of National Certified Bridge Inspectors meeting the criteria outlined in this section.

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, and 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 and score 70 percent or greater on each end-of-course assessment.

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)

When required for the specific inspection type, the BITL shall be present on-site throughout the duration of the bridge inspection and shall oversee the work of the inspectors. A BITL must possess, at a minimum, all four (4) of the Qualifications listed in Table 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 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 and score 70 percent or greater on each end-of-course assessment.	
Qualification #3	Maintained documentation supporting the satisfaction of this section.	
Qualification #4 *(The BITL must satisfy one of the four Certification Options.)*	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 (or higher) 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 can be used to provide the additional required experience. If at least 50 percent of experience comes from bridge inspection, the remaining experience can be documented as bridge design, bridge maintenance, or bridge construction without BIPM approval needed.

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, some bridge inspection experience shall be required.

The remaining experience would preferably be obtained through other design, maintenance, and construction activities. The BIPM may approve 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 outside of bridge design, bridge maintenance, and bridge construction (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 Dive Personnel for UW Inspections

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

All dive team members 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 UW BITL, shall be certified through the Association of Diving Contractors International (ADCI) or equivalent agency, such as federal or military commercial-diver training. The dive team shall include one dive supervisor who shall possess the proper ADCI Dive Supervisor certification. The BMQE shall be contacted to review training for equivalent agencies.

Certifications, including professional registrations and appropriate certificates for all team members, shall be provided and updated prior to any field work and included in the dive plan. The dive plan shall include team member roles including UW BITL and Inspection Diver(s) and their FHWA-approved underwater bridge inspection trainings.

3.1.3.1 BITLs on UW Inspections

The UW inspection shall have one lead UW BITL who shall personally inspect at least 25% of substructure units (SSUs) on all UW inspections. A qualified UW BITL shall be present during the entire inspection duration.

The inspector who performs as the UW BITL shall be qualified as a BITL per Section 3.1.2. The UW BITL shall also complete the FHWA-approved underwater bridge inspection training, or equivalent training course, and score 70 percent or greater on an end-of-course assessment.

3.1.3.2 Inspection Divers (§ 650.309(e))

Inspector divers who perform the inspection of the SSUs shall complete the FHWA-approved underwater bridge inspection training, or an FHWA-approved equivalent training course, and score 70 percent or greater on an end-of-course assessment.

3.1.3.3 Other Divers

Other divers may be used as support during UW inspections, but they may not inspect portions of the SSUs without being qualified as an UW BITL Inspection or an Inspection Diver.

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

Some bridges may have specific requirements for the BITL on NSTM inspections; these requirements are listed in the BSIP.

BITLs who perform NSTM inspections shall 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.

The NHI Course 130078 or the NHI Course 130078A "*Bridge Inspection Techniques for Nonredundant Steel Tension Members Refresher*" shall be taken at intervals no greater than ten years apart. The inspector must score 70 percent or greater on each end-of-course assessment.

3.1.5 BITLs on Complex Inspections

BITLs who perform inspections on stayed-girder bridges, segmental concrete bridges, or movable bridges shall be qualified as a BITL. In addition, the BITLs shall meet the requirements in Section 3.1.5.1 or Section 3.1.5.2. Some bridges may have specific requirements for the BITL on complex inspections; these requirements are listed in the BSIP.

3.1.5.1 BITL for Stayed-Girder Bridges and Segmental Concrete Bridges

The BITL for the inspections of cable stayed bridges and segmental box bridges shall submit qualifications at least 3

months prior to the scheduled inspection to the BMO. The BITL shall document the previous experience that they have on similar bridge types. Generally, the BITL should have experience on inspections of at least five similar type bridges with complex components.

3.1.5.2 BITL for Movable Bridges

The BITL for the inspections of movable bridges shall submit qualifications at least 3 months prior to the scheduled inspection to the BMO. BITLs who perform inspections on movable bridges shall have at least five years of experience performing structural, mechanical, and electrical bridge inspections on movable bridges. In addition, the BITL for structural, 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.

3.1.6 Quality Control Reviewer (QCR) and Quality Assurance Reviewer (QAR)

The Quality Control Reviewer (QCR) and Quality Assurance Reviewer (QAR) who performs the review of an inspection shall meet the same qualification requirements as a BITL.

3.1.7 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.

3.2 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 to meet the training requirements outlined the NBIS. More information, including information on course changes or new course offerings, can be found on the NHI website.

CHAPTER 4 GENERAL TYPES, SCOPE AND INTERVAL OF INSPECTIONS

This chapter describes the various types of inspections, related intervals, and the scope of inspections performed. Table 3 summarizes specifics requirements for bridge inspections.

During all inspections, element data shall be collected and updated on all bridges subject to the NBIS Program Requirements, undersized bridges owned by SCDOT, Pedestrian and Bikeway Bridges owned by SCDOT, and other bridges as directed by the BIPM.

While most inspections occur on established, federally required intervals, some inspections are unscheduled or only happen occasionally during a bridge's life.

The BITL is responsible for confirming all inspection intervals for the subject bridge and shall use their discretion to determine inspection intervals outside the explicit guidance provided here. If the BITL adds a required inspection, removes an inspection or revises the interval of an inspection, a reason for the change shall be noted in the inspection report.

If at any time during the inspection, the inspector discovers a need to reduce the interval of the inspection or of another scheduled inspection type, the inspections are not considered out-of-interval, but the inspections must be completed or re-scheduled within 3 months of the discovery. If inspections take place outside of the 3 months, the inspections would then be considered out-of-interval. For example, if during a scour monitoring inspection part of storm response, the routine and underwater inspections need to have their interval reduced; the BITL is not expected to perform those inspections at that time, but they must be scheduled and performed within 3 months from the date of the scour monitoring inspection.

At all times, the DBIS or Consultant PM are responsible for adherence to the scheduled inspections and the intervals of the inspections assigned to them. SCDOT policy is to inspect all bridges within their established interval. The BMQE or their designee monitors the conformance of inspection dates with the required inspection intervals. If a bridge inspection cannot be completed, the procedure in Section 4.17 shall be followed. If a bridge inspection is completed out-of-interval, the procedure in Section 4.18 shall be followed.

4.1 TEAM LEADER ASSIGNMENTS AND INSPECTION SCHEDULING

4.1.1 Team Leader Assignments

The DBIS should, if possible, assign a BITL who has not inspected the bridge in previous inspections.

The Consultant PM shall not assign the same BITL to consecutive scheduled inspections of the same type (routine, underwater, NSTM, in-depth, service, or complex).

Rotating BITLs improves the overall quality of the program.

4.1.2 Inspection Scheduling and Inspection Reassignments

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.

The DBIS and Consultant PM is required to evaluate the upcoming workload from month to month and request reassignment to others, when needed, to meet the required intervals. When scheduling inspections, the requestor must consider the type of inspections required. If the number and/or complexity of the bridges to be inspected exceed the capabilities of the specific inspection staff, then a reassignment shall be requested.

Reassignment requests on bridges over railroads which are active, 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.

Reassignment requests for other bridges shall be sent to the BMO for review no later than the 15th 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.

4.1.3 Inspection Requests

If an inspector is requesting another type of inspection or a change in inspection interval, it will be reviewed by the BMO. The inspector shall include a reason for the request in the inspection report. An example would be if a BITL recommends an underwater inspection for a bridge not currently receiving an underwater inspection.

4.1.4 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 estimated inspection date to change the time of year the bridge would be inspected next. As practicable, but still maintaining compliance with required inspection frequencies, inspections shall be performed when seasonal weather conditions have minimal impact on workflow. If possible, inspections over rivers and streams shall periodically be scheduled during low-flow months to allow the best view of components above the waterline. For effective inspections, periods of extreme temperature or high winds should be avoided, if possible. If the BITL changes the time of year the bridge will be inspected next, this change, and a reason for the change shall be noted. 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 3.

Table 3 – Inspection Types, BSIP Requirement, Qualifications and Intervals

	Inspection Type	BSIP	Qualifications	Chapter 3 Section	Interval[I]	Chapter 4 Section
Scheduled Inspections	Routine	As Needed[R]	BITL	3.1.2	24 Months	4.2
	Underwater (UW)	Mandatory	UW BITL and Dive Team	3.1.3	60 Months	4.3
	Special	Mandatory	BITL/See BSIP[Q]	Varies	Interval required but varies	4.4
	Non-Redundant Steel Tension Member (NSTM)	Mandatory	NSTM BITL	3.1.4	24 Months	4.5
	In-Depth	Mandatory	BITL/See BSIP[Q]	Varies	Interval required but varies	4.6
	Service	Not Required	BITL	3.1.2	Interval required but varies[S]	4.7
	Complex	Mandatory	See BSIP	3.1.5	24 Months	4.8
Unscheduled Inspections or Non-Field Inspection Events	Initial	Not Required	BITL/See BSIP[Q]	Varies	Within 3 months of bridge opening to traffic	4.9
	Maintenance	Not Required	BITL/See BSIP[Q]	Varies	Data updated 3M after Bridge Maintenance	4.10
	Load Rating	Not Required	SC PE	3.1.7	Data updated 3M after Load Rating request	4.11
	Hydraulic Analysis	Not Required	Hydraulic Engineer	N/A	Data updated 9M after Hydraulic Analysis request	4.12
	Damage	Not Required	BITL/See BSIP[Q]	Varies	As soon as possible after occurrence	4.13
	Data Update	Not Required	BITL	3.1.2	Data updated within 3M	4.14
	Scour Monitoring	As Required by POA	BITL[SM]	3.1.2	As soon as possible after a triggering event, as dictated by the Plan of Action (POA), or as needed, or as requested	4.15

[R] = As the most common inspection type, routine inspections may have vastly different procedures based on bridge type such as a bridge with timber piles or a bridge with fatigue prone details.

[Q] = The BITL for special, in-depth, initial, maintenance, and damage shall be qualified as needed to perform inspection based on bridge type and inspection scope. For example, special or in-depth inspections of submerged portions of the bridge shall be performed by an UW BITL and Dive Team. Specific qualifications for the BITL shall be added to the BSIP, where applicable.

[I] = Inspection intervals included in Table 3 are typical intervals. Intervals may vary if an abbreviated interval is required or recommended or if an extended interval is recommended. For example, if a GCR is 4 or less, a 12M routine inspection is required.

[S] = When a service inspection is used as part of the process to increase the routine inspection interval, the interval of the service inspection shall be set at 24 months. Interval for other uses of a service inspection shall be determined by the BITL.

[SM] = In widespread storm events, SCDOT permits a non-BITL to perform monitoring of a bridge. Any updates to bridge condition or data require a field visit by the BITL responsible for the bridge.

4.2 ROUTINE INSPECTIONS

Table 4 – Routine Inspections - BSIP Requirement, Qualifications and Intervals

Inspection Type	BSIP	Qualifications	Chapter 3 Section	Interval[I]
Routine	As Needed[R]	BITL	3.1.2	24 Months

[R] = As the most common inspection type, routine inspections may have vastly different procedures based on bridge type such as a bridge with timber piles or a bridge with fatigue prone details.

[I] = Inspection intervals included in Table 4 are typical intervals. Intervals may vary if an abbreviated interval is required or recommended or if an extended interval is recommended.

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 unless the interval is reduced or extended. Permitted routine inspection intervals are less than 12 months, 12 months, 24 months, or 48 months.

A routine inspection may have agency wide inspection procedures that must be followed or bridge-specific procedures that shall be included in the Bridge File.

4.2.1 Reduced Intervals for Routine Inspections

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

Table 5 – Reduced Interval Routine Inspection Criteria

Criteria	SNBI Item	Notes
Deck Condition Rating ≤ 4	B.C.01	For bridges only
Superstructure Condition Rating ≤ 4	B.C.02	For bridges only
Substructure Condition Rating ≤ 4	B.C.03	For bridges only
Culvert Condition Rating ≤ 4	B.C.04	For culverts only
Scour Condition Rating ≤ 4	B.C.11	Only for bridges over water
Bridge is a Channel Beam Bridge with Skinny Legs	SC.G.17	See Section 4.2.4.3
Bridge is a Timber Pile Bridge with Split Bent Caps	N/A	See Section 4.2.4.5

A routine inspection with a 12-month interval shall be required as stated in Table 5 but exceptions may be made for the following conditions. With all conditions, a routine inspection could remain at a 24-month interval if a special inspection at a 12-month interval or less is required for the bridge.

- If the Component Condition Rating is linked to an isolated defect. Note that defects which effect over approximately 10% of a component and are causing the Component Condition Rating to be a "4" or less should have a routine inspection with a 12-month interval.
- If the Component 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 4.3. The Underwater Inspection Condition (B.C.15) shall match the Component Condition Rating, and a note shall be included in the inspection report.

4.2.2 Extended Intervals for Routine Inspections

If, and only if, all applicable criteria on Table 6 are met, the routine inspection interval may be set to 48 months. If the interval for the routine inspection is 48 months, a service inspection shall be scheduled to occur 24 months after the last routine inspection.

Table 6 – Extended Interval Routine Inspection Criteria

Criteria	SNBI Item	Notes
Deck Condition Rating ≥ 6	B.C.01	For bridges only
Superstructure Condition Rating ≥ 6	B.C.02	For bridges only
Substructure Condition Rating ≥ 6	B.C.03	For bridges only
Culvert Condition Rating ≥ 6	B.C.04	For culverts only
Bridge Railing Condition Rating ≥ 6	B.C.05	
Bridge Railing Transitions Condition Rating ≥ 6	B.C.06	
Bridge Bearings Condition Rating ≥ 6	B.C.07	For bridges only
Bridge Joints Condition Rating ≥ 6	B.C.08	For bridges only
Channel Condition Rating ≥ 6	B.C.09	Only for bridges over water
Channel Protection Condition Rating ≥ 6	B.C.10	Only for bridges over water
Scour Condition Rating ≥ 6	B.C.11	Only for bridges over water
Scour Vulnerability = “A” or “B”	B.AP.03	Only for bridges over water
Inventory Rating Factor ≥ 1.0	B.LR.05	
Operating Rating Factor ≥ 1.0	B.LR.06	
Routine Permit Loads = “A” or “N”	B.LR.08	
Minimum Roadway Vertical Clearance ≥ 17’-0”	B.H.13	Only for bridges over roadway
Main/Approach Span Material Type = (See Tables)[1]	B.SP.04	See Table 7[1]
Main/Approach Span Design Type = (See Tables)[1]	B.SP.06	See Table 8[1]
Steel Fatigue Details = No Category E or E'	B.IR.02	Only for steel bridges

[1] = Table 7 and Table 8 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 the material type is timber, the routine inspection cannot be extended. Another example would be that if design type is a through truss, the routine inspection cannot be extended.

Table 7 – Allowable Span Material Type for Extended Intervals (SNBI Item B.SP.04)

SNBI 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 8 – Allowable Span Type for Extended Intervals (SNBI Item B.SP.06)

SNBI 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 Removing Routine Inspections

Routine inspections shall only be removed from a bridge when the bridge has been removed from the inventory.

4.2.4 Additional Considerations for Routine Inspections

4.2.4.1 Routine Inspections on Closed Bridges

Routine inspections shall be the only inspection associated with a bridge that is closed for 3 months or longer unless another inspection is deemed necessary by the BITL for a safety. Non-routine inspections on closed bridges require BMO acknowledgement. The routine inspection on a closed bridge should be scheduled for 24 months unless the BITL deems necessary for safety. A reduced interval for a routine inspection or non-routine inspections on a closed bridge may be requested due to the following:

- Local knowledge of the bridge,
- Bridge is open to pedestrians, or
- Structural deterioration conditions could affect public safety of individuals that use the facility underneath the structure or the facility itself.

If routine inspections at an increased interval or non-routine inspections are scheduled for a bridge, the inspection report shall note the reason for the inspections being arranged.

The inspections of closed bridges must confirm that the bridge is properly closed to vehicles and, when required, pedestrians as well. The inspection reports for closed bridges must include a confirmation that the bridge is still closed to traffic. This confirmation includes the photographic documentation that barricades, barrier, fences, or other objects are in place and secure, thus preventing traffic from crossing the structure. The inspections of closed bridges shall also include evaluation of any portion of the bridge that is open to pedestrian traffic.

If the bridge is re-opened, non-routine inspections may be required to be scheduled per the requirements of this chapter and shall be requested by the BITL.

4.2.4.2 Routine Inspections on Non-NBIS Bridges

While the inspection of non-NBIS bridges is not mandated by the FHWA, they should be inspected in accordance with this section. Scheduling priority within districts will always be for NBI bridges. Routine inspections for Non-NBIS Bridges owned by SCDOT shall be performed per the requirements of this section. Routine inspections on Non-NBIS Bridges that are not owned by SCDOT shall be done only to collect clearance data.

4.2.4.3 Routine Inspections on Skinny Leg Channel Bridges

Channel beam bridges with "skinny leg" channels should have a routine inspection at 12 month intervals. Inspectors must be able to distinguish between "skinny leg" channels and "wide leg" channels. In general, wide-leg channel beams were most likely designed for H-15 loading, whereas skinny-leg channel beams were an earlier type, with lighter design loading.

Skinny leg channels can be identified by having a single vertical row of prestressing strands in the legs, whereas the wide leg channel beams have two vertical rows of prestressing strands. Figures 3 and 4 include cross sketches showing the difference between the two section types.

If an inspector discovers a channel beam bridge with skinny leg details that is not documented as such in the bridge inventory, the BITL shall revise the inspection interval accordingly and document the justification for the change.

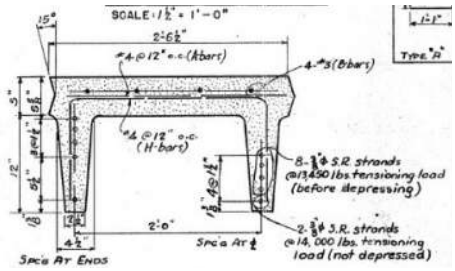


Figure 3 – "Skinny Leg" Channel Section

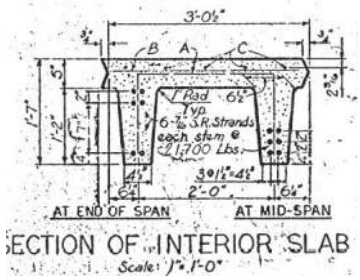


Figure 4 – "Wide Leg" Channel Section

4.2.4.4 Routine Inspections on Bridges with Low Freeboard

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 as discussed in Section 4.1.4 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; see Section 4.3.1.1.

4.2.4.5 Bridge is a Timber Pile Bridge with Split Bent Caps

If the bridge has a substructure that consists of at least one bent that is founded on timber piles which supports a non-continuous or split cap, the bridge shall have a routine inspection every 12 months. Any bridge which has at least one Agency Defined Element (ADE) which is a split cap element, the routine inspection interval shall be set at 12 months.



Figure 5 – Split Reinforced Concrete Cap Founded on Timber Piles

4.3 UNDERWATER (UW) INSPECTIONS

Table 9 – UW Inspections - BSIP Requirement, Qualifications and Intervals

Inspection Type	BSIP	Qualifications	Chapter 3 Section	Interval[I]
Underwater (UW)	Mandatory	UW BITL and Dive Team	3.1.3	60 Months

[I] = Inspection intervals included in Table 9 are typical intervals. Intervals may vary if an abbreviated interval is required or recommended or if an extended interval is recommended

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. When the water depth at a substructure element is greater than four feet, an underwater inspection is required. If the depth is near, but not significantly exceeding four feet, and the inspector can properly inspect the elements with wading and probing, an UW inspection may not be required. In those cases, justification is required in the inspection report and consultation with BMO may be necessary. 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. Permitted UW inspection intervals are less than 12 months, 12 months, 24 months, 60 months, or 72 months.

4.3.1 Reduced Interval Underwater Inspection

If any of the following criteria are met, the underwater inspection interval shall be equal to or less than 24 months. The BITL can schedule an inspection interval less than 24 months, if desired.

Table 10 – Reduced Interval Underwater Inspection Criteria

Criteria	SNBI Item
Underwater Inspection Condition Rating ≤ 4	B.C.15
Channel Condition Rating ≤ 4	B.C.09
Scour Condition Rating ≤ 4	B.C.11

In addition to the requirements listed above, 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 may prompt a BITL to request a reduced interval

4.3.2 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 11 – Extended Interval Underwater Inspection Criteria

Criteria	SNBI Item
Underwater Inspection Condition Rating ≥ 6	B.C.15
Channel Condition Rating ≥ 6	B.C.09
Channel Protection Condition Rating ≥ 6	B.C.10
Scour Vulnerability = A or B	B.AP.03
Scour Condition Rating ≥ 6	B.C.11

4.3.3 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 regularly less than four feet at the bents, the underwater inspection can be removed with a note explaining why in the inspection report.

4.3.4 Additional Considerations for UW Inspections

4.3.4.1 UW Inspections on Bridges with Low Freeboard

See Section 4.2.4.4 regarding the need for routine and UW inspections performed together on bridges with minimal freeboard or culverts filled with water. These bridges shall have a BSIP created before the UW inspection starts to identify which members are to be inspected by the combined inspection. For these structures, the routine and underwater inspections shall both have intervals equal to or less than 24 months; see Section 4.2.4.4.

4.3.4.2 Underwater Inspections after Initial Inspections

The UW inspection shall be performed within 3 months of the initial inspection as the SSUs are being built in the water. The UW BITL may need to coordinate with district construction or the Contractor to examine substructure or channel components. Several underwater inspections may be needed for bridges with phased construction.

4.4 SPECIAL INSPECTIONS

Table 12 – Special Inspections - BSIP Requirement, Qualifications and Intervals

Inspection Type	BSIP	Qualifications	Chapter 3 Section	Interval
Special	Mandatory	BITL/See BSIP[Q]	Varies	Interval required but varies

[Q] = The BITL for special, in-depth, initial, maintenance, and damage shall be qualified as needed to perform inspection based on bridge type and inspection scope. For example, special or in-depth inspections of submerged portions of the bridge shall be performed by an UW BITL and Dive Team. Specific qualifications for the BITL shall be added to the BSIP, where applicable.

A special inspection is an inspection scheduled at the discretion of the BITL. It is used to monitor a specific member condition or suspected defect 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 or UW inspection, a special inspection should be scheduled. Typically, special inspections are inspections with limited scope and targeted at a specific member or defect; if additional investigation not typically done during a routine or UW inspection or testing is needed, an in-depth inspection shall be scheduled.

Special inspections should be performed at intervals of 12 months or less, but longer for special inspections that require diving or other special access. 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. The special inspection shall be used to only document findings associated with the specific member condition or defect.

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.
3. Temporary supports are in place.
4. Fatigue cracks have been found (in NSTM or redundant structure).
5. Posted bridges exhibit heavy truck traffic if a Component Condition Rating is in 5 (Fair) or worse condition.
6. Recommended by the BITL.

4.4.1 BSIPs for Special Inspections

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. The BSIP shall be developed before the special inspection is performed and the BSIP must define which members are subject to the special inspection along with access needs, special equipment, additional required measurements, etc.

Each bridge requiring a special inspection shall have documented inspection procedures in the Bridge File developed in accordance with Section 4.2 of the MBE. The procedures, whether general or specific:

- Identify each bridge member or specific details requiring inspection and document each location.
- Detail any advanced inspection methods or techniques to be used to fully ascertain the existence of or extent of a deficiency.
- Specify any additional qualifications, or specialized training, required of the inspection team leader or specific bridge inspectors.
- Specify any needed special access equipment or traffic control.

4.4.2 Removing Scheduled Special Inspections

Special inspections can be removed whenever deemed appropriate by the BITL if the monitor a specific member condition or suspected defect is no longer needed.

4.5 NON-REDUNDANT STEEL TENSION MEMBER (NSTM) INSPECTIONS

Table 13 – NSTM Inspections - BSIP Requirement, Qualifications and Intervals

Inspection Type	BSIP	Qualifications	Chapter 3 Section	Interval[I]
NSTM	Mandatory	NSTM BITL	3.1.4	24 Months

[I] = Inspection intervals included in Table 13 are typical intervals. Intervals may vary if an abbreviated interval is required or recommended or if an extended interval is recommended

A NSTM inspection is required on any steel member is that is non-redundant. A NSTM inspection requires a hands-on inspection of NSTMs, 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.

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 an NSTM inspection.

It is required for all bridges with NSTMs to have a hands-on NSTM inspection performed at intervals no greater than 24 months. If the SNBI Item B.C.14 (NSTM Condition Rating) 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.

4.5.1 BSIPs for NSTM Inspections

NSTM 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. The BSIP shall be developed before the NSTM inspection is performed and the BSIP must define which members are subject to the NSTM inspection.

4.5.2 Removing Scheduled NSTM Inspections

If there has been a determination by the DBIS that an NSTM can be reclassed as redundant or not in tension, the NSTM inspection can be removed from the bridge.

4.6 IN-DEPTH INSPECTIONS

Table 14 – In-Depth Inspections - BSIP Requirement, Qualifications and Intervals

Inspection Type	BSIP	Qualifications	Chapter 3 Section	Interval
In-Depth	Mandatory	BITL/See BSIP[Q]	Varies	Interval required but varies

[Q] = The BITL for special, in-depth, initial, maintenance, and damage shall be qualified as needed to perform inspection based on bridge type and inspection scope. For example, special or in-depth inspections of submerged portions of the bridge shall be performed by an UW BITL and Dive Team. Specific qualifications for the BITL shall be added to the BSIP, where applicable.

An in-depth inspection is a close-up, detailed inspection of one or more bridge members using specialized visual, nondestructive evaluation, or destructive techniques as required to identify any deficiencies not readily detectable using routine inspection procedures. Examples of in-depth inspections on bridges include cable inspections, post-tensioning tendon inspections, inspections with a survey or detailed monitoring, etc. However, some bridges may require in-depth inspections to compliment or enhance the routine inspections.

Permitted in-depth inspection intervals are less than or equal to 12 months, 24 months, 48 months, or 72 months.

4.6.1 BSIPs for In-Depth Inspections

Procedures for an in-depth inspection are beyond standard procedures performed during routine inspections. Bridges with complex components may require in-depth inspections according to their BSIPs. Hands-on inspection may be necessary at some locations. The members which require an in-depth inspection, and their locations shall be identified in the BSIP. If a bridge requires an in-depth inspection for multiple components, the BITL shall make sure the specific procedures are in place and intervals are specified for each required inspection.

Each bridge requiring an in-depth inspection shall have documented inspection procedures in the Bridge File developed in accordance with Section 4.2 of the MBE. The procedures, whether general or specific:

- Identify each bridge member or specific details requiring inspection and document each location.
- Detail any advanced inspection methods or techniques to be used to fully ascertain the existence of or extent of a deficiency.
- Specify any additional qualifications, or specialized training, required of the inspection team leader or specific bridge inspectors.
- Specify any needed special access equipment or traffic control.

4.6.2 In-Depth Inspection of Pins

In-depth inspections on pins are required for steel bridges with pin elements. This might include steel truss bridges pinned at their joints, or steel arch bridges with pins.

Pins on the truss must have ultrasonic testing to check for fatigue cracks and measure the pin lengths. In addition, inspectors shall measure pin length readings, forging, and thickness of the bar fashioned around the pins. The ultrasonic pin testing usually requires specialized access to place personnel and the test equipment close to the pin.

If a pin connection is considered NSTMs and requires a hands-on, visual inspection of all elements of the connection; both an NSTM inspection and in-depth inspection shall be scheduled for the pins.

Pin connections not considered NSTMs shall be inspected with ultrasonic testing methods at no greater than a 72-month interval if they are in good or fair condition state. Pin connections not considered NSTMs which are in poor or severe condition state shall be inspected with ultrasonic testing methods at no greater than a 24-month interval.

Table 15 – Interval for In-Depth Inspections on Pins

Pin Condition	Required Interval
Pin Connection is NSTM	In-Depth Inspection Interval Matches NSTM Inspection Interval
Any Quantity of Element 161 in CS1 or CS2	72 Months
Any Quantity of Element 161 in CS3 or CS4	24 Months

4.7 SERVICE INSPECTIONS

Table 16 – Service Inspections - BSIP Requirement, Qualifications and Intervals

Inspection Type	BSIP	Qualifications	Chapter 3 Section	Interval
Service	Not Required	BITL	3.1.2	Interval required but varies

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. Service inspections are not permitted on bridges with complex features. Element level data does not need to be updated during a service inspection.

If the BITL discovers a defect or change at the bridge during a service inspection that changes the interval for another inspection type and that inspection would be overdue, the BITL shall, if possible, change the inspection scope from a service inspection to the newly required inspection. If this is not possible, the BITL shall complete the service inspection but schedule the newly required inspection to be completed within three months of the date of the service inspection. Specific examples of a discovery that would change the interval for another inspection type would be change in a Component 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 17).
- The inspectors shall document the condition of the bridge by taking the photographs that are required for a routine inspection.
- The inspectors shall verify that previously performed load rating matches the current condition of the bridge.
- For bridges over a roadway or over a railroad, the inspectors shall verify the accuracy of the previously recorded vertical clearances. 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 verity that any at-bridge and advance posting signs are in place (if required).
- The inspectors shall verify that any at-bridge and advance 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 and Horizontal Clearance
    - Navigable Pier Protection
    - Minimum Navigable Vertical Clearance
    - Navigable Channel Minimum Horizontal Clearance

Table 17 – Condition Ratings Verified During Service Inspections

Criteria	SNBI Item
Deck Condition Rating	B.C.01
Superstructure Condition Rating	B.C.02
Substructure Condition Rating	B.C.03
Culvert Condition Rating	B.C.04
Bridge Railing Condition Rating	B.C.05
Bridge Railing Transitions Condition Rating	B.C.06
Bridge Bearings Condition Rating	B.C.07
Bridge Joints Condition Rating	B.C.08
Channel Condition Rating	B.C.09
Scour Condition Rating	B.C.11

4.7.1 Service Inspections for Verifying Interim Bridge Condition

Service inspections may be scheduled by the BITL whenever they determine the overall bridge condition and/or status needs to be verified. If the bridge has a specific member condition or suspected defect that requires monitoring, a special inspection with a BSIP is required. If the bridge has a condition where the routine inspection needs to be reduced to less than 24 months, a special inspection must be used to maintain the interval for routine inspection and not a service inspection; see Section 4.2.1.

4.7.2 Service Inspections for Increasing Routine Inspection Intervals

A service inspection which is used to increase a bridge's routine interval to 48 months must be performed midway between routine inspections.

4.8 COMPLEX INSPECTIONS

Table 18 – Complex Inspections - BSIP Requirement, Qualifications and Intervals

Inspection Type	BSIP	Qualifications	Chapter 3 Section	Interval
Complex	Mandatory	See BSIP	3.1.5	24 Months

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 cable stayed superstructures. The *AASHTO MBE* provides guidance on bridge inspection requirements for bridges with complex features. Bridges with complex features are structure types with unusual characteristics. SCDOT has identified the following structures types as needing a complex inspection. Complex inspections are performed at intervals of 24 months.

- Cable Stayed

- Movable – Lift
- Movable – Bascule
- Movable – Swing
- Segmental Box

4.8.1 BSIPs for Complex Inspections

All bridges with complex components must be identified, inspection procedures shall be developed and may require additional training and experience requirements for these structures. Complex inspections require BSIP's reviewed and updated before the inspection takes place. The BSIP shall identify which members are complex. If no BSIP is present, the BMO shall be notified, and a professional engineer will need to develop them prior to the inspection taking place.

4.9 INITIAL INSPECTIONS

Table 19 – Initial Inspections - BSIP Requirement, Qualifications and Intervals

Inspection Type	BSIP	Qualifications	Chapter 3 Section	Interval
Initial	Not Required	BITL/See BSIP[Q]	Varies	Within 3 months of bridge opening to traffic

[Q] = The BITL for special, in-depth, initial, maintenance, and damage shall be qualified as needed to perform inspection based on bridge type and inspection scope. For example, special or in-depth inspections of submerged portions of the bridge shall be performed by an UW BITL and Dive Team. Specific qualifications for the BITL shall be added to the BSIP, where applicable.

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 inventory data, such as 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, the changing of bridge clearances, or if inventory photographs are due.

Initial inspections shall be performed in accordance with 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.

4.9.1 Coordination for Initial Inspections

Coordination between the DBIS, the district, 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 district construction staff regarding any relevant projects. If the DBIS is unsure of who they should coordinate with, the DBIS shall contact the BMO as soon as practical.

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 inspection and the bridge's first UW inspection, NSTM inspection, or complex inspection (if needed). Every effort should be made to complete the inspection(s) prior to opening the bridge to traffic. The initial inspection must be completed after construction is completed or around substantial completion. At times, it may make sense to revisit the bridge multiple times to complete the initial inspection prior to opening depending on construction access, bridge type, etc. However, a BITL complete the initial inspection after the construction or the phase of construction is substantially complete.

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

4.9.2 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 bridge owner or contractor. 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.

4.9.3 Initial Inspection Findings

Within two weeks of the completion of the inspection, the DBIS or Consultant PM shall provide the district or owner with repair recommendations and/or preliminary results.

4.9.4 Load Ratings, UW Inspections, and Hydraulic Analysis for Initial Inspections

A load rating is needed for a bridge that is receiving an initial inspection if an as-built load rating does not exist. The BITL shall request the load rating as soon as possible. The load rating shall be completed within 3 months of the initial inspection.

If an underwater inspection is needed for a bridge that is receiving an initial inspection, the BITL of the initial inspection shall request the initial underwater inspection as soon as possible. The underwater inspection shall be completed within 3 months of the initial inspection unless otherwise approved by the BMO.

A hydraulic analysis is needed for a bridge that is receiving an initial inspection if a hydraulic analysis does not exist for a bridge over a waterway, including an analysis at each phase. The BITL shall request the hydraulic analysis as soon as possible. The hydraulic analysis shall be completed within 9 months of the initial inspection.

4.10 MAINTENANCE INSPECTIONS

Table 20 – Maintenance Inspections - BSIP Requirement, Qualifications and Intervals

Inspection Type	BSIP	Qualifications	Chapter 3 Section	Interval
Maintenance	Not Required	BITL/See BSIP[Q]	Varies	Data updated 3M after Bridge Maintenance

[Q] = The BITL for special, in-depth, initial, maintenance, and damage shall be qualified as needed to perform inspection based on bridge type and inspection scope. For example, special or in-depth inspections of submerged portions of the bridge shall be performed by an UW BITL and Dive Team. Specific qualifications for the BITL shall be added to the BSIP, where applicable.

Maintenance inspections may occur when a bridge has repair or rehabilitation work performed and data requires an update and an inspection is not scheduled. An example of maintenance inspection would be following the completion of specific work on Critical Findings or repair recommendations by bridge maintenance; a BITL performs a maintenance inspection to confirm the work was completed. If updates to data are needed because of bridge damage, a damage inspection shall be performed. If updates to bridge data are needed because of a scour event or per the bridge's POA, a scour monitoring inspection shall be performed.

Maintenance inspections shall detail any repairs performed in accordance with SNBI Item B.W.03 (Work Performed). All locations where repairs have been made shall be included in the inspection report. If structural repairs have been made, a typical photograph of the repair type shall be included in the inspection report. A photograph of every repair location is not required. If plans, sketches, or drawings for the repairs exist, the BITL shall indicate the existence of plans, sketches, or drawings and confirm that those applicable documents have been uploaded to the Bridge File. Thes documents may include:

- For contracted repairs, construction documents (as-builts, if available)
- For in-house repairs, drawings, sketches, plans, work specifications, or other repair documentation

The BITL is responsible for confirming the files have been uploaded to the Bridge File.

4.11 LOAD RATINGS

Table 21 – Load Ratings - BSIP Requirement, Qualifications and Intervals

Inspection Type	BSIP	Qualifications	Chapter 3 Section	Interval
Load Rating	Not Required	SC PE	3.1.7	Data updated 3M after Load Rating request

Load ratings are performed in accordance with the Load Rating Guidance Document (LRGD).

4.12 HYDRAULIC ANALYSIS

Table 22 – Hydraulic Analysis - BSIP Requirement, Qualifications and Intervals

Inspection Type	BSIP	Qualifications	Chapter 3 Section	Interval
Hydraulic Analysis	Not Required	Hydraulic Engineer	N/A	Data updated 9M after Hydraulic Analysis request

Hydraulic analyses are performed in accordance with the polices of the Hydraulic Design Support Office (HDSO).

4.13 DAMAGE INSPECTIONS

Table 23 – Damage Inspections - BSIP Requirement, Qualifications and Intervals

Inspection Type	BSIP	Qualifications	Chapter 3 Section	Interval
Damage	Not Required	BITL/See BSIP[Q]	Varies	As soon as possible after occurrence

[Q] = The BITL for special, in-depth, initial, maintenance, and damage shall be qualified as needed to perform inspection based on bridge type and inspection scope. For example, special or in-depth inspections of submerged portions of the bridge shall be performed by an UW BITL and Dive Team. Specific qualifications for the BITL shall be added to the BSIP, where applicable.

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.

The inspector may also need to collect the following:

- Accident Patrol / Police Report
- Critical Findings / Repair Recommendations
- Photographs
- Date of Impact

- Time of Impact
- Weather at Impact
- Number of Lanes Closed on, under, or above Bridge
- Parties Contacted by SCDOT
- Controlling Minimum Vertical Clearance (with location and additional pertinent information)

4.14 DATA UPDATE INSPECTIONS

Table 24 – Data Update Inspections - BSIP Requirement, Qualifications and Intervals

Inspection Type	BSIP	Qualifications	Chapter 3 Section	Interval
Data Update	Not Required	BITL	3.1.2	Data updated within 3M

A data update inspection may be required to revise bridge information with or without a field visit. A BITL shall initiate the inspection, record updates and submit the inspection as practical. A data update inspection shall not take place following bridge repair or rehabilitation.

4.15 SCOUR MONITORING INSPECTIONS

Table 25 – Scour Monitoring Inspections - BSIP Requirement, Qualifications and Intervals

Inspection Type	BSIP	Qualifications	Chapter 3 Section	Interval
Scour Monitoring	As Required by POA	BITL[SM]	3.1.2	As soon as possible after a triggering event, as dictated by the Plan of Action (POA), or as needed, or as requested

[SM] = In widespread storm events, SCDOT permits a non-BITL to perform monitoring of a bridge. Any updates to bridge condition or data require a field visit by the BITL responsible for the bridge.

A scour monitoring inspection is an inspection used to update the bridge's channel, waterway, and scour condition and/or assess an existing bridge's vulnerability to scour and stream instability. A scour monitoring inspection shall be performed as determined to be needed at the discretion of SCDOT or per the bridge's POA. In addition, a scour monitoring inspection allows for documentation of scour changes since the previous inspection.

The visual inspection performed during scour monitoring shall confirm the overall existing condition of the bridge. At a minimum, the inspector shall collect a summary and location of the damage (including photographs) and request a new hydraulic analysis, if required. A channel survey is likely to be taken during the scour monitoring inspection. The list below includes some factors that may need to be considered during the scour monitoring inspection, but the POA shall be reviewed for any specific requirements prior to the scour monitoring inspection.

- Flood stage and approximate water flow or velocity at which the bridge was visited and the time of the visit
- Potential or presence of debris
- Increase scour at substructure components
- Substructure alignment relative to the stream including lateral movement of the stream
- Effectiveness, condition, or absence of scour countermeasures
- Stream aggradation or degradation
- Upstream and downstream channel stability
- Bed and bank soil material

The inspector may consider any recommendations for scour countermeasures, bank protection, channel protection, etc., which may protect the bridge from damage during future flooding or reduce the potential for scouring.

4.16 NON-BRIDGE INSPECTIONS

The inspection of these elements is not covered by this document.

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

If, during the course of bridge inspections, deficiencies are discovered on these elements, the district shall be contacted. Retaining walls supporting bridge live or dead load may be included in the bridge inspection per the bridge's BSIP.

4.17 INCOMPLETE INSPECTIONS

The inspection must be completed within the acceptable tolerances for the inspection, see Table 26. If the inspection cannot be completed within this tolerance than the inspection will be considered out-of-interval and subject to review by the BMQE.

If a bridge or portion thereof cannot be accessed to complete an inspection, 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, an inspection from as close as possible shall be done to ensure there are no obvious safety issues. The report should also clearly indicate areas of the bridge which were not inspected and provide the reason.

The BITL shall then return to the bridge within 30 days to complete the inspection when access is granted and/or possible.

If the BITL is unable to return to the bridge within 30 days, the following actions are required:

- The BITL shall request another inspection of the same type with an accurate estimated inspection date.
- The BITL shall note the inspection as being out-of-interval.
- The BITL shall inform the DBIS responsible for the bridge that they have made this request.

4.18 OUT-OF-INTERVAL POLICY

Bridge inspections should be completed either before or during the month in which the inspection is due. FHWA evaluates interval compliance as part of the NBIS program. The month due is determined by the date of the previous inspection and the interval for the inspection type.

4.18.1 Inspections Within Acceptable Tolerance

A tolerance for inspections to be performed beyond the due month is permitted as outlined in Table 26. Inspections performed within the acceptable tolerances are not considered out-of-interval.

Table 26 – 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 BMQE. The DBIS or Consultant PM shall note that the inspection is being performed in a later month within the acceptable interval tolerance when making the reassignment request. The reassignment request should be made during the month the inspection is due or prior.

4.18.2 Out-of-Interval Inspections Beyond Acceptable Tolerance

Exceptions to the acceptable inspection interval tolerance due to rare and unusual circumstances must be approved by FHWA. The DBIS or Consultant PM shall notify BMQE in advance of the inspection due date. The inspection due date is considered the current due date for the inspection based on the inspection interval and last inspection date if

conditions have not changed.

If an inspection is considered out-of-interval and subject to review, the DBIS or Consultant PM will prepare related information for review by the BMQE. The BMQE or designee will then notify FHWA of the out-of-interval occurrence. FHWA may approve of the out-of-interval occurrence. This approval may be granted depending on circumstances, but advanced notice is required, and sufficient reasoning is needed.

4.18.3 Out-of-Interval Checks

Out-of-interval checks will be performed to monitor compliance with the NBIS. The BMQE or designee shall monitor inspection interval compliance. The out-of-interval check shall determine all bridge inspections due in previous month which were not performed.

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 can be initiated, if not already started. These identified inspections shall be completed as soon as possible.

CHAPTER 5 PRE-INSPECTION ACTIONS

Chapter 5 includes the required actions that must be taken prior to the start of the inspection. The first action is to consider safety and then prepare any inspection equipment needed.

5.1 INSPECTION SAFETY

Safety is planned into every bridge inspection. For safety, all bridge and culvert inspections shall have at least two inspectors present during the time of inspection. The team leader and members shall discuss the sites that will be visited, the work to be done during the day and the equipment to be used.

SCDOT has prepared the *SCDOT Employee Safety Manual* which includes requirements and safe operating procedures to provide guidance to the bridge inspector. Additional safety references are available on the Bridge Management Office website.

The BITL and the inspection team should discuss the sites, hazards, risks, the work to be done during the day, and the equipment to be used at a daily safety briefing.

5.2 INSPECTION EQUIPMENT

Table 27 indicates required inspection equipment and Table 28 indicates required underwater inspection equipment. Annually the DBIS will provide confirmation to the SBIS that the district has access to all required equipment. Consultants shall indicate their process for maintaining required equipment in their QC Plan.

Depending on the size of the bridge or culvert and its height above ground level, inspection access could be as simple as ground-level observations. Proper equipment shall be used to achieve appropriate proximity to a component or element shall be sufficient to properly access the component or element. The Unmanned Aircraft Systems Bridge Inspection Guidance includes procedures on the use of Unmanned Aerial Systems (UAS), or drones, in bridge inspection. If inspectors are using a camera on an extension pole, the camera on an extension pole cannot be used to assess any National Bridge Element or Agency Defined Element in CS3 or CS4; it can be used for Bridge Management Elements.

However, determining access methods requires consideration of specific needs, including:

- The topography and features crossed by the bridge which might limit access options; whether traffic interruptions can be tolerated,
- Any load restrictions on the bridge or culvert,
- The geometry of the bridge or culvert,
- Bridge/culvert rails and fencing, and
- A review of whether certain access methods may provide a cost advantage by saving time and labor even at the expense of the equipment costs or rental.

Table 27 – Standard Inspection Equipment

General Access	Inspection	Timber Inspection	Miscellaneous
Waders (Hip and/or Chest)	Camera	Pick Hammer	Cooler / Drinking Water / Provisions
Machete / Brush Hook / Sickle	Hammer	Awl, Pointed and Flat Probes	Sunblock
Extension Ladder	Scraper	Resistance Drill	Insect Repellent
Cellular Phone	Flashlight/Headlamp	Resistance Drill Supplies	Knee Pads
Magnifying Glass	Wire Brush/Broom	Extra Batteries	Chargers/Inverter/Extra Batteries
Compass	Binoculars	Pile Diameter Tape Measure	Utility Belt, Tool Belt or Utility Bag
Internet Connection Device (Hotspot)	Inspection Mirror	Silicone Sealant or Marine Adhesive	Eye Wash Bottle
Rooftop Strobe Lights (Yellow & White)	Shovel		Cones/Warning Signs
Fire Extinguisher	Screwdriver		Reference Manuals
Required Entry Phone Numbers and/or Entry Permit (if required)	Cordless Drill and Drill Set		
	Sounding Chain/Rotary Percussion Tool		

Measuring	Note Taking	Personal Protection
6-Foot Rule Ruler	Inspection Forms	Hard Hat
Probing Rod/Range Pole	Extra Paper	High-Visibility Vest
Level	Laptop/Tablet Computer	Safety Glasses / Goggles
25-Foot Tape (with weight on end)	Field Bag / Backpack	Rain Gear / Umbrella
100-Foot Tape (with weight on end)	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	*Keel/Chalk*	Dust Mask / Respirator
Crack Gauge/Comparator	*Sharpie / Paint Stick*	Two-Way Radio
Electric Calipers	*Spray Paint*	Harness/ Lanyard
D-Meter (UT Gauge)	Plans / Labeling Diagrams	Life Jackets
Portable Monitoring Devices (Sonar Depth Finder/Fathometer)	Device Charger/ Inverter/Charging Cables	Hand Sanitizer / Sanitizing Wipes

Table 28 – Standard Underwater Inspection Equipment

General Equipment	Mode 1: SCUBA Diving	Mode 2: Surface-Supplied Air (SSA)
Wetsuit or Drysuit	Full-Face Dive Mask with Communications	Dive Helmet with Communications
Weight Belt	SCUBA Bottle (Primary & Secondary Air Supply)	Umbilical/Tether (Air Supply & Comms)
Knife	Secondary Air Regulator (Octopus)	Harness and Secondary Air Bottle
Fins	Diver Tether	Surface Communications
Dive Computer, Compass	Wired or Wireless Communications	Surface Air Supply
Depth Guage	Surface Communications	Surface Delivery System (Rack Box)
Dive Light		
Buoyancy Compensator		
Inspection Tools		

5.3 PLANNING, PREPARING AND SCHEDULING

Prior to inspecting, the BITL must plan and prepare in order to use time efficiently, to have adequate knowledge of the bridge, and to obtain the necessary equipment. A successful inspection program depends on proper planning and techniques, adequate equipment, understanding the properties of materials, and the types of defects and their locations.

5.3.1 Review of Bridge Data

The BITL shall review previous reports, structure plans, maintenance, and repair records and load rating files. This review shall familiarize the inspector with the bridge and areas which require special attention. The inspector shall determine any equipment or traffic control needed for the inspection.

Some bridges have BSIPs and specific access or equipment requirements. The procedures, equipment, and access needs shall be reviewed prior to an inspection, if applicable. This information does not require an update every inspection or site visit unless something needs updating.

5.3.1.1 Bridge File

The Bridge File may contain existing plans and shop drawings. The Bridge File should also contain past inspection reports, including any previous underwater reports. Reviewing these past reports not only helps the inspector identify problem areas of the bridge previously documented, but they may also document the progression of damage or deterioration over the course of multiple inspections, thus allowing the inspector to identify trends or problem areas worsening over time. The previous report should be referenced by the inspectors while in the field and while writing the report. If any files appear missing from the Bridge File, the BMO should be contacted.

5.3.1.2 Labeling Diagram

Bridge inspectors may also find the use of the labeling diagram helpful when determining bridge orientation. To promote uniformity in reporting inspection data, all bridge components shall be oriented using the standard conventions included on the labeling diagram. In the event of discrepancies between the labeling diagram and other bridge documents such as previous inspection reports, the labeling diagram should supersede other documents. If the labeling diagram is inaccurate, DOT inspectors should contact the BMO, and the consultants should fix the labeling diagram.

5.3.1.3 Load Rating

The BITL shall note the last load rating date, the plans, assumptions, and conditions that were used for the development of the most current rating. The review of the full load rating is not required by the inspection team. The first load rating is typically performed during the design phase of a project. Typically, the design phase ratings are developed using the As-Let plans. To updated the bridge record with the As-Built condition, bridge inspections shall request a load rating after the initial inspection including after each stage of phased construction.

Considerations for load rating, including assumptions and the level of deterioration on primary structural members, should be reviewed. At a minimum, the BITL shall review the following items prior to conducting an inspection:

- The Load Rating Summary Form (LRSF),
- The Posting Form/Posting Recession Form (if required), and
- The labeling diagram included with the load rating.

During inspection preparation, the inspector may discover the lack of a load rating or a need for an updated load rating. If discovered, the BITL shall submit a load rating request as soon as possible, but no later than five (5) calendar days from the discovery warranting a rating during the inspector's desk review. See Chapter 7 for load ratings that may be required as a post-inspection action.

5.3.1.4 Hydraulic Analysis

If the structure has a waterway feature, the hydraulic analysis summary shall be reviewed for information. The review of the full hydraulic analysis is not required by the inspection team. The first hydraulic analysis is typically performed during the design phase of a project. At a minimum, the BITL shall review the following items prior to conducting an inspection for a bridge over a waterway:

- Noted SNBI Item B.C.11 (Scour Condition Rating), SNBI Item B.C.09 (Channel Condition Rating), SNBI Item B.C.10 (Channel Protection Condition Rating), and SNBI Item B.AP.03 (Scour Vulnerability),
- Scour Assessment Summary (including previous assumptions, critical tapedowns, and/or conditions used),
- Scour Plan of Action if bridge is scour critical, and
- Previous Inspection Reports (Cross Sections).

During inspection preparation, the inspector may discover a lack of a hydraulic analysis or the need for an updated hydraulic analysis. If discovered, the BITL shall submit a hydraulic analysis request as soon as possible, but no later than five (5) calendar days from the discovery. See Chapter 7 for hydraulic analyses that may be required as a post-inspection action.

5.3.2 Preparation for UW Inspections

Due to their nature, UW inspections require more extensive planning and preparation and must follow the BSIP for the inspection.

The BSIP for the UW inspection is different from the dive plan required during every underwater mobilization. The BSIP for the UW inspection may not change from inspection to inspection. If BSIPs for UW inspections are not present, and a Professional Engineer who is qualified to be a team leader for underwater inspections will need to develop them prior to the inspection taking place. The BSIP for an UW inspection shall:

l Engineer who is qualified to be a team leader for underwater inspections will need to develop them prior to the inspection taking place. The BSIP for an UW inspection shall:

- Include a list of procedures for use by inspectors in the field during the UW inspection,
- Include needed access, inspection equipment, structural details, hydraulic features and characteristics, risk factors, and inspection methods,
- List subsurface units and other elements or scour countermeasures requiring underwater inspection.

The BSIP shall be reviewed prior to the inspection by the inspection team. If the BSIP requires updates, a BITL who is qualified to be a team leader for underwater inspections shall make necessary updates.

Prior to mobilization for every underwater inspection, the consultant performing the inspection shall upload the dive plan to the Bridge File at least 30 days before the dive according to the BFP. The dive plan shall include ADCI certification for at least three dive team members, including the BITL and inspection diver(s). The dive plan is unique for each mobilization. The dive plan will cover the diving mode, expected underwater and surface conditions, specific operation hazards, equipment, and emergency procedures. Per ADCI, the minimum amount of personnel comprising a dive team is never less than three.

The underwater inspection team should consider if the water level is lower than average, and inspect areas that are not generally observable during average water levels.

5.3.3 Preparation for Special Inspections

The BSIP for the special inspection can vary greatly from bridge to bridge and even from inspection to inspection. At a minimum, the BSIP shall indicate the portions of the bridge that are subject to the special inspection. A bridge may have multiple special inspections and a BSIP shall be included for each inspection.

5.3.4 Preparation for NSTM Inspections

NSTM inspections typically require advanced planning which must be done prior to inspection. This work is usually based in the office and includes a review of plans or the BSIP for the NSTM inspection.

The BITL will arrange for necessary access to the NSTMs including special equipment needs. This will also include lighting adequate to identify small defects. The equipment will need to be sufficient to provide hands-on access to 100% of the NSTM. The inspector shall be no further than 24 inches from the surface being inspected and shall work with a light source of at least 50 to 100 foot candles. NSTM inspections shall not be performed at night unless approved by the BMO. When requesting approval for a nighttime NSTM inspection, the BITL shall provide a lighting plan. The best viewing angle is at approximately 120°.

Other necessary special tools and equipment which may be required to inspect and evaluate the NSTM once access is gained in addition to the normal inspection gear include the items below.

- A high-pressure washer is often useful in cleaning areas where a large accumulation of debris, bird nests, or bird droppings might obscure view or inhibit inspection access.
- Some BSIPs for the NSTM inspection may require the use of NDT or material testing, such as an ultrasonic thickness gauge on box-type bent caps.

The procedures for an NSTM inspection are required. If a procedure for the NSTM inspection does not exist, a BITL will need to develop them prior to the inspection taking place. The BSIP shall be updated as needed prior to, during, or after the inspection. A photograph, diagram or sketch which shows the location of each NSTM shall be placed in the Bridge File. This will show which parts of the bridge require hands-on inspection. The BSIP shall:

1. Include a list of procedures for use by inspectors in the field during the NSTM inspection.
2. Note any particular or unique members in the structure which may require special field attention, such as built-up tension members composed of individual pieces, NSTMs which are in high stress areas or are fatigue-prone details.

The BITL shall review the previous NSTM inspection report for any unique aspects of a bridge. These may include:

- Any narrative describing what types of flaws and the locations of the flaws, and
- Any fabrication, transport, erection, construction and accident damage or defects (scrapes, dings, flaws, tack welds, plug welds, etc.) in the NSTMs and the locations of these members.

5.3.5 Preparation for In-Depth Inspections

The BSIP for the in-depth inspection can vary greatly from bridge to bridge and even from inspection to inspection. At a minimum, the BSIP shall indicate the portions of the bridge that are subject to the in-depth inspection. A bridge may have multiple in-depth inspections and a BSIP shall be included for each inspection.

5.3.6 Preparation for Complex Inspections

Complex inspections typically require advanced planning which must be done prior to inspection. This work is usually based in the office and includes a review of plans or the BSIP for the complex inspection.

The BITL will arrange for necessary access including special equipment needs.

The procedures for a complex inspection are required. If a procedure for the complex inspection does not exist, a BITL will need to develop them prior to the inspection taking place. The BSIP shall be updated as needed prior to, during, or after the inspection. A photograph, diagram or sketch which shows the location of each complex feature shall be placed in the Bridge File. The BSIP shall:

1. Include a list of procedures for use by inspectors in the field during the inspection of the bridge with a complex feature.
2. Note any particular or unique members in the structure which may require special field attention, such as mechanical and movable components on a movable bridge.
3. For movable bridges, include procedures for how the inspection may interfere with the operation of the movable bridges.

The BITL shall review the previous complex inspection report for any unique aspects of a bridge. These may include:

- Any narrative describing what types of flaws and the locations of the flaws, and
- Any fabrication, transport, erection, construction and accident damage or defects (scrapes, dings, flaws, tack welds, plug welds, etc.) in the complex feature and the locations of these members.

5.3.7 Determine Required Inspection Documentation and Prepare Needed Sketches

In reviewing the available information for the bridge or culvert, the inspector will begin to develop an understanding of the structure. In preparation for the upcoming inspection, it may be necessary to prepare sketches or tables in advance to be used for documenting current conditions to be more efficient in the field and to more clearly record crucial inspection findings. Data or sketches may be prepared for use in recording crack locations and sizes for the underside surface of the bridge deck or for individual piers or abutments. Inspectors are encouraged to download all inspection documentation in the office prior to inspection mobilization.

5.3.8 Required Agency Notifications and Permits

Many bridges and culverts cross facilities requiring advanced notification or permits with SCDOT or other agencies. If coordination is required, notes on the coordination required shall be included as a BSIP.

5.3.8.1 Coordination with SCDOT for Bridge Construction (Existing Bridges)

Prior to the inspection of an existing structure around a construction site, the BITL is responsible for coordinating with district construction to coordinate the inspection activities during construction operations. The inspection will be conducted to minimize disrupting the contractor's operations and the contractor shall not interfere with scheduled inspections. If possible, the inspection should be scheduled before the start of the construction project or after the completion of the construction project.

If possible, the BITL will provide three weeks' notice to district construction for upcoming inspections. District construction shall provide the contractor with at least two weeks' notice of upcoming inspections to ensure that the contractor's operations can be scheduled such that they do not interfere with inspections.

A complete inspection must be performed on all existing components including any part of the project carrying live load. If construction operations prevent inspection of certain existing components and the inspection cannot be completed in 30 days, then this shall be noted in the inspection report, and it shall be stated when the BITL expects to return to the bridge to complete the inspection.

5.3.8.2 Coordination with SCDOT for Bridge Construction (Partially Constructed Bridges)

When superstructure elements are being constructed over state owned roadways and/or over a navigable waterway, a BITL shall perform an initial inspection. An initial inspection shall be performed to determine clearances over the roadway and/or waterway. Clearances for a temporary condition shall be reported based on the plans unless the temporary condition is more restrictive than the clearances on the bridge plans. An initial inspection shall be performed when a permanent component of the partially constructed bridge first impedes existing clearances. Another initial inspection shall then be performed after construction (or a phase/stage of construction) is complete.

5.3.8.3 Coordination with SCDOT for Traffic Control

South Carolina work zone mobility requirements shall apply to inspection work. These requirements apply to consultants, all subconsultants or subcontractors, all the SCDOT staff and designated representatives acting on behalf of SCDOT performing duties with responsibilities related to a work zone, including but not limited to contract management, inspection, operation and maintenance activities. Different policies are listed for interstates, primary and secondary routes.

The BITL shall review traffic data when preparing for an inspection to determine if traffic control is needed. The Consultant PM should determine coordination requirements for closures with district staff. The DBIS or the Consultant PM shall be responsible for coordination with SCDOT regarding lane closures and proper notification. Additional coordination may be needed depending on the route impacted by the traffic control, especially if the inspector is requesting a deviation from approved lane closure windows. If requested by the district, the BITL may be required to notify the State Traffic Management Center (STMC).

5.3.8.4 Coordination with USCG

Bridges over navigable waterway, where B.N.01 is 'Y', may require advanced notice to the USCG so waterway operators can be advised of the inspection activities. The BITL should consider discussing with the USCG especially if the inspection will require inspection access equipment be extended below the bridge where it could conflict with waterway traffic.

5.3.8.5 Coordination with Railroad Entities

Bridges over railroads may require notification to the railroads so inspection activities do not conflict with active train traffic. In addition, the use of a railroad flagger may be required to control train movement during bridge inspection activities. The railroad shall be notified far enough in advance to allow time to schedule a flagger for the inspection and to obtain the access permit. The BITL is responsible for coordinating with the various railroad companies in South Carolina. See References for a list of railroad companies in South Carolina and a state rail map. Contact information or the railroad company name shall appear in the bridge inspection procedure. The BITL will need to determine the need for the following which all pertain to potential coordination with railroad entities:

- Right of Entry (ROE) or Right of Way (ROW) permits which may be required to access railroad property which may dictate if there is a need to have a railroad flagger present
- Training (either safety and/or security training) may be required for ROE and/or ROW permits to be issued or for inspectors to access railroad property, and
- Any railroad insurance.

Various railroads may have different requirements. When a bridge requiring railroad coordination is due for inspection over the tracks, the BITL shall schedule, in advance, requests for flagging services so the frequency of inspection will be maintained. The lead time for railroad coordination may be over six months. In the event the railroad will not provide coordination within a reasonable time, the BITL shall follow the process for out-of-interval inspection and include coordination efforts for BMO and FHWA review and concurrence.

5.3.8.6 Coordination with Utility Entities

If there are any utilities mounted on or cross under the bridge or culvert which could cause safety concerns, advanced coordination with the utility may be needed. Inspection of bridges around hydraulics structures such as dams, fish ladders, and gates shall be coordinated with the facility owner.

5.3.8.7 Coordination with Other Entities

There may be other entities that require coordination on a case-by-case basis.

Some bridges and culverts located in District 7 require advanced coordination with representation from the Savannah River Site (SRS). The SRS is a nuclear reservation owned by the United States Department of Energy.

Some bridges may require advanced coordination or notification to SCDOT's Environmental Office. If an inspector believes there is evidence of endangered species activity (such as bats) on a bridge, the inspector shall contact the Environmental Office and add a note with any findings or determination to the Bridge File for future review.

CHAPTER 6 INSPECTION PROCEDURES AND METHODS

All surface areas of each structure must be examined. As the condition of the structure worsens, the effort required for the inspection will increase.

An inspector shall record the type, size, quantity, severity and location of deterioration and deficiencies. The inspection shall provide a narrative description of the conditions. Inspectors shall note the following: signs of distress, failure, or defects with sufficient accuracy so another inspector at a future date can make a comparison of condition or rate of deterioration; load, speed, or traffic restrictions on the bridge; information about bridge components and their capacities.

The elements documented at the bridge should be used as a guide to assure complete inspections. Non-elements such as approach guard rails, lighting, and signs shall also be inspected since they have a significant impact on the performance of the bridge and on public safety.

All work or repairs to the bridge since the last inspection shall be documented. Verify or obtain new dimensions when maintenance or improvement work has altered the dimensions of the structure. Repair notes must include measurable information about the condition of interest, allowing subsequent inspectors to more easily and accurately determine if the condition is changing. Photos, sketches, and/or measurements are among the ways to provide this information, which must also clearly include location and date.

The inspection shall ensure the public a safe structure is in place to carry traffic. The data collected on defects found helps with the determination of the safe load carrying capacity of the structure. The documentation include information for maintenance

If, for any reason, a specific component or member cannot be inspected and the inspector was unable to complete the inspection within 30 days, it must be noted in the inspection report and when the BITL plans to return to the bridge to finish the inspection. The end inspection date shall be no more than 30 days from the start of the inspection. If a return visit is needed, separate inspections of the same inspection type will be needed.

6.1 GUIDANCE ON FIELD MEASUREMENT

Sufficient dimensions shall be provided of any deficiencies observed. The dimensioning shall provide size measurements and depth measurements, if applicable, to capture the scale of the defect. These measurements shall then be referenced to a fixed and definable reference point on the structure. It is desirable for all reference points to refer from a uniform datum, such as the centerline of bearings for the structure. Depending on the bridge's geometry it may be required for the inspector to gain proper access to complete the required measurements. Depending on the defect, proper cleaning of the area may also be required to complete the required measurements; this can include the removal of debris, delaminated concrete, or corrosion build up on steel. Inspectors should report as accurate as measurements as possible, for example, do not report widespread member capacity losses if not applicable to all of the members on a bridge.

6.1.1 Structure Movement

Inspectors encounter bridge components, often substructure elements, which have settled or rotated from the original positions shown on the as-built drawings. Superstructure elements may move vertically or longitudinally over a bent. Whenever possible, the inspectors shall quantify the movement to relay the degree of movement observed.

In horizontal applications, the degree of settlement can be quantified by using a stringline to establish the proper plane in which the member should exist and measure the distance from the stringline to the face of the element being investigated. Settlement in the horizontal plane is often quantified by the drop in elevation over the horizontal length of the affected portion of the element.

Typically, movement of vertically oriented elements is quantified by the total horizontal movement from the bottom to the top of the element.

The magnitude of the reported rotation and/or settlement is critical in tracking the movement over subsequent inspections and determining the severity/criticality of the findings. The magnitude of these measurements can identify immediate risks to the structure for which remedial action can be prioritized. No matter what the circumstances, structure settlement over 1" shall be photographed for future comparison. The photograph shall include a tape measure for scale. Spray paint or other marking tools must be used to mark locations of measurement

for future use whenever possible horizontal or vertical movement is being monitored.

6.1.2 Concrete Crack Measurements

Inspectors shall measure and record crack sizes in Condition State 3 (CS3) or larger (0.1875" in reinforced concrete or 0.009" in precast concrete) found during inspections unless a BSIP exists with a more stringent requirement. They shall record the lengths, widths and depths were possible and reference the locations of the cracks.

6.1.3 Steel Crack Measurements

If any cracks, blemishes, or other irregularities are found in steel members, the inspector will need to evaluate these further, which may include the use of a magnifying glass. Smaller cracks are not likely to be detected visually unless the carefully cleaned. A dye penetrant kit can be used to establish the limits of a crack. Use of magnetic or ultrasonic testing devices may be required to detect internal problems not apparent to the eye. Some of these devices will provide more accurate and dependable information than others.

The inspector will need to record the location and size of any cracks found. Mark and date the crack ends with a permanent marker for follow up on the structure. Take a photograph of such cracks to provide visual documentation.

6.1.4 Steel Section Remaining

When inspectors discover diminished section remaining on structural steel elements (i.e.; girders, stringers, diaphragms acting as primary capacity members, truss elements, piles or reinforcing bars) they shall measure and state the remaining structural steel available (do not report as "section loss"). Calipers can be used to determine the remaining section of exposed reinforcing bars, prestressing strands, or flanges. Non-destructive test equipment such as an ultrasonic thickness gauge may be advantageous in this situation, especially for steel girder webs.

For exposed reinforcing bars in superstructure elements with section remaining of less than 90 percent and for any exposed prestressing strands, inspectors shall include the length of the exposed reinforcement and the section remaining over the length. Inspectors shall provide detailed measurements along the length of the exposed reinforcement if the remaining section varies over the length of the defect.

6.2 PHOTOGRAPHS, VIDEOS, AND SKETCHES

Inspectors shall take relevant photographs of bridge elements. Photographs capture member conditions in the field and support justification of resulting ratings, condition states, or recommendations. Generally, the worst case photographs should be included in the report to document the controlling condition. One photograph may capture more than one required photograph so long as it is captioned appropriately.

6.2.1 Photographs

6.2.1.1 Required Photographs

The required photographs for all inspections are summarized below:

- Bridge
    - Typical Top of Deck
    - Typical Superstructure Condition
    - Typical Substructure Condition
    - Bridge Elevation (from Upstream or from Upstation Feature Below)
    - Bridge Elevation (from Downstream or from Downstation Feature Below)
- Culvert
    - Top of Roadway
    - Typical Culvert Condition
    - Culvert Elevation (from Upstream)
    - Culvert Elevation (from Downstream)

Structures elevation photos are taken when standing away from the bridge, upstream and downstream from the bridge and looking at the bridge. If it is not possible to get a bank-to-bank picture, several pictures can be used.

Other inspection photographs (if applicable), are to include but not limited to:

- Component with CCR of 5 or less (SNBI Items B.C.01 to B.C.10),
- Significant Change from Previous Inspection,
- Bridge or Shoulder Closure Barricades And/or Signs,
- Critical Findings,
- Repair Recommendations (consultant performed inspection only),
- Resistance Drill Records for timber piles,
- Any Elements with Condition States 3 or 4,
- Vertical Clearance Sign(s) including at-bridge and advance (when clearance is 17'-0" or less), and
- Posting (or Weight Limit) Sign(s) or Evidence of Removal of Posting Sign(s)

Photographs of at bridge and any advance (if present) posting or vertical clearance signs with the bridge in the background are required to be taken during all field inspections and shall be included in the inspection report. This requirement is applicable to the posting or vertical clearance signs at the bridge and in advance of the bridge which could require many signs to be photographed. If performing the first inspection after the removal of posting signs, a photograph of the location of the sign with the bridge in the background is required.

6.2.1.2 Required Initial Photographs

During every initial inspection, a series of photographs shall be taken to document the structure for inventory purposes. If during review of a Bridge File, the BITL discovers the required initial photographs are missing, they shall be taken during the next routine inspection. Initial photographs shall be updated whenever the bridge is altered and at a minimum at intervals no greater than ten (10) years.

The BITL shall review initial inspection photographs and photographs from the previous inspection. If the condition depicted in those photographs has changed, photographs of the changes shall be taken and included in the inspection report; all new initial photographs are not required.

At a minimum, the following photographs are considered initial photographs and shall be taken, if needed:

- Two Photographs for each feature: Feature intersected by the bridge in both directions (including waterways meaning that a photo looking upstream and looking downstream shall be taken),
- Four Photographs: Both approaches (one photo looking at bridge and away from bridge on each approach),
- Two Photographs: Both elevations of the bridge,
- One photograph for each component (deck, superstructure and substructure for bridges and top of roadway for culverts),
- Typical bridge joint conditions,
- Typical transitions between the bridge and the approach guardrail (only different types need to be shown, only one photograph is required unless different),
- Typical handrails, fenders, and barriers (bridge rail, approach rail, and pier protection),
- If the bridge has any unusual features or characteristics,
- If the bridge has NSTMs or FPDs, a typical photograph of each unique member shall be taken during the initial inspection (a photo is not required of every member; only one photograph showing typical member condition),
- If the bridge has a memorial sign, geodetic survey marker, benchmark or other state landmark, a photograph of each shall be taken during the initial inspection, and/or

- If the bridge has a commemorative plaque or multiple commemorative plaques attached to the structure, a photograph of each plaque shall be taken and included in the inventory photos. The photo shall be taken directly perpendicular to the plaque with a measured scale, such as a tape or ruler, placed adjacent to the plaque within the photograph so its true size can be obtained in case it needs to be duplicated in the future.

6.2.2 Videos

In some cases, a deficiency is only apparent when under traffic. For example, beams deflecting independently of each other under live load. This situation could only be documented during a video of a vehicle going over the bridge. In such cases, the video shall show the deficiency in action. The video shall be properly focused, well-lit, and the view shall be framed such that the entire action is kept within the view of the camera without having to move the camera to follow the action. The video will then be uploaded to the Bridge File and a reference to the video included in the inspection report.

6.2.3 Sketches

Sketches, and not photographs, shall be used are required to document conditions as listed below.

6.2.3.1 Deck Sketch

If the CCR for the SNBI Item B.C.02 (Deck Condition Rating) is 4 or less, the use of a sketch is required, if the component was inspected during that inspection.

6.2.3.2 Superstructure Sketch

If the CCR for the SNBI Item B.C.02 (Superstructure Condition Rating) is 4 or less or if any superstructure element has at least 1 linear foot in Condition State 4, the use of a sketch is required to document the measurements taken per Section 6.1 if the component was inspected. Section 6.1 provides field guidance on how to measure defects in superstructure components.

6.2.3.3 Bearing Sketch

If CCR for the SNBI Item B.C.07 (Bearings Condition Rating) is 5 or less or if any bearing element is in Condition State 4, the use of a sketch is required if the bearing was inspected.

6.2.3.4 Pile Sketch

If the CCR for the SNBI Item B.C.03 (Substructure Condition Rating) is 5 or less or if any pile element is in Condition State 4 for timber pile supported bridges or for steel pile supported bridges, the use of a sketch is required if a pile was inspected.

6.2.3.5 Culvert Undermining

If there is any undermining of the culvert and if CCR for the SNBI Item B.C.11 (Culvert Condition Rating) is 5 or less or if the SNBI Item B.C.11 (Scour Condition Rating) is 5 or less, the use of an undermining sketch is required if the culvert was inspected.

If a Hydraulic Analysis is requested on a culvert, an undermining sketch is required to be included in the inspection report along with the request.

6.3 DECK INSPECTION PROCEDURES AND METHODS

This section includes agency inspection procedures and methods for decks. Because they are often inspected together, this section also includes inspection procedures and methods for other bridge components or elements. The condition of the wearing surface, joints, drains, bridge railing, and transitions shall not be considered in the overall deck condition rating.

6.3.1 Concrete Decks

The BIRM and the MBE are the inspectors' guide for identifying members and deficiencies. Additional considerations for inspection procedures and methods are provided below, when applicable:

- Rutting of the riding surface and/or ponding of water on the top of the deck shall be noted.
- Temperature and shrinkage cracking in a concrete deck is generally inherent.

- Midspan transverse cracking in the tension zone shall be noted.
- Areas around deck cracks in Condition State 3 (0.05" or wider) shall be given closer attention due to the higher probability of a delaminated area developing.
- The underside of the concrete deck shall be inspected for dampness.
- Discolored areas of the deck shall also be sounded more vigorously.

6.3.1.1 Concrete Deck Sounding

The purpose of sounding is to identify spalls that may damage vehicles traveling on or under the bridge and to identify any areas where the capacity of the deck may be affected. Deck sounding may be performed using several methods. Chain drag, hammer tapping, or steel rod/pipe tapping are the typical methods to find delaminated areas of the deck.

6.3.1.2 Poor Condition Concrete Decks

If the SNBI Item B.C.02 (Deck Condition Rating) is 4 or less, the inspector shall include in the report a sketch of the deterioration area and deterioration type. This sketch may be used by load raters or by maintenance forces.

The poor condition deck may require sounding during inspections. Alternative methods of determining deteriorated areas of concrete can be utilized. These include thermal imaging, vibration reading, ground penetrating radar, impact echo and ultrasonic surface wave. The BITL may need to request an in-depth inspection for a poor condition deck.

6.3.1.3 Not Visible Concrete Decks

Because overlays or stay-in-place forms may hide deteriorated areas, the BITL shall use his or her discretion to determine the condition of the concrete deck. The following items should be considered by the BITL for decks with overlays or stay-in-place to determine the condition:

- Condition of the top of the deck prior to the placement of the overlay
- Approximate age of the deck and the amount of time the overlay has been placed
- Amount and patterns of cracking or spalls in the overlay or deck soffit
- Decks with epoxy injections or patching
- Condition of the stay-in-place forms

If it is not possible to determine the condition of the deck, the BITL may request an in-depth inspection to determine deck deterioration under overlays or stay-in-place forms with other techniques.

6.3.1.4 In-Depth Inspections on Concrete Decks

Non-destructive testing on a concrete deck can help determine condition. Some of these methods include thermal imaging, vibration reading, ground penetrating radar, impact echo and ultrasonic surface wave. Two additional options for extensive concrete destructive testing on decks are listed below. These testing procedures shall only be performed during in-depth inspections and are not expected to be performed during routine inspections.

6.3.1.4.1 Coring

To establish strength, composition of concrete, crack depth and positioning of reinforcing steel, cylindrical cores are taken. In decks with large amounts of reinforcement, it is difficult to avoid cutting steel if large diameter cores are used. The choice of core locations can have a significant impact on the findings.

6.3.1.4.2 Chloride Analysis

To determine the chloride content profile from the deck surface to a depth of about 3 inches or more, a chemical analysis of pulverized samples of the bridge deck concrete extracted from the deck or by in-place drilling can be performed. An inspector should take chloride many samples per span to provide diversified results.

6.3.2 Timber Decks

The BIRM and the MBE are the inspectors' guide for identifying members and deficiencies. Additional

considerations for inspection procedures and methods are provided below, when applicable:

- Running boards or planks are not considered part of the deck but are considered a timber wearing surface.
- Drainage deficiencies can manifest themselves as rot or stained lumber on the top or bottom of the deck or on the outside edges of the deck.
- Laminated timber decks shall be checked for loose or delaminating members, and if the laminated members are post-tensioned together, post-tensioning anchorages shall be checked for corrosion, crushing, decay, or signs of anchor failure.
- The boring and probing of timber decks with a thin wire probe may help detect the presence of interior voids. This destructive process is only permitted on poor condition decks and may cause extensive damage to the member which may require a repair recommendation.

6.3.3 Steel Decks

The BIRM and the MBE are the inspectors' guide for identifying members and deficiencies. Additional considerations for inspection procedures and methods are provided below, when applicable:

- Rutting of the riding surface and/or ponding of water on the top of the deck (for concrete-filled or orthotropic decks) shall be noted.
- Debonding of the overlay (for orthotropic decks) shall be noted.

6.3.4 Wearing Surface

Signs of distress or failures of the underlying bridge deck are often relayed through the overlaying wearing surface. Teams shall inspect wearing surfaces for loose or missing pavement, exposed waterproofing membrane, and cracks. Cracks, especially map cracking, usually indicate deterioration of the underlying bridge deck. The condition of the wearing surface shall not be considered in the overall deck condition evaluation but can be helpful in identifying locations where further inspection of the deck may be warranted.

If there is a wearing surface, the thickness shall be measured. The wearing surface thickness shall be recorded for comparison to previous load rating assumptions and for future inspections. Common techniques of measuring the wearing surface are to be used as appropriate.

- Direct Measurement (With Boring) - The preferred and most accurate method for determining the wearing surface thickness is to drill a hole in locations as needed, measure the drill bit penetration to concrete, then plug the hole with adequate sealant. The hole should only be large enough to probe and measure the length of the probe. This method allows the inspector to visually identify variances or tapers in the wearing surface and perform targeted borings to measure and record the maximum wearing surface thickness.
- Direct Measurement (Without Boring) - When the wearing surface does not span the entire deck and areas of the deck are exposed, a direct thickness measurement should be taken from the top of the wearing surface to the exposed deck. Similar, the thickness of the wearing surface may be measurable at drains or joints. Several measurements should be taken on the bridge. Inspectors shall then compare the thickness measurements with any observed crowns or tapers to estimate the approximate maximum wearing surface thickness.
- Reveal Measurement (Plans Required) - When the wearing surface spans the entire deck and the deck is not exposed, inspectors can determine the maximum wearing surface thickness by measuring the vertical reveal from the top of curb or railing to the top of the wearing surface. The plans must provide a curb/railing height over the deck. A wearing surface thickness is calculated by subtracting the thickness of the measured reveal from the plan value. Inspectors shall calculate a wearing surface thickness at all corners of the structure and combine with any observed crowns or tapers to estimate the approximate maximum thickness.

6.3.5 Bridge Joints

Bridge joints are designed to accommodate deck and superstructure expansion and contraction caused by temperature changes. The inspector shall confirm the joints are functioning properly and shall document any deterioration to the joints. If SNBI Item B.C.08 (Bridge Joints Condition Rating) is 5 or less, inspectors shall collect

air temperature, movement, and detailed condition notes of bridge joints.

Edge lines between adjacent precast panels or concrete girder top flanges are not considered bridge joints.



Figure 6 – Edge Lines Between Precast Panels

6.3.6 Bridge Drains

Bridge drains, drainage systems, or scuppers shall be inspected for functionality and condition. Inspectors shall submit repair recommendations if drains need to be cleaned or fixed. The condition of the drains shall not be considered in the overall deck condition rating.

6.3.7 Bridge Railing

The overall condition of the bridge railing shall be examined, including the alignment and the height of the rails. Sighting down the line of a railing can be a quick way to identify obvious problems, such as substructure settlement. The height of the railing, especially for bridge decks which have been overlaid, may be needed to properly code the item as roadside hardware. Any damage due to traffic impact shall be noted as well as any rotation of the railing. Damaged concrete railing and broken steel or timber railing elements shall be noted as well as structural defects which may affect the intended function of the railing. For bridge railings bolted to the bridge deck, any apparent anchorage failures or separation from the deck shall also be noted.

The LRSF included in the load rating documentation may indicate that the stiffness of the traffic barrier was used in the load rating. If this was the case, the inspector shall carefully inspect the condition of the barrier/deck interface. If any condition is present which conflicts with the existing rating, a re-rating shall be requested.

Bridge railing is required on all bridges that carry NHS highways.

6.3.8 Curbs and Sidewalks

Inspectors shall observe the condition of the curb and sidewalk, if applicable. Determining if a curb is mountable or non-mountable is important for load rating. The classification of a mountable curb versus a non-mountable is determined based off the curb's reveal, which is defined as the vertical face or vertical portion of the curb measured from the top of deck or wearing surface to the top of the curb.

If inspectors indicate the bridge has a mountable or non-mountable curb, the inspectors are to measure the curb reveal at each corner of the structure and include the measurements in the inspection report. This measurement only needs to be measured once and visually confirmed during subsequent inspections unless a change is noted.

6.3.9 Transitions, Guardrail, End Treatments, and Other Railings

Inspectors shall note the condition and damage of the transition, guardrails, end treatments, and other railings. Other railings include installations around substructure components. Inspection procedures do not require digging around posts to search for rot or scour. If visible rot or scour is seen, it should be noted. Inspectors shall note any missing

components or loose connections.

The installations shall be inspected using the following guidelines:

- Approach guardrails shall be inspected to the limits of the end treatment. In some installations, the approach guardrails continue for long distances past the structure. In these instances, the inspectors shall inspect a minimum of 75 feet from the beginning and end of the bridge or culvert.
- Guardrails surrounding bents, piers and/or abutments and along the toe of berms must be inspected if they are physically attached to the substructure. Any deterioration found shall be noted.
- Guardrails surrounding bents, piers and/or abutments and along the toe of berms not attached to the substructure shall be given solely a visual inspection. In these instances, the inspectors shall examine a minimum of 75 feet from bents, piers and/or abutments.

6.4 SUPERSTRUCTURE INSPECTION PROCEDURES AND METHODS

This section includes agency inspection procedures and methods for superstructures. General inspection guidance for superstructures of all material types is included below. Superstructures should be closely examined for:

- Signs of distress, which may include horizontal or vertical displacement of components affecting structural stability, cracking, deterioration, diminished section remaining, collision damage or overload damage,
- Any defects in superstructure members in high stress areas; any instances of overload to a structure will usually be manifested in high stress zones, see below,
- Any areas vulnerable to drainage run-off and/or corrosion (under bridge joints, on surfaces where water collects, in places where dissimilar materials meet),
- Any portions of the superstructure exposed to traffic, and
- Any locations of previously performed repairs.

If overload is suspected, particular attention shall be paid to bearing areas where the load would be transferred from superstructure to substructure; high shear zones, and high moment regions. This includes the middle third of a span for positive moment and the end fourths at intermediate supports for negative moment in continuous spans.

6.4.1 Reinforced Concrete Superstructures

The BIRM and the MBE are the inspectors' guide for identifying members and deficiencies. Additional considerations for inspection procedures and methods are provided below, when applicable:

- Areas of Condition State 3 (CS3) spalling and delamination shall be sounded to allow proper sizing of defects and to determine the capacity of the reinforcing steel.
- Deterioration at bearing areas shall be inspected where typically concrete may interface with concrete and cause cracking or spalling.
- The inspector shall consider whether a crack may be a construction joint.

6.4.2 Prestressed Concrete Superstructures

The BIRM and the MBE are the inspectors' guide for identifying members and deficiencies. Additional considerations for inspection procedures and methods are provided below, when applicable:

- Areas of Condition State 3 (CS3) spalling and delamination shall be sounded to allow proper sizing of defects and to determine the capacity of the prestressing steel or reinforcing steel.
- Deterioration at bearing areas shall be inspected where typically concrete may interface with concrete and cause cracking or spalling.
- Examination of prestressed beams and slabs for indication of cracking should take place, especially at midspan or end regions.

6.4.2.1 Prestressing Strands

Prestressed steel is more susceptible to corrosion and will corrode faster than mild steel reinforcing. If there is exposed prestressing strands from either deterioration or impact damage, defects shall be documented during the inspection.

The load carrying capacity of a beam can be compromised by concrete deterioration around the prestressing strands. A common area for deterioration is at the ends of the beams where water can leak onto the beam ends through bridge joints and contaminate the concrete, thus causing corrosion to begin in the strand or bar.

Another common reason for loss of prestress strands is due to impact of overheight vehicles traveling under the bridge. Impacts can cause spalling around the strands or bars.

6.4.3 Steel Superstructures

The BIRM and the MBE are the inspectors' guide for identifying members and deficiencies. Additional considerations for inspection procedures and methods are provided below, when applicable:

- Cleaning and removing of paint or rust and delaminated steel shall take place to inspect the steel member if there is a diminished section or a crack.
- Cleaning and removing of pack rust should take place to inspect the steel member.
- Examination of web stiffeners for indication of cracking and member loss should take place, especially at bearing stiffeners.
- Examination of areas of collision damage with displacement shall be documented and quantified in the inspection.

6.4.3.1 Weathering Steel Members

Typical oxide colors can be expected for properly performing weathering steel, including a yellow-orange color for new steel or a purple-brown color for members in service for many years. Weathering steel members exhibiting a black or yellow color could indicate a failed condition of the protective oxide and may show small flakes or laminar sheets of loose oxide film. Any tape test strips shall be photographed and included in the documentation of the inspection.

6.4.3.2 Nonredundant Steel Tension Members

Preparation for NSTM inspections is included in Section 5.3.4. The hands-on inspection shall be conducted carefully and thoroughly. Gusset plates may be considered NSTMs. The intent of hands-on inspection is that the inspector is within arm's length of the entire (all sides) NSTM being inspected so that they can locate small defects, such as fatigue cracks.

6.4.3.3 Fatigue Details

Fatigue is the initiation and/or propagation of cracks due to a repeated variation of normal stress with a tensile component. Fatigue details require additional attention and monitoring. AASHTO fatigue specifications classify details that are commonly used on steel bridges into fatigue Categories A, B, B', C, C', D, E, and E'. Details which fall into Categories E and E' shall be considered Fatigue Prone Details (FPDs). The inspector on bridges with any fatigue details shall be familiar with the categories and be able to classify the categories encountered in the field to determine the seriousness of the detail.

Bolted or riveted connections shall be inspected for loose or missing bolts or rivets, section loss to the bolt or rivet heads, and corrosion of the connecting parts.

Triaxial constraint is a 3-dimensional stress state which reduces the ductility of a material. Under triaxial constraint, steel is unable to deform, and brittle fracture can occur under service conditions where ductile behavior is normally expected. Due to the nature of these unique conditions, the chance for member failure is greater for these conditions and they warrant added emphasis during inspection. Finally, the ability of inspectors to recognize conditions of triaxial constraint is important to guard against brittle failure.

6.4.4 Timber Superstructures

The BIRM and the MBE are the inspectors' guide for identifying members and deficiencies. Additional considerations for inspection procedures and methods are provided below, when applicable:

- Knots in timber stringers can be detrimental to the stringers' capacity. The area around a knot shall be closely examined for splits.
- Laminated timber beams shall be checked for loose or delaminating members, and if the laminated members are post-tensioned together, post-tensioning anchorages shall be checked for corrosion, crushing, decay, or signs of anchor failure.
- Where areas of severe decay are noted, the element should be inspected for interior decay and shelling. With a resistance drill, drill a small hole in the element and probe the interior of the beam for areas of rot. All holes shall be filled after drilling by injecting a small amount of silicone sealant or marine adhesive into the drill hole.

6.4.5 Other Superstructures

6.4.5.1 Frames

The BIRM and the MBE are the inspectors' guide for identifying members and deficiencies. Deterioration of the frame can have a greater impact on the load capacity of this type of bridge than a typical girder bridge. The midspan, corners, and mid-height of the frame legs are locations of high stress and shall be given special attention for the presence of cracks.

6.4.5.2 Complex Bridges (Non-Movable)

Complex bridges that are non-movable include Cable Stayed and Segmental Box bridges. These bridges have developed Bridge-Specific Inspection Procedures (BSIPs). The BSIPs shall be followed during the inspections on these bridges.

6.4.5.3 Complex Bridges (Movable)

Complex bridges that are movable include Swing and Bascule bridges. These bridges have developed Bridge-Specific Inspection Procedures (BSIPs). The BSIPs shall be followed during the inspections on these bridges. Additional guidance is included below.

These structures may require special monitoring on critical members. They may have NSTMs depending on the type of structure. Movable bridges are considered bridges with complex features and have BSIPs which shall be followed.

Trunnions are the pivot points of the spans. The lift span has the weight on one side and is counterbalanced in the back to pivot on the trunnion. Trunnion alignment is determined by measuring and recording tooth wear and backlash on the pinion and rack gear sets and by observing grease patterns.

Inspection limits for movable bridges also include the entire bridge, including walkways under, walkways to the bridge tender houses, fender systems above water, fenders, and dolphins.

Calipers, flashlights, scrappers and other types of specialty tools are used for such inspections.

6.5 BEARING INSPECTION PROCEDURES AND METHODS

Bearings transfer the load from the superstructure to the substructure. They are designed to accommodate movement and/or rotation due to temperature and live load forces.

All bearings can accommodate rotational movement, but bearings are also designed to either accommodate or restrain longitudinal movement. Bearings are defined on a plan set as either fixed or expansion. Fixed bearings accommodate rotation only, while expansion bearings accommodate rotation along with longitudinal movement. Special bearing types can accommodate lateral movement as well. Integral bearings cannot be inspected and only portions of semi-integral bearings can be inspected.

Expansion bearings are set at construction according to the ambient temperature. This setting may not correspond to the temperature during the inspection. Movement should be set for expansion during the summer months and contraction during the winter months. When movement is seen which does not correspond to the temperatures of the

season, measurement of the bearing and the temperature must be documented.

Pack rust which may be limiting the ability of the bearing to move properly shall be noted. Bearings under bridge joints are more susceptible to corrosion and pack rust because of joint leakage.

6.6 SUBSTRUCTURE INSPECTION PROCEDURES AND METHODS

This section includes agency inspection procedures and methods for substructures. General inspection guidance for substructures of all material types is included below. Substructures should be closely examined for:

- Signs of foundation settlement, rotation (tipping), lateral movement, overstress due to poorly functioning bridge bearings, scour and undermining damage, see below,
- Any areas of loose backfill or areas where scour action has removed streambed material from around or under the footings which may be discovered from probing,
- Any high stress zones of substructure members including bearing pedestals and high shear or flexural zones,
- Any exposed piles, especially timber piles and steel piles which may be more prone to deterioration,
- Any portions of the substructure exposed to traffic, and
- Any locations of previously performed repairs.

Substructures shall be examined for signs of atypical movement. Settlement of footings can cause tipping. Any unusual movement shall be documented with vertical alignment measurements if over 1".

6.6.1 Concrete Substructures

The BIRM and the MBE are the inspectors' guide for identifying members and deficiencies. Additional considerations for inspection procedures and methods are provided below, when applicable:

- Areas of Condition State 3 (CS3) spalling and delamination shall be sounded to allow proper sizing of defects and to determine the capacity of the reinforcing steel.
- Deterioration at bearing areas shall be inspected where typically concrete may interface with concrete and cause cracking or spalling.
- The inspector shall consider whether a crack may be a construction joint.

6.6.2 Steel Substructures

The BIRM and the MBE are the inspectors' guide for identifying members and deficiencies. Additional considerations for inspection procedures and methods are provided below, when applicable:

- Dig around the base of steel piles on land for a minimum of 12" to examine for hidden defect(s).
- Cleaning and removing of paint or rust should take place to inspect the steel member if there is a diminished section or a crack.
- Cleaning and removing of pack rust and delaminated steel should take place to inspect the steel member.

6.6.2.1 Nonredundant Steel Tension Members

Preparation for NSTM inspections is included in Section 5.3.4. The hands-on inspection shall be conducted carefully and thoroughly. Steel bent caps may be considered NSTMs.

6.6.3 Timber Substructures

Hammer sounding (on all timber piles) and drilling/probing shall be used in combination with visual inspection to conduct an assessment of the condition of a timber substructure components, mostly timber piles.

The following procedures shall take place during routine inspections and may take place during other inspections when exposed timber piles are subject to examination.

- Dig around the base of timber piles on land for a minimum of 12" to examine for hidden defect(s) if rot is

at groundline.

- Sound the entire length of the exposed pile from cap to waterline or a point 12" below the groundline if rot is at groundline.
- Thoroughly examine the timber around each through bolt (above, below and on each side of the bolt on each face of the pile).
- If the controlling defect on a pile in a bent is decay (Defect 1140) and is coded in Condition State 3 (CS3) or Condition State 4 (CS4), perform resistance drilling on at least one (1) timber pile in that bent. If the results are unexpected, the same pile may be drilled once more or additional piles in the same bent may also be drilled. Surface probing does not satisfy the requirement to drill. If all timber piles are in CS1 or CS2, drilling is not required.

6.6.3.1 Surface Probing

Probing with a moderately pointed tool locates decay near the wood surface. This is indicated by excessive softness or a lack of resistance to probe penetration and the breakage pattern of the splinters. A brash break indicates decayed wood, whereas a splintered break reveals sound wood. Care must be taken to differentiate between decay and water-softened wood that may be sound but somewhat softer than dry wood. Flat bladed probes or narrow rules can also be used to assess the depth of splits and checks.

6.6.3.2 Drilling

By drilling, the inspector can determine areas of low, mild, and high levels of decay, and quantify the level of decay in the cross-section. All holes shall be filled after drilling by injecting a small amount of silicone sealant or marine adhesive into the drill hole. The location of drilling shall be field marked and photographed.



Figure 7 - Field use of a resistance drill (left photo) and the field marking of a timber pile that has been drilled and sealed (right photo)

The BITL shall determine which locations on each timber pile are drilled. The BITL shall also review any drilling previous performed on the bridge. If the pile has previously been drilled and no or minimal defects have been noticed, a different pile should be selected for the current inspection. If decay was already noted on the pile, the general area of the decay should be drilled again but at a 90 degree angle in an adjacent quadrant of the pile. If a check/split is discovered during drilling, the inspector shall turn the drill 90 degrees and redrill. Both drillings need to be reported.

BITLs may be able determine decay on the pile visually or following the sounding the pile and removing decayed timber. If the pile decay has already reached a condition were a Critical Finding or 'A Flag' is required, the pile does not need to be drilled and another pile in that bent should be selected to satisfy the drilling requirement.

Results from drilling shall be placed in the Bridge File, included in the inspection report, used during condition assessment, and submitting any post-inspection actions.

6.6.3.3 Timber Cross Bracing and Unbraced Pile Length

Cross bracing should be visually inspected and sounded if a defect is visually detected. Drilling is not required on the

cross bracing and the member should be recommended for replacement, if required.

The unbraced length shall be verified for all timber piles. Refer to Appendix D, Tables D.1 and D.2 for bracing recommendations. The maximum unbraced length can be taken as the maximum of any of the following:

- Length from the bottom of cap to groundline or mudline (piles in water),
- Length from the bottom of cap to cross bracing (if cross bracing has not failed),
- Length from the cross bracing (if cross bracing has not failed) to the groundline or mudline (in water), or
- Length between cross bracing (if cross bracing has not failed).

10" diameter piles or smaller lose capacity quickly under the conditions of either section loss or pile decay. The combination of pile diameter and unbraced length may warrant post-inspection action; see Chapter 7.

6.7 CULVERT INSPECTION PROCEDURES AND METHODS

This section includes agency inspection procedures and methods for culverts. General inspection guidance for culverts of all material types is included below. Culverts should be closely examined for:

- Any approach roadway and embankment settlement,
- Any horizontal blockage or vertical blockage,
- The condition of their end treatments (headwalls, parapets, and wingwalls), and
- The condition of their appurtenance structures (such as aprons, weirs, and energy dissipaters).

Weep holes shall be checked to determine if they are functioning or if they are plugged. Joints shall be checked for deterioration, spalls, or signs of backfill migration into the culvert.

Culverts shall be examined for signs of atypical movement. Any unusual movement shall be documented with alignment measurements if over 1".

6.7.1 Culvert Measurements

6.7.1.1 Fill Depth

The fill depth at different locations along the length of a culvert must be measured for all culvert types during initial inspections and confirmed during all other inspections. This information is needed for both live and dead load calculations used for the load rating. Measurements are to be taken at the following locations.

1. Culvert Inlet (only if within 15 feet of the edge of the roadway)
2. Edge of Roadway on Inlet Side of Roadway
3. Edge of Roadway on Outlet Side of Roadway
4. Culvert Outlet (only if within 15 feet of the edge of the roadway)

Depending on the level of fill, and the cross-section of the roadway, fill depths may be the same across the different locations to be measured; not all depth measurements are required to be recorded for this reason.

If the fill on top of a culvert is 8 feet or more, the fill depth can be estimated by the inspector. At this depth, there is less live load impact on the culvert.

6.7.1.2 Undermining

If one or more feet horizontal of the culvert exhibits undermining at the inlet or the outlet, the inspectors measure the distance from the edge of the roadway closest to the undermining to the impacted inlet or outlet. If the distance is over 10 feet, the distance can be approximated.

6.7.2 Concrete Culverts

6.7.2.1 Concrete Headwalls

For concrete headwalls, the following items shall be reviewed at each inspection:

1. Wall condition – wall tipping, settlement, loss of backfill, cracking, and concrete scaling
2. Apron condition – concrete scaling, settlement and cracking
3. Curtain wall – stream bottom elevation, piping of water under or around the curtain wall and riprap present

6.7.2.2 Concrete Barrels

For concrete barrels, the following items shall be reviewed at each inspection:

1. Wall condition – cracking, spalling, scaling, bulging, leaching and joint openings permitting backfill loss
2. Slab condition – cracking, spalling, scaling, leaching, and joint openings permitting loss of backfill
3. Floor condition (if applicable) – sediment depth, spalling, scaling, settlement and heaving

6.7.3 Metal Culverts

For metal culverts, the following items shall be reviewed at each inspection:

1. Corrosion – surface rust and section remaining of metal
2. Erosion – potential piping around the culvert
3. Distortion – unusual defections or alignment
4. Connections – loose or missing bolts, cracks, diminished section remaining, and joint openings permitting loss of backfill

6.7.4 Concrete or Stone Masonry Arches

For concrete or stone masonry arches, the following items shall be reviewed at each inspection:

1. Footings – scour, cracking, spalling, and pile exposure
2. Arches – spalling, scaling, leaching, exposed reinforcing, shifted blocks, mortar loss, and conditions at the springline
3. Wingwalls – wall tipping, settlement, loss of backfill, cracking, and concrete scaling
4. Fill – signs of settlement, sink holes, and pavement settlement

6.8 CHANNEL AND CHANNEL PROTECTION INSPECTION PROCEDURES

This section includes agency inspection procedures and methods for channels and channel protection.

6.8.1 Channels

Channels shall be inspected for the physical condition associated with the flow of water through the bridge, such as stream stability and the condition of the channel. The inspector shall be particularly concerned with visible signs of excessive water velocity, which may affect the undermining of slope protection, erosion of banks, and realignment of the stream. Accumulation of drift and debris on the superstructure and substructure shall be noted in the inspection report but shall not be included in the condition rating unless damage has occurred.

6.8.2 Channel Protection

Channel protection shall be inspected for the physical condition associated devise in place to protect the channel, such as riprap, slope protection or stream control devices. Revetment mats and other bed or slope armoring materials (riprap, crushed stone, geotextile, etc.) shall be reviewed at each inspection for signs of erosion, scour, or deterioration.

6.8.3 Cross Sections

During an inspection over a waterway, a cross section shall be performed. The elevation of the mudline must be determined and referenced to a known elevation on the bridge. Cross sections are performed during routine inspections, underwater inspections, and some other inspection types.

If a BITL recommends more frequent cross sections but does not recommend reducing the interval of already scheduled inspections, a special inspection may be scheduled to perform cross sections. Factors which may warrant more frequent channel surveys include bridge scour vulnerability and scour condition.

The stream bed profile shall be taken at each bent and at the middle of the stream in the approximate location of the thalweg. It will be necessary to take stream bed profiles at both the upstream and downstream fascia during an initial inspection and during subsequent inspections. This could be used in the future to determine if scour is occurring and if a re-evaluation of scour vulnerability is required by a hydraulic analysis. In some cases, the measurements can be taken with drop lines from the bridge deck. If stream flow is too swift for drop lines, the use of a fathometer or sonar depth finder may be required. The inspector may use a weighted tape to determine the depth to top of water and a depth finder to determine the mudline. The two dimensions can be combined to complete the cross section.

If any of the measurements are not able to be taken due to high water height, high water flow or some other reason, it should be noted which channel measurements were able to be obtained. The inspector shall either return to the bridge to complete the inspection within the month the inspection is due when water levels or flow lessen or request an underwater inspection.

If the distance from the water surface to the top of deck is more than 30 feet, the bridge is supported on pile foundations, and the bridge has an underwater inspection, a cross section is not required.

6.8.3.1 Historical Cross Sections

Historical cross sections may be available in the Bridge File.

Only the most recent cross section shall be added unless required by this section. Inspectors may choose to add additional cross sections, if desired. Historical data listed below shall be input into the cross section if any of the following criteria is met:

- SNBI Item B.C.09 (Channel Condition Rating) is 4 or less
- SNBI Item B.C.11 (Scour Condition Rating) is 4 or less

Historical data which shall be input includes the following:

- Foundation Bottom Elevation (i.e. Footing, Drilled Shaft, Pile Tip, if known)
- Critical Scour Elevations from Hydraulic Analysis (if available)
- Water Elevations from the minimum of the last five (5) inspections from the last ten (10) years
- Channel Bottom Elevations from the minimum of the last five (5) inspections from the last ten (10) years

If the inspector observes scour, they should review the overall scour development using the available information regardless of the SNBI Item B.C.09 or SNBI Item B.C.11. While inspectors only need to input data as required by this section if scour is observed at the bridge and the channel and/or scour are in poor or worse condition, the inspectors shall review all available information to determine if scour occurred beyond the minimum of the last five (5) inspections or from the last ten (10) years. If data showing that scour occurred beyond the minimum of the last five (5) inspections or from the last ten (10) years, inspectors shall continue to input reliable data until the inspection before the historical scour had occurred, if available.

6.9 UNDERWATER INSPECTIONS

The underwater bridge inspection shall includes a 100% Level I inspection and a 10% Level II inspection. It may also include additional Level II inspections and Level III inspections if necessary to determine the structural condition of the submerged substructure elements with certainty. Exact requirements for each bridge are included in the BSIPs for underwater inspections. Three diving inspection intensity levels are as follows:

- Level I: Visual, tactile inspection
- Level II: Detailed inspection with partial cleaning
- Level III: Highly detailed inspection with NDT or partially NDT

If footings are exposed, the corner of each exposed corner shall be noted. In addition to noting exposed footings, the underwater inspection report shall also note if the cofferdam seal coat or footing piles are exposed.

6.9.1 FHWA Level I Inspection

Level I intensity inspection consists of a close visual inspection at arm's length with minimal cleaning to remove

marine growth of the submerged portions of the bridge. This intensity level of inspection is used to confirm the continuity of the members and to detect any undermining or elements that may be exposed that would normally be buried. Although the Level I intensity inspection is referred to as a "swim-by" inspection, it needs to be detailed enough to detect obvious major damage or deterioration. A Level I intensity inspection is normally conducted over the total (100%) exterior surface of each underwater element, involving a visual and tactile inspection with limited probing of the substructure and adjacent streambed. In areas where light is minimal, handheld lights may be needed. If the water clarity is poor enough that the inspector cannot inspect the member visually, a tactile inspection may be performed by making a sweeping motion of the hands and arms to cover the entire substructure.

6.9.2 FHWA Level II Inspection

Level II intensity inspection is a detailed inspection that requires that portions of the structure be cleaned of marine or aquatic growth. Cleaning can be time consuming and needs to be restricted to critical areas of the structure. Generally, the critical areas include the list below:

- Near the low waterline,
- Near the mud line, and
- Midway between the low waterline and the mud line.

On pile structures, horizontal bands, approximately 6 to 12 inches in height, preferably 10 to 12 inches, need to be cleaned at designated locations:

- Rectangular piles - the cleaning includes at least three sides
- Octagonal piles - at least six sides
- Round piles - at least three-fourths of the perimeter
- H-piles - at least the outside faces of the flanges and one side of the web

On large elements, such as piers and abutments, clean areas at least 1 square foot in size at three or more levels on each face of the element. For a wide structural element that is greater than 50 feet in width, such as a culvert barrel or pier wall, clean an additional three levels on each exposed face. It is important to select the locations to clean to help minimize any potential damage to the structure and to target more critical locations. Measure and document any deficient areas, including both the extent and severity of the damage. It is intended to detect and identify high stress, damaged and deteriorated areas that may be hidden by surface growth.

Deterioration shall be noted and traced to termination or mudline. For all bridges receiving an underwater inspection, a FHWA Level II Inspection is required. This type of inspection shall occur to a minimum of 10% of underwater elements.

6.9.3 FHWA Level III Inspection

If a FHWA Level II Inspection does not permit a complete determination as to the safety and/or structural integrity of the bridge, then a FHWA Level III shall be initiated. A FHWA Level III Inspection consists of extensive cleaning, detailed measurements, material sampling and testing and NDT.

A FHWA Level III Inspection is a highly detailed inspection of a critical structure or structural element, or a member where extensive repair or possible replacement is contemplated. The purpose of this type of inspection is to detect hidden or interior damage, or loss in cross-sectional area, and to evaluate material homogeneity.

This level of inspection includes extensive cleaning, detailed measurements, and selected non-destructive and partially DT techniques such as ultrasonic testing, sample coring or boring, physical material sampling, and in-situ hardness testing. The use of testing techniques is generally limited to key structural areas, areas which are suspect, or areas which may be representative of the entire underwater structure.

6.9.4 Cross Sections During UW Inspection

When performing an underwater inspection, scouring can vary significantly from one end of a footing to the other. Therefore, multiple readings should be taken along the length of the footings to properly assess the bridge substructure. Particular attention should be given on spread footings where scouring or undermining can be more

critical. In addition, scouring and undermining should be carefully evaluated for deep foundations since these deficiencies can greatly affect the horizontal stability. This situation is especially of concern when scour has occurred on only one face of the substructure unit, causing asymmetrical horizontal loading of the substructure unit.

For channels, readings should also be considered for local extremes that may not otherwise be apparent when determining the waterway opening cross section, which is critical in completing the bridge scour assessment.

Measurements and locations where the stream bed profiles shall be taken during an underwater inspection are listed in Table 29. These soundings can be made with a continuous reading depth sounder or other sounding methods determined by the BITL. The method of sounding shall be included in the inspection report. The soundings shall be made on the upstream and downstream faces as parallel to the centerline of the structure as possible. The soundings shall be plotted along with the previous measurement (if available) and original groundline (if available). A common benchmark may be used by the underwater inspectors to determine distance from the structure to the waterline but waterline measurements must be taken from the waterline to the channel bottom.

Requirements for historical cross sections in Section 6.8.3.1 are still applicable for underwater inspections.

Table 29 - Measurements & Locations for Profile (Structure to Channel Bottom) (Underwater Inspection Only)

Span Length	Locations of Measurements
Greater than 75 feet	At every bent and at 1/4 points along span length
30 feet to 75 feet	At every bent and at 1/2 point along span length
Less than 30 feet	At every bent

6.9.5 Underwater Inspection Requirements for Timber Piles

The following procedures shall take place during underwater inspections and may take place during other inspections when exposed timber piles are subject to examination. This includes timber piles on low freeboard bridges were the piles cannot be inspected during a routine inspection.

- If evidence of sediment infill of scour around piles is present or the channel bottom is soft or uncompacted, excavate or probe around the base of timber piles a minimum of 6” to examine for hidden defect(s),
- Perform a FHWA Level II inspection on 50% of underwater timber pile elements,
- Sound each through bolt and perform a hands-on inspection of the bolt (if any),
- Sound the timber around each bolt (if any) (above, below and on each side of the bolt on each face of the pile) and,
- If the controlling defect on the pile is decay (Defect 1140) and if the decay is noted underwater, resistance drill or probe one (1) location on one timber pile on each bent for timber piles listed as CS3 or CS4 (FHWA Level III Inspection). If results are unexpected, drilling or probing may be warranted on a maximum of one (1) additional pile in that bent if additional piles on the bent exhibit underwater decay. Drilling or probing is to be completed at the discretion of the UW BITL as part of underwater inspections of timber piles.

6.10 STRUCTURE APPURTENANCES AND OTHER COMPONENTS INSPECTION PROCEDURES AND METHODS

6.10.1 Encroachments

Lights, signs, utilities and fences which are physically attached to bridge structures receive a limited review during inspections. For overhead signs which are physically attached to the bridge, only the connection to the structure shall be inspected. Navigation lights on bridges are often placed over navigable waterways. The operation of navigational lights must be checked during inspection. The presence of encroachments shall be documented in the inspection report.

6.10.2 Bridge Related Signage

6.10.2.1 Weight Limit or Posting Signs

The presence, visibility, and values of at-bridge and advance posting signs shall be noted during every inspection at a bridge. The BITL shall verify the posting signs used match the signs included on the most current, approved Posting Form in the Bridge File.

Non-SCDOT owned bridges which have a signed Posting Form in the Bridge File may have signs that deviate from the sign type on the Posting Form. Deviations are allowed for non-SCDOT owned bridges per the requirements below:

- The deviation is conservative and encompasses load rating results for all legal vehicles.
- The BMO has documented the deviation by adding it to a revised Posting Form.

Signs which deviate from the sign type on the Posting Form shall be coordinated with the owner or the district.

If posting values are higher than the values on the posting form or in the load rating summary form or the sign is missing, a Critical Finding shall be reported. Note that a signed Posting Form may be repealed by a signed Posting Rescission Form. Actions related to at-bridge and advance posting signs are included in Appendix D.

6.10.2.2 Asset ID Placard

An Asset ID placard shall appear on all bridges. If a bridge does not have an Asset ID posted or if it has an incorrect number posted, it shall be replaced. Placards shall be located at Abutment 1 (for bridges) or at Barrel 1 (for culverts) per direction from the BMO to assist with bridge orientation. To promote uniformity, the Asset ID placards should on the right side when looking upstation. Inspectors shall move incorrectly placed Asset ID placards. If consultants discover an Asset ID Number placard missing or if the placard has the incorrect number, the consultant shall recommend the placard be installed as a Priority C (or “C Flag”) .

6.10.2.3 Vertical Clearance Signs

The presence, visibility, and values of at-bridge and advance vertical clearance signs shall be noted during every routine inspection at a bridge, when required. The BITL shall verify the values on the signs used match the measured vertical clearance.

If the measured vertical clearance of 14.5’ or less and an at-bridge and advance vertical clearance sign is missing or illegible or sign has value over 14.5’, a Critical Finding shall be reported. Actions related to vertical clearance signs are included in Appendix D.

6.10.2.4 Other Signs

The presence and visibility of the following signs shall be noted during every routine inspection at a bridge.

- Bridge Pier or End Markers
- Guardrail End Treatments

6.10.3 Retaining Walls

Retaining walls are subject to inspection if the BITL suspects the retaining walls transfer loads from the superstructure to the foundation material. The BITL is encouraged to look for expansion joints or some other physical attribute which marks a separation point along the retaining wall. If existing bridge plans are available, the BITL may be able to determine the extent of retaining walls which must be inspected. Limits of retaining wall inspection shall be included in the inspection report to ensure consistency for future inspection.

CHAPTER 7 INSPECTION FOLLOW-UP ACTIONS

The purpose of this chapter is to:

- Provide consistent procedures for reporting and following up on bridge repair recommendations. FHWA has general reporting requirements related to critical findings.
- Highlight follow-up actions such as requests for a load rating, hydraulic analysis, or other inspections.

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 recommendations. The following sections outline the procedures to follow for various types of repair and maintenance needs.

This chapter is specifically written for inspections on both state and structures owned by others. Municipalities and counties are encouraged to also follow these guidelines but can tailor internal procedures to their specific organizational needs.

7.1 REPAIR RECOMMENDATIONS

7.1.1 Repair Recommendation Identification

The BITL shall assign a priority flag to any observed defects that require corrective action to maintain the bridge. Priority flag categorization is made based on the time frame in which the bridge owner should complete the recommended repair. Examples of recommended repairs and priority categorization are included in Appendix D.

Table 30 below notes the required time frame for work to be completed depending on the type of repair. Repair recommendations are only required on SCDOT owned bridges.

Inspectors are required to review previous repair recommendations prior to a bridge inspection. If a BITL has previously recommended repairs, another recommendation shall be submitted with an update date. If the flag type has escalated, the lower priority flag shall be closed and a new, higher priority flag shall be used.

Table 30 - Time Frame for Repair Recommendations

Flag Type	Timeline for Work Completion [T]
Priority A	30 Calendar Days [CF]
Priority B	90 Calendar Days [B&C]
Priority C	365 Calendar Days [B&C]

T = These timelines are a guideline.

CF = A “Priority A” flag alone shall not be used for any findings that are classified as Critical Findings. The Critical Findings must be reported per FHWA policy.

B&C = An inspection with “Priority B” flags and/or “Priority C” flags does have follow-up actions but is not considered an inspection with follow-up actions and require an expedited inspection report schedule.

7.1.1.1 Priority A Flags

There is some overlap with Critical Findings and Priority A Flags. A Critical Finding is considered a Priority A Flag, however, not all Priority A Flags are Critical Findings. Priority A Flag deficiencies should be addressed within 30 calendar days of being reported.

7.1.1.2 Priority B Flags

Maintenance is expected to address Priority B Flag deficiencies within 90 calendar days of being reported.

7.1.1.3 Priority C Flags

Maintenance is expected to address Priority C Flag deficiencies within 12 months of being reported. 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.

7.1.2 Post Repair Actions

The status of repair recommendations will be checked during the following inspection unless a maintenance inspection is needed. The DBE should inform the DBIS of a repair that would update bridge data. The maintenance inspection shall be conducted so that data can be updated in 3 months.

Owners of non-SCDOT owned bridges may notify the DBE that repairs have been completed. A maintenance inspection may be carried out, if the repair would update bridge data. The maintenance inspection should be conducted so that data can be updated in 3 months.

7.2 CRITICAL FINDINGS

7.2.1 Classification of Critical Findings

The NBIS 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 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
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. The initial classification of a Critical Finding shall be completed by the BITL who discovered the Critical Finding. The classification can change over the lifespan of a Critical Finding.

- Bridge Closure
- Lane or Shoulder Closure
- Structural Defect/Repair (Non-Closure)
- Structural in Load Rating (Non-Closure)
- Non-Structural/Safety (Non-Closure)

7.2.2 Discovery of Critical Findings

At any time during the observation of field conditions, someone may discover the need to notify the bridge owner of a Critical Finding.

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.

7.2.2.1 Field Observation

Field observation can be initiated from a variety of sources varying from inspectors, load rating engineers, hydraulic engineers, maintenance crews, or the general public. 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. Judgment must be used in determining whether to categorize a finding as critical.

Detailed examples and minimum requirements of what may be discovered in the field and what may warrant a Critical Finding are included in Appendix D. If a field condition changes to one of the Condition Ratings listed below, a Critical Finding shall be documented.

- Bridges which are given a condition evaluation rating code of 3 or less; this includes:

- SNBI Item B.C.01 (Deck Condition Rating)
- SNBI Item B.C.02 (Superstructure Condition Rating)
- SNBI Item B.C.03 (Substructure Condition Rating)
- SNBI Item B.C.04 (Culvert Condition Rating)
- SNBI Item B.C.14 (NSTM Inspection Condition Rating)
- SNBI Item B.C.15 (Underwater Inspection Condition Rating)

- Bridges which are given any waterway rating of 3 or less; this includes:
  - SNBI Item B.C.09 (Channel Condition Rating)
  - SNBI Item B.C.10 (Scour Condition Rating)

7.2.2.2 Completion of a Load Rating

If a load rating engineer completes the load rating and the resulting controlling legal load (Item B.LR.07) results in a load restriction of 6 tons or less, a Critical Finding shall be documented, unless the bridge is already posted for 17 tons or less. Existing posting signs which may be displaying restrictions of 6 tons or less shall not be used as a reason for submitting a new Critical Finding. FHWA has set 3 tons as the absolute minimum gross live load capacity for a bridge. Bridge closure is required for load ratings that result in less than 3 tons gross. If the load restriction is less than 3 tons, the bridge needs to be closed.

7.2.3 Documenting Critical Findings Initially

The BITL shall not wait to document the deficiency and shall immediately take action to protect the public. This may include regulating load ratings, posting bridge lane closure, bridge closure, etc.

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.

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.

7.2.4 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. The DBIS 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 as available.

7.2.5 Responsible Party for Documenting the Life Cycle of Critical Findings

The DBIS is the responsible party for documenting the Critical Finding. The DBIS shall ensure that the requirements of this section are followed for all Critical Findings. The BMO, DBE, or others may be involved as needed to assist the DBIS. The DBIS is ultimately responsible for maintaining documentation for the life cycle of a Critical Finding from notification to resolution.

7.2.6 Actions on Critical Findings

Some actions needed to address Critical Findings may require time before they are completed. Actions may include the completion of a load rating on an expedited schedule or additional inspections to monitor. District maintenance personnel may be 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 priority, the DBIS shall update the priority and status, if applicable, of the Critical Finding. The reason for a change in priority of status shall be included in the update.

7.2.6.1 Bridge Closure Procedure

If the structure is in imminent danger of collapse, the inspector shall close the bridge to traffic. The following is a review of the procedures expected of the BITL/DBIS when a bridge closure is recommended.

If the closure is considered the action to address a Critical Finding, the bridge shall be closed within 30 days of the discovery date.

1. The DBIS has the ultimate responsibility to determine if a bridge closure is needed. The DBIS shall make preliminary determination if the bridge shall remain closed, open with restrictions, or open without restrictions.
2. The BITL will first contact the DBIS with the closure recommendation.
3. The DBIS will then inform the DBE and recommend closing the bridge. 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.
4. The DBIS will then contact the BMO to inform them of the recommended closure.
5. The BITL shall update the inspection with an updated Load Posting Status and Posting Status Change Date. If needed, the BITL will request a load rating.
7. The BITL shall complete the draft Critical Finding documentation and submit it to the DBIS.
8. The DBIS shall approve of the draft Critical Finding and FHWA is notified of the Critical Finding within 24 hours.

If the decision is made to close the bridge, the DEA is responsible for the coordination of information being released to the necessary public, private officials, and local stakeholders upon the bridge closure. At least once a year, the DEA or district designee shall review his or her list of stakeholders which need to be informed about the change in structure status and update as necessary. This list of officials and parties who need to be informed shall be kept in the district office.

7.2.6.2 Load Ratings

A load rating may be required to determine the capacity of the bridge as part of the Critical Finding. If one is required, the DBIS or designee shall document that a load rating has been assigned related to the Critical Finding. Generally, preliminary results will be requested within 5 days of Critical Finding discovery, this duration may be shorter, if needed. The scheduling of the load rating cannot address a Critical Finding, but the load rating may prove that a Critical Finding is no longer needed and can resolve a Critical Finding.

7.2.6.3 Additional Inspections and Load Ratings

Additional information may be needed following the discovery of a Critical Finding. Additional inspections may include an underwater inspection or testing (as an in-depth inspection), including NDT or load testing to determine condition of bridge. Then, a load rating may be needed to determine structural capacity based on current condition. The scheduling of future inspections or load ratings alone is not considered an action that can address a Critical Finding.

7.2.6.4 Maintenance

Maintenance work may be required and the DBIS shall notify the district within 1 day of notification of the Critical Finding. The status of the maintenance actions, including planning, mobilization, execution, and completion of the work shall be documented by the DBIS or others as needed.

7.2.7 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.

Critical Finding notifications are sent to the BMO and district personnel for evaluation.

7.2.7.1 Addressed Critical Findings

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. An estimated date of when the Critical Finding will be addressed shall be reported with the Critical Finding.

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. Load restrictions can be used to address a Critical Finding (done by Critical Finding Postings) are temporary while additional actions are performed.

Some Critical Findings may skip the addressed status and become resolved without ever being addressed.

7.2.7.1.1 Critical Finding Posting

Per the LRGD, a bridge may be given a temporary 3-ton interim posting (termed a Critical Finding Posting) prior to a load rating being performed. This temporary posting is considered an acceptable method to address a Critical Finding as long as the posting would remove the immediate safety concern with the structure, but Critical Finding Postings cannot resolve a Critical Finding. A load rating request must be submitted within 24 hours and concurrent with the finding. BMO should review the load rating request and, if approved, distribute it to the assigned load rater within two business days. The expedited load rating, including QC Review, should be completed within 15 days of the inspection date. This load rating is to determine if the Critical Finding Posting reflects the bridge condition or is too conservative, and it must be completed as soon as possible to provide accurate posting values. If the load rating determines Critical Finding Posting values are conservative (lower), the district can elect to keep the values posted during the Critical Finding Posting and the Critical Finding can still be resolved. 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 and shall not be determined by the DBIS. See the LRGD for additional guidance.

An approved weight restriction that results in a 3-ton posting based on a calculated load rating is not considered a Critical Finding Posting and the Critical Finding can be resolved when signs are in place.

7.2.7.2 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 postings, 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.

The DBE and DBIS shall coordinate with each other, regularly monitor, and provide status updates on all Critical Findings. When the repairs are completed, a maintenance inspection shall be performed to verify the work has been completed. The inspection shall include updated bridge data, such as condition ratings, element condition, and photos.

7.2.7.2.1 Bridge Re-Opening Procedure

The DBE is responsible for opening bridges in their districts following a closure for repairs. The following process shall be used.

1. The DBE shall contact the DBIS and inform them of the target date when the bridge closure signs will be removed.
2. A maintenance inspection should be performed after repairs are complete and within 7 days of the bridge reopening.
3. The BITL for the maintenance inspection shall document reopening data and update Load Posting Status and Posting Status Change Date. In addition to the maintenance inspection, a load rating shall be considered and, if deemed needed, requested by the BITL and performed. The DBE may assist in the documentation process when a bridge is re-opened.

7.2.7.2.2 Resolved Critical Findings with a Load Rating

If the load rating related to a Critical Finding determines that the resulting controlling legal load (Item B.LR.07) results in a load restriction of more than 6 tons the Critical Finding may be resolved as long as the safety issue is deemed to be not present by the BITL and confirmed by the DBIS.

7.2.8 Review of Critical Findings on Non-SCDOT Owned Bridges

Bridge inspectors or load rating engineers may find a Critical Finding on a municipality/county owned bridge. The DBE shall be responsible for notifying the bridge owner.

Following the initial notification of the Critical Finding, the DBE or their designee shall follow up at the midpoint of the follow-up period (15 days) with the non-state owner to confirm whether the Critical Finding has been addressed; however, shorter follow up times may be needed based on the Critical Finding. The DBE or their designee may routinely check for any unaddressed Critical Findings on municipality/county owned bridges and shall document any updates, including correspondence with the bridge owner. The Critical Findings reminder and the notification of the failure to act shall be sent to the bridge owner by the DBE if needed. If the municipality or county fails to perform needed actions, SCDOT may be required to close the bridge to protect the traveling public.

7.2.9 Critical Findings Submittal

Every month, SCDOT will provide FHWA with a status report on all resolved, unresolved and addressed Critical Findings.

7.3 ADDITIONAL FOLLOW-UP ACTIONS

7.3.1 Request for Load Rating

All NBIS bridges shall have a load rating which reflects the current configuration and condition of the bridge.

If one does not exist in the Bridge File, the inspector is to request a load rating. If As-Let or incorrect plans were used during the current rating or if for another reason a load rating is needed, the BITL shall submit a load rating request as soon as possible, but no later than five (5) calendar days from the discovery warranting a rating during the inspector's desk review.

Inspectors should be aware of levels of deterioration which may warrant a rating or re-rating. A new load rating shall be requested for bridges for any of the following reasons:

- If SNBI Item B.C.02 (Superstructure Condition Rating), SNBI Item B.C.03 (Substructure Condition Rating) or SNBI Item B.C.04 (Culvert Condition Rating) is decreased from Good Condition (7) to Fair Condition (5) (i.e. a decrease of two (2)) since the last load rating was performed.
- If SNBI Item B.C.02 (Superstructure Condition Rating), SNBI Item B.C.03 (Substructure Condition Rating) or SNBI Item B.C.04 (Culvert Condition Rating) drops to Poor Condition (4) or Serious Condition (3).
- If SNBI Item B.C.03 (Substructure Condition Rating) on a bridge with timber piles drops to Fair Condition (5), Poor Condition (4) or Serious Condition (3).
- If a structural element has an increased quantity of Condition State 4, see Table 31.
- If the bridge is found to be supporting an increased dead load, such as a thicker overlay since the previous load rating.
- If a repair or rehabilitation has been completed that would potentially change the Component Condition Rating (CCR) of the bridge, change the capacity of a structural member, or change the load configuration on the bridge.
- If the BITL determines a load rating assessment/request is required.

The BITL shall complete the load rating request within five (5) calendar days of the last day of the inspection or five (5) calendar days from the discovery of the condition warranting a rating.

7.3.1.1 Load Ratings on Phased or Staged Construction Bridges

For bridges constructed with staged, phased, or partial-width construction, a load rating shall be requested at the completion of each phase or stage. This construction stage stipulation extends to existing structures that are being rehabilitated or replaced, requiring a load rating to be performed for any intermediate stages during which a partially demolished bridge will be open to traffic. All load ratings shall be completed within three months of the phase/stage being opened to traffic.

7.3.1.2 Timber Pile Load Ratings

The following criteria is used to determine when a timber pile load rating should be requested.

1. If SNBI Item B.C.03 (Substructure Condition Rating)on a bridge with timber piles drops to Fair Condition (5), Poor Condition (4) or Serious Condition (3).
2. Substructures shall be rated when there is deterioration, tipping, or damage present that is determined to be detrimental to the substructure's load carrying capabilities.
3. Piles should be rated if a significant amount of soil has been lost by scour or other means around the pile that could cause a buckling issue, if there is significant pile deterioration (decay or brooming of timber piles) that could affect their load carrying capability, or if loss of soil around the piles would preclude adequate geotechnical support of the piles for piles deriving their load in friction.

7.3.1.3 Evaluation (Load Rating) for Timber Decks

Timber decks shall be rated if there is deterioration or other structural issues present that would have an effect on the capacity of the timber deck or if the loading on the deck has changed such as an additional overlay.

7.3.1.4 Evaluation (Load Rating) for Pier Caps

Pier caps shall be rated if there is deterioration or other structural issues present that would have an effect on the capacity of the cap. Consideration shall also be given to the geometry present and its impact on the load rating.

7.3.1.5 Evaluation (Load Rating) for Structural Elements in Condition State 4 (CS4)

If a structural, non-deck element is discovered that meets the criteria for Condition State 4 (CS4), a load rating shall be requested. A Repair Recommendation or Critical Finding may also be submitted, if required.

Table 31 - Structural Non-Deck Elements (CS4 Quantity Requires Load Rating Request)

No.	Element Name	No.	Element Name	No.	Element Name
38	Reinforced Concrete Slab	147	Steel Main Cables	233	Prestressed Concrete Pier Cap
54	Timber Slab	148	Sec Steel Cables	234	Reinforced Concrete Pier Cap
65	Other Slab	161	Steel Pin	235	Timber Pier Cap
102	Steel Closed Box Girder	162	Steel Gusset Plate	236	Other Pier Cap
104	Prestressed Closed Box Girder	202	Steel Column	240	Steel Culvert
105	Reinforced Conc Closed Box Girder	203	Other Column	241	Reinforced Concrete Culvert
106	Other Closed Web/Box Girder	204	Prestressed Concrete Column	242	Timber Culvert
107	Steel Open Girder/Beam	205	Reinforced Concrete Column	243	Other Culvert
109	Prestressed Open Conc Girder/Beam	206	Timber Column	244	Masonry Culvert
110	Reinforced Conc Open Girder/Beam	207	Steel Tower	245	Prestressed Concrete Culvert
111	Timber Open Girder	208	Timber Trestle	810	Split Pier Cap (Steel)
112	Other Open Girder/Beam	210	Reinforced Concrete Pier Wall	811	Split Pier Cap (Renf. Concrete)
113	Steel Stringer	211	Other Pier Wall	812	Split Pier Cap (Timber)
115	Prestressed Concrete Stringer	212	Timber Pier Wall	813	Split Pier Cap (Other)
116	Reinforced Concrete Stringer	213	Masonry Pier Wall	870	Timber Pile Under Crutch
117	Timber Stringer	215	Reinforced Concrete Abutment*	872	Stubbed or Spliced Timber Pile
118	Other Stringer	216	Timber Abutment*	874	Wrapped Timber Pile
142	Other Arch	217	Masonry Abutment*	876	Rebar Repair Timber Pile
143	Prestressed Concrete Arch	218	Other Abutments*	877	FRP Repair Timber Pile
144	Reinforced Concrete Arch	219	Steel Abutment*	878	Structural Repair Timber Pile
145	Masonry Arch	220	Reinforced Conc Pile Cap/Footing	880	Temporary Support
146	Timber Arch	225	Steel Pile	881	Crutch Bent
152	Steel Floor Beam	226	Prestressed Concrete Pile	882	Crutch Beam
154	Prestressed Floor Beam	227	Reinforced Concrete Pile	883	Saddle
155	Reinforced Concrete Floor Beam	228	Timber Pile	** = If abutment elements are used only for lagging or retaining approach fill/embankments, they are not considered structural elements. A structural element must transmit vertical loads to the foundation, not only lateral loads.*	
156	Timber Floor Beam	229	Other Pile		
157	Other Floor Beam	231	Steel Pier Cap		

7.3.1.6 Discovery of a Load Rating Need during Inspection Review

If a QC or QA Review discovers that a BITL omitted the load rating request, a load rating request shall be requested by the BITL, and the load rating due date shall be 3 months from the inspection date. The BITL's omission shall be noted in the load rating request.

If comment resolution during a QC or QA Review leads to a reduction in the Component Condition Rating, Condition State, or other bridge data, and then a load rating would be required based on the relevant revisions, a load rating request shall be requested by the BITL, and the load rating due date shall be 3 months from the date the QC or QA comment was incorporated. A note regarding the circumstances around the need for the load rating shall be included in the load rating request to justify the extra time.

7.3.2 Request for Hydraulic Analysis

7.3.2.1 Request for Hydraulic Analysis for Scour Vulnerability (B.AP.03)

The BITL must be aware, able to recognize and document changes which are occurring in the channel upstream and downstream of the structure. These documented changes are to be used to determine if the request for re-evaluation

of SNBI Item B.AP.03 (Scour Vulnerability) is necessary. A request for re-evaluation of SNBI Item B.AP.03 shall be submitted for the following cases:

- When a structure over water has been replaced
- Substructure scour repairs performed and/or streambed scour countermeasures have been installed
- Significant changes have occurred which impact the stream bed or flow characteristics of the waterway
- Significant changes from assumptions which were part of the bridge's scour analysis or Plan of Action assumptions
- If the BITL determines a re-evaluation of Scour Vulnerability is required.

7.3.2.1.1 Stream Bed or Waterway Changes

The BITL shall compare channel condition and waterway changes to what was documented in past inspections. The loss of the stream bed material or change in flow characteristics may warrant the re-evaluation of Scour Vulnerability (B.AP.03) to ensure proper coding and structural stability.

The concerns mentioned below could require a BITL to request a re-evaluation of SNBI Item B.AP.03.

- Channel changing course
- Evidence of erosion or scour around footings and embankments
- Large amounts of debris around the substructure
- Evidence of rip rap or bank protection removed or altered
- Stream work performed by others which might change the hydraulic characteristics at the bridge

7.3.2.2 Request for Hydraulic Analysis for Overtopping Likelihood (B.AP.02)

A request for re-evaluation of SNBI Item B.AP.02 (Overtopping Likelihood) shall be submitted for the following cases:

- When a structure over water has been replaced when SNBI Item B.AP.02 is outdated.
- Evidence of overtopping/flooding found during any site visit to the bridge when SNBI Item B.AP.02 does not match the observations.

7.3.3 Request for Testing (In-Depth Inspection)

If an inspector believes that additional testing, beyond the typical testing and scope of an inspection, is required to determine accurate condition then an in-depth inspection should be requested.

7.3.3.1 Destructive Testing

DT can be used in evaluating bridge materials. This requires taking samples from the various bridge components. If A BITL wants to perform DT as part of an in-depth inspection, they shall request it for approval from the BMO and include a detailed scope and a justification.

If the DT requirement is specifically stated in the bridges' inspection procedure or in the consultant's scope of work, the detailed scope and a justification should indicate this.

7.3.3.2 Non-Destructive Testing (NDT)

NDT can be used to augment visual inspection by highlighting or defining the extent of the defect. Some BSIPs may require NDT. Since most types of NDT require special equipment and detailed instructions to perform the various tests and correctly interpret the results, it is essential to have the NDT performed and interpreted by qualified personnel.

The BITL should request an in-depth inspection to coordinate NDT. The BITL performing the testing is responsible for adding the testing to the BSIP for the bridge. Similarly, they are responsible for any testing included in a BSIP that requires removal or revision. NDT may include any of the tests included in Table 32 to be performed as an in-depth inspection.

Table 32 - Types of Specialty Testing

Steel	Concrete	Other Materials
Radiographic	Impact Echo	Stress Wave
Eddy Current	GPR	Vibration
Acoustic Emissions	Infrared Thermal	Underwater Imaging
	Rebound/Penetrometer	Borings/Corings[1]
	Electromagnetic Methods	Sonic Testing
	Pachometer	Timber Moisture Content

1 – Not including timber resistance drilling already performed inspection scope for routine, underwater, and other inspections.

7.3.3.3 Load Testing

Coordinate with the BMO for the need for load testing in accordance with the MBE and LRGD. Load testing should be requested as an in-depth inspection with detailed scope and a justification.

7.3.4 Request for Other Inspections

If an inspector believes that other inspections are required for a bridge, they shall be requested and scheduled by the BITL as soon as practical after the need is discovered. Typical inspections that may need to be requested would be special or underwater based on the requirements of Chapter 4.

CHAPTER 8 BRIDGE INSPECTION QUALITY CONTROL/QUALITY ASSURANCE

8.1 INTRODUCTION

The focus of the QC/QA program is to provide independent reviews to minimize the inconsistencies in the data collected. The information gathered from this program will be used to improve the final quality of the data and reports available to manage the bridge inventory.

The QC/QA program seeks to establish and define quality in terms of measurable variations from established procedures, practices, and requirements. The objectives of the QC/QA program are:

- Establish and monitor the qualifications of the personnel involved,
- Generate a greater consistency of the data collected,
- Standardize the documentation and prioritization of inspection findings,
- Identify unclear or misleading information in the guides and manuals, and
- Increase communication between all consultants, SCDOT districts and SCDOT HQ.

This QC/QA program is meant to establish procedures and practices which are practical, pertinent to the statewide bridge management program, and to improve the quality of the bridge inspection program.

Prior to the formalized QC/QA process, everyone involved in the bridge inspection program shall make efforts to perform quality work and produce accurate reports. Quality is the responsibility of every person involved in the daily activities of the bridge inspection program. Quality begins with proper preparation including scheduling, pre-visit reviews, and equipment checks before bridge visit. Ahead of some inspections, as an effort to improve quality, the BITL may review and discuss the upcoming work. This may include bridges that will require procedures, special equipment, safety concerns, or additional time.

8.2 QUALITY CONTROL (QC)

QC procedures help to ensure public safety is maintained at each bridge, Bridge Files are complete and accurate, and the documentation of these daily activities is maintained. QC is the enforcement of procedures which are intended to maintain the caliber of bridge inspection and documentation at or above the NBIS and SCDOT requirements. Effective QC procedures will increase the statewide uniformity of inspection and recording methods and will ensure quality reports.

8.2.1 Inspection Team Qualification

BITLs shall confirm the following are recorded prior to their field work and are maintained as staff continue to work on SCDOT inspections. The DBIS and Consultant PMs are responsible for making sure their staff maintain accurate records.

- Years and types of bridge inspection experience
- Record of any training completed
- Certifications for bridge inspectors

8.2.1.1 Years and Types of Experience

The inspector is responsible for maintaining an updated log of the number of years in which they have experience in bridge inspection and the type of experience gained.

8.2.1.2 Certifications and Registration

The inspector is responsible for keeping copies of required certifications.

8.2.2 General Quality Control (QC) Procedures

QC shall be performed to review inspection reports and validate data. The reviewer who performs the QC review is considered the Quality Control Reviewer (QCR). The QCR shall have the required qualifications for the inspection type.

QC oversight is typically assigned to the DBIS. In the event the DBIS is not able to complete this review or if the DBIS was serving as the BITL, the SBIS or their designee shall serve as the QCR. A subordinate of any BITL cannot complete the review.

The QCR shall review each inspection report for completeness and conformity to the NBIS requirements. The QC review is not limited to the items listed below. Special attention shall be paid to the following points:

- Summary and/or repair recommendations given to assess the overall condition of the bridge,
- Consistency occurs between inspection data, photographs, sketches, notes,
- Review all information has been correctly entered in accordance with the NBIS, the Specification for the National Bridge Inventory, and the BIGD criteria. This review will include, but not be limited to, a check of proper coding conventions, format, significant digits, and correct units have been used,
- Condition Rating coding:
    - Each item should be compared to the previous report for consistency.
    - CCRs should be consistent with element level condition states and defects.
    - Special attention should be given to CCRs rated at 5 or less.
- Element level data should be reviewed for accuracy, including elements, quantities, and condition states with emphasis on Condition State 3 and Condition State 4 quantities and notes.
- Review inclusion of posting signs and clearance signs,
- Verify information between the current inspection report and previous inspection reports, as well as the underwater inspection report, hydraulic analysis, and/or load rating documentation and request applicable follow-up actions, if needed,
- For initial inspections:
    - A check of the inventory data against the construction plans to ensure the data is consistent.
    - A set of inventory photos has been taken and included in the report.
- Completeness of NSTMs, FPDs, and complex feature documentation and procedures, if applicable

The QCR will return the reports when necessary for revision and discuss program-wide or common issues with the BMQE or QA Consultant. All QC comments shall be logged. The BITL is directly responsible for the accuracy of all data in the inspection report. Any significant or pertinent items may be discussed at the next Annual QA Meeting for the benefit of all inspectors.

8.2.3 SCDOT QC Procedures

8.2.3.1 Field Review (SCDOT Only)

8.2.3.1.1 Scope and Documentation for Field Reviews

The DBIS will perform a formal field review of each BITL at least once per calendar year.

This evaluation shall document the arrival time, set-up time, preparations made for equipment, safety conformance, access methods and the quality and thoroughness of each inspection team's activities. It should also note whether or not safety equipment was properly used, whether appropriate access methods were used and an evaluation of whether the inspection served its desired purpose.

During a field review, the reviewer shall complete the Field Review Quality Form. This quality form is meant to assist the reviewer in the field review but may not cover all noteworthy items that a reviewer may find.

The completed Field Review Quality Form shall be released by the reviewer to the BITL being reviewed and BMQE with the quality form.

If a field review results in an unsatisfactory review of the inspection performed by the BITL, then the reviewer shall notify the BIPM, BMQE, SBIS, and BITL of the result of the field evaluation. The subject BITL shall then address the comments for the unsatisfactory review and shall send them to the SBIS and BMQE. The BITL shall be given temporary BITL status and be reviewed again in three months.

The BMQE or a designee may, at any time, perform an additional field review of a BITL using a similar process as described herein.

8.2.3.1.2 Planning for Field Reviews

The DBIS shall decide when the field review shall take place. Each review will occur at a different bridge from all previous reviews. While the DBIS may be present during many inspections, this formal field review is a structured, quality review. If the DBIS is serving as a BITL throughout the course of the year, the SBIS or their designee shall perform a field review on the DBIS at least once per calendar year. The SBIS is responsible for coordinating this effort.

BITLs subject to a field review are any SCDOT inspectors who have served as BITLs on at least one NBIS reportable inspection in that calendar year or any inspector who performed as a QC Reviewer on at least one NBIS reportable inspection in that calendar year. The annual requirement for field reviews is applicable for a BITL who is certified for the entire 12 months of the year or if the BITL is certified before August 1. If a BITL is certified after August 1, they are exempt from this field review process for that calendar year. If a BITL retires or leaves the position during the calendar year, they are exempt from the requirement to be subject to a field review. If a BITL had stopped performing inspections in a previous calendar year and they have no field reviews in their inspection history for the following year, the BIPM or their designee may grant temporary BITL status for 3 months. However, a field review on the subject BITL must occur within the trial period to be certified for the rest of the calendar year.

8.2.3.2 Independent Inspection (SCDOT Only)

8.2.3.2.1 Scope and Documentation for Independent Inspections

The independent review will require the reviewer to visit the bridge site to compare conditions and perform another inspection of the bridge. The previously complete inspection report, which is reviewed prior to the start of the independent inspection, is compared to the actual field conditions, and discrepancies (if any) are noted for discussion with the original BITL. Changes, revisions or updates to previously completed inspection reports shall be performed with a data update inspection.

This procedure shall be used to form the basis of an inspection report evaluation. The report shall list the structure type, team and comparisons of the previous and current data in the inspection report. This procedure shall be undertaken in the field. Also, the report should address the documentation provided by the inspection team with a particular emphasis on sketches, photographs and detailed explanations. Conclusions shall be checked to verify they are logically stated and correct, and they were independently checked by the reviewer. Finally, an overall evaluation shall be given of the inspection report.

During and after the independent inspection, the reviewer shall complete the Independent Inspection Check Form. This quality form is meant to assist the reviewer in the independent inspection but is not all-inclusive.

The completed Independent Inspection Check Form shall be released by the reviewer to the BITL being reviewed, the BIPM and BMQE. This form shall be released within 30 calendar days from the date of the independent inspection.

If an independent inspection results in an unsatisfactory review of the actual inspection report produced by the BITL, then the reviewer shall notify (via email) the BIPM, BMQE, DME and the BITL of the result of the field evaluation.

Any significant or pertinent items shall be discussed at the next Annual QA Meeting.

8.2.3.2.2 Planning for Independent Inspections for SCDOT Inspectors

For every SCDOT BITL actively performing inspections, his or her work shall be reviewed once per calendar year by the use of an independent inspection. For BITLs working under a DBIS, the DBIS shall elect an inspection report

which has been completed in the last three months for review. For the DBISs who are serving as BITLs, the supervisor of the DBIS or their designee shall perform his/her independent inspection review. A subordinate cannot complete the review.

If a BITL is certified after August 1, they are exempt from this independent inspection process for that calendar year. If a BITL retires or leaves the position during the calendar year, they are exempt from the requirement to be subject to an independent inspection. If a BITL stopped performing inspections in a previous calendar year and they have no independent inspection in their inspection history for the following year, the BIPM or their designee may grant temporary BITL status but an independent inspection on the subject BITL must occur within three (3) months of their first completed routine inspection.

8.2.3.3 Inspection Quality Summary Form (SCDOT Only)

SCDOT inspectors are responsible for maintaining documentation to summarize their field reviews and independent inspections. Inspector information and a summary of the field review and independent inspections are to be included on the Inspection Quality Summary Form (IQSF). The IQSF will be updated annually by each BITL for certification to perform inspections for next calendar year.

8.2.3.4 District Quality Meetings (SCDOT Only)

The DBIS shall conduct quarterly quality meetings (four per year) with the bridge inspection staff in their district. These meetings will be used to help ensure consistency in the bridge inspection program, provide training, and keep the staff updated on current inspection activities. These quarterly quality meetings will recap ongoing QC efforts including field reviews, field QC checks, QC checking of inspection reports and maintaining inspection equipment in their inventory.

The District Quality Meeting Form includes a meeting sign-in sheet, a list of required topics and the checklist of required equipment. This form shall be added to the Bridge File and sent by the DBIS to the SBIS and BMQE within 30 calendar days of the meeting.

8.2.4 Consultant QC Procedures

8.2.4.1 Planning for Independent Inspection (Consultant Inspectors)

While staff from SCDOT may visit consultant field inspections, a structured field observation of the consultant is not required. Every prime consultant firm shall be evaluated with an independent inspection once a calendar year by the BMQE or designee. The BMQE may designate another consultant to perform the independent inspection. The BMQE shall share the results of the independent inspection with the BIPM and the Consultant PM. Independent inspections performed shall be included in the Consultant Quality Control (QC) Plan and summarized in a table in the QC Plan.

8.2.4.2 Review of Consultant Inspection Reports

QC for inspection reports has been assigned to the consultant performing the inspection. The inspection reports submitted by consultants may be reviewed for completeness, conformance to SCDOT standards, and presence of proper endorsements by the BMQE or designee.

The BMQE or designee may review reports of repeated problems and meet with appropriate staff to remedy the problems. In the event of consistent issues with consultant reports, the BIPM or the BMQE may request a meeting with the consultant to discuss. This meeting must be attended by the consultant's PM for the inspection work

8.2.4.3 Consultant Quality Control (QC) Plan

The BMQE or designee shall verify the consultant has a written QC Plan and may periodically audit or check QC processes are followed and documented. Verification of a written QC Plan shall be completed with the Consultant QC Plan Review Checklist. The consultant shall submit a QC Plan which contains:

- An outline how the consultant shall state the work complies with applicable documents.
- QC procedures which are SCDOT specific.
- A list of personnel responsible for management involved in their bridge inspection program with their role defined.

- Processes how the consultant will monitor quality and deal with failing procedures and work.
- Processes to maintain the required inspection equipment listed in Chapter 5 for both topside and underwater inspections.

The initial plan shall be submitted to SCDOT prior to each calendar year. The plan shall be updated as requested. An updated QC Plan shall be submitted by the Consultant in December of each calendar year the consultant is performing inspections.

8.3 QUALITY ASSURANCE (QA)

QA is a measurement of the level and consistency of the overall program. The objective of QA activities is not to identify and correct deficiencies within a specific inspection report or bridge folder, but rather to monitor and modify as necessary the statewide bridge inspection program requirements to ensure the overall quality levels are maintained.

8.3.1 QA Roles and Responsibilities

QA shall be an independent function which is primarily executed by the BMQE. This BMQE or designee will serve as the QA Reviewer (QAR). The BMQE may designate consultants to assist with the QA review of inspection reports and other tasks related to QA.

8.3.2 Quality Assurance for Inspection Reports

Characteristics of comprehensive QA programs also include provisions for corrective actions and mechanisms for continual improvement. Corrective actions directed at the source of the variability, inconsistency, or misunderstanding will raise the level of quality throughout the bridge inspection program. Corrective actions may be very specific, such as changing the description or definition of an inspection term to provide clarity, or more general such as changes in personnel descriptions and qualifications.

Characteristics of the yearly QA may change from year to year depending on general inspection results, observed problems, inconsistencies in reporting, or the desire to monitor new or critical evaluation items.

8.3.3 Quality Assurance Review Procedure

Using various priority categories, a selection of inspection reports is selected for QA review. The categories, in order of priority, include but may not be limited to:

1. Bridges with a Poor (or worse) SNBI Item B.C.12 (Bridge Condition Classification).
2. Bridges with Poor (or worse) SNBI Item B.C.11 (Scour Condition Rating).
3. Bridges where an NSTM Inspection is being performed.
4. Bridges which carry a highway feature on the National Highway System (NHS).
5. Bridges with SNBI Item B.AP.03 (Scour Vulnerability) ‘C’ or ‘D’ or Bridges with an Unknown Foundation.
6. Bridges with at least one span 125’ or more (SNBI Item B.G.03) or 25 or more spans (SNBI Item B.SP.02).
7. Bridges with Complex Features.
8. All Remaining Bridges.

For each category, QA review shall be performed on 10% of the inspection reports submitted each month. The QAR shall review the previously completed QC review. The QAR will review the report to verify consistency in bridge inspection operations across the bridge inspection process.

8.3.4 Annual Quality Assurance Meeting

Each year, the BMO shall schedule a QA meeting to review quality topics, as determined by the BMO.

The agenda for the Annual QA Meeting shall be set by the BIPM. The purpose of the meeting shall be to discuss issues and items from past inspections so all parties can be aware of them for future inspections. This meeting is meant to be used as an effective collaboration opportunity to confirm uniformity across districts. This meeting shall

review any Technical Notes released in the year. Meeting notes or presentations should be shared with all attendees.

8.4 PARTICIPATION IN FHWA AUDITS AND REVIEWS

All members of the bridge inspection program in South Carolina are reminded at any time that the FHWA may perform audits of the state's bridge inspection program. At least once annually, FHWA conducts a review of the state's bridge inspection program. All members must be cooperative with these audits and reviews.